Final Preliminary Assessment/Site Inspection Report

Additional and Uncharacterized Sites Operable Unit
Crab Orchard National Wildlife Refuge NPL Site
Marion, Illinois (Williamson County)

June 2003

This Final PA/SI Report is identical to the "Draft-Final" Report issued in September 2001.

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ACRONYM LIST
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ACRONYM	DEFINITION
$3S_b$	Mean plus three standard deviations
A.N.	Ammonium Nitrate
ARAR	Applicable, Relevant and Appropriate Requirements
AOC	Area of Concern
AST	Aboveground Storage Tank
ASTER	Assessment Tools for the Management of Risk (USEPA database)
AUS OU	Additional Uncharacterized Sites Operable Unit
BGS	Below Ground Surface
BNA	Base-Neutral Acids
BOD	Biological Oxygen Demand
BOR	U.S. Bureau of Reclamation
BRA	Baseline Risk Assessment
BTAG	Biological Technical Assistance Group
BTOC	Below Top of Casing
BWT	Below Water Table
CCME	Canadian Council of Ministers of the Environment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act of 1980 (a.k.a. Superfund)
CIA	Central Intelligence Agency
CIPS	Central Illinois Public Service
CLP	Contract Laboratory Program
CM/SEC	Centimeters per Second
COC	Chain-of-Custody
COC	Chemical of Concern
COC	Crab Orchard Cemetery
COI	Chemical of Interest
COL	Crab Orchard Lake
CONWR	Crab Orchard National Wildlife Refuge
COP	Crab Orchard Pond
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CSC	Commercial Solvents Corporation
CSEQGs	Canadian Sediment Quality Guidelines
CSOQGs	Canadian Soil Quality Guidelines
CTI	Central Technologies Incorporated
CVOC	Chlorinated Volatile Organic Compounds
CWQG	Canadian Water Quality Guidelines
DAF	Dilution Attenuation Factor
DEHP	bis(2-ethylhexyl)phthalate
DERP	Defense Environmental Restoration Program
DGOLs	New Dutchlist Groundwater Optimum Levels
DNT	Dinitrotoluene
DOD	Department of Defense
DOI	U.S. Department of the Interior

ACRONYM LIST
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ACRONYM	DEFINITION
DQCR	Daily Quality Control Reports
DQO	Data Quality Objective
DRO	Diesel Range Organics
DSOLs	New Dutchlist Soil Optimum Levels
DTW	Depth to water
DU	Depleted Uranium
EMMA OU	Explosives and Munitions Manufacturing Area Operable Unit
EPA	U.S. Environmental Protection Agency
EqP	Equilibrium Partitioning
ERL	Effects-Range Low
ERM	Effects-Range Medium
ESV	Ecological Screening Value
FDAP	Field Director of Ammunition Plants
FFA	Federal Facility Agreement
FID	Flame Ionization Detector
FOIA	Freedom of Information Act
FNH	Flashless Non-hydroscopic Powder
FS	Feasibility Study
FSP	Field Sampling Plan
FT	feet or foot
FWS	U.S. Fish and Wildlife Service
GPS	Global Positioning System
GRO	Gasoline Range Organics
GSA	General Services Administration
GW	Ground Water
HBX	High Blast Explosives
HE	High Explosives
HEDP	High Explosive Detonation Product
HEI	High Explosives Igniter
HMX	Her Majesty's Explosive (Cyclotetramethylenetetranitramine)
HQ	Hazard Quotient
HSA	Hollow Stem Auger
HSP	Health and Safety Plan
IAC	Illinois Administrative Code
IDW	Investigation Derived Waste
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
IOP	Illinois Ordnance Plant
K_{ow}	Octanol-to-Water Partitioning Coefficient
LAW	Light Antitank Weapon
LOEC	Lowest Observed Effects Concentration
MAOU	Metals Area Operable Unit
MATC	Maximum Acceptable Toxicant Concentration

ACRONYM LIST
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ACRONYM	DEFINITION
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MG/KG	milligrams per kilogram
MG/L	milligrams per liter
MHSPE	Ministry of Housing, Spatial Planning, and the Environment
MISCA OU	Miscellaneous Areas Operable Unit
MM	millimeter
MOCA	4,4' - Methylenebis (2-chloroaniline)
MSDS	Material Safety Data Sheets
MSL	Mean Sea Level
MW	Monitoring Well
NA	Not analyzed
NA	Not applicable
NAPL	Non-aqueous Phase Liquid
NEC	No Effect Concentration
NCP	National Contingency Plan
ND	Not detected
NG	Nitroglycerin
NG/KG	Nanograms per kilogram
NOAA	National Oceanic and Atmospheric Administration
NaOH	Caustic Soda
NOEC	No-observed-effect concentration
NPL	National Priorities List
OD	Outside Diameter
OE	Ordnance and Explosives
OEW	Ordnance and Explosive Waste
OFDAP	Ordnance Field Director of Ammunition Plants
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbons
PA/SI	Preliminary Assessment/Site Investigation
PBX	Plastic Bonded Explosives
PCB	Poly-chlorinated Biphenyl
PCB OU	PCB Operable Unit
PCE	Tetrachloroethylene
PEC	Probable Effect Concentration
PEL	Probable Effect Level
PETN	Pentaerythritol Tetranitrate
PID	Photo Ionization Detector
PLC	Preliminary Levels of Concern
PM	Project Manager
PPB	Parts Per Billion
PPE	Personnel Protection Equipment

ACRONYM LIST
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ACRONYM	DEFINITION
PPM	Parts Per Million
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
R&D	Research & Development
RAGS	Risk Assessment Guidance for Superfund (USEPA document)
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive (Cyclonite)
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RL	Reporting Limit
ROD	Record of Decision
RR	Railroad
RRTC	Railroad Tank Car
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act (1986)
SI	Site Investigation
SIU	Southern Illinois University
SMCL	Secondary Maximum Contaminant Level
SMDP	Scientific Management Decision Point
SOP	Standard Operating Procedure
SPO	Solid Propellant Operations
SSLs	Soil Screening Levels (USEPA)
SVOC	Semi-volatile Organic Compound
SWDC	Sherwin Williams Defense Corporation
TACO	Tiered Approach to Corrective Action Objectives
TAL	Target Analyte List
TBD	To Be Determined
TCDD	Tetrachlorodibenzo-p-Dioxin
TCE	Trichloroethylene
TCL	Target Compound List
TDS	Total Dissolved Solids
TEC	Threshold Effect Concentration
TEL	Threshold Effect Level
TEQ	Toxicity Equivalent for Dioxins/Furans
TNT	Trinitrotoluene
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
TRV	Toxicity Reference Value

ACRONYM LIST
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ACRONYM	DEFINITION
TSS	Total Suspended Solids
UET	Upper Effect Threshold
UG/KG	micrograms per kilogram
UG/L	micrograms per liter
UMC	Universal Match Corporation
USACE	U.S. Army Corp of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
ECOTOX	Ecological Toxicity Database
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VJ Day	Victory over Japan day (August 15, 1945)
VOCs	Volatile Organic Compounds
WAA	War Assets Administration
WSA	West Shop Area
WWII	World War II
WWTP	Wastewater Treatment Plant

The first few pages of this section describe Areas 11 and 12 as a whole. These areas are addressed together because they were part of a single, large post-World War II industrial facility which included former Illinois Ordnance Plant (IOP) facilities in Areas 11 and 12 and the land between the two areas that was developed by later industrial tenants. The enlarged Areas 11 and 12, which are now contiguous, are located south of Ogden Road and west of Route 148, on the south side of Crab Orchard Lake.

The original Area 11 is the site of the former IOP Group II Load Line; the original Area 12 is the site of the former IOP Ammonium Nitrate (AN) Plant. During the IOP era, shells were loaded with TNT and ammonium nitrate in Load Line II. At the end of World War II, the War Department retained a small portion of Area 12 (49.76 acres) for the production of fertilizer grade ammonium nitrate. Silas Mason Company, under contract with the War Department, operated this Ammonium Nitrate Plant from 1946 to early 1950. In May 1950, after ammonium nitrate production had ceased, the Army transferred this area to the U.S. Fish & Wildlife Service (USFWS) which accepted it as part of the Refuge.

Beginning in 1956, Areas 11 and 12 were leased by Olin (then the Olin Mathieson Chemical Company) which used these areas for manufacturing industrial (non-military) explosives. During its tenure, Olin developed hundreds of acres of previously undeveloped land between the Group II Load Line and the AN plant, which it used for production of industrial blasting explosives and nitroglycerin and for underwater storage of explosive powder. In 1964, Olin sold this portion of its business to Commercial Solvents Corporation[1] (CSC), which began phasing out production in 1971. CSC ended all production by 1982. In the 1970s and early 1980s, CSC and its successor, International Minerals and Chemical Corporation (IMC), decontaminated (burned) significant quantities of unused explosives stored at its facility. The remaining structures in the enlarged Areas 11 and 12 were demolished by the USFWS in the early 1990s. Since that time, the area, which covers over 600 acres, including buffer zones, is being allowed to return to a natural state.

SUBDIVISION OF AREAS 11 AND 12

Because of its size and the variety of past industrial activities, Area 11 was subdivided into five sites for the purposes of this report. The boundaries of these five sites are based on industrial use by Olin/CSC, as follows:

Area 11A—acid and ammonium nitrate manufacturing (Site AUS-A11A).

Area 11H—high explosives manufacturing (Site AUS-A11H).

Area 11N—nitroglycerin manufacturing (Site AUS-A11N).

[1] Commercial Solvents Corporation (CSC) was acquired by International Minerals and Chemical Corporation (IMC) in 1975 and changed its name, first to IMC Chemical Group, Inc. (IMC) and later to IMCERA Group, Inc. (IMCERA). In 1994, IMCERA changed its name to Mallinckrodt Group, Inc.; in 1996, the name was changed to Mallinckrodt, Inc. In this report, "CSC" is generally used to refer to the original company, its successors and its divisions, including U.S. Powder Company (U.S. Powder) and Trojan Powder Company (Trojan).

Area 11P—propellant manufacturing (Olin), explosive cap manufacturing (CSC) (Site AUS-A11P).

Area 11S—support area for explosives manufacturing (Site AUS-A11S).

These five sites are addressed in Sections 15 through 19, respectively. Area 12 (AUS-0A12) was used for burning scrap explosives and other waste material by both Olin and CSC. It was also used by CSC for manufacturing Royal Demolition Explosive (RDX). Area 12 is addressed in Section 20 of this report.

Locations of these sites are shown in Figure 15-1.

IOP ERA

The outline of the 31-building Load Line II complex is visible on Figure 15-1; Figure 15-2 is a detailed map with building numbers. Load Line II was designed and built for loading 105 or 155mm shells, but was also used to load other ordnance products.[2] The Sherwin Williams Defense Corporation, under contract with the War Department (SWDC/War Department), operated the IOP from August 1942 through September 1945.

Due to a shortage of trinitrotoluene (TNT) during the first year of production, shells were filled with amatol, a TNT substitute that was a mixture of TNT and ammonium nitrate. After that, TNT was widely available and was primarily used alone.[3,4]

TNT was not manufactured at the site. It was delivered by rail, then melted and poured into shell casings at the IOP.[5]

Empty shells were brought in and stored in Buildings II-1-1 and II-1-2. The shells were cleaned and painted in Building II-1-3, loaded with melted amatol or TNT in Building II-1-6, and cooled in Building II-1-12. The ordnance products were then drilled out so that boosters could be placed inside. Finally the shells were loaded on rail cars and shipped off site. Rail lines paralleled Load Line II on the south side of the load line.

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[2] From the time that Load Line II began operations on August 24, 1942 through April 1, 1943, the following shells were produced: Shells, Semi-fired, HE [High Explosive], M1W/P[M1 White Phosphorus], M48A1, 105mm Howitzer, M2 and M2A1. On April 1, 1943, Load Line II was converted to produce the following 500-pound (lb) bombs: 500-lb General Purpose [G.P.] Bombs, AN-M64 [Ammonium Nitrate-M64]). Sometime later, the following mines were manufactured: Mines, AT [Anti-Tank], High Explosive, M1A1. This line was later reconverted for the manufacture of 105mm shells. References: NAR 000042. Illinois Ordnance Plant, Illinois Ordnance Plant Historical Record, August 18, 1941 through December 31, 1942, Page 37. NAR 000128. Illinois Ordnance Plant, Illinois Ordnance Plant Historical Record, January 1, 1943 through March 31, 1943, Appendix E. U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 2, Section 1, Page 3. NAR 000559. Illinois Ordnance Plant, Illinois Ordnance Plant Historical Record, April 1, 1944 through June 1, 1944, Page 15.

[3] Interview with Mr. Kermit Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin Williams Company, Illinois Ordnance Plant, Pages B-1 through B-5.

[4] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 2-14 and 2-15.

[5] DPRA Document No. 00010780. US Army Toxic and Hazardous Materials Agency, 1980, Archive Search Report for the Former (Crab Orchard) Illinois Ordnance Plant, Marion Illinois, Report No. A008, Page 1.

In 1944, 40,000 amatol-loaded shells were emptied so that they could be refilled with TNT. To accomplish this, "steam-out" facilities were developed for Load Line II. The steam was used to melt the amatol so that it could be poured out of the shells. Records do not indicate how the steamed-out amatol was disposed of.[6]

All IOP production at Load Line II ended on V-J Day, September 2, 1945.[7]

IOP Decontamination

After IOP operations ended, the plant was to be decontaminated in accordance with standard Army procedures. See Section 3.1.2.3 of this report for a discussion of these procedures. Post-World War II military records are insufficient to determine if Load Line II was decontaminated and, if so, whether the decontamination instructions were followed.

Leftover bombs and shells were shipped off site, as confirmed by Mr. Virgil Hollis, a former SWDC employee. Mr. Hollis said that remaining anti-tank landmines were detonated in pits.[8]

OLIN ERA

According to Olin's 1956 lease, the manufacturing or production processes allowed on the property included "explosives and related products and chemicals, acids, ammonium nitrates, nitrocellulose, strontium nitrates, and/or other materials necessary or useful in the manufacture or production of explosives or related products."[9]

COMMERCIAL SOLVENTS CORPORATION ERA

In 1963, Olin sold its industrial explosives business, which included its entire Area 11/12 operation, to CSC, who moved into the area in 1964.[10,11] CSC and its successors leased this area from 1964 to 1982. The facility was apparently operated primarily by U.S. Powder/Trojan,[12] which were divisions of CSC.

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[6] NAR 000559. Illinois Ordnance Plant, Illinois Ordnance Plant Historical Record, April 1, 1944 through June 1, 1944, Page 15.

[7] NAR 000691. War Department, Illinois Ordnance Plant memorandum, dated October 30, 1945, regarding Quarterly History Illinois Ordnance Plant for Period 1 July 1945 to 30 September 1945.

[8] ACO 000128. Interview with Mr. Virgil Hollis as found in Appendix H, Page H-7, of an unidentified report.

[9] DOI 001433. Ninth Amendment and Codification of Lease, Olin Lease No. 14-19-008-2675, dated October 1, 1963, Page 7. On pages 5 and 6, the lease prohibited the manufacture of chemicals and acids or other ingredients that were not necessary to the manufacture or production of explosives or related products. It allowed Olin to dispose of any excess quantities of chemicals, acids or ingredients that it did not need for the manufacture or production of its products (page 6). It contained limitations on the testing of explosives, including restrictions on the time and number of sticks of dynamite exploded (page 16).

[10] PRI-00481. Olin Mathieson Chemical Corporation, Letter to Commercial Solvents Corporation regarding the Agreement between Olin and Commercial Solvents, dated September 24, 1963, Page 1.

[11] DOI 004849. Agreement between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated August 28, 1963, Page 4, Article 1, Paragraph 5(d).

[12] The name of CSC's U.S. Powder division was apparently later changed to Trojan. In the Petition for Variance (CRO 001684), IMC refers to "its Trojan Division." Trojan was later spun off as a separate company, and changed its name to Ensign Bickford Industries.

The business Olin sold to CSC included scrap powder: Composition A-3, Cyclotol, Composition B, Composition C, DuPont Tetryl (2,3,6-trinitrophenylmethylnitramine).[13,14] The location of this material at the facility was not identified.

Manufacturing at the facility was phased out beginning in 1968, and was apparently ended by 1976.[15] Trojan did some explosive decontamination in 1971 and 1972, but was still storing explosives at the site in 1977, when its successor, IMC Chemical Group, petitioned the Illinois Pollution Control Board for a variance from the regulations that prohibited open burning because open burning was necessary for further decontamination of the buildings in Areas 11 and 12.[16] Three variances were granted during 1977 and 1978, for building decontamination and destruction of unusable explosives. After IMC removed the remaining explosives and completed the explosive decontamination, they left the site in 1982. The remaining buildings were demolished by the USFWS in the early 1990s.

OLIN AND U.S. POWDER PLANT MAPS OF AREAS 11 AND 12

Figure 15-3 identifies the buildings in Areas 11 and 12 that were used by Olin and/or CSC. Olin's information is from a plant map last revised by Olin in 1963 (the "Olin Map"), and CSC's information is from a map last revised by U.S. Powder in 1974 (the "U.S Powder map"). U.S Powder building numbers appear on the figure along with a legend identifying the corresponding Olin building numbers. Table 15-1 identifies all of the IOP, Olin, and U.S. Powder building designations that have been used for each of the buildings in Areas 11/12.

AREA 11A

AUS Original Site Designations

Two of the original sites designated in 1997-1999 by the USFWS as part of the Additional and Uncharacterized Sites Operable Unit (AUS OU) were located partly in Area 11A: AUS-0049 and AUS-0050. The applicable portions of these original AUS sites have been incorporated in Site AUS-A11A.

15.1 HISTORIC SEARCH INFORMATION

15.1.1 Site Description

This site has not been used since the early 1980s. There are currently no buildings on site and it is being allowed to return to its natural state.

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[13] DOI 004980. Bill of Sale, Conveyance and Assignment, between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated October 1, 1963, Page 4, Paragraph 2(c).

[14] Cyclotol and Composition B are mixtures of RDX and TNT. Composition A-3 is RDX with wax. Composition C is RDX with a plasticizer: Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-32 and 8-100 through 8-111.

[15] ACO 000300, IMC internal memorandum from J.M. Kelly to R.R. Barra regarding Shut Down – Decontamination – Marion, dated April 2, 1981.

[16] CRO 001684. Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), September 1977.

15.1.2 Operational History and Waste Characteristics

15.1.2.1 IOP Load Line II Operations

These five original IOP buildings were located within the boundaries of Site AUS-A11A: Buildings II-1-7, II-1-8, II-1-9, II-1-11 and II-1-33. They are shown in Figure 15-2.

Ammonium nitrate and TNT were delivered to the Ammonium Nitrate Service Building, II-1-8, and the TNT Service Building, II-1-9, respectively.[17]

These buildings were connected via ramps to each other and to the Screening Building, II-1-7.[18] The first floor of the Screening Building contained the four screens used for TNT and ammonium nitrate and the second floor contained the ammonium nitrate and TNT charging rooms.[19] There were also two ammonium nitrate pre-heaters and one press in this building.[20]

The Condensate Pump House, Building II-1-33, was located near the Screening Building.[21]

The fifth original IOP building located in AUS-A11A was the Auxiliary Booster Service Magazine, Building II-1-11.

A more detailed discussion of the melt loading operation is presented in Section 12 of this report, which addresses the Group III Load Line. Much of the information in Section 12 is from a former SWDC employee who worked on the Group III Load Line. Based on the similarity of the layout and operation, it is assumed that most of the information about the Group III Load Line is applicable to the Group II Load Line.

15.1.2.2 Olin Operations

In 1957 Olin began production of acid and ammonium nitrate in this area, which was referred to as the "Chemical Area". Most of the buildings were specific to either acid or ammonium nitrate production. Building 47, the Chemical Area Maintenance Shop; serviced both areas.

Acid Manufacturing

The nitric acid manufactured at the plant was used in the ammonium nitrate production, and in the production of nitroglycerin in the plant to the south of this area. Sulfuric acid may also have been produced, since both acids are raw materials in the production of nitroglycerin.

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[17] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.
[18] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.
[19] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Pages 7 and 33.
[20] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 7.
[21] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.

The Acid Manufacturing Area consisted of the following buildings, shown in Figure 15-3:

- Building 30 – Ammonia Oxidation House
- Building 31 – Cooling Tower and Control
- Building 32 – Acid Office and Shop[22] (IOP Building II-1-8)
- Building 35 – Nitric Acid Concentration
- Building 35A – Switch House Sub No. 1
- Building 38 – Spent Acid House

The Acid Magazine Pond shown in Figure 15-3 is also visible in the 1960 aerial photograph.[23] The pond, which was apparently constructed by Olin as part of the acid manufacturing operation, received runoff from the acid production area.

There were fourteen aboveground storage tanks (36-D1 through 36-D14) located southeast of the Acid Magazine Pond.

Ammonium Nitrate Production

The following buildings were used in the production of ammonium nitrate:

- Building 40 – Prill Tower and Wet End
- Building 40A – Ammonium Nitrate Control Building
- Building 41 – Cooling and Bagging
- Building 41A – Ammonium Nitrate Recovery Building
- Building 42 – Graining Building.

The following were support buildings:

- Building 37 – Ammonia Compressor House
- Building 37A – Ammonia Hortensphere
- Building 41B – Ammonium Nitrate Truck Dock/Shipping[24] (IOP Building II-1-11)
- Building 43 – Ammonium Nitrate Lab
- Building 44 – Compressor House Steam
- Building 45 – Ammonium Nitrate Lunchroom
- Building 46 – Ammonium Nitrate Storage[25] Halfway House (IOP Building II-1-7) – the 1960 aerial photograph indicated a possible liquid release north of this building[26]
- Building 46A – Ammonium Nitrate Raw Material Storage and/or Nitroglycerin Dry House[27,28] (IOP Building II-1-9).

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[22] PRI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.
[23] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.
[24] PRI-00503. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 2.
[25] PRI-00503. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 2.
[26] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.
[27] PRI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.

The general procedure for manufacturing ammonium nitrate is as follows:[29]

Ammonia gas is passed into 40% to 60% nitric acid. The solution is then concentrated in evaporating pans that use air agitation and heating coils. The concentrated solution is sprayed from the top of a prill tower (Building 40) and allowed to fall. The remainder of the moisture evaporates in the fall and spherical grains of ammonium nitrate, called prills, are formed.

Dynoil Mix House, Building 53; and Building 50

Dynoil is a mixture of dynamite and possibly diesel oil. Aerial photographs identify a possible truck loading area near the northwest corner of the building. It appears that Building 50 may be associated with Building 53 based on its proximity. Building 50 is not named on the Olin Map but is described as a storage building on the U.S. Powder Map. Aerial photographs identify a possible truck loading area on the western side of Building 50.

15.1.2.3 Commercial Solvents Corporation (CSC) Operations

CSC and its successors operated the "Chemical Area" from 1964 until production stopped in 1969.[30]

Acid Manufacturing

CSC used the same buildings as Olin, with minor changes.[31] CSC apparently also used the Acid Magazine Pond.

A fifteenth aboveground storage tank, 36-D15 was also added. The contents of these tanks are not noted on the Olin Map but are described on the U.S. Powder Map. The tanks contained nitric acid, sulfuric acid, or mixed acids.

Ammonium Nitrate Production

CSC used the same buildings as Olin in the Ammonium Nitrate Manufacturing area. The building descriptions were the same on both maps, but U.S. Powder changed some building numbers.[32]

There were two possible drum storage areas identified next to Building 46 in the 1965 aerial photograph – one on the west side and one near the southwest corner.[33]

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[28] PRI-00503. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 2.
[29] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-94.
[30] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[31] The Olin Switch House Station (Building 35A) was removed and replaced by a new Switch House Station (Building 35-1) in a different location.
[32] Buildings 40-A, 41-A, 41-B, and 46-A were renumbered 40-1, 41-1, 41-2, and 46-1, respectively.
[33] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.

Sometime between 1965 and 1971, a northeast-southwest trending drainage ditch just north of the ammonium nitrate production area was cleared and/or widened.[34]

Former Dynoil Mix House

CSC used Building 53, the Olin Dynoil Mix House, for storage. Building 50 was also used for storage.

15.1.2.4 U.S. Fish and Wildlife Services Demolition

In 1990, a USFWS contractor demolished what were apparently the last remaining buildings in Area 11A: Buildings 32, 41-2, 46, 46-1, and a building not listed on the U.S. Powder Map[35].

The structures were buried on site, most likely at the locations where they were demolished. The foundations were buried in place. All debris was required by the contract to be covered with at least 36 inches of fill material.[36]

15.1.3 Area 11A Previous Sampling Results

There were two previous Explosives and Munitions Manufacturing Operable Unit (EMMA OU) sites located in the Area 11 Acid and Ammonium Nitrate Production Area: COPGII and COP-1. O'Brien & Gere[37] investigated one site in the former Acid and Ammonium Nitrate Production Area, that was designated as Site 5 – the Area 11 Acid Pond. This site was later renamed as COP-1 in the Woodward Clyde Consultants (WCC) Confirmation Study.[38] COP-1 was further investigated in the ESE EMMA OU Remedial Investigation/Baseline Risk Assessment (RI/BRA) Report and the COP site locations can be found on Figure 15-4.[39] EMMA OU Site COPGII was not investigated until Parsons Engineering Science Inc., conducted their investigation in 1997. The results of this investigation were discussed in Parsons' Engineering Evaluation and Cost Analysis report,[40] which only addressed ordnance and explosive waste (OEW) concerns at this site.

O'Brien & Gere Remedial Investigation, 1988

Site 5 in the O'Brien & Gere RI, the Area 11 Acid Pond, is the Acid Magazine Pond shown in Figure 15-3. One composite surface water sample and one composite sediment sample was

[34] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 4 and 5.
[35] These buildings were referenced in the contract as II-1-8, II-1-11, II-1-7, II-1-9, and II-1-33, respectively.
[36] USFWS file for Contract No. 14-16-0003-89-0033, White Equipment – Building Demolition.
[37] O'Brien & Gere, 1988, Remedial Investigation Report, Crab Orchard National Wildlife Refuge, Volume I, Final Report, Pages 11-1 – 11-5.
[38] Woodward Clyde Consultants, 1988, Final Confirmation Study at Crab Orchard National Wildlife Refuge, Hampton Cemetery and Ammunition Plant Dera Site, Volume I, Figure 3.45.
[39] Environmental Science & Engineering, Inc., 1994, Draft Final Remedial Investigation/Baseline Risk Assessment Report, Explosives/Munitions Manufacturing Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I, Remedial Investigation (RI) Report, Page 4-77.
[40] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-36.

collected from this pond. One composite soil sample was collected from downstream of the pond nearby some dead trees.[41] Soil and sediment results are reported in dry weight except where noted. Some results reported by O'Brien and Gere are not included here because they were determined to be not useable. Results reported here are estimated.[42]

In surface water, aluminum (200 milligrams per Liter (mg/L)) exceeded the United States Environmental Protection Agency (USEPA) Region IV values. Barium (0.03 mg/L) exceeded USEPA ECOTOX values. In the soil sample, chromium (140 mg/kg) exceeded Canadian Soil Quality Guidelines (CSOQGs) and Refuge background level. The following semi-volatile organic compounds (SVOCs) were detected above USEPA Region IV and/or Canadian Sediment Quality Guidelines (CSEQGs) in the sediment samples: anthracene (0.022 mg/kg wet weight (wt)) and phenanthrene (0.01 mg/kg wet wt). Aroclor 1254 (0.46 mg/kg wet wt) exceeded USEPA Region IV levels. In the sediment samples, chromium (110 mg/kg) was detected above CSEQGs and Refuge background levels.[43]

Woodward Clyde Consultants Confirmation Study, 1988

Woodward Clyde Consultants, under contract with the Department of the Army, conducted a Confirmation Study in 1988 that included the O'Brien & Gere Site 5, but the site was renamed COP-1 (Figure 15-5).[44] Two soil borings were done at COP-1 and one monitoring well was installed. Soil and groundwater samples were collected for analysis. The results from this site showed some evidence of chemical contamination. Based on these results, the site required a follow-up investigation and was included in the RI done by ESE (discussed below).

One sediment sample result from the WCC Confirmation Study in the 1988 report is shown in Figure 15-5. See the note at the bottom of the figure for more explanation of the data that are shown.

Environmental Science & Engineering, Inc. Remedial Investigation, 1994

Site COP-1 was included in the EMMA OU RI.[45] Sediment, groundwater, and surface water samples were analyzed for explosives, metals, and total recoverable petroleum hydrocarbons (TRPH) at COP-1. A few sediment and surface water samples were also analyzed for SVOCs. No samples were analyzed for volatile organic compounds (VOCs). Sediment and surface water samples were obtained from the pond, and from the stream that receives drainage from the pond.

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[41] O'Brien & Gere, 1988, Remedial Investigation Report, Crab Orchard National Wildlife Refuge, Volume I, Final Report, Page 11-1.

[42] DPRA Document No. 00018887. Letter from Richard Boice to Dick Ruelle of USFWS regarding Crab Orchard Lake RI/FS, dated February 18, 1987. The letter reports that the data for the following constituents are not useable: 2-butanone, vinyl acetate, 4-methyl-2-pentanone, aniline, bis(2-chloro-isopropyl)ether, 4-chloroaniline, 2-nitrosodiphenylamine, benzidine, di-n-octyl-phthalate, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, cyanide, Ag, As, Be, Cd, Cu, Ni, Pb, Se, Zn, and Hg.

[43] See Table 1-11 of this report for Refuge background soil values used for the PA.

[44] Woodward Clyde Consultants, 1988, Final Confirmation Study at Crab Orchard National Wildlife Refuge, Hampton Cemetery and Ammunition Plant Dera Site.

[45] Environmental Science and Engineering, Inc., 1994, Draft Final Remedial Investigation/Baseline Risk Assessment Report, Explosives/Munitions Manufacturing Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I, Remedial Investigation (RI) Report.

According to the ESE 1994 report, the outfall from the pond is a 12-inch pipe that discharges at the location of Sample SD-COP1-7 (Figure 15-5). A discussion of the maximum concentrations detected follow.

Chromium (642 mg/kg) and zinc (1,380 mg/kg) exceeded CSEQGs and Refuge background levels in the sediment samples. Copper (58.5 mg/kg), lead (89.3 mg/kg), mercury (0.703 mg/kg), and silver (0.8 mg/kg) in sediment exceeded both USEPA Region IV and Refuge background levels. Antimony (2.68 mg/kg) in sediment exceeded the USEPA Region IV value. In the surface water samples, barium (0.04 mg/L) exceeded USEPA ECOTOX and Refuge background levels. Aluminum (0.24 mg/L) and zinc (0.159 mg/L) exceeded USEPA Region IV and Refuge background levels. Antimony (20 micrograms per Liter (ug/L)) and beryllium (4 ug/L) in groundwater exceeded maximum contaminant levels (MCLs). All results from the ESE EMMA OU RI exceeding background values or detection limits are shown in Figure 15-5 (some values are not shown on the figure). See the note at the bottom of the figure for more explanation of the data that are shown. This report concluded that there were no unacceptable human health risks or ecological risks associated with COP-1.

Based on the water level information obtained as a part of this investigation, the general groundwater flow direction was found to be to the north in Areas 11 and 12. These data are presented in Figure 15-6.

Parsons Engineering, 1997

Parsons Engineering conducted an OEW investigation at the former EMMA OU Site COPGII in 1997. COPGII covers all of Area 11, including the AUS-A11A, AUS-A11H, AUS-A11N, AUS-A11P, and AUS-A11S. This area is approximately 11,440,000 square feet (ft) in size. There was no chemical investigation done in this area at this time. The area was divided into 572 grids (100ft by 200ft grids). Eleven grids, each 100 ft square, were investigated at this site and a total of 629 magnetic anomalies were identified.[46] Of these, 255 were intrusively investigated and all were non-ordnance scrap.[47]

USEPA Sampling, 1998

USEPA sample locations are shown in Figures 15-7, 15-8, and 15-9. The results for all detected constituents are listed in Table 15-1A.

Three samples (49-01 through 49-03) were collected from the original AUS OU Site AUS-0049 (Load Line II Drainage Ditch Sediments), in addition to a duplicate sample (49-02 DUP). AUS-0049 was incorporated into AUS-A11A; however, only sample 49-02 was actually located in the Acid and Ammonium Nitrate Area. The other two were located in other areas within Area 11. Sample 49-02 was analyzed for semi-volatile organic compounds and metals. The following SVOC compounds were detected at the site above USEPA SSLs: benzo[a]anthracene (0.13

[46] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-36 through 2-44.
[47] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-36 through 2-44.

mg/kg), benzo[b]fluoranthene (0.22 mg/kg), and benzo[a]pyrene (0.13 mg/kg). Mercury (0.17 mg/kg), and nickel (24 mg/kg) exceeded USEPA SSLs and Refuge background values. Zinc (180 mg/kg) exceeded DSOLs and Refuge background values. Chromium (66 mg/kg) exceeded CSOQGs and Refuge background levels.

15.1.4 Observations During Site Visit

There were numerous mounded areas and ponded areas observed during the site reconnaissance (spring, 1999). The former acid pond was the largest water body. Ponded areas are shown in Figure 15-7, which is based on aerial photography from January 2000. Most of the mounded areas appear to coincide with the location of former buildings (Figure 15-7).

Many of the apparently original drainage ditches were still present. Most of the surface water in this area drains to the north. One creek identified during the site reconnaissance that runs northward through this area has been nicknamed "Solid Propellant Creek" because there are solid propellant pellets strewn along the length of the creek in this area. This creek (Figure 15-7) appears to drain all of Site AUS-A11A that is located to the west of the former Ammonium Nitrate Production Area.

In general, most of this area is tree-covered and densely vegetated.

15.1.5 Recommendations Based on Preliminary Assessment

Based on the historic search, all potential releases from Area 11A have not been previously addressed. Based on the lack of previous investigation covering all areas and the exceedances of Preliminary Assessment (PA) screening levels in the USEPA 1998 results, AUS-A11A was included in the Site Investigation (SI).

15.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-A11A from March 21 through May 24, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[48] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 15.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 15-7, 15-8, and 15-9. Survey coordinates for all sample locations in Area 11A are listed in Table 15-2. Table 15-5 lists the sample locations and the matrix sampled at that location.

[48] U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

15.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. There were several areas of concern investigated during the SI. They are as follows:

Ammonium Nitrate Production Area

Chromates are a potential chemical of interest in the Ammonium Nitrate (A.N.) Production Area, because they may have been used in the Olin and CSC manufacturing process of A.N., according to an Olin patent regarding the manufacture of A.N.[49] It is not known for certain what process was used in this area to manufacture A.N.

Samples A11A-011 (sediment), A11A-012 through A11A-015 (soil) and A11A-018 (soil) were located in the area of ammonium nitrate production. Sample location A11A-014 also included a surface water sample. Sample locations A11A-011, A11A-013 and A11A-014 were located along a drainageway that appears to have received drainage from this area. A11A-014 was located in a ponded area next to former Building 42 (Olin/CSC A.N. Graining Building). Sample A11A-013 was planned to be collected from the sediment in the bottom of a storm sewer drain that was located along this former drainageway. Sample location A11A-011 was to be collected from the former drainageway, downstream of the storm sewer drain and across a former roadway as seen in historical aerial photographs. It appears that the drainage ditch that contains sample location A11A-011, also received drainage from the drainageway that is located west of former Building 47 (Olin/CSC Chemical Area Maintenance Shop), as discussed below.

Sample A11A-015 was located next to former Building 41 (Olin/CSC Ammonium Nitrate Cooling and Bagging Building) and north of former Building 41-2 (former IOP TNT Booster Service Magazine and Olin/CSC A.N. Loading Dock). This location was chosen for its potential for spillage of materials, since anything dumped in this area would likely flow to the former north-flowing drainageway, located west of these buildings, along the east side of the asphalt roadway.

Sample A11A-018 was located between former Buildings 40 (Olin/CSC Prill Tower and Wet End), 40-1 (Olin/CSC A.N. Recovery Building) and 43 (Olin/CSC A.N. Laboratory).

Sample A11A-012 was located on a 5-ft high soil mound, that may be related to the A.N. production facility, based on its proximity to this area. However, the actual purpose of this soil mound is not known.

Acid Production Area/Acid Magazine Pond

This area was used for the production, recovery and storage of acids (sulfuric or oleum, nitric and mixed acid) that were used in the nitroglycerin manufacturing process. Sample locations A11A-019 through A11A-021 (soil), A11A-023 (sediment and surface water), A11A-026

[49] U.S. Patent 106,455, Filed 06/01/61, Ammonium Nitrate Explosives Containing Chromates, as found in DPRA Document No. 00022521, Exhibit B to Sales Contract between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation.

(sediment and surface water), A11A-027 (soil), A11A-028 (sediment and surface water), A11A-030 (soil), A11A-031 (sediment), A11A-032 (sediment and surface water), A11A-033 (sediment and surface water), and A11A-034 (sediment) were in this area.

Acid Production Area: Sample A11A-020 is located on a soil mound that appears to be located to the north-northeast of former Building 46-1 (former IOP TNT Service Building and Olin/CSC A.N. Storage/Nitroglycerin Dry House). Sample location A11A-019 was to be located in the former loading area for Building 46-1. This sample location was identified using coordinates obtained from historical aerial photographs[50].

Sample location A11A-027 was to be located in the former loading area for former Building 32 (former IOP A.N. and possibly a TNT Service Building, and Olin/CSC Acid Office & Shop). This sample was actually located on a soil mound that appears to be located in the same location as former Building 32.

Sample location A11A-023 was located in a drainage ditch and sample location A11A-028 was located in a ponded area; both were located in the area surrounding the former acid aboveground storage tanks (ASTs). Sample A11A-029 was planned to be collected from a sewer manhole that was located south of these former acid ASTs. It is not known if the sewer manhole received drainage from this area. This sample was not collected because there was no sediment/sludge material present in the bottom of the manhole.

Sample A11A-021 was located in a drainage ditch that appears to originate just to the south of former Building 46-1 (former IOP TNT Service Building and Olin/CSC A.N. Storage/Nitroglycerin Dry House).

Sample location A11A-030 was located to the north of former Building 31(Olin/CSC Cooling Tower and Control Building), in a low-lying area with some ponding. The actual use of this building is not known.

Acid Magazine Pond: Sample locations A11A-026 and A11A-031 are located in drainageways that appear to drain into the Olin/CSC Acid Magazine Pond. Sample locations A11A-033 and A11A-034 are located in the Acid Magazine Pond, on the south and north sides, respectively. Sample location A11A-032 is located in the northwest-flowing creek that runs along the west side of the Acid Magazine Pond, just upgradient of the valve that appears to drain the pond into the northwest-flowing creek.

A monitoring well, MW-COP1-3, was identified during the historical records search, to the northwest of the Acid Magazine Pond. This monitoring well was installed during a previous investigation. The monitoring well was not located during the field investigation, therefore it is assumed that it was removed and it was not sampled as planned.

[50] At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few ft.

Buildings 46 and 47

Former Building 46 (former IOP TNT and A.N. Screening Building and Olin/CSC A.N. Storage) and former Building 47 (Olin/CSC Chemical Area Maintenance Shop) were both located in the area between the former A.N. Production Area and the former Acid Production Area. Former Building 46 contained a press during IOP's occupation of this building, therefore there was the potential for contamination due to cutting oils used in the press. There was a possible liquid release identified in the 1960 aerial photographs near the north corner of this building. Soil Sample A11A-025 is located in the area of this possible liquid release. The 1965 aerial photographs identified two possible drum or crate storage areas located on the west and south side of this building. Soil sample locations A11A-036 (on west side) and A11A-037 (on south side) were placed in these two possible storage areas.

A monitoring well (sample location A11A-W02) was located north of former Building 47 (Chemical Area Maintenance Shop). The areas surrounding this building may have received solvents and lubricants used for maintenance activities. Historically, waste solvents and lubricants have been dumped outside doorways to get rid of them. Sediment Sample locations A11A-022 and A11A-035 were in a drainage ditch/trench identified in the aerial photographs that was located to the northwest and southwest, respectively, of former Building 47. Location A11A-022 also included a surface water sample. It is likely that this drainageway received drainage from the area surrounding Building 47 and thus it may also contain waste solvents and lubricants. Sample A11A-024 (sediment and surface water) is located in a ponded area, to the south of former Building 47 and it may also receive drainage from around this building.

Dynoil Mixing Area

Former Building 53 was used by Olin as a Dynoil Mix House and by CSC as a Storage Building. Building 50 appears to be associated with Building 53, since the road that leads to Building 53, dead ends in front of Building 50 (see Figure 15-3). Dynoil is reported to be a mixture of dynamite and diesel fuel. A monitoring well (sample location A11A-W01) was planned to be located just west of former Building 53, in what appeared to have been a former truck loading area according to historical aerial photographs. It is likely that this area received spillage from the wash waters used to clean up after the Dynoil mixing operations were done. Sediment Sample A11A-001 was planned to be located in a drainage ditch that may have received drainage from the area surrounding former Building 53. Both the well and the sediment sample were actually collected about 150 ft west and 20 ft south of where they were planned to be collected. Therefore the results obtained from these locations are not expected to accurately reflect the conditions of the Dynoil Mixing Area.

Sample A11A-002 (soil) was planned to be located in what appeared to be a former truck loading dock for former Building 50. This building may have been used in association with the Dynoil Mix House (Building 53). Sample A11A-003 (sediment) was planned to be located in a ponded area located just southeast of former Building 50. Sample A11A-004 (soil) was planned to be collected from a sewer manhole located to the south of former Building 50. These three sample locations were actually located approximately 350 ft southwest of where they were planned to be collected (south of Building 50), and therefore any results obtained from these locations may not accurately reflect the conditions next to this building. These three sample locations were located within the boundary of AUS-A11P, not within AUS-A11A as planned.

All other samples were collected in accordance with the tables in the Field Sampling Plan (FSP) (URS, 2000) with the following exceptions:

- AUS-A11A-001-SW-00 No surface water was present at this location during the field investigation, therefore no sample was taken.
- AUS-A11A-003-SW-00 No surface water was present at this location during the field investigation, therefore no sample was taken.

Miscellaneous Drainage in AUS-A11A

In general, most of the surface water in this area drains to the north via drainage ditches and/or creeks. One main creek that runs northward through this area has been nicknamed "Solid Propellant Creek" because there are solid propellant pellets strewn along the length of the creek in this area. Samples A11A-006 (sediment and surface water), A11A-008 (sediment and surface water) and A11A-009 (sediment only) were all collected from "Solid Propellant Creek." Sediment Samples A11A-005, A11A-016 and A11A-017 were all collected from smaller ditches that drained into this creek (along the former load line) from both the east and the west. Sediment and surface water sample location A11A-007 was from a ponded area located south of the former railroad bed, which also appears to have drained into "Solid Propellant Creek."

Sample Location A11A-010 (sediment and surface water) is on the north side of Chemical Area Road, in the same north-flowing drainage ditch that appears to drain the area surrounding the A.N. production area.

All samples were collected in accordance to the tables in the FSP with the following exception:

- AUS-A11A-007-SW-00 This sample was not analyzed for phosphorus, although the FSP did call for it.

15.2.2 Field Results

15.2.2.1 Site Conditions

AUS-A11A - Acid and Ammonium Nitrate Production Area is primarily wooded and includes a large pond referred to as the acid magazine pond, see Figure 15-7. Area 11 as a whole contains concrete roadways and exposed and buried building foundations.

15.2.2.1.1 Geologic Conditions

There were a total of eight wells installed in Area 11. This includes two wells in AUS-A11A. Two geologic cross-sections (Figures 15-10 and 15-11) were made for Area 11 using the soil boring information obtained from the monitoring wells. Boring logs and monitoring well construction diagrams are included in Appendices A and B, respectively.

As shown in the geologic cross-sections (Figures 15-10 and 15-11), AUS-A11A has approximately 1 to 1.5 ft of fill material (topsoil, etc.) overlying the site. Below the fill, there is at least 18 to 19 ft of low plastic silty clay. Both borings end within the silty clay layer, and the bottom of boring depth was 20 ft for A11A-W01 and A11A-W02. A11A-W02 had a black sediment layer from 5 to 5.5 ft bgs.

15.2.2.1.2 Hydrogeologic Conditions

At AUS-A11A groundwater was encountered in both soil borings during drilling at depths of 16 and 19 ft, as seen in Figure 15-10. The groundwater elevations taken at Area 11A are presented on Table 15-4. A groundwater contour map (Figure 15-12) was made for Area 11 using groundwater elevations obtained from October 2000. Groundwater elevations were collected several times during this investigation, and they showed similar flow directions each time. As seen in this groundwater contour map, the overall flow direction of the groundwater appears to be toward the north-northwest in AUS-A11A.

Slug tests were performed on each of the two wells that were installed in Area 11A during the AUS OU investigation, resulting in hydraulic conductivities that ranged from 2.89E-05 to 5.12E-05 centimeters per second (cm/sec). Slug tests are presented in Table 15-3. Hydraulic conductivity values from slug tests are less than the trigger values for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)). Based on the borings at the site, the aquifer does not appear to meet any of the other criteria for Class I Groundwater (35 IAC 620), although one trigger criterion has not been measured. That criterion is "sustained groundwater yield, from up to a 12-inch borehole, of 150 gallons per day or more from a thickness of 15 ft or less" (35 IAC 620.210(a)(4)(A)). Based on the slow recovery of wells at this site, yields that would indicate Class I groundwater by that criterion would definitely not be expected. In accordance with 35 IAC 620.220, groundwater that does not meet the criteria for Class I, III, or IV is classified as Class II. Based on the available data, the groundwater at this site appears to be Class II as defined by the State of Illinois. This classification could change based on additional data.

15.2.2.1.3 Hydrologic Conditions

Based on the topographic map that was created for A11A using aerial photographs, the overall surface flow at the site appears to be towards the north. The main drainage in this area is "Solid Propellant Creek" which flows north through A11H and A11A, see Figure 15-7. Two drainage ditches running north of the former railroad bed and a ponded area south of the former railroad bed flow east and west draining into the "Solid Propellant Creek" as shown on Figure 15-7. In addition, to the creek there are numerous ponded areas. The largest pond is the Acid Magazine Pond, which is located in the northern portion of the site. The "Solid Propellant Creek" turns east in the northern portion of the site and drains into the Acid Magazine Pond. Several other ditches also eventually drain to Acid Magazine Pond, including a ditch that runs west along the Chemical Area road, a creek that follows the Chemical Area Road draining east into the "solid propellant creek", and two ditches that run parallel to a north-south road (east of the "Solid Propellant Creek"), one of which intersects the "Solid Propellant Creek" and one drains directly into the Acid Magazine Pond.

15.2.2.2 Chemical Results

The sample analytical results are summarized as follows:

- Table 15-6 – soil samples results,
- Table 15-7 – sediment samples results,
- Table 15-8 – groundwater samples results, and
- Table 15-9 – surface water samples results.

These tables list all the chemicals detected in Area 11A during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report (QCSR).

Sample results are presented on figures as follows:

- Figure 15-7 – organic results for soil and sediment samples,
- Figure 15-8 – inorganic results for soil and sediment samples, and
- Figure 15-9 – all results for surface water and groundwater samples at this site.

15.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 15-10 through 15-16 as follows:

- Table 15-10--human health risk screening for soils,
- Table 15-11--human health risk screening for sediment,
- Table 15-12--human health risk screening for groundwater,
- Table 15-13--human health risk screening for surface water,
- Table 15-14--ecological risk screening for soils,
- Table 15-15--ecological risk screening for sediment, and
- Table 15-16--ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 11A. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 15-7 through 15-9 the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 15-17 (human health risk) and 15-18 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 15-17) and COPECs (Table 15-18) are shaded in the tables.

15.3.1 Human Health Risk

15.3.1.1 Soil/Sediment

Human health screening results for soil and sediment samples are presented in Tables 15-10 and 15-11, respectively. Soil screening values were conservatively used to screen the sediment samples.

For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6}. In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

15.3.1.2 Groundwater

Human health screening results for groundwater are presented in Table 15-12. The maximum groundwater concentrations from Area 11A were screened against MCLs and Illinois Class I groundwater standards.

15.3.1.3 Surface Water

Human health risk screening results for chemicals in surface water from Area 11A are presented in Table 15-13. The maximum concentrations from Area 11A were screened against the Illinois Environmental Protection Agency (IEPA) General Use Surface Water Quality Criteria – Human Health.

15.3.2 Ecological Risk

15.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 15-14. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[51]
- Environment Canada (1995)[52]
- Talmage *et al.* (1999)[53]
- Efroymson *et al.* (1997a, 1997b)[54]
- CCME (1999)[55]
- MHSPE (1994)[56]
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)[57] used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

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[51] USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.
[52] Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.
[53] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. Rev Environ. Contam. Toxicol 161:1-156.
[54] Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3.
Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2.
[55] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.
[56] Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards.* Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.
[57] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

15.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 15-15. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)[58]
- USEPA (1996 – summarized by Ingersoll *et al.* 1996)[59]
- Ontario Ministry of the Environment and Energy (1995)[60]
- NOAA (1999)[61]
- Ecotox (USEPA 1996)[62]
- Long *et al.* (1995)[63]
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed "consensus-based" freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely

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[58] MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. MacDonald Environmental Services Ltd., British Columbia, Canada.

[59] Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfirld, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22(3):602-623.

[60] Ontario Ministry of Environment and Energy. 1995. Ontario's Approach to Sediment Assessment and Remediation. Second SETAC World Congress (16TH Annual Meeting). Vancouver, British Columbia, Canada.

[61] NOAA. 1999. Screening quick Reference Tables. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

[62] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

[63] Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management. 19(1): 81-97.

observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the "equilibrium-partitioning" (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 15.3.2.1.

15.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 15-16. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)[64]
- EcoTox (USEPA 1996)[65]
- USEPA Region IV Freshwater Screening Values (1999b)[66]
- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)[67]
- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 15.3.2.1.

15.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-A11A, based on exceedances of the SI screening criteria.

[64] USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.
[65] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.
[66] USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at http://www.epa.gov/region4/waste/oftecser/ecolbul.htm.
[67] ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 15-17; and on the COPEC list, Table 15-18. COPCs in this category include antimony and cadmium in sediment; and arsenic and selenium in soil. COPECs coded with "D" on Table 15-18 include beryllium and cadmium in surface water; and arsenic, manganese, and selenium in soil. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be evaluated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 15-19.

Other areas of the site, media, and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

TABLE 15-1
AREA 11 –HISTORIC BUILDING NUMBERS AND NAMES

Illinois Ordnance Plant		Olin (1956–1964)		U.S. Powder Design/CSC (1964-1982)	
Bldg. No.	**Building Name**	**Bldg. No.**	**Building Name**	**Bldg. No.**	**Building Name**
II-1-6	Melt Loading Building	7	Dope House	7	Dope House
	No IOP building at this location.	7-A	Track Shed	7-1	Track Shed
	No IOP building at this location.	7-E	Control House (Not Shown On Map)	7-5	Control House (New)
II-1-25	Change House	8	Dynamite & First Aid Office & Change House	8	Dynamite Off. & First Aid
	No IOP building at this location.	9	Nitrator	9	Nitrator
	No IOP building at this location.	9-A	Spent Acid	9-1	Spent Acid House
	No IOP building at this location.	9-B	Soda House	9-2	Soda House
	No IOP building at this location.		No building present in this location at this time.	9-3	Water Softener Bldg. (New)
	No IOP building at this location.	9-E	Control House	9-5	Control House
	No IOP building at this location.	10	N.G. Storage	10	N.G. Storage Bldg.
	No IOP building at this location.	10-A	Catch Tank		(Removed)
	No IOP building at this location.	10-B	Control House	10-5	Control House
	No IOP building at this location.	?	Nitroglycerin Loading Dock (location unknown)	?	May still be in use.
	No IOP building at this location.	11	(Not Shown On Map)	11	Former Mix House (Not Shown On Map)
	No IOP building at this location.	12	Mix House	12	Mix House No. 2 Fig. 8 Mixer (Gelatin)
	No IOP building at this location.	12DS	DNT Storage (Not Shown On Map)		(Removed)
	No IOP building at this location.		No building present in this location at this time.	12-3	Water Softener Bldg.(New)
	No IOP building at this location.	12-E	Air Condition House	12-5	Control House
	No IOP building at this location.	12-M	Motor House		(Removed)
	No IOP building at this location.	12-P	Pump House	12-2	Storage Bldg.
	No IOP building at this location.	13	Pack House - Hall	13	Hall Pack House (Dynamite)
	No IOP building at this location.	13-E	Air Condition House	13-5	Control House
	No IOP building at this location.	13-T	Toilet	13-7	Toilet
	No IOP building at this location.	14	Pack House - Starrett	14	"LL" Pack House (Dynamite)
	No IOP building at this location.	14-E	Air Condition House	14-5	Control House
	No IOP building at this location.	14-M	Motor House	14-6	Storage Bldg.
	No IOP building at this location.	15	Pack House - Cil-Vibra Pack	15	Cil-Vibra Pack House (Dynamite)
	No IOP building at this location.		No building present in this location at this time.	15-2	Storage Bldg. (New)
	No IOP building at this location.	15-E	Air Condition House	15-5	Control House
	No IOP building at this location.	15-M	Motor House		(Removed)
	No IOP building at this location.	15-T	Toilet	15-7	Toilet
	No IOP building at this location.	16	Gel Cartridge Pack House	16	Gel Cartridge Pack House
	No IOP building at this location.		No building present in this location at this time.	16-2	Storage Bldg. (New)

Sheet 1 of 5

TABLE 15-1
AREA 11 –HISTORIC BUILDING NUMBERS AND NAMES

Illinois Ordnance Plant		Olin (1956–1964)		U.S. Powder Design/CSC (1964-1982)	
Bldg. No.	**Building Name**	**Bldg. No.**	**Building Name**	**Bldg. No.**	**Building Name**
	No IOP building at this location.	16-E	Air Condition House	16-5	Control House
	No IOP building at this location.	17	Mix House - Talley	17	Talley Mix House (Dynamite)
	No IOP building at this location.	17-E	Air Condition House	17-5	Control House
	No IOP building at this location.	18	Pack House/MXU 4A Mix House	18	Powder Stripping House
	No IOP building at this location.	18-E	Air Condition House	18-5	Control House
	No IOP building at this location.	18-T	Toilet	18-7	Toilet
	No IOP building at this location.	19	Shell House	19	Shell House
	No IOP building at this location.	19-W	Wax House	19-8	Wax House
	No IOP building at this location.	20	Case House No. 1 - 8" waxers	20	Case House No. 1
	No IOP building at this location.	20-E	Electrical Control House	20-5	Control House
	No IOP building at this location.	20-W	Wax House	20-8	Wax House
	No IOP building at this location.	21	Case House No. 2 - large and 24" waxers	21	Superprime & Slurry
	No IOP building at this location.	21-E	Electrical Control House	21-5	Control House
	No IOP building at this location.	21-W	Wax House	21-8	Wax House
	No IOP building at this location.	22	Case House No. 3 - small waxers	22	Torpex Operation/Storage Bldg.
	No IOP building at this location.	22-E	Electrical Control House	22-5	Control House
	No IOP building at this location.	22-W	Wax House	22-8	Wax House
	No IOP building at this location.	23	ANOIL Manufacturing Building	23	ANOIL Mfg. Bldg.
	No IOP building at this location.	23-A	Heated House - ANOIL Mix Building		(Building either removed or not in use.)
	No IOP building at this location.		No building present in this location at this time.	23-5	Control House (New)
II-1-27	Timekeepers Building	24	Dynamite Maintenance Shop/R&D Laboratory	24	R&D Laboratory
	No IOP building at this location.	24-A	Dynamite	24-1	Dynamite Maint. Shop
	No IOP building at this location.	24-C	Parts Cleaning - Dynamite	24-3	Dynamite Parts Cleaning
	No IOP building at this location.	25	N.C. - TNT Screening (Not Shown On Map)	25	NC-TNT-Screening (New)
	No IOP building at this location.	26	Box Assembly	26	Box Assembly
	No IOP building at this location.	27	Tractor House	27	Tractor House
	No IOP building at this location.		No building present in this location at this time.	29	Loading Dock (New)
	No IOP building at this location.		No building present in this location at this time.	29-1	Storage Bldg. (New)
	No IOP building at this location.	30	Ammonia Oxidation House	30	Ammonia Oxidation Bldg.
	No IOP building at this location.	31	Cooling Tower & Control	31	Cooling Tower & Control Bldg.
II-1-8	Ammonium Nitrate Service Building	32	Office & Shop (Acid)	32	Acid Office & Shop
	No IOP building at this location.	32-R	Ramp 32 to 46-A	32-9	Ramp 32 to 46-1

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TABLE 15-1
AREA 11 –HISTORIC BUILDING NUMBERS AND NAMES

Illinois Ordnance Plant		Olin (1956–1964)		U.S. Powder Design/CSC (1964-1982)	
Bldg. No.	**Building Name**	**Bldg. No.**	**Building Name**	**Bldg. No.**	**Building Name**
	No IOP building at this location.	35	Nitric Acid Concentration	35	Nitric Acid Concentration
	No IOP building at this location.	35-A	Switch House Sub No. #1		(Removed)
	No IOP building at this location.		No building present in this location at this time.	35-1	Switch House - Sub Station #1 (New)
	No IOP building at this location.	36-D1	Off-site Tank	36-D1	Off-site Tank - 200 - Weak N.A.
	No IOP building at this location.	36-D2	Off-site Tank	36-D2	Off-site Tank - 201 - Weak N.A.
	No IOP building at this location.	36-D3	Off-site Tank	36-D3	Off-site Tank - 202 - Weak N.A.
	No IOP building at this location.	36-D4	Off-site Tank	36-D4	Off-site Tank - 203 - Weak N.A.
	No IOP building at this location.	36-D5	Off-site Tank	36-D5	Off-site Tank - 204 - Weak N.A.
	No IOP building at this location.	36-D6	Off-site Tank	36-D6	Off-site Tank - 400 - 68% Sulphuric
	No IOP building at this location.	36-D7	Off-site Tank	36-D7	Off-site Tank - 401 - 68% Sulphuric
	No IOP building at this location.	36-D8	Off-site Tank	36-D8	Off-site Tank - 402 - 68% Sulphuric
	No IOP building at this location.	36-D9	Off-site Tank	36-D9	Off-site Tank - 500 - Oleum Stor.
	No IOP building at this location.	36-D10	Off-site Tank	36-D10	Off-site Tank - 501 - Oleum Stor.
	No IOP building at this location.	36-D11	Off-site Tank	36-D11	Off-site Tank - 300 - Mixed Acid
	No IOP building at this location.	36-D12	Off-site Tank	36-D12	Off-site Tank - 301 - Mixed Acid
	No IOP building at this location.	36-D13	Off-site Tank	36-D13	Off-site Tank - 302 - M.A. Scale TK.
	No IOP building at this location.	36-D14	Off-site Tank	36-D14	Off-site Tank - 303 - S.A. Circ. TK.
	No IOP building at this location.			36-D15	Off-site Tank - Unknown Contents
	No IOP building at this location.	37	Ammonia Compressor House	37	Ammonia Compressor House
	No IOP building at this location.	37-A	Ammonia Hortensphere	37-1	Ammonia Hortensphere
	No IOP building at this location.	38	Spent Acid House	38	Spent Acid House
	No IOP building at this location.	40	Prill Tower & Wet End	40	Prill Tower & Wet End
	No IOP building at this location.	40-A	Control Bldg. (A.N.)	40-1	Control Bldg. A.N.
	No IOP building at this location.	41	Cooling & Bagging Bldg.	41	Cooling & Bagging Bldg.
	No IOP building at this location.	41-A	A.N. Recovery Bldg.	41-1	A.N. Recovery Bldg.
II-1-11	Auxiliary Booster Service Magazine	41-B	A.N. Truck Dock/Shipping	41-2	A.N. Truck Dock
	No IOP building at this location.	42	Graining Bldg.	42	Graining Bldg.
	No IOP building at this location.	43	A.N. Laboratory	43	A.N. Laboratory
	No IOP building at this location.	44	Compressor House (Steam)	44	Compressor House (Steam)
	No IOP building at this location.	45	A.N. Lunch Room	45	Lunch Room
II-1-7	Screening Building	46	A.N. Storage (Halfway House)	46	A.N. Storage
II-1-9	TNT Service Building	46-A	A.N. Raw Material Storage/N.G. Dry House	46-1	A.N. Raw Material Storage
		46-R	Ramp 46 to 32-R	46-9	Ramp 46 to 32-9

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TABLE 15-1
AREA 11 –HISTORIC BUILDING NUMBERS AND NAMES

Illinois Ordnance Plant		Olin (1956–1964)		U.S. Powder Design/CSC (1964-1982)	
Bldg. No.	**Building Name**	**Bldg. No.**	**Building Name**	**Bldg. No.**	**Building Name**
	No IOP building at this location.	47	Chemical Area Maintenance Shop	47	Chemical Area Maint. Shop
II-1-12	Cooling Building	48	A.N. Warehouse Grained - A.N. Shipping and/or Jet Starter Cartridge Assembly	48	Storage Bldg.
II-1-15	TNT Screening Building	II-1-15	TNT Screening Building	48-1	Storage Bldg.
	No IOP building at this location.		No building present in this location at this time.	48-5	Electric Control House (New)
	No IOP building at this location.		No building present in this location at this time.	49	Big Inch Cap Assembly Line
	No IOP building at this location.		No building present in this location at this time.	49-1	Big Inch Screening House (New)
	No IOP building at this location.		No building present in this location at this time.	49-5	Electric Control House (New)
	No IOP building at this location.	50	(Not Named - Use Unknown)	50	Storage Bldg.
	No IOP building at this location.	53	DYNOIL Mix House	53	Storage Bldg.
II-1-2	Receiving and Storage Building	55	Carpenter & Machine Shop	55	Carpenter Machine & Sheet Metal Shop
II-1-31	Pump House	55-A	Steam Reg. For 55	55-1	Steam Regulator Station
II-1-3	Cleaning and Painting Building	56	Garage - Washroom - Office/Inert Stores	56	Garage - Washroom & Office
II-1-32	Pump House	56	Becomes a part of Bldg. 56 (see above)	56	Becomes a part of Bldg. 56 (see above)
II-1-5	Paint Service Building	57	Welding Shop	57	Welding Shop
	No IOP building at this location.	58	Salvage Yard	58	Salvage Yard
II-1-23	Boiler House	60	Boiler House (Rebuilt in same location)	60	Boiler House
	No IOP building at this location.	60-A	Boiler House Shop	60-1	Boiler House Shop
II-1-1	Inert Storage Building	65	General Stores	65	General Stores
	No IOP building at this location.		No building present in this location at this time.	65-1	Track Scale (New)
II-1-3	Cleaning and Painting Building	66	Inert Stores No.1	66	Inert Stores No. 1
II-1-6	Melt Loading Building	67	Inert Stores No.2	67	Inert Stores No. 2
	No IOP building at this location.	67-A	Apricot Pit Storage	67-1	Apricot Pit Storage
	No IOP building at this location.	67-B	Bag Sulphur Storage	67-2	Bag Sulphur Storage
	No IOP building at this location.		No building present in this location at this time.	67-3	Bulk A.N. Loading (New)
II-1-4	Paint Shield Cleaning Building	68	Oil Stores	68	Oil Stores
II-1-26	Change House	69	Warehouse - Change House - R&D	69	R&D Office & Lab
II-1-24	Change House	75	Administration Building	75	Administration Bldg.
II-1-28	Timekeepers Building	75-A	Building Rebuilt as a Guard House/Possible Lab	75-1	Guard House
	No IOP building at this location.		Areas Shown But Not Named	77	Employee Parking
	No IOP building at this location.		Areas Shown But Not Named	77-1	Visitor Parking
	No IOP building at this location.		Areas Shown But Not Named	77-2	Vehicle Parking

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TABLE 15-1
AREA 11 –HISTORIC BUILDING NUMBERS AND NAMES

Illinois Ordnance Plant		Olin (1956–1964)		U.S. Powder Design/CSC (1964-1982)	
Bldg. No.	**Building Name**	**Bldg. No.**	**Building Name**	**Bldg. No.**	**Building Name**
	No IOP building at this location.	80	Laboratory	80	Q.C. Laboratory
	No IOP building at this location.	80-A	Laboratory Storage	81	Q.C. Storage
	No IOP building at this location.	Not Listed	Component Magazine (Not Shown On Map)	82	Component Magazine
II-1-17	Drilling and Boostering Building	II-1-17	Pilot Propellant Plant	85	Storage
II-1-18	Vacuum Pump House	II-1-18	Grain Curing Building		Building appears to have been removed
II-1-19	Vacuum Pump House	II-1-19	Grain Curing Building		Building appears to have been removed
	No IOP building at this location.		No building present in this location at this time.	85-1	Dryer Bldg.
II-1-20	Vacuum Pump House	II-1-20	Grain Curing Building	85-2	Compressor Bldg.
II-1-21	Vacuum Pump House	II-1-21	Nitroglycerin Storage	85-3	Storage Bldg.
	No IOP building at this location.		No building present in this location at this time.	85-4	Storage Bldg. (New)
	Building is present on site - use is unknown.		Building is present on site - use is unknown.	85-5	Electric Control House
	No IOP building at this location.		Explosives testing from Pilot Propellant Plant	86	Ingredient Storage for Big Inch Cap Line
	No IOP building at this location.		Building present - use unknown.	87	Big Inch Cap Testing/Storage Bldg.
II-1-22	Booster Service Magazine	II-1-22	Not used by Olin in 1963	88	Storage Bldg.
II-1-16	TNT Service Magazine	II-1-16	Destroyed by explosion.		No longer present on property.
II-1-29	Guard House		Still present on site - may not be in use.		Building appears to have been removed
II-1-30	Guard House		Still present on site - may not be in use.		Building appears to have been removed
II-1-33	Condensate Pump House		Still present on site - may not be in use.		Still present on site - may not be in use.
II-1-34	Pump House		Still present on site - may not be in use.		Still present on site - may not be in use.
II-1-35	Booster Service Magazine	II-1-35	Maintenance Shop and Stores		Still present on site - may not be in use.

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TABLE 15-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
49-02	Bis(2-Ethylhexyl)phthalate	0.50B
	Di-n-butylphthalate	0.12J
	Aluminum	13,000
	Barium	120
	Beryllium	0.9
	Calcium	19,000
	Chromium	60
	Cobalt	14
	Copper	17
	Iron	21,000
	Lead	21
	Magnesium	4,400
	Manganese	990
	Mercury	0.04
	Nickel	26
	Potassium	1,100
	Vanadium	35
	Zinc	180
49-02 DUP	Benzo[a]anthracene	0.13J
	Benzo[a]pyrene	0.13J
	Benzo[b]fluoranthene	0.22J
	Bis(2-Ethylhexyl)phthalate	2.2B
	Chrysene	0.15J
	Di-n-butylphthalate	0.13J
	Fluoranthene	0.33J
	Phenanthrene	0.13J
	Pyrene	0.26J
	Aluminum	13,000
	Barium	100
	Beryllium	0.9
	Calcium	5,400
	Chromium	66
	Cobalt	13
	Copper	18
	Iron	22,000
	Lead	27
	Magnesium	2,600
	Manganese	740
	Mercury	0.17
	Nickel	24
	Potassium	1,100
	Vanadium	35
	Zinc	180

Sheet 1 of 1

mg/kg = milligrams per kilogram
J = Estimated
B = No explanation of "B" qualifier in report

TABLE 15-2
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11A

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11A-001	366614.9	781026.5	430.47	NA	
A11A-002	366212.8	781129.6	437.11	NA	
A11A-003	366214.3	781104.7	435.52	NA	
A11A-004	366222.1	781086.3	436.14	NA	
A11A-005	366090.4	781382.3	435.60	NA	
A11A-006	366143.5	781521.7	430.20	NA	
A11A-007	366066.3	781538.6	432.50	NA	
A11A-008	366528.9	781406.2	426.71	NA	
A11A-009	366782.8	781356.2	426.29	NA	
A11A-010	366900.7	781412.0	425.28	NA	
A11A-011	366613.7	781507.9	429.04	NA	
A11A-012	366487.9	781497.1	434.33	NA	
A11A-013	366507.2	781568.2	431.53	NA	
A11A-014	366430.0	781615.4	430.56	NA	
A11A-015	366413.6	781664.0	435.05	NA	
A11A-016	366237.2	781650.5	435.56	NA	
A11A-017	366156.1	781701.8	433.51	NA	
A11A-018				NA	Survey coordinates are believed to be inaccurate.
A11A-019	366913.5	781610.1	434.64	NA	
A11A-020	366926.7	781686.2	436.21	NA	
A11A-021	366793.8	781634.5	431.98	NA	
A11A-022	366697.5	781757.5	432.40	NA	
A11A-023	366778.1	781818.4	430.85	NA	
A11A-024	366594.9	781760.0	432.54	NA	
A11A-025	366631.6	781836.1	435.92	NA	
A11A-026				NA	No survey data for this location.
A11A-027	367090.2	781898.3	434.28	NA	
A11A-028	366923.9	781789.5	429.44	NA	
A11A-029	366709.8	781977.7	434.94	NA	
A11A-030	367060.5	782035.0	431.07	NA	
A11A-031	367106.8	781799.5	431.63	NA	
A11A-032	367041.1	781668.9	425.98	NA	
A11A-033	367204.2	781684.9	424.99	NA	
A11A-034	367271.5	781769.7	425.85	NA	
A11A-036	366572.2	781829.2	436.08	NA	
A11A-037	366522.0	781863.6	435.82	NA	
A11A-W01	366595.7	781110.6	434.55	436.95	New monitoring well
A11A-W02	366686.0	781794.3	437.42	440.10	New monitoring well

Sheet 1 of 1

NA = Not Applicable

TABLE 15-3
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
A11A-W01	2.89E-05
A11A-W02	5.12E-05

Sheet 1 of 1

cm/sec = centimeters per second

TABLE 15-4
AREA 11 AND AREA 12 WATER LEVEL DATA

Monitoring Well	Ground Surface Elevation (ft MSL)	TOC Elevation (ft MSL)	May-00		July-00		September-00		October-00	
			DTW (ft BTOC)	Water Elev. (ft MSL)	DTW (ft BTOC)	Water Elev. (ft MSL)	DTW (ft BTOC)	Water Elev. (ft MSL)	DTW (ft BTOC)	Water Elev. (ft MSL)
A11A-W01	434.55	436.95	8.81	428.14	9.60	427.35	15.64	421.31	16.86	420.09
A11A-W02	437.42	440.10	9.57	430.53	10.37	429.73	15.70	424.40	16.29	423.81
A11H-W01	441.90	444.62	7.04	437.58	8.39	436.23	12.31	432.31	12.69	431.93
A11P-W01	435.04	437.33	6.20	431.13	7.39	429.94	11.68	425.65	13.30	424.03
A11S-W01	435.71	438.53	10.11	428.42	11.35	427.18	17.02	421.51	17.81	420.72
A11S-W02	436.61	439.55	10.24	429.31	11.06	428.49	16.67	422.88	17.70	421.85
A11S-W03	438.19	440.81	10.82	429.99	11.88	428.93	18.11	422.70	19.12	421.69
A11S-W04	435.16	438.02	6.21	431.81	6.60	431.42	12.00	426.02	13.48	424.54
0A12-W01	453.45	456.19	7.39	448.80	8.21	447.98	16.03	440.16	17.04	439.15
0A12-W02	445.88	448.34	11.11	437.23	10.81	437.53	19.43	428.91	19.93	428.41
MW-COP4-2		442.56	7.63	434.93	10.10	432.46	NA	NA	NA	NA
MW-COP4-2R	449.11	452.48	NA	NA	NA	NA	NA	NA	16.72	435.76
MW-COP4-4	438.07	440.77	5.00	435.77	8.06	432.71	9.96	430.81	10.42	430.35

Sheet 1 of 1

MSL = Mean Sea Level
TOC = Top of Casing
BTOC = Below Top of Casing
NA = Not Analyzed
DTW = Depth to Water

TABLE 15-5
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-A11A

Soil	Sediment	Groundwater	Surface Water
AUS-A11A-002	AUS-A11A-001	AUS-A11A-W01	AUS-A11A-006
AUS-A11A-004	AUS-A11A-003	AUS-A11A-W02	AUS-A11A-007
AUS-A11A-012	AUS-A11A-005		AUS-A11A-008
AUS-A11A-013	AUS-A11A-006		AUS-A11A-010
AUS-A11A-014*	AUS-A11A-007		AUS-A11A-014
AUS-A11A-015	AUS-A11A-008		AUS-A11A-022
AUS-A11A-018	AUS-A11A-009		AUS-A11A-023
AUS-A11A-019	AUS-A11A-010		AUS-A11A-024
AUS-A11A-020	AUS-A11A-011		AUS-A11A-026
AUS-A11A-021*	AUS-A11A-016		AUS-A11A-028
AUS-A11A-025	AUS-A11A-017		AUS-A11A-032
AUS-A11A-027	AUS-A11A-022		AUS-A11A-033
AUS-A11A-030	AUS-A11A-023		
AUS-A11A-036*	AUS-A11A-024		
AUS-A11A-037*	AUS-A11A-026		
AUS-A11A-W01	AUS-A11A-028		
AUS-A11A-W02	AUS-A11A-031		
	AUS-A11A-032		
	AUS-A11A-033		
	AUS-A11A-034		
	AUS-A11A-035		

Sheet 1 of 1

* Note that the samples at this location were originally designated as sediment, but are actually soil samples.

TABLE 15-6
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compound		
2-Methylnaphthalene	4/14	47 ug/kg to 670 ug/kg
Acenaphthene	1/14	44 ug/kg
Anthracene	2/14	120 ug/kg to 260 ug/kg
Benzo(a)Anthracene	2/14	660 ug/kg to 2,600 ug/kg
Benzo(a)Pyrene	2/14	600 ug/kg to 2,700 ug/kg
Benzo(b)Fluoranthene	2/14	750 ug/kg to 2,200 ug/kg
Benzo(g,h,i)Perylene	2/14	550 ug/kg to 1,800 ug/kg
Benzo(k)Fluoranthene	2/14	620 ug/kg to 2,600 ug/kg
Benzyl Butyl Phthalate	1/11	1,700 ug/kg
Bis(2-Ethylhexyl) Phthalate	5/11	64 ug/kg to 1,400 ug/kg
Carbazole	2/11	99 ug/kg to 100 ug/kg
Chrysene	3/14	66 ug/kg to 2,600 ug/kg
Dibenz(a,h)Anthracene	2/14	260 ug/kg to 1,100 ug/kg
Dibenzofuran	2/11	130 ug/kg to 180 ug/kg
Di-N-Butyl Phthalate	2/11	82 ug/kg to 310 ug/kg
Fluoranthene	3/14	76 ug/kg to 3,800 ug/kg
Indeno(1,2,3-c,d)Pyrene	2/14	510 ug/kg to 1,800 ug/kg
Naphthalene	2/14	150 ug/kg to 420 ug/kg
Phenanthrene	5/14	49 ug/kg to 690 ug/kg
Pyrene	3/14	100 ug/kg to 3,800 ug/kg
Metals		
Aluminum	22/22	3,410 mg/kg to 24,200 mg/kg
Antimony	5/22	0.23 mg/kg to 0.87 mg/kg
Arsenic	22/22	3 mg/kg to 12.8 mg/kg
Barium	22/22	30.9 mg/kg to 229 mg/kg
Beryllium	1/22	0.43 mg/kg
Boron	6/22	1.8 mg/kg to 9.5 mg/kg
Cadmium	9/22	0.16 mg/kg to 1.3 mg/kg
Calcium	22/22	350 mg/kg to 136,000 mg/kg
Chromium, Total	22/22	4.5 mg/kg to 79.2 mg/kg
Cobalt	12/22	3.6 mg/kg to 17.9 mg/kg
Copper	21/22	3.9 mg/kg to 70.5 mg/kg
Iron	22/22	9,090 mg/kg to 43,300 mg/kg
Lead	22/22	7.4 mg/kg to 89.7 mg/kg
Magnesium	22/22	826 mg/kg to 79,700 mg/kg
Manganese	22/22	84.4 mg/kg to 1,440 mg/kg
Mercury	7/22	0.029 mg/kg to 0.13 mg/kg
Nickel	21/22	5 mg/kg to 23.1 mg/kg
Potassium	22/22	181 mg/kg to 1,300 mg/kg
Selenium	12/22	0.23 mg/kg to 1.8 mg/kg

Sheet 1 of 2

TABLE 15-6
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Silver	11/22	0.22 mg/kg to 0.82 mg/kg
Sodium	3/22	73.4 mg/kg to 881 mg/kg
Thallium	2/22	0.15 mg/kg to 0.31 mg/kg
Vanadium	22/22	8.2 mg/kg to 42.4 mg/kg
Zinc	22/22	17.7 mg/kg to 362 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that arc outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

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TABLE 15-7
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Acetone	1/2	35 ug/kg
Semivolatile Organic Compound		
2-Methylnaphthalene	4/17	86 ug/kg to 300 ug/kg
2,4-Dinitrotoluene	1/19	63 ug/kg
4-Methylphenol (P-Cresol)	1/15	53 ug/kg
Benzo(a)Anthracene	5/17	39 ug/kg to 100 ug/kg
Benzo(a)Pyrene	5/17	61 ug/kg to 100 ug/kg
Benzo(b)Fluoranthene	6/17	95 ug/kg to 180 ug/kg
Benzo(g,h,i)Perylene	3/17	51 ug/kg to 61 ug/kg
Benzo(k)Fluoranthene	5/17	36 ug/kg to 100 ug/kg
Bis(2-Ethylhexyl) Phthalate	5/15	55 ug/kg to 530 ug/kg
Dibenz(a,h)Anthracene	1/17	15 ug/kg
Dibenzofuran	2/15	75 ug/kg to 100 ug/kg
Diethyl Phthalate	1/15	140 ug/kg
Di-N-Butyl Phthalate	4/15	88 ug/kg to 290 ug/kg
Fluoranthene	5/17	81 ug/kg to 170 ug/kg
Indeno(1,2,3-c,d)Pyrene	2/17	32 ug/kg to 60 ug/kg
Naphthalene	2/17	130 ug/kg to 150 ug/kg
N-Nitrosodiphenylamine	1/15	710 ug/kg
Pentachlorophenol	2/15	65 ug/kg to 170 ug/kg
Phenanthrene	5/17	24 ug/kg to 180 ug/kg
Pyrene	5/17	69 ug/kg to 210 ug/kg
Metals		
Aluminum	21/21	5,330 mg/kg to 15,500 mg/kg
Antimony	4/21	0.26 mg/kg to 1.1 mg/kg
Arsenic	21/21	3.4 mg/kg to 53.5 mg/kg
Barium	21/21	58.3 mg/kg to 496 mg/kg
Beryllium	8/21	0.42 mg/kg to 2.5 mg/kg
Boron	8/21	2.1 mg/kg to 14.1 mg/kg
Cadmium	10/21	0.04 mg/kg to 0.66 mg/kg
Calcium	21/21	1,680 mg/kg to 25,300 mg/kg
Chromium, Total	21/21	7.8 mg/kg to 102 mg/kg
Chrysene	6/21	59 mg/kg to 150 mg/kg
Cobalt	17/21	3.5 mg/kg to 61.4 mg/kg
Copper	21/21	6.3 mg/kg to 27.3 mg/kg
Iron	21/21	2,600 mg/kg to 65,700 mg/kg
Lead	21/21	9.4 mg/kg to 92 mg/kg
Magnesium	21/21	1,220 mg/kg to 5,810 mg/kg
Manganese	21/21	134 mg/kg to 8,960 mg/kg

Sheet 1 of 2

TABLE 15-7
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Mercury	11/21	0.026 mg/kg to 0.24 mg/kg
Nickel	21/21	5.8 mg/kg to 32.7 mg/kg
Potassium	21/21	318 mg/kg to 1,130 mg/kg
Selenium	15/21	0.47 mg/kg to 5.2 mg/kg
Silver	11/21	0.22 mg/kg to 0.69 mg/kg
Sodium	5/21	64.9 mg/kg to 311 mg/kg
Vanadium	21/21	17.6 mg/kg to 138 mg/kg
Zinc	21/21	29.7 mg/kg to 261 mg/kg
Other Inorganics		
Total Organic Carbon	1/1	42,000 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

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TABLE 15-8
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Metals		
Aluminum	2/2	1,370 ug/L to 1,490 ug/L
Barium	2/2	17.7 ug/L to 53.5 ug/L
Calcium	2/2	228,000 ug/L to 399,000 ug/L
Iron	2/2	1,670 ug/L to 1,730 ug/L
Magnesium	2/2	125,000 ug/L to 986,000 ug/L
Manganese	2/2	159 ug/L to 211 ug/L
Mercury	1/2	0.075 ug/L
Nickel	2/2	6.7 ug/L to 10.1 ug/L
Potassium	1/2	2,140 ug/L
Sodium	2/2	124,000 ug/L to 1,220,000 ug/L
Zinc	1/2	4.3 ug/L
Other Inorganics		
Alkalinity, Total (as CACO3)	1/1	252 mg/L
Nitrogen, Ammonia (as N)	2/2	0.21 mg/L to 0.99 mg/L
Nitrogen, Nitrate-Nitrite	2/2	3.2 mg/L to 140 mg/L
Phosphorus, Total (as P)	1/1	0.095 mg/L
Sulfate (as SO_4)	2/2	490,000 ug/L to 6,400,000 ug/L
Suspended Solids (Residue, Non-Filterable)	1/1	29.5 mg/L
Total Dissolved Solids (Residue, Filterable)	2/2	2,070 mg/L to 6,170 mg/L

Sheet 1 of 1

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

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TABLE 15-9
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Bis(2-Ethylhexyl) Phthalate	1/9	410 ug/L
Metals		
Aluminum	11/12	183 ug/L to 69,000 ug/L
Antimony	1/12	1.6 ug/L
Arsenic	5/12	2.6 ug/L to 38.7 ug/L
Barium	12/12	19.4 ug/L to 632 ug/L
Beryllium	1/12	1.5 ug/L
Boron	6/12	16.2 ug/L to 57.3 ug/L
Cadmium	1/12	3 ug/L
Calcium	12/12	27,400 ug/L to 172,000 ug/L
Chromium, Total	9/12	1.1 ug/L to 105 ug/L
Cobalt	2/12	29.4 ug/L to 63 ug/L
Copper	5/12	3.9 ug/L to 89.3 ug/L
Iron	12/12	688 ug/L to 98,000 ug/L
Lead	4/12	3.3 ug/L to 95.1 ug/L
Magnesium	12/12	6,170 ug/L to 89,700 ug/L
Manganese	12/12	92.4 ug/L to 6,720 ug/L
Mercury	6/12	0.21 ug/L to 0.66 ug/L
Nickel	5/12	1.4 ug/L to 87.9 ug/L
Potassium	12/12	825 ug/L to 6,190 ug/L
Selenium	3/12	2 ug/L to 7.9 ug/L
Sodium	11/12	1,670 ug/L to 48,900 ug/L
Sulfate (as SO4)	4/12	13,000 ug/L to 240,000 ug/L
Thallium	1/12	3.8 ug/L
Vanadium	4/12	7.7 ug/L to 158 ug/L
Zinc	4/12	193 ug/L to 616 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	6/6	72.8 mg/L to 200 ug/L
Nitrogen, Ammonia (as N)	11/12	0.25 mg/L to 1.9 mg/L
Nitrogen, Nitrate-Nitrite	8/12	0.038 mg/L to 174 ug/L
Phosphorus, Total (as P)	3/3	0.15 ug/L to 0.42 ug/L
Sulfate	4/4	13,000 ug/L to 240,000 ug/L
Suspended Solids (Residue, Non-Filterable)	2/2	12 mg/L to 853 mg/L
Total Dissolved Solids (Residue, Filterable)	12/12	189 mg/L to 1,038 mg/L

Sheet 1 of 1

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).
Checked by: SEA 7/20/01

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			1.80E-06	6.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG		6.68E-09	1.54E-06	3.00E+01
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG		3.16E-09	3.94E-05	6.67E+00
75-34-3	1,1-Dichloroethane	6	UJ	UG/KG			2.91E-06	6.00E-03
75-35-4	1,1-Dichloroethene	6	U	UG/KG		5.05E-08	8.91E-05	2.00E+00
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG		7.85E-09	1.70E-04	6.00E+00
540-59-0	1,2-Dichloroethene (total)	6	UJ	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	6	U	UG/KG		7.81E-09	2.82E-04	6.00E+00
78-93-3	2-Butanone (MEK)	13	U	UG/KG			4.69E-07	
591-78-6	2-Hexanone	13	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	13	U	UG/KG			4.50E-06	
67-64-1	Acetone	13	U	UG/KG			2.09E-06	1.63E-02
71-43-2	Benzene	6	U	UG/KG		4.10E-09	2.48E-04	3.00E+00
75-27-4	Bromodichloromethane	6	U	UG/KG		2.55E-09	5.75E-06	2.00E-01
75-25-2	Bromoform	6	UJ	UG/KG		1.92E-11	3.41E-07	1.50E-01
74-83-9	Bromomethane	6	U	UG/KG			4.57E-04	6.00E-01
75-15-0	Carbon disulfide	6	U	UG/KG			4.96E-06	3.00E-03
56-23-5	Carbon tetrachloride	6	U	UG/KG		1.13E-08	8.58E-04	2.00E+00
108-90-7	Chlorobenzene	6	U	UG/KG			1.11E-05	8.57E-02
75-00-3	Chloroethane	6	U	UG/KG		9.22E-10	3.18E-07	
67-66-3	Chloroform	6	U	UG/KG		1.15E-08	4.66E-03	2.00E-01
74-87-3	Chloromethane	6	U	UG/KG		2.25E-09		
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG			4.07E-05	3.00E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
124-48-1	Dibromochloromethane	6	U	UG/KG		2.26E-09	3.77E-06	3.00E-01
100-41-4	Ethylbenzene	6	U	UG/KG			1.00E-06	8.57E-03
75-09-2	Methylene chloride	6	U	UG/KG		2.92E-10	6.14E-07	6.00E+00
110-54-3	N-Hexane	6	U	UG/KG			1.49E-05	
100-42-5	Styrene	6	U	UG/KG			2.94E-07	3.00E-02
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG		3.21E-10	3.52E-06	2.00E+00
108-88-3	Toluene	6	U	UG/KG			3.02E-06	1.00E-02
1330-20-7	total Xylenes	6	U	UG/KG			1.35E-06	6.00E-04
156-60-5	trans-1,2-Dichloroethene	6	UJ	UG/KG			2.80E-05	2.00E-01
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG		9.81E-10	7.59E-05	2.00E+00
75-01-4	Vinyl chloride	6	U	UG/KG		1.23E-07		8.57E+00
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	560	U	UG/KG			7.35E-05	1.87E+00
95-50-1	1,2-Dichlorobenzene	560	U	UG/KG			1.69E-04	6.22E-01
541-73-1	1,3-Dichlorobenzene	560	U	UG/KG			1.08E-02	
106-46-7	1,4-Dichlorobenzene	560	U	UG/KG		6.89E-08	2.91E-04	5.60E+00
95-95-4	2,4,5-Trichlorophenol	2800	U	UG/KG			3.18E-05	2.80E-01
88-06-2	2,4,6-Trichlorophenol	560	U	UG/KG		2.50E-09		7.00E+01
120-83-2	2,4-Dichlorophenol	560	U	UG/KG			2.12E-04	1.12E+01
105-67-9	2,4-Dimethylphenol	560	U	UG/KG			3.18E-05	1.40E+00
51-28-5	2,4-Dinitrophenol	2800	U	UG/KG			1.59E-03	2.80E+02
91-58-7	2-Chloronaphthalene	560	U	UG/KG			2.05E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-57-8	2-Chlorophenol	560	U	UG/KG			2.32E-03	2.80E+00
90-12-0	1-Methylnaphthalene	44	U	UG/KG			2.33E-04	1.10E-02
91-57-6	2-Methylnaphthalene	670		UG/KG			1.24E-05	3.35E-03
95-48-7	2-Methylphenol	560	U	UG/KG			1.27E-05	7.00E-01
88-74-4	2-Nitroaniline	2800	U	UG/KG			5.56E-02	
88-75-5	2-Nitrophenol	560	U	UG/KG			7.95E-05	
91-94-1	3,3'-Dichlorobenzidine	560	U	UG/KG		1.02E-07		1.87E+03
99-09-2	3-Nitroaniline	2800	U	UG/KG			5.56E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2800	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	560	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	560	U	UG/KG			1.27E-05	
106-47-8	4-Chloroaniline	1100	U	UG/KG			3.12E-04	3.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	560	U	UG/KG				
106-44-5	4-Methylphenol	560	U	UG/KG			1.27E-04	
100-01-6	4-Nitroaniline	2800	U	UG/KG			5.56E-02	
100-02-7	4-Nitrophenol	2800	U	UG/KG			3.97E-04	
83-32-9	Acenaphthene	44	J	UG/KG			1.15E-06	1.47E-03
208-96-8	Acenaphthylene	560	U	UG/KG			1.03E-05	2.80E-03
120-12-7	Anthracene	260	J	UG/KG			6.67E-07	4.33E-04
56-55-3	Benzo(a)anthracene	2600		UG/KG		9.01E-07		3.25E+01
50-32-8	Benzo(a)pyrene	2700		UG/KG		9.35E-06		6.75E+00
205-99-2	Benzo(b)fluoranthene	2200		UG/KG		7.62E-07		1.10E+01
191-24-2	Benzo(g,h,i)perylene	1800		UG/KG			3.32E-05	9.00E-03
207-08-9	Benzo(k)fluoranthene	2600		UG/KG		9.01E-08		1.30E+00

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
111-91-1	bis(2-Chloroethoxy)methane	560	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	560	U	UG/KG		9.03E-07		2.80E+04
108-60-1	bis(2-Chloroisopropyl) ether	560	U	UG/KG		6.93E-08	1.32E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1400		UG/KG		7.95E-09	7.95E-05	
85-68-7	Butyl benzyl phthalate	1700		UG/KG			9.65E-06	2.13E-03
86-74-8	Carbazole	100	J	UG/KG		8.11E-10		3.33E+00
218-01-9	Chrysene	2600		UG/KG		9.01E-09		3.25E-01
84-74-2	Di-n-butyl phthalate	310	J	UG/KG			3.52E-06	1.03E-03
117-84-0	Di-n-octyl phthalate	560	U	UG/KG			3.18E-05	5.60E-05
53-70-3	Dibenz(a,h)anthracene	1100		UG/KG		3.81E-06		1.38E+01
132-64-9	Dibenzofuran	180	J	UG/KG			3.56E-05	
84-66-2	Diethyl phthalate	560	U	UG/KG			7.95E-07	
131-11-3	Dimethyl phthalate	560	U	UG/KG			6.36E-08	
206-44-0	Fluoranthene	3800		UG/KG			1.26E-04	1.90E-02
86-73-7	Fluorene	560	U	UG/KG			1.69E-05	1.87E-02
118-74-1	Hexachlorobenzene	560	U	UG/KG		3.63E-07	7.95E-04	5.60E+00
87-68-3	Hexachlorobutadiene	560	U	UG/KG		1.77E-08	3.18E-03	5.60E+00
77-47-4	Hexachlorocyclopentadiene	560	U	UG/KG			9.50E-05	2.80E-02
67-72-1	Hexachloroethane	560	U	UG/KG		3.18E-09	6.36E-04	2.80E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	1800		UG/KG		6.24E-07		2.57E+00
78-59-1	Isophorone	560	U	UG/KG		2.16E-10	3.18E-06	1.87E+01
621-64-7	N-Nitroso-di-n-propylamine	560	U	UG/KG		1.59E-06		2.80E+05
86-30-6	N-Nitrosodiphenylamine	560	U	UG/KG		1.11E-09		9.33E+00
91-20-3	Naphthalene	420	J	UG/KG			2.23E-03	1.05E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
87-86-5	Pentachlorophenol	2800	U	UG/KG		2.52E-07	1.96E-04	2.80E+03
85-01-8	Phenanthrene	690		UG/KG			1.27E-05	3.45E-03
108-95-2	Phenol	560	U	UG/KG			1.06E-06	1.12E-01
129-00-0	Pyrene	3800		UG/KG			7.01E-05	1.90E-02
Explosives								
99-35-4	1,3,5-Trinitrobenzene	410	UJ	UG/KG			1.55E-05	
99-65-0	1,3-Dinitrobenzene	410	UJ	UG/KG			4.65E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	830	UJ	UG/KG		1.01E-08	1.88E-03	
121-14-2	2,4-Dinitrotoluene	410	UJ	UG/KG			2.33E-04	1.03E+04
606-20-2	2,6-Dinitrotoluene	750	UJ	UG/KG			8.51E-04	2.50E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	830	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	830	UJ	UG/KG				
99-08-1	3-Nitrotoluene	830	UJ	UG/KG			4.09E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	830	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	830	UJ	UG/KG			4.09E-04	
2691-41-0	HMX	830	UJ	UG/KG			1.88E-05	
98-95-3	Nitrobenzene	410	UJ	UG/KG			3.58E-03	
55-63-0	Nitroglycerin	1500	UJ	UG/KG		8.51E-09		
78-11-5	Pentaerythritol tetranitrate (PETN)	2600	U	UG/KG				
121-82-4	RDX	830	UJ	UG/KG		3.70E-08	3.14E-04	
479-45-8	Tetryl	1200	UJ	UG/KG			1.36E-04	
Metals								
7429-90-5	Aluminum	24200		MG/KG	8.40E-01		1.44E-02	
7440-36-0	Antimony	0.87		MG/KG	1.05E+00		1.06E-03	2.90E+00

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TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-38-2	Arsenic	12.8		MG/KG	9.48E-01	4.69E-06	2.91E-02	1.28E+01
7440-39-3	Barium	229		MG/KG	1.17E+00		1.84E-03	2.86E+00
7440-41-7	Beryllium	0.43	J	MG/KG	5.66E-01	1.92E-10	1.16E-04	1.43E-01
7440-42-8	Boron	9.5	J	MG/KG	1.79E+00		1.20E-04	
7440-43-9	Cadmium	1.3		MG/KG	6.84E+00	4.35E-10	1.60E-03	3.25E+00
7440-70-2	Calcium	136000		MG/KG	5.45E+01			
7440-47-3	Chromium	79.2		MG/KG	3.14E+00	1.77E-07		3.96E+01
7440-48-4	Cobalt	17.9		MG/KG	8.25E-01		1.46E-04	
7440-50-8	Copper	70.5		MG/KG	6.24E+00		9.29E-04	
7439-89-6	Iron	43300	J	MG/KG	2.24E+00		7.07E-02	
7439-92-1	Lead	89.7		MG/KG	3.83E+00			
7439-95-4	Magnesium	79700		MG/KG	5.14E+01			
7439-96-5	Manganese	1440		MG/KG	3.96E-01		4.47E-02	
7439-97-6	Mercury	0.13		MG/KG	2.17E+00			
7440-02-0	Nickel	23.1		MG/KG	1.22E+00		5.65E-04	3.30E+00
2023695	Potassium	1300		MG/KG	2.08E+00			
7782-49-2	Selenium	1.8		MG/KG	7.69E-01		1.76E-04	6.00E+00
7440-22-4	Silver	0.82	J	MG/KG	1.41E+00		8.02E-05	4.10E-01
7440-23-5	Sodium	881		MG/KG	5.18E+00			
7440-28-0	Thallium	0.31	J	MG/KG	7.56E-01		2.17E-06	
7440-62-2	Vanadium	42.4		MG/KG	8.98E-01		2.96E-03	1.41E-01
7440-66-6	Zinc	362		MG/KG	7.04E+00		5.91E-04	6.03E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			3.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG	7.32E-07	7.32E-07	3.00E-01
75-34-3	1,1-Dichloroethane	6	UJ	UG/KG	3.00E-08	3.00E-08	2.61E-04
75-35-4	1,1-Dichloroethene	6	U	UG/KG	3.33E-07	3.33E-06	1.00E-01
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG	9.52E-05	4.29E-06	3.00E-01
540-59-0	1,2-Dichloroethene (total)	6	UJ	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	6	U	UG/KG	7.14E-05	3.33E-06	2.00E-01
78-93-3	2-Butanone (MEK)	13	U	UG/KG			
591-78-6	2-Hexanone	13	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	13	U	UG/KG			
67-64-1	Acetone	13	U	UG/KG	6.50E-08	6.50E-08	8.13E-04
71-43-2	Benzene	6	U	UG/KG	3.00E-05	1.40E-06	2.00E-01
75-27-4	Bromodichloromethane	6	U	UG/KG	6.52E-05	3.00E-06	1.00E-02
75-25-2	Bromoform	6	UJ	UG/KG	8.33E-06	3.75E-07	7.50E-03
74-83-9	Bromomethane	6	U	UG/KG	2.07E-06	6.00E-06	3.00E-02
75-15-0	Carbon disulfide	6	U	UG/KG	3.00E-08	3.00E-07	1.88E-04
56-23-5	Carbon tetrachloride	6	U	UG/KG	1.36E-04	1.46E-05	8.57E-02
108-90-7	Chlorobenzene	6	U	UG/KG	1.46E-07	1.46E-06	6.00E-03
75-00-3	Chloroethane	6	U	UG/KG			
67-66-3	Chloroform	6	U	UG/KG	6.38E-06	3.00E-06	1.00E-02
74-87-3	Chloromethane	6	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG			
124-48-1	Dibromochloromethane	6	U	UG/KG	1.46E-07	1.46E-07	1.50E-02
100-41-4	Ethylbenzene	6	U	UG/KG	3.00E-08	3.00E-07	4.62E-04
75-09-2	Methylene chloride	6	U	UG/KG	7.89E-06	5.00E-07	3.00E-01
110-54-3	N-Hexane	6	U	UG/KG			
100-42-5	Styrene	6	U	UG/KG	1.46E-08	1.46E-07	1.50E-03
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG	5.45E-05	2.50E-06	1.00E-01
108-88-3	Toluene	6	U	UG/KG	1.46E-08	1.46E-08	5.00E-04
1330-20-7	total Xylenes	6	U	UG/KG	6.00E-09	1.46E-08	4.00E-05
156-60-5	trans-1,2-Dichloroethene	6	UJ	UG/KG	1.46E-07	1.46E-07	8.57E-03
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG	1.15E-05	5.00E-06	1.00E-01
75-01-4	Vinyl chloride	6	U	UG/KG	2.00E-03	9.23E-05	6.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	560	U	UG/KG	2.80E-05	2.80E-04	1.12E-01
95-50-1	1,2-Dichlorobenzene	560	U	UG/KG	3.11E-06	3.11E-05	3.29E-02
541-73-1	1,3-Dichlorobenzene	560	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	560	U	UG/KG			2.80E-01
95-95-4	2,4,5-Trichlorophenol	2800	U	UG/KG	1.40E-05	1.40E-05	1.04E-02
88-06-2	2,4,6-Trichlorophenol	560	U	UG/KG	1.08E-03	5.09E-05	2.80E+00
120-83-2	2,4-Dichlorophenol	560	U	UG/KG	9.18E-05	9.18E-04	5.60E-01
105-67-9	2,4-Dimethylphenol	560	U	UG/KG	1.37E-05	1.37E-05	6.22E-02
51-28-5	2,4-Dinitrophenol	2800	U	UG/KG	6.83E-04	6.83E-03	1.40E+01
91-58-7	2-Chloronaphthalene	560	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-57-8	2-Chlorophenol	560	U	UG/KG	5.60E-05	5.60E-05	1.40E-01
90-12-0	1-Methylnaphthalene	44	U	UG/KG	5.37E-07	5.37E-06	5.24E-04
91-57-6	2-Methylnaphthalene	670		UG/KG	1.10E-05	1.10E-05	1.60E-04
95-48-7	2-Methylphenol	560	U	UG/KG	5.60E-06	5.60E-06	3.73E-02
88-74-4	2-Nitroaniline	2800	U	UG/KG			
88-75-5	2-Nitrophenol	560	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	560	U	UG/KG	4.31E-02	2.00E-03	8.00E+01
99-09-2	3-Nitroaniline	2800	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2800	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	560	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	560	U	UG/KG			
106-47-8	4-Chloroaniline	1100	U	UG/KG	1.34E-04	1.34E-03	1.57E+00
7005-72-3	4-Chlorophenyl phenyl ether	560	U	UG/KG			
106-44-5	4-Methylphenol	560	U	UG/KG			
100-01-6	4-Nitroaniline	2800	U	UG/KG			
100-02-7	4-Nitrophenol	2800	U	UG/KG			
83-32-9	Acenaphthene	44	J	UG/KG	3.67E-07	3.67E-07	7.72E-05
208-96-8	Acenaphthylene	560	U	UG/KG	9.18E-06	9.18E-06	1.33E-04
120-12-7	Anthracene	260	J	UG/KG	4.26E-07	4.26E-07	2.17E-05
56-55-3	Benzo(a)anthracene	2600		UG/KG	3.25E-01	1.53E-02	1.30E+00
50-32-8	Benzo(a)pyrene	2700		UG/KG	3.38E+00	1.59E-01	3.38E-01
205-99-2	Benzo(b)fluoranthene	2200		UG/KG	2.75E-01	1.29E-02	4.40E-01
191-24-2	Benzo(g,h,i)perylene	1800		UG/KG	2.95E-05	2.95E-05	4.29E-04
207-08-9	Benzo(k)fluoranthene	2600		UG/KG	3.33E-02	1.53E-03	5.31E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
111-91-1	bis(2-Chloroethoxy)methane	560	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	560	U	UG/KG	1.12E-01	7.47E-03	1.40E+03
108-60-1	bis(2-Chloroisopropyl) ether	560	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1400		UG/KG	3.41E-03	3.41E-04	3.89E-04
85-68-7	Butyl benzyl phthalate	1700		UG/KG	4.15E-06	4.15E-06	1.83E-03
86-74-8	Carbazole	100	J	UG/KG	3.45E-04	1.61E-05	1.67E-01
218-01-9	Chrysene	2600		UG/KG	3.33E-03	1.53E-04	1.63E-02
84-74-2	Di-n-butyl phthalate	310	J	UG/KG	1.55E-06	1.55E-06	1.35E-04
117-84-0	Di-n-octyl phthalate	560	U	UG/KG	1.37E-05	1.37E-04	5.60E-05
53-70-3	Dibenz(a,h)anthracene	1100		UG/KG	1.38E+00	6.47E-02	5.50E-01
132-64-9	Dibenzofuran	180	J	UG/KG			
84-66-2	Diethyl phthalate	560	U	UG/KG	5.60E-07	5.60E-07	1.19E-03
131-11-3	Dimethyl phthalate	560	U	UG/KG			
206-44-0	Fluoranthene	3800		UG/KG	4.63E-05	4.63E-05	8.84E-04
86-73-7	Fluorene	560	U	UG/KG	6.83E-06	6.83E-06	1.00E-03
118-74-1	Hexachlorobenzene	560	U	UG/KG	1.40E-01	7.18E-03	2.80E-01
87-68-3	Hexachlorobutadiene	560	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	560	U	UG/KG	4.00E-05	4.00E-05	1.40E-03
67-72-1	Hexachloroethane	560	U	UG/KG	2.80E-04	2.80E-04	1.12E+00
193-39-5	Indeno(1,2,3-cd)pyrene	1800		UG/KG	2.25E-01	1.06E-02	1.29E-01
78-59-1	Isophorone	560	U	UG/KG	1.37E-06	1.37E-06	7.00E-02
621-64-7	N-Nitroso-di-n-propylamine	560	U	UG/KG	7.00E-01	3.11E-02	1.12E+04
86-30-6	N-Nitrosodiphenylamine	560	U	UG/KG	4.67E-04	2.24E-05	5.60E-01
91-20-3	Naphthalene	420	J	UG/KG	5.12E-06	5.12E-05	5.00E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
87-86-5	Pentachlorophenol	2800	U	UG/KG	1.17E-01	5.38E-03	9.33E+01
85-01-8	Phenanthrene	690		UG/KG	1.13E-05	1.13E-05	1.64E-04
108-95-2	Phenol	560	U	UG/KG	5.60E-07	4.67E-06	5.60E-03
129-00-0	Pyrene	3800		UG/KG	6.23E-05	6.23E-05	9.05E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	410	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	410	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	830	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	410	UJ	UG/KG	4.88E-02	2.28E-03	5.13E+02
606-20-2	2,6-Dinitrotoluene	750	UJ	UG/KG	8.93E-02	4.17E-03	1.07E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	830	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	830	UJ	UG/KG			
99-08-1	3-Nitrotoluene	830	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	830	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	830	UJ	UG/KG			
2691-41-0	HMX	830	UJ	UG/KG			
98-95-3	Nitrobenzene	410	UJ	UG/KG	4.10E-04	4.10E-04	4.10E+00
55-63-0	Nitroglycerin	1500	UJ	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	2600	U	UG/KG			
121-82-4	RDX	830	UJ	UG/KG			
479-45-8	Tetryl	1200	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	24200		MG/KG			
7440-36-0	Antimony	0.87		MG/KG	1.06E-03	1.06E-02	1.74E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-38-2	Arsenic	12.8		MG/KG	4.27E+00	2.10E-01	4.57E-01
7440-39-3	Barium	229		MG/KG	1.64E-03	1.64E-02	1.91E-01
7440-41-7	Beryllium	0.43	J	MG/KG	4.30E-01	1.48E-02	6.52E-02
7440-42-8	Boron	9.5	J	MG/KG	5.28E-05	5.28E-04	
7440-43-9	Cadmium	1.3		MG/KG	6.50E-04	6.50E-03	3.51E-01
7440-70-2	Calcium	136000		MG/KG			
7440-47-3	Chromium	79.2		MG/KG	7.92E-03	1.93E-02	2.83E+00
7440-48-4	Cobalt	17.9		MG/KG	1.49E-04	1.49E-03	
7440-50-8	Copper	70.5		MG/KG	8.60E-04	8.60E-03	6.41E-03
7439-89-6	Iron	43300	J	MG/KG			
7439-92-1	Lead	89.7		MG/KG	2.24E-01	2.24E-01	
7439-95-4	Magnesium	79700		MG/KG			
7439-96-5	Manganese	1440		MG/KG	1.50E-02	1.50E-01	
7439-97-6	Mercury	0.13		MG/KG	2.13E-04	2.13E-03	8.67E-01
7440-02-0	Nickel	23.1		MG/KG	5.63E-04	5.63E-03	3.04E-01
2023695	Potassium	1300		MG/KG			
7782-49-2	Selenium	1.8		MG/KG	1.80E-04	1.80E-03	7.50E-01
7440-22-4	Silver	0.82	J	MG/KG	8.20E-05	8.20E-04	5.47E-01
7440-23-5	Sodium	881		MG/KG			
7440-28-0	Thallium	0.31	J	MG/KG	1.94E-03	1.94E-03	1.29E-01
7440-62-2	Vanadium	42.4		MG/KG	3.03E-03	3.03E-02	4.33E-02
7440-66-6	Zinc	362		MG/KG	5.93E-04	5.93E-03	1.01E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			2.10E-06	7.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG		7.79E-09	1.79E-06	3.50E+01
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG		3.68E-09	4.60E-05	7.78E+00
75-34-3	1,1-Dichloroethane	7	U	UG/KG			3.40E-06	7.00E-03
75-35-4	1,1-Dichloroethene	7	U	UG/KG		5.90E-08	1.04E-04	2.33E+00
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG		9.15E-09	1.99E-04	7.00E+00
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG			4.75E-05	3.50E-01
78-87-5	1,2-Dichloropropane	7	U	UG/KG		9.12E-09	3.29E-04	7.00E+00
78-93-3	2-Butanone (MEK)	14	U	UG/KG			5.05E-07	
591-78-6	2-Hexanone	14	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	14	U	UG/KG			4.85E-06	
67-64-1	Acetone	35		UG/KG			5.63E-06	4.38E-02
71-43-2	Benzene	7	U	UG/KG		4.78E-09	2.89E-04	3.50E+00
75-27-4	Bromodichloromethane	7	U	UG/KG		2.97E-09	6.71E-06	2.33E-01
75-25-2	Bromoform	7	U	UG/KG		2.24E-11	3.97E-07	1.75E-01
74-83-9	Bromomethane	7	U	UG/KG			5.33E-04	7.00E-01
75-15-0	Carbon disulfide	7	U	UG/KG			5.79E-06	3.50E-03
56-23-5	Carbon tetrachloride	7	U	UG/KG		1.32E-08	1.00E-03	2.33E+00
108-90-7	Chlorobenzene	7	U	UG/KG			1.29E-05	1.00E-01
75-00-3	Chloroethane	7	U	UG/KG		1.08E-09	3.71E-07	
67-66-3	Chloroform	7	U	UG/KG		1.34E-08	5.43E-03	2.33E-01
74-87-3	Chloromethane	7	U	UG/KG		2.63E-09		
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG			4.75E-05	3.50E-01
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	7	U	UG/KG		2.64E-09	4.40E-06	3.50E-01
100-41-4	Ethylbenzene	7	U	UG/KG			1.17E-06	1.00E-02
75-09-2	Methylene chloride	7	U	UG/KG		3.41E-10	7.16E-07	7.00E+00
110-54-3	N-Hexane	7	U	UG/KG			1.73E-05	
100-42-5	Styrene	7	U	UG/KG			3.42E-07	3.50E-02
127-18-4	Tetrachloroethylene (PCE)	7	U	UG/KG		3.75E-10	4.11E-06	2.33E+00
108-88-3	Toluene	7	U	UG/KG			3.52E-06	1.17E-02
1330-20-7	total Xylenes	7	U	UG/KG			1.57E-06	7.00E-04
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG			3.27E-05	2.33E-01
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG		1.14E-09	8.85E-05	2.33E+00
75-01-4	Vinyl chloride	7	U	UG/KG		1.44E-07		1.00E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	640	U	UG/KG			8.40E-05	2.13E+00
95-50-1	1,2-Dichlorobenzene	640	U	UG/KG			1.93E-04	7.11E-01
541-73-1	1,3-Dichlorobenzene	640	U	UG/KG			1.24E-02	
106-46-7	1,4-Dichlorobenzene	640	U	UG/KG		7.87E-08	3.33E-04	6.40E+00
95-95-4	2,4,5-Trichlorophenol	3200	U	UG/KG			3.63E-05	3.20E-01
88-06-2	2,4,6-Trichlorophenol	640	U	UG/KG		2.85E-09		8.00E+01
120-83-2	2,4-Dichlorophenol	640	U	UG/KG			2.42E-04	1.28E+01
105-67-9	2,4-Dimethylphenol	640	U	UG/KG			3.63E-05	1.60E+00
51-28-5	2,4-Dinitrophenol	3200	U	UG/KG			1.82E-03	3.20E+02
91-58-7	2-Chloronaphthalene	640	U	UG/KG			2.35E-05	
95-57-8	2-Chlorophenol	640	U	UG/KG			2.65E-03	3.20E+00
90-12-0	1-Methylnaphthalene	60	U	UG/KG			3.18E-04	1.50E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
91-57-6	2-Methylnaphthalene	300	J	UG/KG			5.53E-06	1.50E-03
95-48-7	2-Methylphenol	640	U	UG/KG			1.45E-05	8.00E-01
88-74-4	2-Nitroaniline	3200	U	UG/KG			6.36E-02	
88-75-5	2-Nitrophenol	640	U	UG/KG			9.08E-05	
91-94-1	3,3'-Dichlorobenzidine	640	U	UG/KG		1.17E-07		2.13E+03
99-09-2	3-Nitroaniline	3200	U	UG/KG			6.36E-02	
534-52-1	4,6-Dinitro-2-methylphenol	3200	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	640	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	640	U	UG/KG			1.45E-05	
106-47-8	4-Chloroaniline	1300	U	UG/KG			3.69E-04	4.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	640	U	UG/KG				
106-44-5	4-Methylphenol	53	J	UG/KG			1.20E-05	
100-01-6	4-Nitroaniline	3200	U	UG/KG			6.36E-02	
100-02-7	4-Nitrophenol	3200	U	UG/KG			4.54E-04	
83-32-9	Acenaphthene	640	U	UG/KG			1.67E-05	2.13E-02
208-96-8	Acenaphthylene	640	U	UG/KG			1.18E-05	3.20E-03
120-12-7	Anthracene	640	U	UG/KG			1.64E-06	1.07E-03
56-55-3	Benzo(a)anthracene	100	J	UG/KG		3.46E-08		1.25E+00
50-32-8	Benzo(a)pyrene	100	J	UG/KG		3.46E-07		2.50E-01
205-99-2	Benzo(b)fluoranthene	180	J	UG/KG		6.24E-08		9.00E-01
191-24-2	Benzo(g,h,i)perylene	61	J	UG/KG			1.12E-06	3.05E-04
207-08-9	Benzo(k)fluoranthene	100	J	UG/KG		3.46E-09		5.00E-02
111-91-1	bis(2-Chloroethoxy)methane	640	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	640	U	UG/KG		1.03E-06		3.20E+04
108-60-1	bis(2-Chloroisopropyl) ether	640	U	UG/KG		7.92E-08	1.51E-04	

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	530		UG/KG		3.01E-09	3.01E-05	
85-68-7	Butyl benzyl phthalate	640	U	UG/KG			3.63E-06	8.00E-04
86-74-8	Carbazole	640	U	UG/KG		5.19E-09		2.13E+01
218-01-9	Chrysene	150	J	UG/KG		5.20E-10		1.88E-02
84-74-2	Di-n-butyl phthalate	290	J	UG/KG			3.29E-06	9.67E-04
117-84-0	Di-n-octyl phthalate	640	U	UG/KG			3.63E-05	6.40E-05
53-70-3	Dibenz(a,h)anthracene	15		UG/KG		5.20E-08		1.88E-01
132-64-9	Dibenzofuran	100	J	UG/KG			1.98E-05	
84-66-2	Diethyl phthalate	140	J	UG/KG			1.99E-07	
131-11-3	Dimethyl phthalate	640	U	UG/KG			7.27E-08	
206-44-0	Fluoranthene	170	J	UG/KG			5.65E-06	8.50E-04
86-73-7	Fluorene	640	U	UG/KG			1.93E-05	2.13E-02
118-74-1	Hexachlorobenzene	640	U	UG/KG		4.15E-07	9.08E-04	6.40E+00
87-68-3	Hexachlorobutadiene	640	U	UG/KG		2.02E-08	3.63E-03	6.40E+00
77-47-4	Hexachlorocyclopentadiene	640	U	UG/KG			1.09E-04	3.20E-02
67-72-1	Hexachloroethane	640	U	UG/KG		3.63E-09	7.27E-04	3.20E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	60	J	UG/KG		2.08E-08		8.57E-02
78-59-1	Isophorone	640	U	UG/KG		2.46E-10	3.63E-06	2.13E+01
621-64-7	N-Nitroso-di-n-propylamine	640	U	UG/KG		1.82E-06		3.20E+05
86-30-6	N-Nitrosodiphenylamine	710		UG/KG		1.41E-09		1.78E+01
91-20-3	Naphthalene	150	J	UG/KG			7.96E-04	3.75E-02
87-86-5	Pentachlorophenol	170	J	UG/KG		1.53E-08	1.19E-05	1.70E+02
85-01-8	Phenanthrene	180	J	UG/KG			3.32E-06	9.00E-04
108-95-2	Phenol	640	U	UG/KG			1.21E-06	1.28E-01
129-00-0	Pyrene	210	J	UG/KG			3.87E-06	1.05E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	480	UJ	UG/KG			1.82E-05	
99-65-0	1,3-Dinitrobenzene	480	UJ	UG/KG			5.45E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	950	UJ	UG/KG		1.16E-08	2.16E-03	
121-14-2	2,4-Dinitrotoluene	63	J	UG/KG			3.58E-05	1.58E+03
606-20-2	2,6-Dinitrotoluene	900	UJ	UG/KG			1.02E-03	3.00E+04
	Dinitrotoluene Mixture	63	J	UG/KG		1.75E-08		1.58E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	950	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	950	UJ	UG/KG				
99-08-1	3-Nitrotoluene	950	UJ	UG/KG			4.68E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	950	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	950	UJ	UG/KG			4.68E-04	
2691-41-0	HMX	950	UJ	UG/KG			2.16E-05	
98-95-3	Nitrobenzene	480	UJ	UG/KG			4.19E-03	
55-63-0	Nitroglycerin	1900	UJ	UG/KG		1.08E-08		
121-82-4	RDX	950	UJ	UG/KG		4.24E-08	3.59E-04	
479-45-8	Tetryl	1400	UJ	UG/KG			1.59E-04	
Metals								
7429-90-5	Aluminum	15500		MG/KG	1.38E+00		9.25E-03	
7440-36-0	Antimony	1.1		MG/KG	5.79E-01		1.35E-03	3.67E+00
7440-38-2	Arsenic	53.5		MG/KG	5.19E+00	1.96E-05	1.22E-01	5.35E+01
7440-39-3	Barium	496		MG/KG	2.53E+00		3.98E-03	6.20E+00
7440-41-7	Beryllium	2.5		MG/KG	1.56E+00	1.12E-09	6.77E-04	8.33E-01
7440-42-8	Boron	14.1		MG/KG			1.78E-04	
7440-43-9	Cadmium	0.66	J	MG/KG	4.13E-01	2.21E-10	8.15E-04	1.65E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-70-2	Calcium	25300		MG/KG	1.75E+01			
7440-47-3	Chromium	102		MG/KG	5.93E+00	2.28E-07		5.10E+01
7440-48-4	Cobalt	61.4		MG/KG	6.75E+00		5.01E-04	
7440-50-8	Copper	27.3		MG/KG	1.63E+00		3.60E-04	
7439-89-6	Iron	65700		MG/KG	3.17E+00		1.07E-01	
7439-92-1	Lead	92		MG/KG	3.83E+00			
7439-95-4	Magnesium	5810		MG/KG	3.04E+00			
7439-96-5	Manganese	8960		MG/KG	8.59E+00		2.78E-01	
7439-97-6	Mercury	0.24		MG/KG	1.60E+00			
7440-02-0	Nickel	32.7		MG/KG	1.93E+00		8.00E-04	4.67E+00
2023695	Potassium	1130		MG/KG	7.95E-01			
7782-49-2	Selenium	5.2		MG/KG	8.13E+00		5.09E-04	1.73E+01
7440-22-4	Silver	0.69	J	MG/KG	2.30E-01		6.75E-05	3.45E-01
7440-23-5	Sodium	311		MG/KG	2.14E-01			
7440-28-0	Thallium	4.4	U	MG/KG	1.42E+01		3.08E-05	
7440-62-2	Vanadium	138		MG/KG	4.93E+00		9.65E-03	4.60E-01
7440-66-6	Zinc	261		MG/KG	4.57E+00		4.26E-04	4.35E-01
Other Parameters								
7601-90-3	Perchlorate	9000	U	UG/KG			8.81E-03	
TOC	TOC	42000		MG/KG	6.69E-01			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			3.50E-03
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG	8.54E-07	8.54E-07	3.50E-01
75-34-3	1,1-Dichloroethane	7	U	UG/KG	3.50E-08	3.50E-08	3.04E-04
75-35-4	1,1-Dichloroethene	7	U	UG/KG	3.89E-07	3.89E-06	1.17E-01
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG	1.11E-04	5.00E-06	3.50E-01
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
78-87-5	1,2-Dichloropropane	7	U	UG/KG	8.33E-05	3.89E-06	2.33E-01
78-93-3	2-Butanone (MEK)	14	U	UG/KG			
591-78-6	2-Hexanone	14	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	14	U	UG/KG			
67-64-1	Acetone	35		UG/KG	1.75E-07	1.75E-07	2.19E-03
71-43-2	Benzene	7	U	UG/KG	3.50E-05	1.63E-06	2.33E-01
75-27-4	Bromodichloromethane	7	U	UG/KG	7.61E-05	3.50E-06	1.17E-02
75-25-2	Bromoform	7	U	UG/KG	9.72E-06	4.38E-07	8.75E-03
74-83-9	Bromomethane	7	U	UG/KG	2.41E-06	7.00E-06	3.50E-02
75-15-0	Carbon disulfide	7	U	UG/KG	3.50E-08	3.50E-07	2.19E-04
56-23-5	Carbon tetrachloride	7	U	UG/KG	1.59E-04	1.71E-05	1.00E-01
108-90-7	Chlorobenzene	7	U	UG/KG	1.71E-07	1.71E-06	7.00E-03
75-00-3	Chloroethane	7	U	UG/KG			
67-66-3	Chloroform	7	U	UG/KG	7.45E-06	3.50E-06	1.17E-02
74-87-3	Chloromethane	7	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	7	U	UG/KG	1.71E-07	1.71E-07	1.75E-02
100-41-4	Ethylbenzene	7	U	UG/KG	3.50E-08	3.50E-07	5.38E-04
75-09-2	Methylene chloride	7	U	UG/KG	9.21E-06	5.83E-07	3.50E-01
110-54-3	N-Hexane	7	U	UG/KG			
100-42-5	Styrene	7	U	UG/KG	1.71E-08	1.71E-07	1.75E-03
127-18-4	Tetrachloroethylene (PCE)	7	U	UG/KG	6.36E-05	2.92E-06	1.17E-01
108-88-3	Toluene	7	U	UG/KG	1.71E-08	1.71E-08	5.83E-04
1330-20-7	total Xylenes	7	U	UG/KG	7.00E-09	1.71E-08	4.67E-05
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG	1.71E-07	1.71E-07	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG	1.35E-05	5.83E-06	1.17E-01
75-01-4	Vinyl chloride	7	U	UG/KG	2.33E-03	1.08E-04	7.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	640	U	UG/KG	3.20E-05	3.20E-04	1.28E-01
95-50-1	1,2-Dichlorobenzene	640	U	UG/KG	3.56E-06	3.56E-05	3.76E-02
541-73-1	1,3-Dichlorobenzene	640	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	640	U	UG/KG			3.20E-01
95-95-4	2,4,5-Trichlorophenol	3200	U	UG/KG	1.60E-05	1.60E-05	1.19E-02
88-06-2	2,4,6-Trichlorophenol	640	U	UG/KG	1.23E-03	5.82E-05	3.20E+00
120-83-2	2,4-Dichlorophenol	640	U	UG/KG	1.05E-04	1.05E-03	6.40E-01
105-67-9	2,4-Dimethylphenol	640	U	UG/KG	1.56E-05	1.56E-05	7.11E-02
51-28-5	2,4-Dinitrophenol	3200	U	UG/KG	7.80E-04	7.80E-03	1.60E+01
91-58-7	2-Chloronaphthalene	640	U	UG/KG			
95-57-8	2-Chlorophenol	640	U	UG/KG	6.40E-05	6.40E-05	1.60E-01
90-12-0	1-Methylnaphthalene	60	U	UG/KG	7.32E-07	7.32E-06	7.14E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
91-57-6	2-Methylnaphthalene	300	J	UG/KG	4.92E-06	4.92E-06	7.14E-05
95-48-7	2-Methylphenol	640	U	UG/KG	6.40E-06	6.40E-06	4.27E-02
88-74-4	2-Nitroaniline	3200	U	UG/KG			
88-75-5	2-Nitrophenol	640	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	640	U	UG/KG	4.92E-02	2.29E-03	9.14E+01
99-09-2	3-Nitroaniline	3200	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	3200	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	640	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	640	U	UG/KG			
106-47-8	4-Chloroaniline	1300	U	UG/KG	1.59E-04	1.59E-03	1.86E+00
7005-72-3	4-Chlorophenyl phenyl ether	640	U	UG/KG			
106-44-5	4-Methylphenol	53	J	UG/KG			
100-01-6	4-Nitroaniline	3200	U	UG/KG			
100-02-7	4-Nitrophenol	3200	U	UG/KG			
83-32-9	Acenaphthene	640	U	UG/KG	5.33E-06	5.33E-06	1.12E-03
208-96-8	Acenaphthylene	640	U	UG/KG	1.05E-05	1.05E-05	1.52E-04
120-12-7	Anthracene	640	U	UG/KG	1.05E-06	1.05E-06	5.33E-05
56-55-3	Benzo(a)anthracene	100	J	UG/KG	1.25E-02	5.88E-04	5.00E-02
50-32-8	Benzo(a)pyrene	100	J	UG/KG	1.25E-01	5.88E-03	1.25E-02
205-99-2	Benzo(b)fluoranthene	180	J	UG/KG	2.25E-02	1.06E-03	3.60E-02
191-24-2	Benzo(g,h,i)perylene	61	J	UG/KG	1.00E-06	1.00E-06	1.45E-05
207-08-9	Benzo(k)fluoranthene	100	J	UG/KG	1.28E-03	5.88E-05	2.04E-03
111-91-1	bis(2-Chloroethoxy)methane	640	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	640	U	UG/KG	1.28E-01	8.53E-03	1.60E+03
108-60-1	bis(2-Chloroisopropyl) ether	640	U	UG/KG			

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	530		UG/KG	1.29E-03	1.29E-04	1.47E-04
85-68-7	Butyl benzyl phthalate	640	U	UG/KG	1.56E-06	1.56E-06	6.88E-04
86-74-8	Carbazole	640	U	UG/KG	2.21E-03	1.03E-04	1.07E+00
218-01-9	Chrysene	150	J	UG/KG	1.92E-04	8.82E-06	9.38E-04
84-74-2	Di-n-butyl phthalate	290	J	UG/KG	1.45E-06	1.45E-06	1.26E-04
117-84-0	Di-n-octyl phthalate	640	U	UG/KG	1.56E-05	1.56E-04	6.40E-05
53-70-3	Dibenz(a,h)anthracene	15		UG/KG	1.88E-02	8.82E-04	7.50E-03
132-64-9	Dibenzofuran	100	J	UG/KG			
84-66-2	Diethyl phthalate	140	J	UG/KG	1.40E-07	1.40E-07	2.98E-04
131-11-3	Dimethyl phthalate	640	U	UG/KG			
206-44-0	Fluoranthene	170	J	UG/KG	2.07E-06	2.07E-06	3.95E-05
86-73-7	Fluorene	640	U	UG/KG	7.80E-06	7.80E-06	1.14E-03
118-74-1	Hexachlorobenzene	640	U	UG/KG	1.60E-01	8.21E-03	3.20E-01
87-68-3	Hexachlorobutadiene	640	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	640	U	UG/KG	4.57E-05	4.57E-05	1.60E-03
67-72-1	Hexachloroethane	640	U	UG/KG	3.20E-04	3.20E-04	1.28E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	60	J	UG/KG	7.50E-03	3.53E-04	4.29E-03
78-59-1	Isophorone	640	U	UG/KG	1.56E-06	1.56E-06	8.00E-02
621-64-7	N-Nitroso-di-n-propylamine	640	U	UG/KG	8.00E-01	3.56E-02	1.28E+04
86-30-6	N-Nitrosodiphenylamine	710		UG/KG	5.92E-04	2.84E-05	7.10E-01
91-20-3	Naphthalene	150	J	UG/KG	1.83E-06	1.83E-05	1.79E-03
87-86-5	Pentachlorophenol	170	J	UG/KG	7.08E-03	3.27E-04	5.67E+00
85-01-8	Phenanthrene	180	J	UG/KG	2.95E-06	2.95E-06	4.29E-05
108-95-2	Phenol	640	U	UG/KG	6.40E-07	5.33E-06	6.40E-03
129-00-0	Pyrene	210	J	UG/KG	3.44E-06	3.44E-06	5.00E-05

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	480	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	480	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	950	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	63	J	UG/KG	7.50E-03	3.50E-04	7.88E+01
606-20-2	2,6-Dinitrotoluene	900	UJ	UG/KG	1.07E-01	5.00E-03	1.29E+03
	Dinitrotoluene Mixture	63	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	950	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	950	UJ	UG/KG			
99-08-1	3-Nitrotoluene	950	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	950	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	950	UJ	UG/KG			
2691-41-0	HMX	950	UJ	UG/KG			
98-95-3	Nitrobenzene	480	UJ	UG/KG	4.80E-04	4.80E-04	4.80E+00
55-63-0	Nitroglycerin	1900	UJ	UG/KG			
121-82-4	RDX	950	UJ	UG/KG			
479-45-8	Tetryl	1400	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	15500		MG/KG			
7440-36-0	Antimony	1.1		MG/KG	1.34E-03	1.34E-02	2.20E-01
7440-38-2	Arsenic	53.5		MG/KG	1.78E+01	8.77E-01	1.91E+00
7440-39-3	Barium	496		MG/KG	3.54E-03	3.54E-02	4.13E-01
7440-41-7	Beryllium	2.5		MG/KG	2.50E+00	8.62E-02	3.79E-01
7440-42-8	Boron	14.1		MG/KG	7.83E-05	7.83E-04	
7440-43-9	Cadmium	0.66	J	MG/KG	3.30E-04	3.30E-03	1.78E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-11
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-70-2	Calcium	25300		MG/KG			
7440-47-3	Chromium	102		MG/KG	1.02E-02	2.49E-02	3.64E+00
7440-48-4	Cobalt	61.4		MG/KG	5.12E-04	5.12E-03	
7440-50-8	Copper	27.3		MG/KG	3.33E-04	3.33E-03	2.48E-03
7439-89-6	Iron	65700		MG/KG			
7439-92-1	Lead	92		MG/KG	2.30E-01	2.30E-01	
7439-95-4	Magnesium	5810		MG/KG			
7439-96-5	Manganese	8960		MG/KG	9.33E-02	9.33E-01	
7439-97-6	Mercury	0.24		MG/KG	3.93E-04	3.93E-03	1.60E+00
7440-02-0	Nickel	32.7		MG/KG	7.98E-04	7.98E-03	4.30E-01
2023695	Potassium	1130		MG/KG			
7782-49-2	Selenium	5.2		MG/KG	5.20E-04	5.20E-03	2.17E+00
7440-22-4	Silver	0.69	J	MG/KG	6.90E-05	6.90E-04	4.60E-01
7440-23-5	Sodium	311		MG/KG			
7440-28-0	Thallium	4.4	U	MG/KG	2.75E-02	2.75E-02	1.83E+00
7440-62-2	Vanadium	138		MG/KG	9.86E-03	9.86E-02	1.41E-01
7440-66-6	Zinc	261		MG/KG	4.28E-04	4.28E-03	7.25E-02
Other Parameters							
7601-90-3	Perchlorate	9000	U	UG/KG			
TOC	TOC	42000		MG/KG			

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 15-12
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		1.26E-03	5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L	1.81E-05	2.74E-03	
79-00-5	1,1,2-Trichloroethane	1	U	UG/L	5.01E-06	4.11E-02	2.00E-01
75-34-3	1,1-Dichloroethane	1	U	UG/L		1.23E-03	
75-35-4	1,1-Dichloroethene	1	U	UG/L	2.19E-05	1.83E-02	1.43E-01
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L	8.12E-06	9.88E-02	2.00E-01
78-87-5	1,2-Dichloropropane	1	U	UG/L	6.07E-06	1.45E-01	2.00E-01
78-93-3	2-Butanone (MEK)	2	U	UG/L		1.05E-03	
591-78-6	2-Hexanone	2	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	2	U	UG/L		1.27E-02	
67-64-1	Acetone	2	U	UG/L		3.29E-03	
71-43-2	Benzene	1	U	UG/L	2.44E-06	8.92E-02	2.00E-01
75-27-4	Bromodichloromethane	1	U	UG/L	5.53E-06	8.22E-03	
75-25-2	Bromoform	1	U	UG/L	1.18E-07	1.37E-03	
74-83-9	Bromomethane	1	U	UG/L		1.15E-01	
75-15-0	Carbon disulfide	1	U	UG/L		9.59E-04	
56-23-5	Carbon tetrachloride	1	U	UG/L	5.84E-06	2.35E-01	2.00E-01
108-90-7	Chlorobenzene	1	U	UG/L		9.43E-03	1.00E-02
75-00-3	Chloroethane	1	U	UG/L	2.16E-07	1.16E-04	
67-66-3	Chloroform	1	U	UG/L	6.08E-06	1.60E+00	
74-87-3	Chloromethane	1	U	UG/L	6.62E-07		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		1.64E-02	1.43E-02
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
124-48-1	Dibromochloromethane	1	U	UG/L	7.50E-06	8.22E-03	
100-41-4	Ethylbenzene	1	U	UG/L		7.46E-04	1.43E-03

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 15-12
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
75-09-2	Methylene chloride	1	U	UG/L	2.34E-07	6.16E-04	2.00E-01
110-54-3	N-Hexane	1	U	UG/L		2.85E-03	
100-42-5	Styrene	1	U	UG/L		6.09E-04	1.00E-02
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L	9.24E-07	3.94E-03	2.00E-01
108-88-3	Toluene	1	U	UG/L		1.38E-03	1.00E-03
1330-20-7	total Xylenes	1	U	UG/L		6.99E-04	1.00E-04
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		8.22E-03	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
79-01-6	Trichloroethylene (TCE)	1	U	UG/L	6.10E-07	2.74E-02	2.00E-01
75-01-4	Vinyl chloride	1	U	UG/L	5.06E-05		5.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		1.37E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	50	U	UG/L		6.85E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
90-12-0	1-Methylnaphthalene	1	U	UG/L		1.61E-01	
91-57-6	2-Methylnaphthalene	10	U	UG/L		5.48E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	
88-74-4	2-Nitroaniline	50	U	UG/L		2.40E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-12
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L	1.34E-04		
99-09-2	3-Nitroaniline	50	U	UG/L		2.40E+01	
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	20	U	UG/L		1.37E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	50	U	UG/L		2.40E+01	
100-02-7	4-Nitrophenol	50	U	UG/L		1.71E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	10	U	UG/L		5.48E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	10	U	UG/L	1.09E-04		
50-32-8	Benzo(a)pyrene	10	U	UG/L	1.09E-03		5.00E+01
205-99-2	Benzo(b)fluoranthene	10	U	UG/L	1.09E-04		
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		5.48E-02	
207-08-9	Benzo(k)fluoranthene	10	U	UG/L	1.09E-05		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	U	UG/L	2.08E-06	1.37E-02	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	10	U	UG/L	1.09E-06		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-12
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
84-74-2	Di-n-butyl phthalate	10	U	UG/L		2.74E-03	
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	10	U	UG/L		3.42E-04	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	10	U	UG/L		6.85E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L	1.09E-04		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	10	U	UG/L		1.61E+00	
87-86-5	Pentachlorophenol	50	U	UG/L	8.92E-05	4.57E-02	5.00E+01
85-01-8	Phenanthrene	10	U	UG/L		5.48E-02	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	10	U	UG/L		5.48E-02	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		2.28E-04	
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L	2.23E-07	2.74E-02	
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		3.42E-03	

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 15-12
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		1.37E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	UJ	UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		8.22E-03	
2691-41-0	HMX	0.5	UJ	UG/L		2.74E-04	
98-95-3	Nitrobenzene	0.25	UJ	UG/L		7.36E-02	
55-63-0	Nitroglycerin	1	UJ	UG/L	2.08E-07		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	UJ	UG/L			
121-82-4	RDX	0.5	UJ	UG/L	8.18E-07	4.57E-03	
479-45-8	Tetryl	0.75	UJ	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	1490		UG/L		4.08E-02	
7440-36-0	Antimony	12	U	UG/L		8.22E-01	2.00E+00
7440-38-2	Arsenic	20	U	UG/L	4.46E-04	1.83E+00	4.00E-01
7440-39-3	Barium	53.5	J	UG/L		2.09E-02	2.68E-02
7440-41-7	Beryllium	10	U	UG/L		1.37E-01	2.50E+00
7440-42-8	Boron	200	U	UG/L		6.09E-02	1.00E-01
7440-43-9	Cadmium	10	U	UG/L		5.48E-01	2.00E+00
7440-70-2	Calcium	399000		UG/L			
7440-47-3	Chromium	20	U	UG/L			2.00E-01
7440-48-4	Cobalt	100	U	UG/L		4.57E-02	1.00E-01
7440-50-8	Copper	20	U	UG/L		1.48E-02	3.08E-02
7439-89-6	Iron	1730		UG/L		1.58E-01	3.46E-01
7439-92-1	Lead	15	U	UG/L			2.00E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-12
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7439-95-4	Magnesium	986000		UG/L			
7439-96-5	Manganese	211		UG/L		2.41E-01	1.41E+00
7439-97-6	Mercury	0.075	J	UG/L			3.75E-02
7440-02-0	Nickel	10.1		UG/L		1.38E-02	1.01E-01
2023695	Potassium	2140	J	UG/L			
7782-49-2	Selenium	10	U	UG/L		5.48E-02	2.00E-01
7440-22-4	Silver	20	U	UG/L		1.10E-01	4.00E-01
7440-23-5	Sodium	1220000		UG/L			
7440-28-0	Thallium	20	U	UG/L		7.83E+00	1.00E+01
7440-62-2	Vanadium	100	U	UG/L		3.91E-01	
7440-66-6	Zinc	4.3	J	UG/L		3.93E-04	8.60E-04
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	252		MG/L			
7664-41-7	Nitrogen, Ammonia (as N)	0.99		MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	140	J	MG/L		1.40E+02	1.40E+02
7601-90-3	Perchlorate	500	U	UG/L		2.74E+01	
7723-14-0	Phosphorus, Total (as P)	0.095		MG/L		1.30E+02	
14808-79-8	Sulfate (as SO4)	6400000		UG/L			1.60E+01
TDS	TDS	6170		MG/L			5.14E+00
TSS	TSS	29.5		MG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-13
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	2	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	2	U	UG/L		
67-64-1	Acetone	5	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	1	U	UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1	U	UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-13
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	410		UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-13
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	10	U	UG/L	1.00E+00	1.00E-01
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	U	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	U	UG/L		
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	U	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L		
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		
2691-41-0	HMX	0.5	U	UG/L		
98-95-3	Nitrobenzene	10	U	UG/L		
55-63-0	Nitroglycerin	1	UJ	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L		
121-82-4	RDX	0.5	U	UG/L		
479-45-8	Tetryl	0.75	U	UG/L		
Metals						
7429-90-5	Aluminum	69000		UG/L	3.45E+02	
7440-36-0	Antimony	1.6	J	UG/L	2.67E-01	
7440-38-2	Arsenic	38.7		UG/L	3.87E+00	
7440-39-3	Barium	632		UG/L	2.78E+01	1.26E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-13
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7440-41-7	Beryllium	1.5	J	UG/L	3.00E-01	
7440-42-8	Boron	57.3	J	UG/L		5.73E-02
7440-43-9	Cadmium	3	J	UG/L	6.00E-01	
7440-70-2	Calcium	172000		UG/L	2.39E+01	
7440-47-3	Chromium	105		UG/L	1.05E+01	
7440-48-4	Cobalt	63		UG/L	1.26E+00	
7440-50-8	Copper	89.3		UG/L	8.93E+00	
7439-89-6	Iron	98000		UG/L	9.80E+02	9.80E+01
7439-92-1	Lead	95.1		UG/L	4.76E+01	
7439-95-4	Magnesium	89700		UG/L	3.54E+01	
7439-96-5	Manganese	6720		UG/L	1.15E+01	6.72E+00
7439-97-6	Mercury	0.66		UG/L	3.30E+00	5.50E+01
7440-02-0	Nickel	87.9		UG/L	8.79E+00	8.79E-02
2023695	Potassium	6190		UG/L	3.84E+00	
7782-49-2	Selenium	7.9		UG/L	2.93E+00	7.90E-03
7440-22-4	Silver	20	U	UG/L	2.00E+00	4.00E+00
7440-23-5	Sodium	48900		UG/L	1.54E+01	
7440-28-0	Thallium	3.8	J	UG/L	3.80E-01	
7440-62-2	Vanadium	158		UG/L	3.16E+00	
7440-66-6	Zinc	616		UG/L	3.08E+01	6.16E-01
Other Parameters						
ALK	Alkalinity, Total (as CaCO3)	200		MG/L	6.51E+00	
7664-41-7	Nitrogen, Ammonia (as N)	1.9		MG/L	7.31E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	174		MG/L	3.48E+03	
7601-90-3	Perchlorate	500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.42		MG/L	8.40E+00	
14808-79-8	Sulfate (as SO4)	240000		UG/L		4.80E-01
TDS	TDS	1038		MG/L	1.45E+01	1.04E+00
TSS	TSS	853		MG/L	1.07E+02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-14
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		6	U	UG/KG	2.01E-04	
79-34-5	1,1,2,2-Tetrachloroethane		6	U	UG/KG	4.72E-02	
79-00-5	1,1,2-Trichloroethane		6	U	UG/KG	2.10E-04	
75-34-3	1,1-Dichloroethane		6	UJ	UG/KG	2.99E-04	
75-35-4	1,1-Dichloroethene		6	U	UG/KG	7.25E-04	
107-06-2	1,2-Dichloroethane (EDC)		6	U	UG/KG	2.83E-04	
540-59-0	1,2-Dichloroethene (total)		6	UJ	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		6	U	UG/KG	8.57E-06	
78-93-3	2-Butanone (MEK)		13	U	UG/KG	1.45E-04	
591-78-6	2-Hexanone		13	U	UG/KG	1.03E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		13	U	UG/KG	2.93E-05	
67-64-1	Acetone		13	U	UG/KG	5.20E-03	
71-43-2	Benzene		6	U	UG/KG	3.75E-04	
75-27-4	Bromodichloromethane		6	U	UG/KG	1.11E-02	
75-25-2	Bromoform		6	UJ	UG/KG	3.77E-04	
74-83-9	Bromomethane		6	U	UG/KG	2.55E-02	
75-15-0	Carbon disulfide		6	U	UG/KG	6.37E-02	
56-23-5	Carbon tetrachloride		6	U	UG/KG	6.00E-06	
108-90-7	Chlorobenzene		6	U	UG/KG	1.50E-04	
75-00-3	Chloroethane		6	U	UG/KG		
67-66-3	Chloroform		6	U	UG/KG	5.04E-03	
74-87-3	Chloromethane		6	U	UG/KG	5.77E-04	
156-59-2	cis-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-01-5	cis-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
124-48-1	Dibromochloromethane		6	U	UG/KG	2.93E-03	
100-41-4	Ethylbenzene		6	U	UG/KG	1.20E-03	
75-09-2	Methylene chloride		6	U	UG/KG	1.48E-03	
110-54-3	N-Hexane		6	U	UG/KG		
100-42-5	Styrene		6	U	UG/KG	2.00E-05	
127-18-4	Tetrachloroethylene (PCE)		6	U	UG/KG	4.62E-04	
108-88-3	Toluene		6	U	UG/KG	2.00E-03	
1330-20-7	total Xylenes		6	U	UG/KG	1.00E-02	
156-60-5	trans-1,2-Dichloroethene		6	UJ	UG/KG	7.62E-03	
10061-02-6	trans-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
79-01-6	Trichloroethylene (TCE)		6	U	UG/KG	6.67E-04	
75-01-4	Vinyl chloride		6	U	UG/KG	9.29E-03	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		560	U	UG/KG	2.80E-02	
95-50-1	1,2-Dichlorobenzene		560	U	UG/KG	1.89E-01	
541-73-1	1,3-Dichlorobenzene		560	U	UG/KG	1.49E-02	
106-46-7	1,4-Dichlorobenzene		560	U	UG/KG	2.80E-02	

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TABLE 15-14
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2800	U	UG/KG	7.00E-01	
88-06-2	2,4,6-Trichlorophenol		560	U	UG/KG	5.60E-02	
120-83-2	2,4-Dichlorophenol		560	U	UG/KG	6.40E-03	
105-67-9	2,4-Dimethylphenol		560	U	UG/KG	5.60E+01	
51-28-5	2,4-Dinitrophenol		2800	U	UG/KG	1.40E-01	
91-58-7	2-Chloronaphthalene		560	U	UG/KG	4.60E+01	
95-57-8	2-Chlorophenol		560	U	UG/KG	2.31E+00	
90-12-0	1-Methylnaphthalene		44	U	UG/KG		
91-57-6	2-Methylnaphthalene		670		UG/KG	2.07E-01	YES
95-48-7	2-Methylphenol		560	U	UG/KG	1.39E-02	
88-74-4	2-Nitroaniline		2800	U	UG/KG	3.78E-02	
88-75-5	2-Nitrophenol		560	U	UG/KG	3.50E-01	
91-94-1	3,3'-Dichlorobenzidine		560	U	UG/KG	8.66E-01	
99-09-2	3-Nitroaniline		2800	U	UG/KG	8.86E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2800	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		560	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		560	U	UG/KG	7.04E-02	
106-47-8	4-Chloroaniline		1100	U	UG/KG	1.00E+00	
7005-72-3	4-Chlorophenyl phenyl ether		560	U	UG/KG		
106-44-5	4-Methylphenol		560	U	UG/KG	3.44E-03	
100-01-6	4-Nitroaniline		2800	U	UG/KG	1.28E-01	
100-02-7	4-Nitrophenol		2800	U	UG/KG	4.00E-01	
83-32-9	Acenaphthene		44	J	UG/KG	6.45E-05	YES
208-96-8	Acenaphthylene		560	U	UG/KG	8.21E-04	
120-12-7	Anthracene		260	J	UG/KG	1.76E-04	YES
56-55-3	Benzo(a)anthracene		2600		UG/KG	4.99E-01	YES
50-32-8	Benzo(a)pyrene		2700		UG/KG	6.14E-04	YES
205-99-2	Benzo(b)fluoranthene		2200		UG/KG	3.68E-02	YES
191-24-2	Benzo(g,h,i)perylene		1800		UG/KG	1.51E-02	YES
207-08-9	Benzo(k)fluoranthene		2600		UG/KG	4.35E-02	YES
111-91-1	bis(2-Chloroethoxy)methane		560	U	UG/KG	1.85E+00	
111-44-4	bis(2-Chloroethyl) ether		560	U	UG/KG	2.36E-02	
108-60-1	bis(2-Chloroisopropyl) ether		560	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1400		UG/KG	1.51E+00	YES
85-68-7	Butyl benzyl phthalate		1700		UG/KG	7.12E+00	YES
86-74-8	Carbazole		100	J	UG/KG		YES
218-01-9	Chrysene		2600		UG/KG	5.50E-01	YES
84-74-2	Di-n-butyl phthalate		310	J	UG/KG	1.55E-03	YES
117-84-0	Di-n-octyl phthalate		560	U	UG/KG	7.90E-04	
53-70-3	Dibenz(a,h)anthracene		1100		UG/KG	5.98E-02	YES
132-64-9	Dibenzofuran		180	J	UG/KG		YES
84-66-2	Diethyl phthalate		560	U	UG/KG	5.60E-03	

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TABLE 15-14
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		560	U	UG/KG	2.80E-03	
206-44-0	Fluoranthene		3800		UG/KG	3.11E-02	YES
86-73-7	Fluorene		560	U	UG/KG	1.87E-02	
118-74-1	Hexachlorobenzene		560	U	UG/KG	5.60E-04	
87-68-3	Hexachlorobutadiene		560	U	UG/KG	1.41E+01	
77-47-4	Hexachlorocyclopentadiene		560	U	UG/KG	5.60E-02	
67-72-1	Hexachloroethane		560	U	UG/KG	9.39E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		1800		UG/KG	1.65E-02	YES
78-59-1	Isophorone		560	U	UG/KG	4.03E-03	
621-64-7	N-Nitroso-di-n-propylamine		560	U	UG/KG	1.03E+00	
86-30-6	N-Nitrosodiphenylamine		560	U	UG/KG	2.80E-02	
91-20-3	Naphthalene		420	J	UG/KG	1.69E-03	
87-86-5	Pentachlorophenol		2800	U	UG/KG	4.67E-01	
85-01-8	Phenanthrene		690		UG/KG	1.51E-02	YES
108-95-2	Phenol		560	U	UG/KG	1.40E-02	
129-00-0	Pyrene		3800		UG/KG	4.84E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		410	UJ	UG/KG	1.09E+00	
99-65-0	1,3-Dinitrobenzene		410	UJ	UG/KG	6.26E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		830	UJ	UG/KG	2.77E-02	
121-14-2	2,4-Dinitrotoluene		410	UJ	UG/KG	3.20E-01	
606-20-2	2,6-Dinitrotoluene		750	UJ	UG/KG	2.28E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		830	UJ	UG/KG	1.04E-02	
88-72-2	2-Nitrotoluene (ONT)		830	UJ	UG/KG		
99-08-1	3-Nitrotoluene		830	UJ	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		830	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		830	UJ	UG/KG		
2691-41-0	HMX		830	UJ	UG/KG	3.32E-02	
98-95-3	Nitrobenzene		410	UJ	UG/KG	1.03E-02	
55-63-0	Nitroglycerin		1500	UJ	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		2600	U	UG/KG		
121-82-4	RDX		830	UJ	UG/KG	8.30E-03	
479-45-8	Tetryl		1200	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	24200		MG/KG		
7440-36-0	Antimony	0.83	0.87		MG/KG	1.74E-01	
7440-38-2	Arsenic	13.5	12.8		MG/KG	1.42E+00	
7440-39-3	Barium	195	229		MG/KG	4.58E-01	
7440-41-7	Beryllium	0.76	0.43	J	MG/KG	4.30E-02	
7440-42-8	Boron	5.3	9.5	J	MG/KG	1.90E+01	
7440-43-9	Cadmium	0.19	1.3		MG/KG	4.48E-02	
7440-70-2	Calcium	2497	136000		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 15-14
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-47-3	Chromium	25.2	79.2		MG/KG	1.58E+01	
7440-48-4	Cobalt	21.7	17.9		MG/KG	8.95E-01	
7440-50-8	Copper	11.3	70.5		MG/KG	2.27E+00	
7439-89-6	Iron	19306	43300	J	MG/KG	2.17E+02	
7439-92-1	Lead	23.4	89.7		MG/KG	2.07E-01	
7439-95-4	Magnesium	1552	79700		MG/KG		
7439-96-5	Manganese	3640	1440		MG/KG	1.44E+01	
7439-97-6	Mercury	0.06	0.13		MG/KG	1.86E-02	YES
7440-02-0	Nickel	18.9	23.1		MG/KG	7.70E-01	
2023695	Potassium	625	1300		MG/KG		
7782-49-2	Selenium	2.34	1.8		MG/KG	1.80E+00	YES
7440-22-4	Silver	0.58	0.82	J	MG/KG	4.10E-01	
7440-23-5	Sodium	170	881		MG/KG		
7440-28-0	Thallium	0.41	0.31	J	MG/KG	3.10E-01	
7440-62-2	Vanadium	47.2	42.4		MG/KG	9.22E-01	
7440-66-6	Zinc	51.4	362		MG/KG	3.02E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-15
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		7	U	UG/KG	4.12E-02	
79-34-5	1,1,2,2-Tetrachloroethane		7	U	UG/KG	7.45E-03	
79-00-5	1,1,2-Trichloroethane		7	U	UG/KG	6.58E-03	
75-34-3	1,1-Dichloroethane		7	U	UG/KG	7.46E-02	
75-35-4	1,1-Dichloroethene		7	U	UG/KG	6.56E-02	
107-06-2	1,2-Dichloroethane (EDC)		7	U	UG/KG	5.70E-03	
540-59-0	1,2-Dichloroethene (total)		7	U	UG/KG	2.82E-02	
78-87-5	1,2-Dichloropropane		7	U	UG/KG	5.07E-03	
78-93-3	2-Butanone (MEK)		14	U	UG/KG	3.18E-03	
591-78-6	2-Hexanone		14	U	UG/KG	1.06E-01	
108-10-1	4-Methyl-2-pentanone (MIBK)		14	U	UG/KG	6.70E-02	
67-64-1	Acetone		35		UG/KG	4.16E-01	
71-43-2	Benzene		7	U	UG/KG	1.23E-01	
75-27-4	Bromodichloromethane		7	U	UG/KG	3.99E-04	
75-25-2	Bromoform		7	U	UG/KG	5.60E-03	
74-83-9	Bromomethane		7	U	UG/KG	6.68E-04	
75-15-0	Carbon disulfide		7	U	UG/KG	3.50E+00	
56-23-5	Carbon tetrachloride		7	U	UG/KG	8.99E-02	
108-90-7	Chlorobenzene		7	U	UG/KG	8.54E-03	
75-00-3	Chloroethane		7	U	UG/KG	4.84E-04	
67-66-3	Chloroform		7	U	UG/KG	9.95E-02	
74-87-3	Chloromethane		7	U	UG/KG	1.47E-04	
156-59-2	cis-1,2-Dichloroethene		7	U	UG/KG	5.95E-03	
10061-01-5	cis-1,3-Dichloropropene		7	U	UG/KG	2.80E+01	
124-48-1	Dibromochloromethane		7	U	UG/KG	2.27E-04	
100-41-4	Ethylbenzene		7	U	UG/KG	1.94E-03	
75-09-2	Methylene chloride		7	U	UG/KG	7.58E-03	
110-54-3	N-Hexane		7	U	UG/KG		
100-42-5	Styrene		7	U	UG/KG	3.24E-04	
127-18-4	Tetrachloroethylene (PCE)		7	U	UG/KG	1.32E-02	
108-88-3	Toluene		7	U	UG/KG	1.04E-02	
1330-20-7	total Xylenes		7	U	UG/KG	2.80E-01	
156-60-5	trans-1,2-Dichloroethene		7	U	UG/KG	5.95E-03	
10061-02-6	trans-1,3-Dichloropropene		7	U	UG/KG	1.44E-01	
79-01-6	Trichloroethylene (TCE)		7	U	UG/KG	4.38E-03	
75-01-4	Vinyl chloride		7	U	UG/KG	2.65E-04	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		640	U	UG/KG	6.96E-02	
95-50-1	1,2-Dichlorobenzene		640	U	UG/KG	1.88E+00	
541-73-1	1,3-Dichlorobenzene		640	U	UG/KG	3.76E-01	
106-46-7	1,4-Dichlorobenzene		640	U	UG/KG	1.83E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-15
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		3200	U	UG/KG	2.21E+00	
88-06-2	2,4,6-Trichlorophenol		640	U	UG/KG	3.48E+01	
120-83-2	2,4-Dichlorophenol		640	U	UG/KG	1.75E+00	
105-67-9	2,4-Dimethylphenol		640	U	UG/KG	1.42E+01	
51-28-5	2,4-Dinitrophenol		3200	U	UG/KG	2.58E+02	
91-58-7	2-Chloronaphthalene		640	U	UG/KG	1.83E-01	
95-57-8	2-Chlorophenol		640	U	UG/KG	2.89E+00	
90-12-0	1-Methylnaphthalene		60	U	UG/KG		
91-57-6	2-Methylnaphthalene		300	J	UG/KG	4.29E+00	YES
95-48-7	2-Methylphenol		640	U	UG/KG	1.40E+02	
88-74-4	2-Nitroaniline		3200	U	UG/KG	6.63E-02	
88-75-5	2-Nitrophenol		640	U	UG/KG	2.01E-01	
91-94-1	3,3'-Dichlorobenzidine		640	U	UG/KG	3.20E-01	
99-09-2	3-Nitroaniline		3200	U	UG/KG	5.38E-02	
534-52-1	4,6-Dinitro-2-methylphenol		3200	U	UG/KG	3.82E+02	
101-55-3	4-Bromophenyl phenyl ether		640	U	UG/KG	4.92E-01	
59-50-7	4-Chloro-3-methylphenol		640	U	UG/KG	4.27E+03	
106-47-8	4-Chloroaniline		1300	U	UG/KG	7.93E-02	
7005-72-3	4-Chlorophenyl phenyl ether		640	U	UG/KG	4.66E-01	
106-44-5	4-Methylphenol		53	J	UG/KG	1.32E-02	
100-01-6	4-Nitroaniline		3200	U	UG/KG	8.84E-02	
100-02-7	4-Nitrophenol		3200	U	UG/KG	7.71E+01	
83-32-9	Acenaphthene		640	U	UG/KG	4.00E+01	
208-96-8	Acenaphthylene		640	U	UG/KG	1.45E+01	
120-12-7	Anthracene		640	U	UG/KG	1.12E+01	
56-55-3	Benzo(a)anthracene		100	J	UG/KG	9.26E-01	YES
50-32-8	Benzo(a)pyrene		100	J	UG/KG	6.67E-01	YES
205-99-2	Benzo(b)fluoranthene		180	J	UG/KG	6.67E+00	YES
191-24-2	Benzo(g,h,i)perylene		61	J	UG/KG	3.81E+00	YES
207-08-9	Benzo(k)fluoranthene		100	J	UG/KG	3.70E+00	YES
111-91-1	bis(2-Chloroethoxy)methane		640	U	UG/KG	4.92E-01	
111-44-4	bis(2-Chloroethyl) ether		640	U	UG/KG	2.24E-01	
108-60-1	bis(2-Chloroisopropyl) ether		640	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		530		UG/KG	7.07E-01	YES
85-68-7	Butyl benzyl phthalate		640	U	UG/KG	5.82E-02	
86-74-8	Carbazole		640	U	UG/KG	1.94E-01	
218-01-9	Chrysene		150	J	UG/KG	9.04E-01	YES
84-74-2	Di-n-butyl phthalate		290	J	UG/KG	2.64E-02	YES
117-84-0	Di-n-octyl phthalate		640	U	UG/KG	9.04E-04	
53-70-3	Dibenz(a,h)anthracene		15		UG/KG	4.55E-01	YES
132-64-9	Dibenzofuran		100	J	UG/KG	5.00E-02	YES
84-66-2	Diethyl phthalate		140	J	UG/KG	2.22E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-15
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		640	U	UG/KG	1.22E-03	
206-44-0	Fluoranthene		170	J	UG/KG	4.02E-01	YES
86-73-7	Fluorene		640	U	UG/KG	8.27E+00	
118-74-1	Hexachlorobenzene		640	U	UG/KG	6.40E+00	
87-68-3	Hexachlorobutadiene		640	U	UG/KG	1.34E+01	
77-47-4	Hexachlorocyclopentadiene		640	U	UG/KG	2.14E+02	
67-72-1	Hexachloroethane		640	U	UG/KG	9.41E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		60	J	UG/KG	3.53E+00	YES
78-59-1	Isophorone		640	U	UG/KG	5.58E-01	
621-64-7	N-Nitroso-di-n-propylamine		640	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		710		UG/KG	1.01E+00	
91-20-3	Naphthalene		150	J	UG/KG	8.52E-01	
87-86-5	Pentachlorophenol		170	J	UG/KG	2.30E+00	YES
85-01-8	Phenanthrene		180	J	UG/KG	8.82E-01	YES
108-95-2	Phenol		640	U	UG/KG	1.33E+01	
129-00-0	Pyrene		210	J	UG/KG	1.08E+00	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		480	UJ	UG/KG	1.17E+01	
99-65-0	1,3-Dinitrobenzene		480	UJ	UG/KG	9.60E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		950	UJ	UG/KG	1.64E+00	
121-14-2	2,4-Dinitrotoluene		63	J	UG/KG	9.71E-02	
606-20-2	2,6-Dinitrotoluene		900	UJ	UG/KG	1.05E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		950	UJ	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		950	UJ	UG/KG	5.65E-02	
99-08-1	3-Nitrotoluene		950	UJ	UG/KG	7.98E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		950	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		950	UJ	UG/KG	5.08E-02	
2691-41-0	HMX		950	UJ	UG/KG	9.50E+01	
98-95-3	Nitrobenzene		480	UJ	UG/KG	8.20E-01	
55-63-0	Nitroglycerin		1900	UJ	UG/KG	5.76E+00	
121-82-4	RDX		950	UJ	UG/KG	4.75E+00	
479-45-8	Tetryl		1400	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	11241	15500		MG/KG	5.96E-01	
7440-36-0	Antimony	1.9	1.1		MG/KG	3.67E-01	
7440-38-2	Arsenic	10.3	53.5		MG/KG	5.46E+00	
7440-39-3	Barium	196	496		MG/KG		
7440-41-7	Beryllium	1.6	2.5		MG/KG		
7440-42-8	Boron		14.1		MG/KG		
7440-43-9	Cadmium	1.6	0.66	J	MG/KG	6.67E-01	
7440-70-2	Calcium	1448	25300		MG/KG		
7440-47-3	Chromium	17.2	102		MG/KG	2.35E+00	

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TABLE 15-15
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-48-4	Cobalt	9.1	61.4		MG/KG	1.23E+00	
7440-50-8	Copper	16.8	27.3		MG/KG	8.64E-01	
7439-89-6	Iron	20750	65700		MG/KG	3.46E-01	
7439-92-1	Lead	24	92		MG/KG	2.57E+00	
7439-95-4	Magnesium	1909	5810		MG/KG		
7439-96-5	Manganese	1043	8960		MG/KG	1.42E+01	
7439-97-6	Mercury	0.15	0.24		MG/KG	1.33E+00	YES
7440-02-0	Nickel	16.9	32.7		MG/KG	1.44E+00	
2023695	Potassium	1421	1130		MG/KG		
7782-49-2	Selenium	0.64	5.2		MG/KG		YES
7440-22-4	Silver	3	0.69	J	MG/KG	6.90E-01	
7440-23-5	Sodium	1450	311		MG/KG		
7440-28-0	Thallium	0.31	4.4	U	MG/KG		
7440-62-2	Vanadium	28	138		MG/KG		
7440-66-6	Zinc	57.1	261		MG/KG	2.16E+00	
Other Parameters							
7601-90-3	Perchlorate		9000	U	UG/KG		
TOC	TOC	62778	42000		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-16
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		2	U	UG/L	1.43E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		2	U	UG/L	1.18E-02	
67-64-1	Acetone		5	U	UG/L	9.86E-03	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		1	U	UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1	U	UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-16
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		410		UG/L	1.37E+02	YES
85-68-7	Butyl benzyl phthalate		10	U	UG/L	5.26E-01	
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-16
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	10	U	UG/L	1.00E-01	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	UJ	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	U	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	U	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	UJ	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	U	UG/L	1.19E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	UJ	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		0.5	UJ	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	UJ	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	U	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	U	UG/L	7.14E-05	
2691-41-0	HMX		0.5	U	UG/L	1.52E-03	
98-95-3	Nitrobenzene		10	U	UG/L	3.70E-02	
55-63-0	Nitroglycerin		1	UJ	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		2	U	UG/L	2.35E-05	
121-82-4	RDX		0.5	U	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	U	UG/L		
Metals							
7429-90-5	Aluminum	200	69000		UG/L	7.93E+02	
7440-36-0	Antimony	6	1.6	J	UG/L	5.33E-02	
7440-38-2	Arsenic	10	38.7		UG/L	2.04E-01	
7440-39-3	Barium	22.7	632		UG/L	1.26E-01	
7440-41-7	Beryllium	5	1.5	J	UG/L	2.83E+00	
7440-42-8	Boron		57.3	J	UG/L	5.73E-02	
7440-43-9	Cadmium	5	3	J	UG/L	2.73E+00	
7440-70-2	Calcium	7197	172000		UG/L	1.48E+00	
7440-47-3	Chromium	10	105		UG/L	5.07E-01	
7440-48-4	Cobalt	50	63		UG/L	2.74E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-16
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11A (AUS-A11A)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7440-50-8	Copper	10	89.3		UG/L	7.57E+00	
7439-89-6	Iron	100	98000		UG/L	9.80E+01	
7439-92-1	Lead	2	95.1		UG/L	4.73E+00	
7439-95-4	Magnesium	2534	89700		UG/L	1.09E+00	
7439-96-5	Manganese	582	6720		UG/L	6.72E+00	
7439-97-6	Mercury	0.2	0.66		UG/L	5.08E-01	YES
7440-02-0	Nickel	10	87.9		UG/L	8.79E-02	
2023695	Potassium	1613	6190		UG/L	1.17E-01	
7782-49-2	Selenium	2.7	7.9		UG/L	7.90E-03	YES
7440-22-4	Silver	10	20	U	UG/L	4.00E+00	
7440-23-5	Sodium	3169	48900		UG/L	7.19E-02	
7440-28-0	Thallium	10	3.8	J	UG/L	9.50E-01	
7440-62-2	Vanadium	50	158		UG/L	8.32E+00	
7440-66-6	Zinc	20	616		UG/L	6.16E-01	
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	30.7	200		MG/L		
7664-41-7	Nitrogen, Ammonia (as N)	0.26	1.9		MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	174		MG/L		
7601-90-3	Perchlorate		500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.05	0.42		MG/L		
14808-79-8	Sulfate (as SO4)		240000		UG/L		
TDS	TDS	71.7	1038		MG/L		
TSS	TSS	8	853		MG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 15-17, AUS-A11A
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	No	A	No	A	No	A
1,1,2,2-Tetrachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,1,2-Trichloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,1-Dichloroethane	No	C	No	A	No	A	No	A
1,1-Dichloroethene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A	No	A
1,2-Dichloropropane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2-Butanone (MEK)	No	C	No	A	No	A	No	A
2-Hexanone	No	C	No	C	No	C	No	C
4-Methyl-2-pentanone (MIBK)	No	C	No	A	No	A	No	A
Acetone	No	C	No	A	No	F	No	A
Benzene	No	A	Uncertainty	B	Uncertainty	B	Uncertainty	B
Bromodichloromethane	No	C	Uncertainty	B	No	A	No	A
Bromoform	No	C	No	A	No	A	No	A
Bromomethane	No	C	No	A	No	A	No	A
Carbon disulfide	No	C	No	A	No	A	No	A
Carbon tetrachloride	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Chlorobenzene	No	C	No	A	No	A	No	A
Chloroethane	No	C	No	A	No	A	No	A
Chloroform	No	C	Uncertainty	B	No	A	No	A
Chloromethane	No	C	No	A	No	A	No	A
cis-1,2-Dichloroethene	No	C	No	A	No	A	No	A
cis-1,3-Dichloropropene	No	C	Uncertainty	B	No	A	No	A
Dibromochloromethane	No	C	Uncertainty	B	No	A	No	A
Ethylbenzene	No	A	No	A	No	A	No	A
Methylene chloride	No	A	No	A	Uncertainty	B	Uncertainty	B
N-Hexane	No	C	No	A	No	A	No	A
Styrene	No	C	No	A	No	A	No	A
Tetrachloroethylene (PCE)	No	C	No	A	Uncertainty	B	Uncertainty	B
Toluene	No	A	No	A	No	A	No	A
total Xylenes	No	A	No	A	No	A	No	A
trans-1,2-Dichloroethene	No	C	No	A	No	A	No	A
trans-1,3-Dichloropropene	No	C	Uncertainty	B	No	A	No	A
Trichloroethylene (TCE)	No	C	No	A	Uncertainty	B	Uncertainty	B
Vinyl chloride	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	No	A	No	A	No	A
1,3-Dichlorobenzene	No	C	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	No	A	No	A	No	A

TABLE 15-17, AUS-A11A
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	No	A	No	A	No	A
2-Chlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	No	A	No	A	No	A
2-Methylnaphthalene	No	A	No	A	No	F	No	F
2-Methylphenol	No	C	No	A	No	A	No	A
2-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
2-Nitrophenol	No	C	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	No	C	No	C	No	C
4-Bromophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Chloro-3-methylphenol	No	C	No	A	No	A	No	A
4-Chloroaniline	No	C	No	A	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Methylphenol	No	C	No	A	No	F	No	A
4-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4-Nitrophenol	No	C	No	A	No	A	No	A
Acenaphthene	No	C	No	A	No	A	No	F
Acenaphthylene	No	A	No	A	No	A	No	A
Anthracene	No	A	No	A	No	A	No	F
Benzo(a)anthracene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Benzo(g,h,i)perylene	No	A	No	A	No	F	No	F
Benzo(k)fluoranthene	No	C	Uncertainty	B	No	F	Yes	E
bis(2-Chloroethoxy)methane	No	C	No	C	No	C	No	C
bis(2-Chloroethyl) ether	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	Uncertainty	G	Uncertainty	B	No	F	No	F
Butyl benzyl phthalate	No	C	No	A	No	A	No	F
Carbazole	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Chrysene	Uncertainty	B	Uncertainty	B	No	F	No	F
Di-n-butyl phthalate	No	C	No	A	No	F	No	F
Di-n-octyl phthalate	No	C	No	A	No	A	No	A
Dibenz(a,h)anthracene	No	C	Uncertainty	B	No	F	Yes	E
Dibenzofuran	No	C	No	A	No	F	No	F
Diethyl phthalate	No	C	No	A	No	F	No	A
Dimethyl phthalate	No	C	No	A	No	A	No	A
Fluoranthene	No	A	No	A	No	F	No	F

TABLE 15-17, AUS-A11A
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	No	A	No	A	No	A
Hexachlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	No	A	No	A	No	A
Hexachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Isophorone	No	C	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	No	A	Yes	E	Uncertainty	B
Naphthalene	No	C	Uncertainty	B	No	F	No	F
Pentachlorophenol	No	C	Uncertainty	B	Yes	E	Uncertainty	B
Phenanthrene	No	A	No	A	No	F	No	F
Phenol	No	A	No	A	No	A	No	A
Pyrene	No	A	No	A	No	F	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	No	F	No	F	No	F
Antimony	Uncertainty	G	Uncertainty	B	Yes	D	Yes	E
Arsenic	Uncertainty	G	Uncertainty	B	Yes	E	Yes	D
Barium	No	F	No	F	Yes	E	Yes	E
Beryllium	Uncertainty	G	Uncertainty	B	Yes	E	No	F
Boron	No	F	No	A	No	F	No	F
Cadmium	Uncertainty	G	Uncertainty	B	Yes	D	Yes	E
Calcium	No	H	No	H	No	H	No	H
Chromium	Uncertainty	G	No	A	Yes	E	Yes	E
Cobalt	Uncertainty	G	No	A	No	F	No	F
Copper	Uncertainty	G	No	A	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	No	F	No	F
Lead	Uncertainty	G	Uncertainty	B	No	F	No	F
Magnesium	No	H	No	H	No	H	No	H
Manganese	Yes	E	Yes	E	No	F	No	F
Mercury	Yes	E	No	F	Yes	E	Yes	J
Nickel	No	F	No	F	Yes	E	Yes	E
Potassium	No	H	No	H	No	H	No	H
Selenium	No	F	No	A	Yes	E	Yes	D
Silver	Uncertainty	B	No	A	No	F	No	F
Sodium	No	H	No	H	No	H	No	H
Thallium	Uncertainty	G	Uncertainty	B	Uncertainty	B	No	F
Vanadium	Uncertainty	G	No	A	No	F	No	F
Zinc	No	F	No	F	No	F	No	F
Explosives								
1,3,5-Trinitrobenzene	No	C	No	A	No	A	No	A
1,3-Dinitrobenzene	No	C	No	A	No	A	No	A

TABLE 15-17, AUS-A11A
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	No	A	No	A	No	A
2,4-Dinitrotoluene	No	C	No	A	Yes	E	Uncertainty	B
2,6-Dinitrotoluene	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	C	No	C	No	C	No	C
2-Nitrotoluene (ONT)	No	C	No	C	No	C	No	C
3-Nitrotoluene	No	C	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	No	C	No	C	No	C
4-Nitrotoluene (PNT)	No	C	No	A	No	A	No	A
HMX	No	C	No	A	No	A	No	A
Nitrobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
Nitroglycerin	No	C	No	A	No	A	No	A
Pentaerythritol tetranitrate (PETN)	No	C	No	C	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	No	A	No	A	No	A
Tetryl	No	C	No	A	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	Uncertainty	G	Yes	E	NA	NA	NA	NA
Phosphorus, Total (as P)	Uncertainty	G	Yes	E	NA	NA	NA	NA

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 15-18, AUS-A11A
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	No	A	No	A
1,1,2,2-Tetrachloroethane	No	A	No	A	No	A
1,1,2-Trichloroethane	No	A	No	A	No	A
1,1-Dichloroethane	No	A	No	A	No	A
1,1-Dichloroethene	No	A	No	A	No	A
1,2-Dichloroethane (EDC)	No	A	No	A	No	A
1,2-Dichloroethene (total)	NA	NA	No	A	No	A
1,2-Dichloropropane	No	A	No	A	No	A
2-Butanone (MEK)	No	A	No	A	No	A
2-Hexanone	No	A	No	A	No	A
4-Methyl-2-pentanone (MIBK)	No	A	No	A	No	A
Acetone	No	A	No	F	No	A
Benzene	No	A	No	A	No	A
Bromodichloromethane	No	A	No	A	No	A
Bromoform	No	A	No	A	No	A
Bromomethane	No	A	No	A	No	A
Carbon disulfide	Uncertainty	B	Uncertainty	B	No	A
Carbon tetrachloride	No	A	No	A	No	A
Chlorobenzene	No	A	No	A	No	A
Chloroethane	No	A	No	A	No	C
Chloroform	No	A	No	A	No	A
Chloromethane	No	A	No	A	No	A
cis-1,2-Dichloroethene	No	A	No	A	No	A
cis-1,3-Dichloropropene	Uncertainty	B	Uncertainty	B	No	A
Dibromochloromethane	No	A	No	A	No	A
Ethylbenzene	No	A	No	A	No	A
Methylene chloride	No	A	No	A	No	A
N-Hexane	No	C	No	C	No	C
Styrene	No	A	No	A	No	A
Tetrachloroethylene (PCE)	No	A	No	A	No	A
Toluene	No	A	No	A	No	A
total Xylenes	No	A	No	A	No	A
trans-1,2-Dichloroethene	No	A	No	A	No	A
trans-1,3-Dichloropropene	No	A	No	A	No	A
Trichloroethylene (TCE)	No	A	No	A	No	A
Vinyl chloride	No	A	No	A	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	No	A	No	A
1,2-Dichlorobenzene	No	A	Uncertainty	B	No	A
1,3-Dichlorobenzene	No	A	No	A	No	A
1,4-Dichlorobenzene	No	A	Uncertainty	B	No	A
2,4,5-Trichlorophenol	No	A	Uncertainty	B	No	A

TABLE 15-18, AUS-A11A
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	Uncertainty	B	No	A
2,4-Dichlorophenol	No	A	Uncertainty	B	No	A
2,4-Dimethylphenol	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	Uncertainty	B	No	A
2-Chloronaphthalene	No	A	No	A	Uncertainty	B
2-Chlorophenol	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	No	C	No	C
2-Methylnaphthalene	No	A	Yes	E	Yes	E
2-Methylphenol	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	A	No	A	No	A
2-Nitrophenol	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	A	No	A	No	A
3-Nitroaniline	No	A	No	A	No	A
4,6-Dinitro-2-methylphenol	Uncertainty	B	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	No	A	No	C
4-Chloro-3-methylphenol	Uncertainty	B	Uncertainty	B	No	A
4-Chloroaniline	No	A	No	A	Uncertainty	B
4-Chlorophenyl phenyl ether	No	A	No	A	No	C
4-Methylphenol	No	A	No	F	No	A
4-Nitroaniline	No	A	No	A	No	A
4-Nitrophenol	No	A	Uncertainty	B	No	A
Acenaphthene	No	A	Uncertainty	B	Yes	E
Acenaphthylene	No	A	Uncertainty	B	No	A
Anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Benzo(a)anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Yes	E	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	Yes	E	Yes	E
bis(2-Chloroethoxy)methane	No	A	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	No	A	No	A
bis(2-Chloroisopropyl) ether	No	C	No	C	No	C
bis(2-Ethylhexyl) phthalate	Yes	E	Yes	E	Yes	E
Butyl benzyl phthalate	No	A	No	A	Yes	E
Carbazole	No	A	No	A	Yes	E
Chrysene	No	A	Yes	E	Yes	E
Di-n-butyl phthalate	Uncertainty	B	Yes	E	Yes	E
Di-n-octyl phthalate	No	A	No	A	No	A
Dibenz(a,h)anthracene	Uncertainty	B	Yes	E	Yes	E
Dibenzofuran	Uncertainty	B	Yes	E	Yes	E
Diethyl phthalate	No	A	No	F	No	A
Dimethyl phthalate	No	A	No	A	No	A
Fluoranthene	Uncertainty	B	Yes	E	Yes	E

TABLE 15-18, AUS-A11A
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobenzene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobutadiene	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	Uncertainty	B	No	A
Hexachloroethane	Uncertainty	B	Uncertainty	B	No	A
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Yes	E	Yes	E
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	Uncertainty	B
N-Nitrosodiphenylamine	No	A	Yes	E	No	A
Naphthalene	No	A	No	F	No	F
Pentachlorophenol	Uncertainty	B	Yes	E	No	A
Phenanthrene	Uncertainty	B	Yes	E	Yes	E
Phenol	No	A	Uncertainty	B	No	A
Pyrene	No	A	Yes	E	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	F	No	F	No	F
Arsenic	No	F	Yes	E	Yes	D
Barium	No	F	Uncertainty	G	No	F
Beryllium	Yes	D	Uncertainty	G	No	F
Boron	No	F	Uncertainty	G	Yes	E
Cadmium	Yes	D	No	F	No	F
Calcium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	Yes	E	Yes	E
Cobalt	Yes	E	Yes	E	No	F
Copper	Yes	E	No	F	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	Yes	E
Lead	Yes	E	Yes	E	No	F
Magnesium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	Yes	E	Yes	E	Yes	D
Mercury	Yes	E	Yes	E	Yes	E
Nickel	No	F	Yes	E	No	F
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	Yes	E	Yes	E	Yes	D
Silver	Uncertainty	B	No	F	No	F
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	No	F	No	C	No	F
Vanadium	Yes	E	Uncertainty	G	No	F
Zinc	No	F	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	Uncertainty	B
1,3-Dinitrobenzene	No	A	Uncertainty	B	No	A

TABLE 15-18, AUS-A11A
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Uncertainty	B	No	A
2,4-Dinitrotoluene	No	A	No	F	No	A
2,6-Dinitrotoluene	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	A	No	C	No	A
2-Nitrotoluene (ONT)	No	A	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	A	No	C	No	C
4-Nitrotoluene (PNT)	No	A	No	A	No	C
HMX	No	A	Uncertainty	B	No	A
Nitrobenzene	No	A	No	A	No	A
Nitroglycerin	No	A	Uncertainty	B	No	C
Pentaerythritol tetranitrate (PETN)	No	A	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	Uncertainty	B	No	A
Tetryl	No	C	No	C	No	C

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 15-19

AUS-A11A - IOP GROUP II MELT LOADING LINE

(ACID AND AMMONIUM NITRATE AREA)

CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND

(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

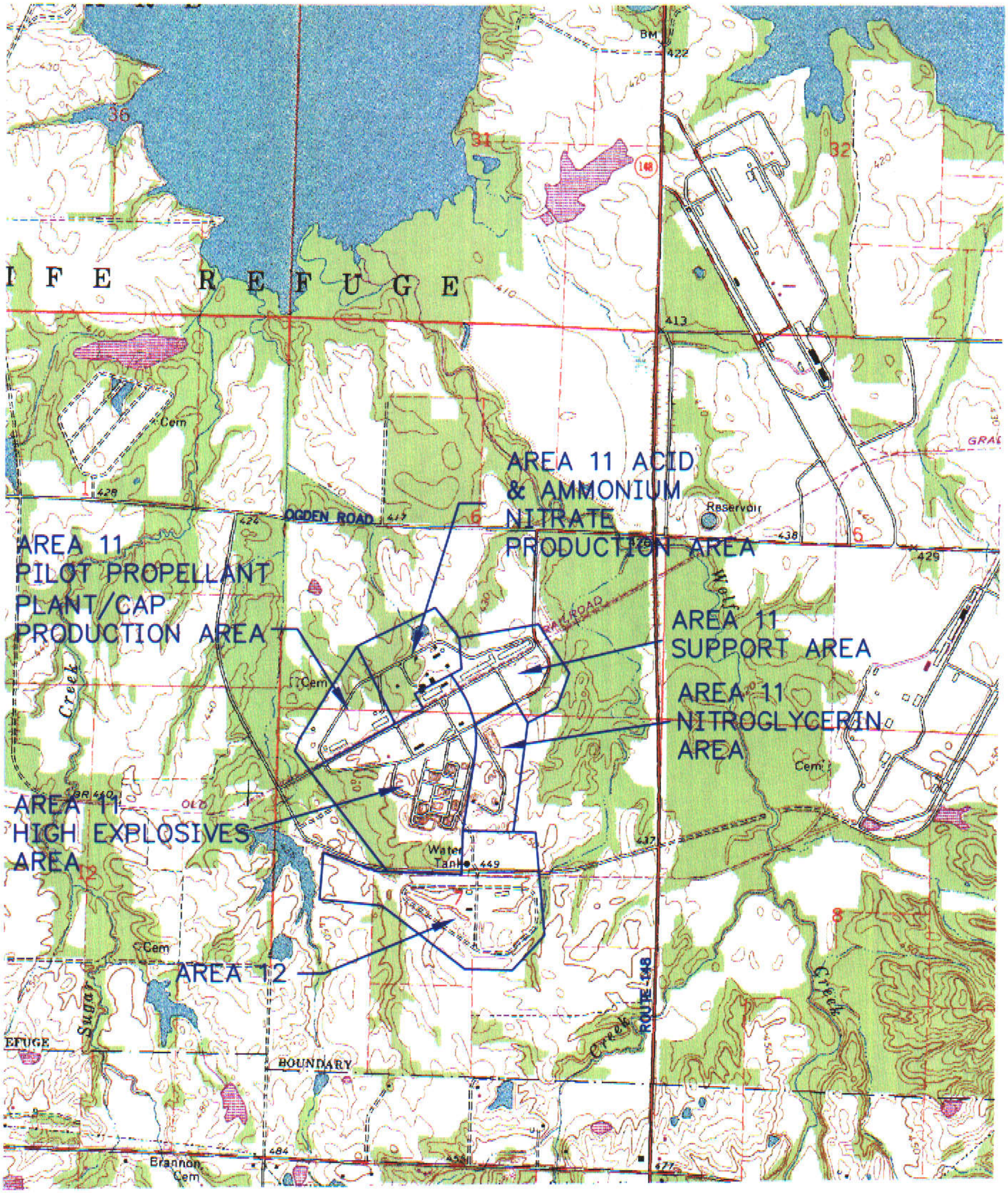
Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
SVOCs					
2-Methylnaphthalene		E	E		
Acenaphthene		E			
Anthracene		E			
Benzo(a)anthracene		H,E	H,E		
Benzo(a)pyrene		H,E	E		
Benzo(b)fluoranthene		H,E	E		
Benzo(g,h,i)perylene		E	E		
Benzo(k)fluoranthene		H,E	E		
bis(2-Ethylhexyl)phthalate		E	E		E
Butyl benzyl phthalate		E			
Carbazole		H,E			
Chrysene		E	E		
Di-n-butyl phthalate		E	E		
Dibenz(a,h)anthracene		H,E	E		
Dibenzofuran		E	E		
Fluoranthene		E	E		
Indeno(1,2,3-c,d)pyrene		H,E	E		
N-Nitrosodiphenylamine			H,E		
Pentachlorophenol			H,E		
Phenanthrene		E	E		
Pyrene		E	E		
Metals					
Aluminum					E
Antimony		H			
Arsenic			H,E		
Barium		H	H		
Beryllium			H		
Boron		E			
Cadmium		H			
Calcium					E
Chromium		H,E	H,E		
Cobalt			E		E
Copper		E			E
Iron		E			H,E
Lead			E		E
Magnesium					E
Manganese			E	H	H,E
Mercury		E	H,E		H,E
Nickel		H	H,E		
Selenium			H,E		E
Vanadium					E
Zinc		E	E		

TABLE 15-19
AUS-A11A - IOP GROUP II MELT LOADING LINE
(ACID AND AMMONIUM NITRATE AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
Explosives					
2,4-Dinitrotoluene			**H**		
Other Parameters					
Nitrogen, Nitrate-Nitrite		NA	NA	**H**	
Phosphorus, Total (as P)		NA	NA	**H**	

Key:
[1] Drums were not present at this site.
NA = not analyzed
H = human health screening criteria exceeded
E = ecological screening criteria exceeded



SOURCE: USGS DIGITAL RASTER GRAPHIC

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0 2000

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PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00

URS

DRN. BY: djd 9/16/99 DSGN. BY: mm CHKD. BY: mch/cmw	Areas 11 & 12 Site Location Map	FIG. NO. 15-1

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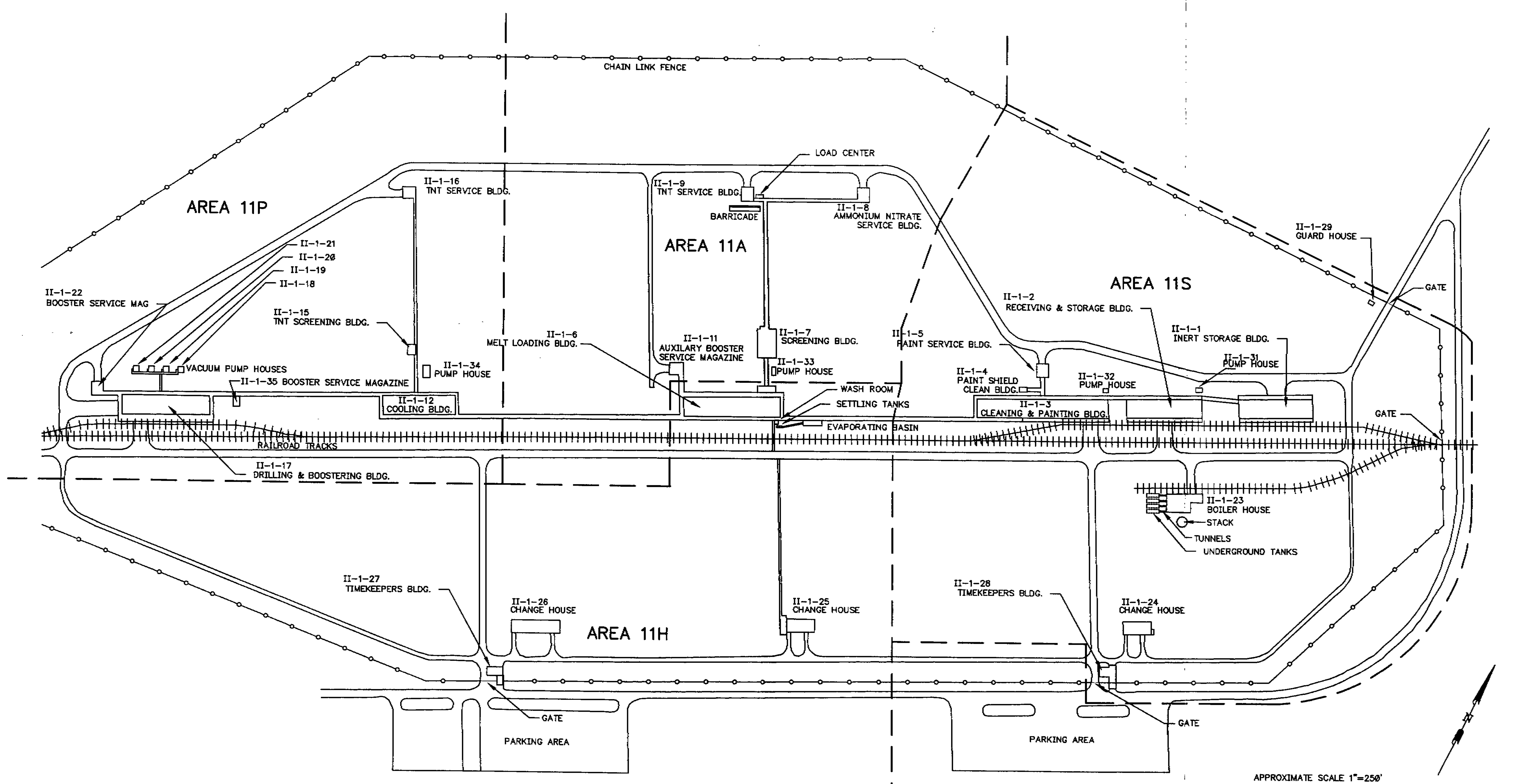
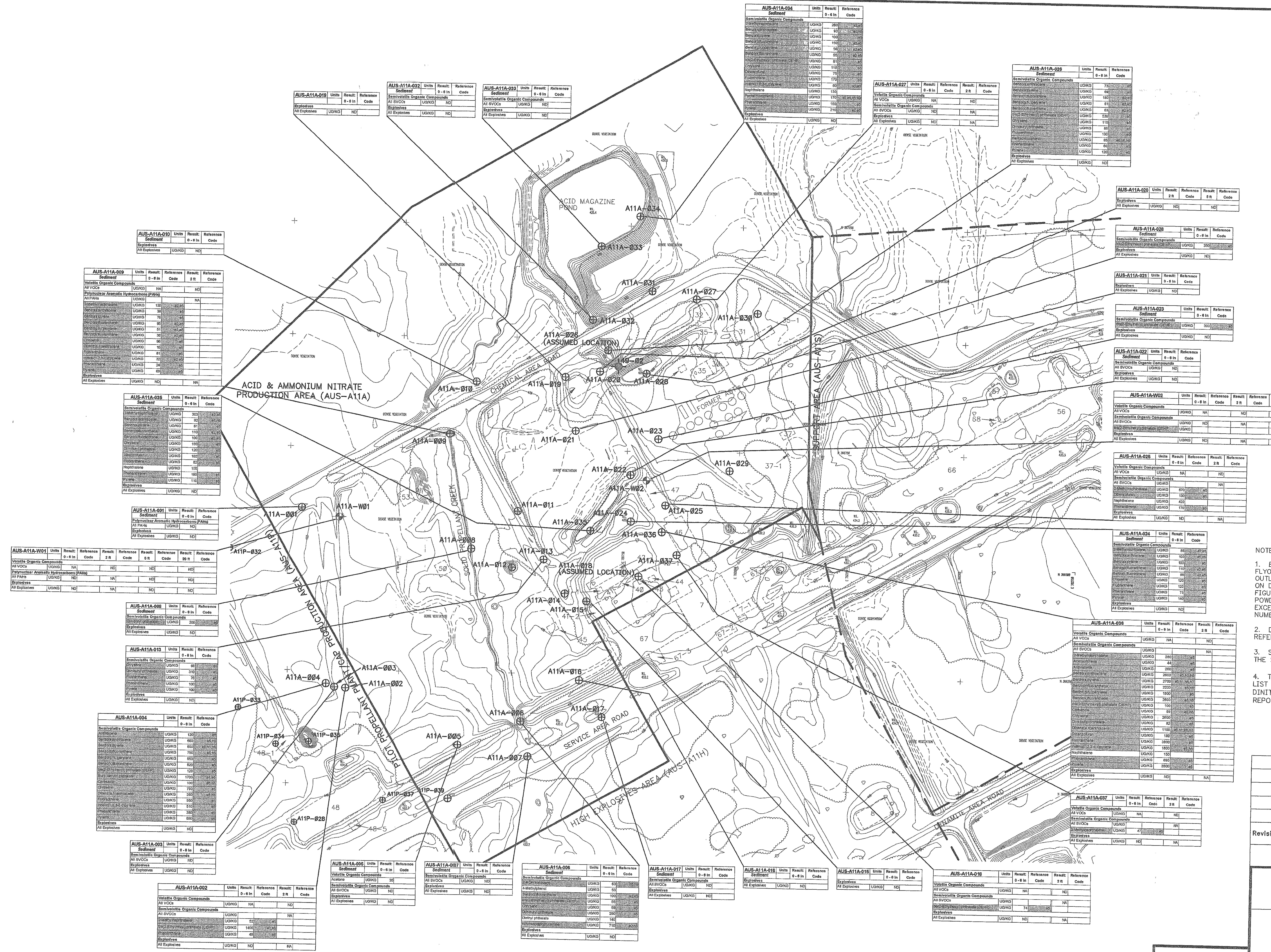


SOURCE:

1. USACE, 1944, WAR DEPARTMENT FACILITIES INVENTORY OF THE ILLINOIS ORDNANCE PLANT, CARBONDALE, ILLINOIS, PART 1, SECTION 5, PAGE 11.

2. DPRA DOCUMENT NO. CO01128. CORPS OF ENGINEERS FILES, LOCATION LAYOUT, GROUP II MELT LOADING LINE, AREA II, (DRAWING SUPERSEDES DRAWING NO. 6844101.21 DATED 11/8/41), DATED 2/14/42.

PA/SI REPORT – AUS OU CRAB ORCHARD NATIONAL WILDLIFE REFUGE MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: djd DSGN. BY: mam CHKD. BY: mch/cmw	IOP Location Layout Group II– Melt Loading Line Area 11 — FIG. NO. 15–2



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

Revision No.	Description	Date	By	App.

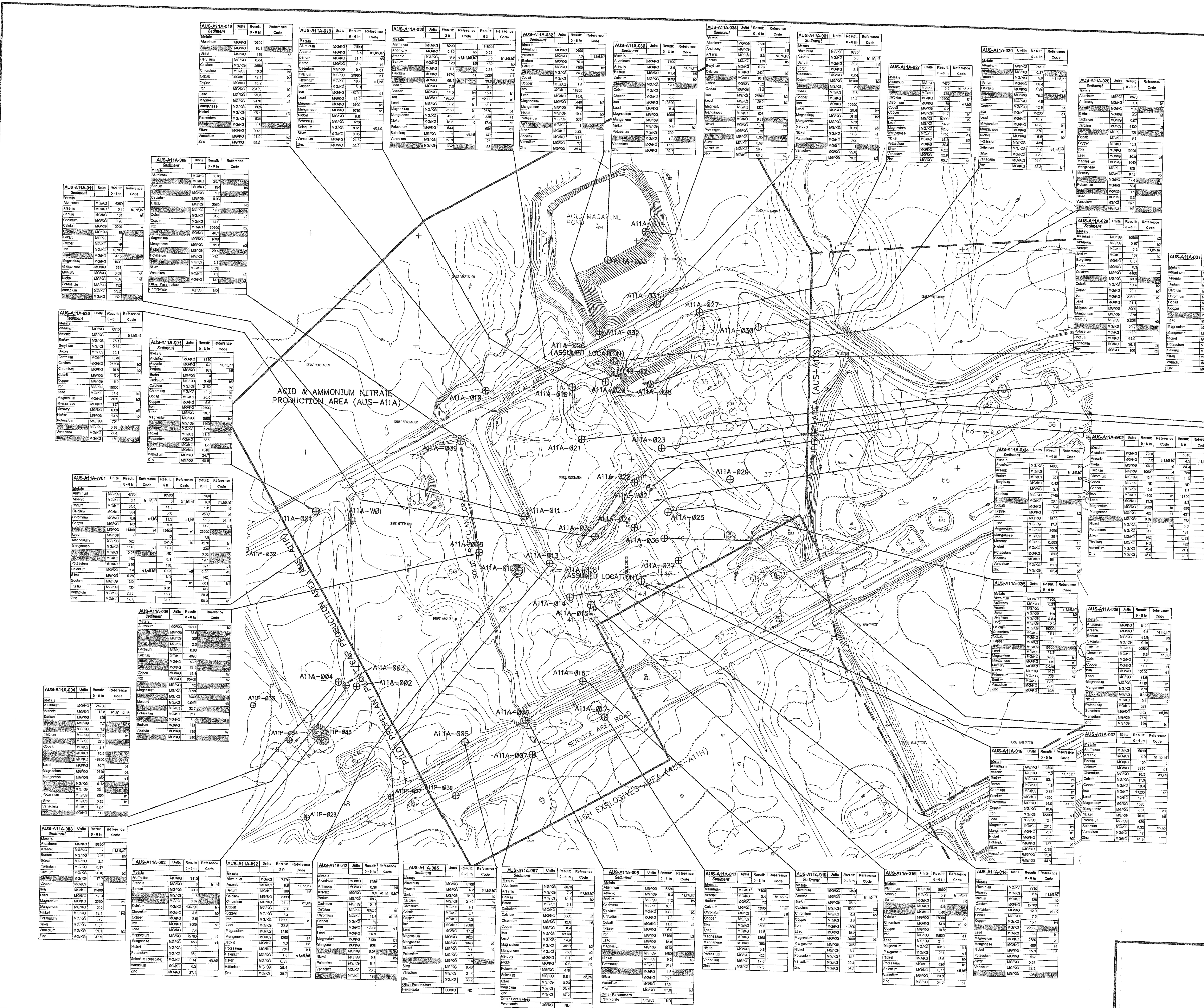
REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11A
Sample Locations and Detections of Organic Compounds in Soils/Sediments

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 15-7
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

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SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2ØØØ. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

Revision No.	Description	Date	By	App.

REVISIONS

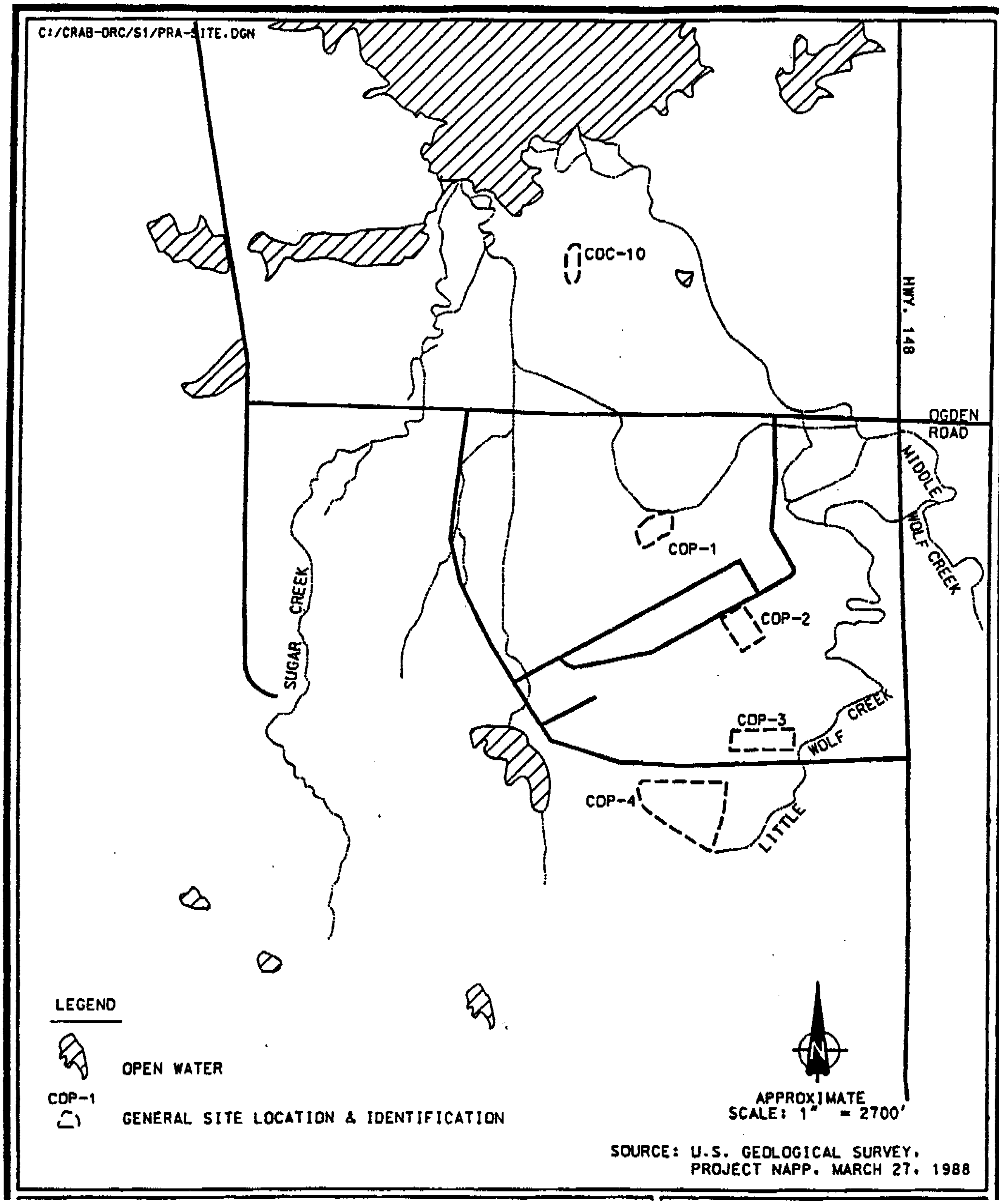
PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11A
Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 15-8
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION (1&2)\AUS-P-A11A.DWG Last edited: AUG. 10, 01 @ 2:42 p.m. URS Corp.



File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG15-4LS.DWG Last edited: JUN. 29, 01 @ 09:19 a.m. by: LHSMITHO

SOURCE: ENVIRONMENTAL SCIENCE & ENGINEERING, INC, SEPTEMBER 1994, DRAFT FINAL REMEDIAL INVESTIGATION/BASELINE RISK ASSESSMENT REPORT, EXPLOSIVES/MUNITIONS MANUFACTURING AREAS OPERABLE UNIT, CRAB ORCHARD NATIONAL WILDLIFE REFUGE, MARION, ILLINOIS, VOLUME I, REMEDIAL INVESTIGATION (RI) REPORT, FIGURE 1-5.

PA/SI REPORT AUS OU CRAB ORCHARD NWR MARION, ILLINOIS		PROJECT NO. 2320000026.00
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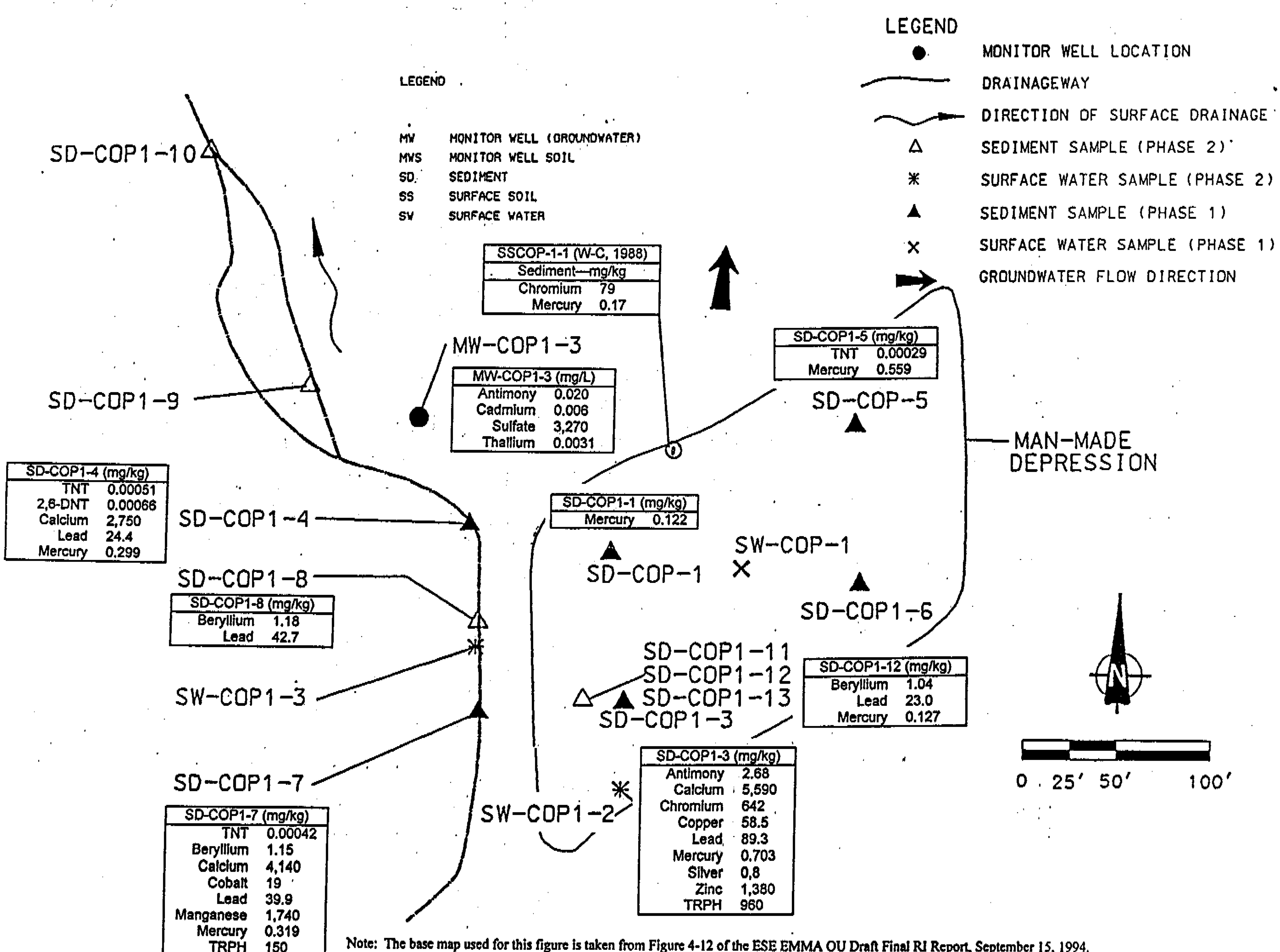
DRN. BY: djd 9/7/99 DSGN. BY: mh CHKD. BY: mch	EMMA OU COP Site Locations	FIG. NO. 15-4



Note: The base map used for this figure is taken from Figure 4-12 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Except for the one W-C result noted, data are from Tables 4-39 and 4-41 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Not all exceedances are shown on this figure.

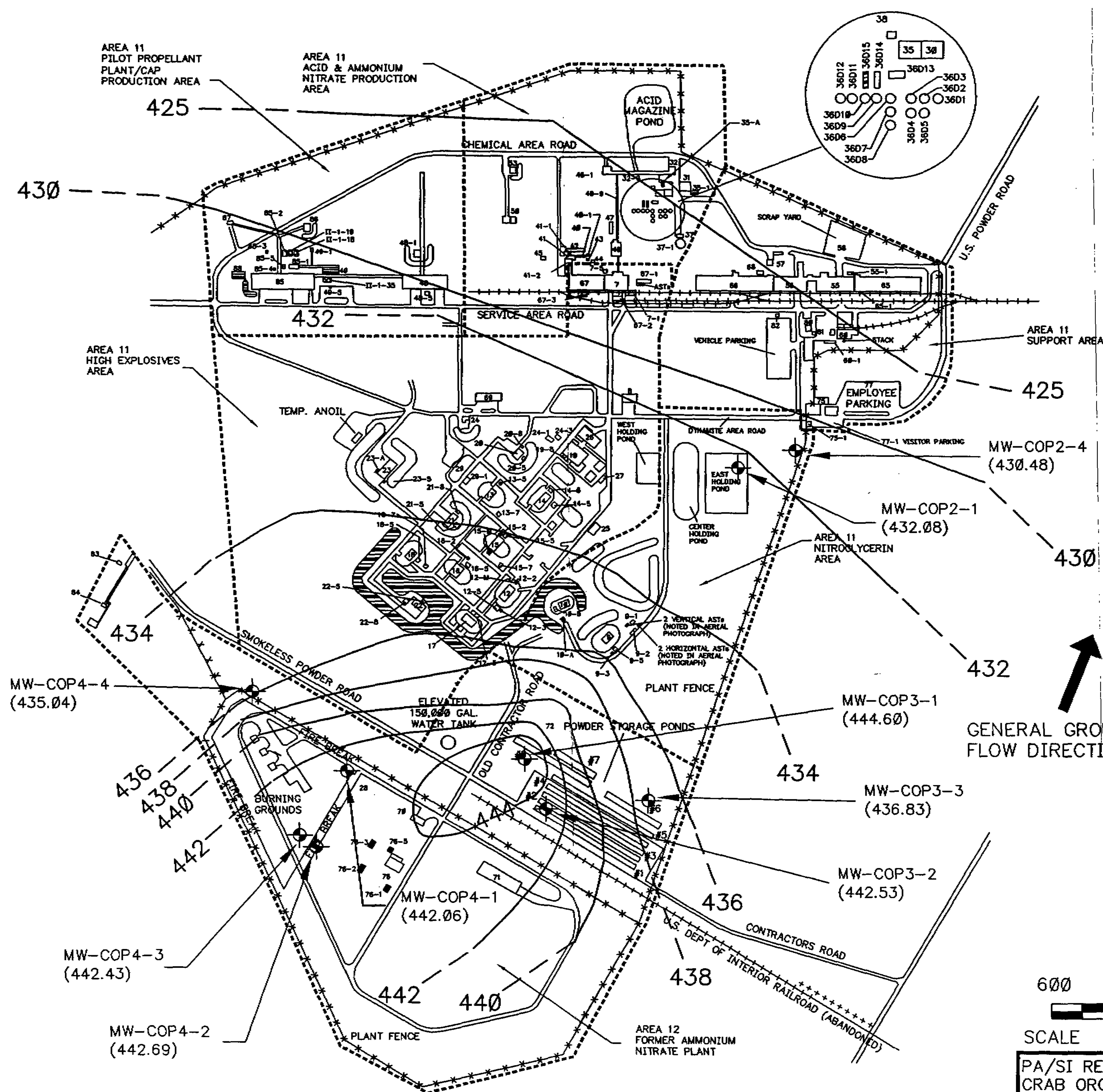
Figure 15–5
Site COP-1

Olin Bldg.	Olin Designation (1956-1964)	U.S. Powder	U.S. Powder/CSC Designation (1964-1982)
7	Dope House	7	Dope House
7-A	Track Shed	7-1	Track Shed
7-E	Control House (Not Shown On Map)	7-5	Control House (New)
8	Dynamite & First Aid Office and Change House	8	Dynamite Off. & First Aid
9	Nitrator	9	Nitrator
9-A	Spent Acid	9-1	Spent Acid House
9-B	Soda House	9-2	Soda House
		9-3	Water Softener Bldg. (New)
9-E	Control House	9-5	Control House
10	N.G. Storage	10	N.G. Storage Bldg.
10-A	Catch Tank		(Removed)
10-B	Control House	10-5	Control House
11	(Not Named) (Not Shown On Map)	11	Former Mix House(Not Shown On Map)
12	Mix House	12	Mix House No. 2 Fq. 8 Mixer (Gelatin)
12DS	DNT Storage (Not Shown On Map)		(Removed)
		12-3	Water Softener Bldg. (New)
12-E	Air Condition House	12-5	Control House
12-M	Motor House		(Removed)
12-P	Pump House	12-2	Storage Bldg.
13	Pack House - Hall	13	Hall Pack House (Dynamite)
13-E	Air Condition House	13-5	Control House
13-T	Toilet	13-7	Toilet
14	Pack House - Stierell	14	"LL" Pack House (Dynamite)
14-E	Air Condition House	14-5	Control House
14-M	Motor House	14-6	Storage Bldg.
15	Pack House - Oil-Vibro Pack	15	Oil Vibro Pack House (Dynamite)
		15-2	Storage Bldg. (New)
15-E	Air Condition House	15-5	Control House
15-M	Motor House		(Removed)
15-T	Toilet	15-7	Toilet
16	Gel Cartridge Pack House	16	Gel Cartridge Pack House
		16-2	Storage Bldg. (New)
16-E	Air Condition House	16-5	Control House
17	Mix House - Talley	17	Talley Mix House (Dynamite)
17-E	Air Condition House	17-5	Control House
18	Pack House/M0J 4A Mix House	18	Powder Stripping House
18-E	Air Condition House	18-5	Control House
18-T	Toilet	18-7	Toilet
19	Shell House	19	Shell House
19-W	Wax House	19-8	Wax House
20	Case House No. 1 8" Wasers	20	Case House No. 1
20-E	Electrical Control House	20-5	Control House
20-W	Wax House	20-8	Wax House
21	Case House No. 2 Large & 24" Wasers	21	Superprime & Slurry
21-E	Electrical Control House	21-5	Control House
21-W	Wax House	21-8	Wax House
22	Case House No. 3 Small Wasers	22	Torpex Operation/Storage Bldg.
22-E	Electrical Control House	22-5	Control House
22-W	Wax House	22-8	Wax House
23	ANOIL Mfg. Bldg.	23	ANOIL Mfg. Bldg.
23-A	Heater House-ANOIL Mfg. Bldg.		(Removed or not in use)
		23-5	Control House (New)
24	Dynamite Maintenance Shop R&D Lab	24	R&D Laboratory
24-A	Dynamite	24-1	Dynamite Maint. Shop
24-C	Parts Cleaning - Dynamite	24-3	Dynamite Parts Cleaning
25	N.C. - TNT Screening (Not Shown On Map)	25	NC-TNT-Screening (New)
26	Box Assembly	26	Box Assembly
27	Tractor House	27	Tractor House
28	Burning House	28	Burning House
		29	Loading Dock (New)
		29-1	Storage Bldg. (New)
30	Ammonia Oxidation House	30	Ammonia Oxidation Bldg.
31	Cooling Tower & Control	31	Cooling Tower & Control Bldg.
32	Office & Shop (Acid)	32	Acid Office & Shop
32-R	Ramp 32 to 46-A	32-9	Ramp 32 to 46-1
35	Nitric Acid Concentration	35	Nitric Acid Concentration
35-A	Switch House Sub No. #1		(Removed)
		35-1	Switch House - Sub Station #1 (New)
36-D1	Off-Site Tank	36-01	Offsite Tank - 200 - Weak N.A.
36-D2	Off-Site Tank	36-02	Offsite Tank - 201 - Weak N.A.
36-D3	Off-Site Tank	36-03	Offsite Tank - 202 - Weak N.A.
36-D4	Off-Site Tank	36-D4	Offsite Tank - 203 - Weak N.A.
36-D5	Off-Site Tank	36-D5	Offsite Tank - 204 - Weak N.A.
36-D6	Off-Site Tank	36-D6	Offsite Tank - 400 - 66% Sulphuric
36-D7	Off-Site Tank	36-D7	Offsite Tank - 401 - 66% Sulphuric
36-D8	Off-Site Tank	36-D8	Offsite Tank - 402 - 66% Sulphuric
36-D9	Off-Site Tank	36-D9	Offsite Tank - 500 - Oleum Stor.
36-D10	Off-Site Tank	36-D10	Offsite Tank - 501 - Oleum Stor.
36-D11	Off-Site Tank	36-D11	Offsite Tank - 300 - Mixed Acid
36-D12	Off-Site Tank	36-D12	Offsite Tank - 301 - Mixed Acid
36-D13	Off-Site Tank	36-D13	Offsite Tank - 302 - M.A. Scale TK.
36-D14	Off-Site Tank	36-D14	Offsite Tank - 303 - S.A. Circ. TK.
		36-D15	Off-Site Tank (Contents Unknown)
37	Ammonia Compressor House	37	Ammonia Compressor House
37-A	Ammonia Hortonsphere	37-1	Ammonia Hortonsphere
38	Spent Acid House	38	Spent Acid House
40	Prill Tower & Wet End	40	Prill Tower & Wet End
40-A	Control Bldg. (A.N.)	40-1	Control Bldg. A.N.
41	Cooling & Bagging Bldg.	41	Cooling & Bagging Bldg.
41-A	A.N. Recovery Bldg.	41-1	A.N. Recovery Bldg.
41-B	A.N. Truck Dock/Shipping	41-2	A.N. Truck Dock
42	Graining Bldg.	42	Graining Bldg.
43	A.N. Lab	43	A.N. Laboratory
44	Compressor House (Steam)	44	Compressor House (Steam)
45	A.N. Lunch Room	45	Lunch Room
46	A.N. Storage (Hallway House)	46	A.N. Storage
46-A	A.N. Raw Material Storage/N.G. Dry House	46-1	A.N. Raw Material Storage
46-R	Ramp 46 to 32-R	46-9	Ramp 46 to 32-9
47	Chemical Area Maintenance Shop	47	Chemical Area Maint. Shop
48	A.N. Whse./Jet Starter Cartridge Assembly	48	Storage Bldg.
II-1-15	TNT Screening Building	48-1	Storage Bldg.
		48-5	Electric Control House (New)
II-1-35	Maintenance Shop & Stores		Still Present On Site-May Not Be In Use
		49	Big Inch Cap Assembly Line
		49-1	Big Inch Screening House (New)
		49-5	Electric Control House (New)
50	Use unknown	50	Storage Bldg.
53	DYNOIL Mix House	53	Storage Bldg.
55	Carpenter & Machine Shop	55	Carpenter Machine & Sht Metal Shop
55-A	Steam Reg. For 55	55-1	Steam Regulator Station
56	Garage - Washroom - Office	56	Garage - Washroom & Office
57	Welding Shop	57	Welding Shop
58	Salvage Yard	58	Salvage yard
60	Boiler House	60	Boiler House
60-A	Boiler House Shop	60-1	Boiler House Shop
65	General Stores	65	General Stores
		65-1	Track Scale (New)
66	Inert Stores No. 1	66	Inert Stores No. 1
67	Inert Stores No. 2	67	Inert Stores No. 2
67-A	Apricot Pit Storage	67-1	Apricot Pit Storage
67-B	Bag Sulphur Storage	67-2	Bag Sulphur Storage
		67-3	Bulk A.N. Loading (New)
68	Oil Stores	68	Oil Stores
69	Warehouse - Change House-R & D	69	R&D Office & Lab
70	Stores - Change House	70	Storage Bldg.
71	Paper Stores	71	Warehouse & Paper Stores
	Powder Storage Ponds (#1-#7)	72	Powder Storage Ponds (#1-#7)
75	Administration Building	75	Administration Bldg.
75-A	Guard House/Possible Lab	75-1	Guard House
	Not known if Olin used this building	76	RDX Separation
		76-1	Air Dryer & Steam Gen. (New)
		76-2	Mixer House (RDX) (New)
		76-3	Tray Drier (RDX) (New)
		76-5	Electric Control House (New)
	Areas Shown But Not Named	77	Employee Parking
	Areas Shown But Not Named	77-1	Visitor Parking
	Areas Shown But Not Named	77-2	Vehicle Parking
80	Laboratory	80	Q.C. Laboratory
80-A	Laboratory Storage	81	Q.C. Storage
Not Listed	Component Magazine (Not Shown On Map)	82	Component Magazine
80-C	Cap Magazine	83	(Not Named)
80-E	Shooting House	84	Shooting House
II-1-17	Pilot Propellant Plant	85	Storage
II-1-17	Pilot Propellant Plant	86	Storage
II-1-18	Grain Curing Building		Building removed
II-1-19	Grain Curing Building		Building removed
		85-1	Dryer Bldg.
II-1-20	Grain Curing Building	85-2	Compressor Bldg.
II-1-21	Nitroglycerin Storage	85-3	Storage Bldg.
		85-4	Storage Bldg. (New)
		85-5	Electric Control House
	Refer to Footnotes 1 & 2	86	Ingredient Storage for Big Inch Cap Line
	Refer to Footnote 1	87	Big Inch Cap Testing/Storage Bldg.
II-1-22	Use unknown	88	Storage Bldg.

Footnotes:

1 Buildings appear to have been built by Olin, based on Olin map however, no use was identified

2 According to R. [illegible] (former Olin employee) the building was used to test explosives manufactured at the Pilot Propellant Plant



NOTES:

1. SOURCES: U.S. POWDER COMPANY PLANT MAP REV. 1, MARCH 13, 1974
OLIN MATHIESON CHEMICAL CORPORATION
PLANT MAP LATEST REVISION MAY 29, 1963

2. U.S POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL BUILDINGS EXCEPT FOR THOSE USED BY OLIN EXCLUSIVELY, WHICH DISPLAY OLIN BUILDING NUMBERS

3. ALL GROUNDWATER ELEVATION INFORMATION WAS OBTAINED FROM THE DRAFT FINAL RI/BRA REPORT FOR THE EMMA OU WHICH WAS SUBMITTED BY ESE, INC. IN SEPTEMBER 1994. ALL ELEVATIONS ARE MEASURED IN FEET ABOVE MEAN SEA LEVEL

LEGEND

USED BY U.S POWDER EXCLUSIVELY

USED BY OLIN EXCLUSIVELY

BORDER OF AUS AREA DESIGNATIONS

MONITORING WELLS

424 POTENTIOMETRIC CONTOUR

600 0 600

SCALE FEET

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	

DRN. BY: djd 12/28/00 DSGN. BY: mam CHKD. BY: cmw	Areas 11 and 12 Groundwater Contour Patterns, July 1993	FIG. NO. 15-6

File: E:\2320000026.00\FIG15-6.DWG Last edited: 09/20/01 @ 10:28 a.m. @ WCC-ST.LOUIS

AUS-A11A-033-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	415	b3,e3
Arsenic	UG/L	2.6	
Barium	UG/L	19.4	
Boron	UG/L	19.9	
Calcium	UG/L	27400	b3
Chromium	UG/L	3.7	
Iron	UG/L	688	b3
Magnesium	UG/L	13500	b3
Manganese	UG/L	345	
Mercury	UG/L	0.26	b3,e5,h10
Potassium	UG/L	825	
Sodium	UG/L	16600	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	72.8	b3
Nitrogen, Ammonia (as N)	MG/L	0.28	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.15	b3
TDS	MG/L	204	b3
TSS	MG/L	12	b3

AUS-A11A-032-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	289	b3,e3
Barium	UG/L	121	b3
Calcium	UG/L	145000	b3,e3
Iron	UG/L	720	b3
Magnesium	UG/L	36300	b3
Manganese	UG/L	92.4	
Potassium	UG/L	3530	b3
Selenium	UG/L	3.4	b3,e5
Sodium	UG/L	26500	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	200	b3
Nitrogen, Ammonia (as N)	MG/L	0.47	b3
Nitrogen, Nitrate-Nitrite	MG/L	18.6	b3
Sulfate (as SO4)	UG/L	13000	
TDS	MG/L	728	b3

AUS-A11A-010-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	69000	b3,e3
Antimony	UG/L	1.6	
Arsenic	UG/L	38.7	b3
Barium	UG/L	632	b3
Boron	UG/L	48.5	
Cadmium	UG/L	3	e3,e4
Calcium	UG/L	172000	b3,e3
Chromium	UG/L	105	b3
Cobalt	UG/L	63	b3,e3
Copper	UG/L	89.3	b3,e3,e4
Iron	UG/L	98000	b3,e3,e4,h10
Lead	UG/L	95.1	b3,e3,e4
Magnesium	UG/L	89700	b3,e3
Manganese	UG/L	3580	b3,e3,e4,h10
Mercury	UG/L	0.66	b3,e5,h10
Nickel	UG/L	87.9	b3
Potassium	UG/L	6190	b3
Selenium	UG/L	7.9	b3,e5
Sodium	UG/L	48900	b3
Vanadium	UG/L	158	b3,e3
Zinc	UG/L	616	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	1.6	b3
Nitrogen, Nitrate-Nitrite	MG/L	174	b3
TDS	MG/L	1038	b3,h10

AUS-A11A-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1370	
Barium	UG/L	17.7	
Calcium	UG/L	399000	
Iron	UG/L	1730	
Magnesium	UG/L	986000	
Manganese	UG/L	211	h6
Mercury	UG/L	0.075	
Nickel	UG/L	6.7	
Potassium	UG/L	2140	
Sodium	UG/L	1220000	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.21	
Nitrogen, Nitrate-Nitrite	MG/L	3.2	h4,h5
Sulfate (as SO4)	UG/L	6400000	h6
TDS	MG/L	6170	h6

AUS-A11A-008-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	410	e3,e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	28000	b3,e3
Arsenic	UG/L	16.2	b3
Barium	UG/L	310	b3
Beryllium	UG/L	1.5	e3
Calcium	UG/L	111000	b3
Chromium	UG/L	31.5	b3
Cobalt	UG/L	29.4	e3
Copper	UG/L	29.1	b3,e3,e4
Iron	UG/L	34100	b3,e3,e4,h10
Lead	UG/L	28.3	b3,e3,e4
Magnesium	UG/L	60300	b3
Manganese	UG/L	6720	b3,e3,e4,h10
Nickel	UG/L	41.9	b3
Potassium	UG/L	3910	b3
Sodium	UG/L	31900	b3
Thallium	UG/L	3.8	
Vanadium	UG/L	54.7	b3,e3
Zinc	UG/L	193	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	193	b3
Nitrogen, Ammonia (as N)	MG/L	1.54	b3
Nitrogen, Nitrate-Nitrite	MG/L	74.4	b3
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.39	b3
Sulfate (as SO4)	UG/L	180000	
TDS	MG/L	574	b3
TSS	MG/L	853	b3

AUS-A11A-006-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	518	b3,e3
Barium	UG/L	78.7	b3
Boron	UG/L	16.2	
Calcium	UG/L	51400	b3
Chromium	UG/L	1.1	
Iron	UG/L	2990	b3,e3,e4,h10
Magnesium	UG/L	13400	b3
Manganese	UG/L	2330	b3,e3,e4,h10
Mercury	UG/L	0.22	b3,e5,h10
Potassium	UG/L	2790	b3
Sodium	UG/L	8290	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.44	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.15	b3
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.42	b3
TDS	MG/L	260	b3

AUS-A11A-007-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	200	e3
Arsenic	UG/L	3.5	
Barium	UG/L	50.1	b3
Calcium	UG/L	43800	b3
Iron	UG/L	1460	b3,e3,e4,h10
Magnesium	UG/L	13000	b3
Manganese	UG/L	882	b3
Potassium	UG/L	3440	b3
Selenium	UG/L	2	e5
Sodium	UG/L	7840	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.36	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
TDS	MG/L	212	b3

AUS-A11A-014-SW-00	Units	Result	Screening Codes
Metals			
Aluminum	UG/L	1840	b3,e3
Barium	UG/L	193	b3
Boron	UG/L	36.6	
Calcium (duplicate)	UG/L	159000	b3,e3
Chromium	UG/L	2.7	
Copper	UG/L	4.2	
Iron	UG/L	3660	b3,e3,e4,h10
Magnesium	UG/L	23000	b3
Manganese (duplicate)	UG/L	2200	b3,e3,e4,h10
Mercury	UG/L	0.3	b3,e5,h10
Potassium	UG/L	1790	b3
Sodium	UG/L	8390	b3
Zinc	UG/L	198	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.97	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.34	b3
TDS	MG/L	417	b3

AUS-A11A-024-SW-00	Units	Rdesult	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Arsenic	UG/L	7.7	
Barium	UG/L	31.1	b3
Calcium	UG/L	443300	b3
Iron	UG/L	1610	b3,e3,e4,h10
Magnesium	UG/L	7970	b3
Manganese	UG/L	102	
Nickel	UG/L	1.4	
Potassium	UG/L	2710	b3
Sodium	UG/L	1670	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.84	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
TDS	MG/L	189	b3

AUS-A11A-026-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	928	b3,e3
Barium	UG/L	75	b3
Boron	UG/L	19.6	
Calcium	UG/L	95200	b3
Chromium	UG/L	4.6	
Iron	UG/L	2040	b3,e3,e4,h10
Magnesium	UG/L	14800	b3
Manganese	UG/L	497	
Mercury	UG/L	0.21	b3,e5,h10
Potassium	UG/L	2440	b3
Sodium	UG/L	9760	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	123	b3
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	0.46	b3
TDS	MG/L	456	b3

AUS-A11A-028-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2530	b3,e3
Barium	UG/L	79.3	b3
Calcium	UG/L	105000	b3
Chromium	UG/L	12.7	b3
Copper	UG/L	3.9	
Iron	UG/L	4390	b3,e3,e4,h10
Lead	UG/L	3.3	b3
Magnesium	UG/L	15100	b3
Manganese	UG/L	694	b3
Nickel	UG/L	6.8	
Potassium	UG/L	2500	b3
Sodium	UG/L	7770	b3
Vanadium	UG/L	7.7	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	106	b3
Nitrogen, Ammonia (as N)	MG/L	0.77	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.038	
Sulfate (as SO4)	UG/L	240000	
TDS	MG/L	466	b3

AUS-A11A-023-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	3950	b3,e3
Barium	UG/L	116	b3
Calcium	UG/L	75800	b3
Chromium	UG/L	9	
Copper	UG/L	12.4	b3,e3,e4
Iron	UG/L	7180	b3,e3,e4,h10
Lead	UG/L	9.2	b3
Magnesium	UG/L	15200	b3
Manganese	UG/L	464	
Nickel	UG/L	17.4	b3
Potassium	UG/L	1410	
Sodium	UG/L	11800	b3
Vanadium	UG/L	11.3	
Zinc	UG/L	202	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	111	b3
Nitrogen, Ammonia (as N)	MG/L	1.9	b3
Nitrogen, Nitrate-Nitrite	MG/L	3.8	b3
Sulfate (as SO4)	UG/L	130000	
TDS	MG/L	354	b3

AUS-A11A-022-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	183	e3
Barium	UG/L	90.4	b3
Boron	UG/L	57.3	
Calcium	UG/L	34000	b3
Chromium	UG/L	1.2	
Iron	UG/L	3150	b3,e3,e4,h10
Magnesium	UG/L	6170	b3
Manganese	UG/L	1700	b3,e3,e4,h10
Mercury	UG/L	0.22	b3,e5,h10
Potassium	UG/L	2830	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.25	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
TDS	MG/L	192	b3

AUS-A11A-W02-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1490	
Barium	UG/L	53.5	
Calcium	UG/L	228000	
Iron	UG/L	1670	
Magnesium	UG/L	125000	
Manganese	UG/L	159	h6
Nickel	UG/L	10.1	
Sodium	UG/L	124000	
Zinc	UG/L	4.3	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	252	
Nitrogen, Ammonia (as N)	MG/L	0.99	
Nitrogen, Nitrate-Nitrite	MG/L	140	h4,h6
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.095	h4
Sulfate (as SO4)	UG/L	490000	h6
TDS	MG/L	2070	h6
TSS	MG/L	29.5	

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–A11A
Sample Locations and Detections in Surface Water and Groundwater

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 15-9
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

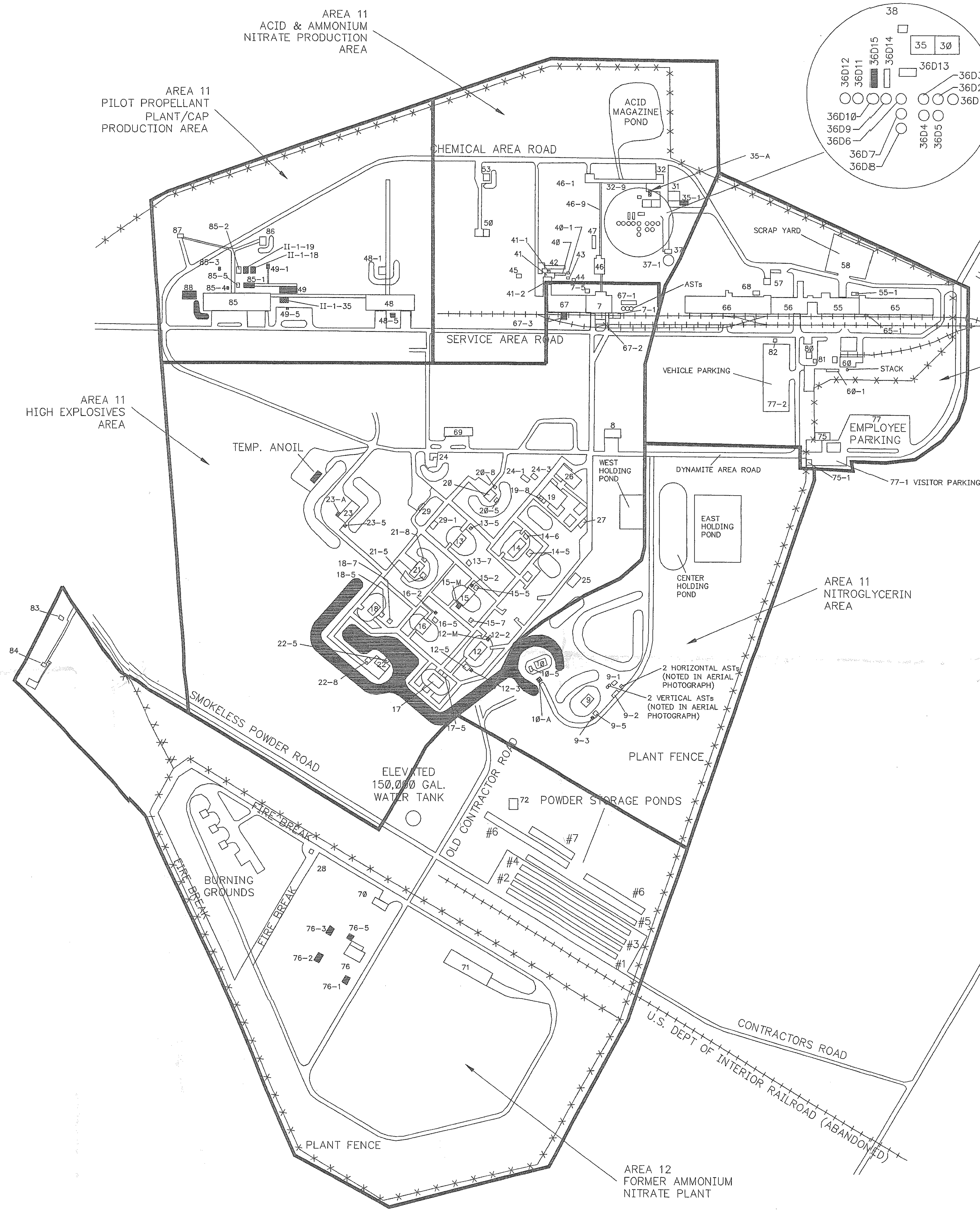
File: E:\23200000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11X17\AUS-8-A11A.DWG Last edited: AUG. 10, 01 @ 2:42 p.m. URS Corp.

Olin Bldg.	Olin Designation (1956-1964)	U.S. Powder	U.S. Powder/CSC Designation (1964-1982)
7	Dope House	7	Dope House
7-A	Track Shed	7-1	Track Shed
7-E	Control House (Not Shown On Map)	7-5	Control House (New)
8	Dynamite & First Aid Office and Change House	8	Dynamite Off. & First Aid
9	Nitrator	9	Nitrator
9-A	Spent Acid	9-1	Spent Acid House
9-B	Soda House	9-2	Soda House
		9-3	Water Softener Bldg. (New)
9-E	Control House	9-5	Control House
10	N.G. Storage	10	N.G. Storage Bldg.
10-A	Catch Tank		(Removed)
10-B	Control House	10-5	Control House
11	(Not Named) (Not Shown On Map)	11	Former Mix House(Not Shown On Map)
12	Mix House	12	Mix House No. 2 Fig. 8 Mixer (Gelatin)
12DS	DNT Storage (Not Shown On Map)		(Removed)
		12-3	Water Softener Bldg.(New)
12-E	Air Condition House	12-5	Control House
12-M	Motor House		(Removed)
12-P	Pump House	12-2	Storage Bldg.
13	Pack House - Hall	13	Hall Pack House (Dynamite)
13-E	Air Condition House	13-5	Control House
13-T	Toilet	13-7	Toilet
14	Pack House - Starrett	14	"LL" Pack House (Dynamite)
14-E	Air Condition House	14-5	Control House
14-M	Motor House	14-6	Storage Bldg.
15	Pack House - Cil-Vibra Pack	15	Cil Vibra Pack House (Dynamite)
		15-2	Storage Bldg. (New)
15-E	Air Condition House	15-5	Control House
15-M	Motor House		(Removed)
15-T	Toilet	15-7	Toilet
16	Gel Cartridge Pack House	16	Gel Cartridge Pack House
		16-2	Storage Bldg. (New)
16-E	Air Condition House	16-5	Control House
17	Mix House - Talley	17	Talley Mix House (Dynamite)
17-E	Air Condition House	17-5	Control House
18	Pack House/MXU 4A Mix House	18	Powder Stripping House
18-E	Air Condition House	18-5	Control House
18-T	Toilet	18-7	Toilet
19	Shell House	19	Shell House
19-W	Wax House	19-8	Wax House
20	Case House No. 1 8" Waxers	20	Case House No. 1
20-E	Electrical Control House	20-5	Control House
20-W	Wax House	20-8	Wax House
21	Case House No. 2 Large & 24" Waxers	21	Superprime & Slurry
21-E	Electrical Control House	21-5	Control House
21-W	Wax House	21-8	Wax House
22	Case House No. 3 Small Waxers	22	Torpex Operation/Storage Bldg.
22-E	Electrical Control House	22-5	Control House
22-W	Wax House	22-8	Wax House
23	ANOIL Mfg. Bldg.	23	ANOIL Mfg. Bldg.
23-A	Heated House-ANOIL Mix Bldg.		(Removed or not in use)
		23-5	Control House (New)
24	Dynamite Maintenance Shop R&D Lab	24	R&D Laboratory
24-A	Dynamite	24-1	Dynamite Maint. Shop
24-C	Parts Cleaning - Dynamite	24-3	Dynamite Parts Cleaning
25	N.C. - TNT Screening (Not Shown On Map)	25	NC-TNT-Screening (New)
26	Box Assembly	26	Box Assembly
27	Tractor House	27	Tractor House
28	Burning House	28	Burning House
		29	Loading Dock (New)
		29-1	Storage Bldg. (New)
30	Ammonia Oxidation House	30	Ammonia Oxidation Bldg.
31	Cooling Tower & Control	31	Cooling Tower & Control Bldg.
32	Office & Shop (Acid)	32	Acid Office & Shop
32-R	Ramp 32 to 46-A	32-9	Ramp 32 to 46-1
35	Nitric Acid Concentration	35	Nitric Acid Concentration
35-A	Switch House Sub No. #1		(Removed)
		35-1	Switch House - Sub Station #1 (New)
36-D1	Off-Site Tank	36-D1	Offsite Tank - 200 - Weak N.A.
36-D2	Off-Site Tank	36-D2	Offsite Tank - 201 - Weak N.A.
36-D3	Off-Site Tank	36-D3	Offsite Tank - 202 - Weak N.A.
36-D4	Off-Site Tank	36-D4	Offsite Tank - 203 - Weak N.A.
36-D5	Off-Site Tank	36-D5	Offsite Tank - 204 - Weak N.A.
36-D6	Off-Site Tank	36-D6	Offsite Tank - 400 - 68% Sulphuric
36-D7	Off-Site Tank	36-D7	Offsite Tank - 401 - 68% Sulphuric
36-D8	Off-Site Tank	36-D8	Offsite Tank - 402 - 68% Sulphuric
36-D9	Off-Site Tank	36-D9	Offsite Tank - 500 - Oleum Stor.
36-D10	Off-Site Tank	36-D10	Offsite Tank - 501 - Oleum Stor.
36-D11	Off-Site Tank	36-D11	Offsite Tank - 300 - Mixed Acid
36-D12	Off-Site Tank	36-D12	Offsite Tank - 301 - Mixed Acid
36-D13	Off-Site Tank	36-D13	Offsite Tank - 302 - M.A. Scale TK.
36-D14	Off-Site Tank	36-D14	Offsite Tank - 303 - S.A. Circ. TK.
		36-D15	Off-Site Tank (Contents Unknown)
37	Ammonia Compressor House	37	Ammonia Compressor House
37-A	Ammonia Hortensphere	37-1	Ammonia Horteonsphere
38	Spent Acid House	38	Spent Acid House
40	Prill Tower & Wet End	40	Prill Tower & Wet End
40-A	Control Bldg. (A.N.)	40-1	Control Bldg. A.N.
41	Cooling & Bagging Bldg.	41	Cooling & Bagging Bldg.
41-A	A.N. Recovery Bldg.	41-1	A.N. Recovery Bldg.
41-B	A.N. Truck Dock/Shipping	41-2	A.N. Truck Dock
42	Graining Bldg.	42	Graining Bldg.
43	A.N. Lab	43	A.N. Laboratory
44	Compressor House (Steam)	44	Compressor House (Steam)
45	A.N. Lunch Room	45	Lunch Room
46	A.N. Storage (Halfway House)	46	A.N. Storage
46-A	A.N. Raw Material Storage/N.G. Dry House	46-1	A.N. Raw Material Storage
46-R	Ramp 46 to 32-R	46-9	Ramp 46 to 32-9
47	Chemical Area Maintenance Shop	47	Chemical Area Maint. Shop
48	A.N. Whse./Jet Starter Cartridge Assembly	48	Storage Bldg.
II-1-15	TNT Screening Building	48-1	Storage Bldg.
		48-5	Electric Control House (New)
II-1-35	Maintenance Shop & Stores		Still Present On Site-May Not Be In Use
		49	Big Inch Cap Assembly Line
		49-1	Big Inch Screening House (New)
		49-5	Electric Control House (New)
50	Use unknown	50	Storage Bldg.
53	DYNOIL Mix House	53	Storage Bldg.
55	Carpenter & Machine Shop	55	Carpenter Machine & Sht Metal Shop
55-A	Steam Reg. For 55	55-1	Steam Regulator Station
56	Garage - Washroom - Office	56	Garage - Washroom & Office
57	Welding Shop	57	Welding Shop
58	Salvage Yard	58	Salvage yard
60	Boiler House	60	Boiler House
60-A	Boiler House Shop	60-1	Boiler House Shop
65	General Stores	65	General Stores
		65-1	Track Scale (New)
66	Inert Stores No.1	66	Inert Stores No. 1
67	Inert Stores No.2	67	Inert Stores No. 2
67-A	Apricot Pit Storage	67-1	Apricot Pit Storage
67-B	Bag Sulphur Storage	67-2	Bag Sulphur Storage
		67-3	Bulk A.N. Loading (New)
68	Oil Stores	68	Oil Stores
69	Warehouse - Change House-R & D	69	R&D Office & Lab
70	Stores - Change House	70	Storage Bldg.
71	Paper Stores	71	Warehouse & Paper Stores
	Powder Storage Ponds (#1-#7)	72	Powder Storage Ponds (#1-#7)
75	Administration Building	75	Administration Bldg.
75-A	Guard House/Possible Lab	75-1	Guard House
	Not known if Olin used this building.	76	RDX Separation
		76-1	Air Dryer & Steam Gen. (New)
		76-2	Mixer House (RDX) (New)
		76-3	Tray Drier (RDX) (New)
		76-5	Electric Control House (New)
	Areas Shown But Not Named	77	Employee Parking
	Areas Shown But Not Named	77-1	Visitor Parking
	Areas Shown But Not Named	77-2	Vehicle Parking
80	Laboratory	80	Q.C. Laboratory
80-A	Laboratory Storage	81	Q.C. Storage
Not Listed	Component Magazine (Not Shown On Map)	82	Component Magazine
80-D	Cap Magazine	83	(Not Named)
80-E	Shooting House	84	Shooting House
II-1-17	Pilot Propellant Plant	85	Storage
II-1-18	Grain Curing Building		Building removed
II-1-19	Grain Curing Building		Building removed
		85-1	Dryer Bldg.
II-1-20	Grain Curing Building	85-2	Compressor Bldg.
II-1-21	Nitroglycerin Storage	85-3	Storage Bldg.
		85-4	Storage Bldg. (New)
		85-5	Electric Control House
	Refer to Footnotes 1 & 2	86	Ingredient Storage for Big Inch Cap Line
	Refer to Footnote 1	87	Big Inch Cap Testing/Storage Bldg.
II-1-22	Use unknown	88	Storage Bldg.

Footnotes:

1. Buildings appear to have been built by Olin, based on Olin map however, no use was identified.

2. According to R. Altekruse (former Olin employee) the building was used to test explosives manufactured at the Pilot Propellant Plant



AREA 11
SUPPORT AREA

NOTES:

1. SOURCES: U.S. POWDER COMPANY PLANT MAP REV. 1, MARCH 13, 1974
OLIN MATHIESON CHEMICAL CORPORATION PLANT MAP LATEST REVISION MAY 29, 1963

2. U.S POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL BUILDINGS EXCEPT FOR THOSE USED BY OLIN EXCLUSIVELY, WHICH DISPLAY OLIN BUILDING NUMBERS

LEGEND

USED BY U.S POWDER EXCLUSIVELY

USED BY OLIN EXCLUSIVELY

BORDER OF AUS AREA DESIGNATIONS

N

250 0 250
SCALE FEET

Revision No.	Description	Date	By	App.

REVISIONS

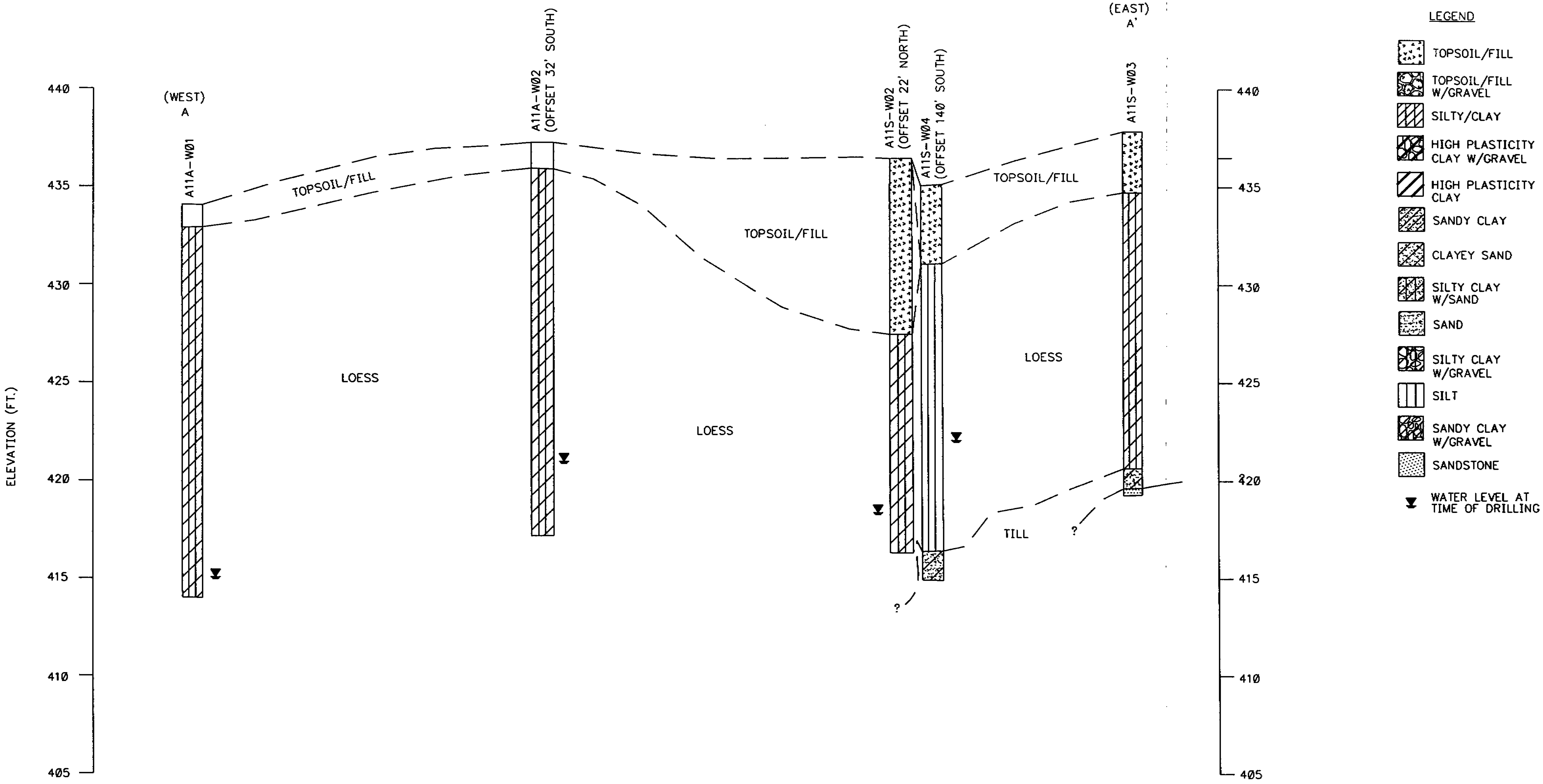
PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

Areas 11 & 12 Site Layout for Olin & U.S. Powder Operations

Date: 12/28/00	Project Number: 2320000026.00	Figure Number: 15-3
Drawn by: DJD	Design by: MAM	Checked by: MMF/SEA

URS

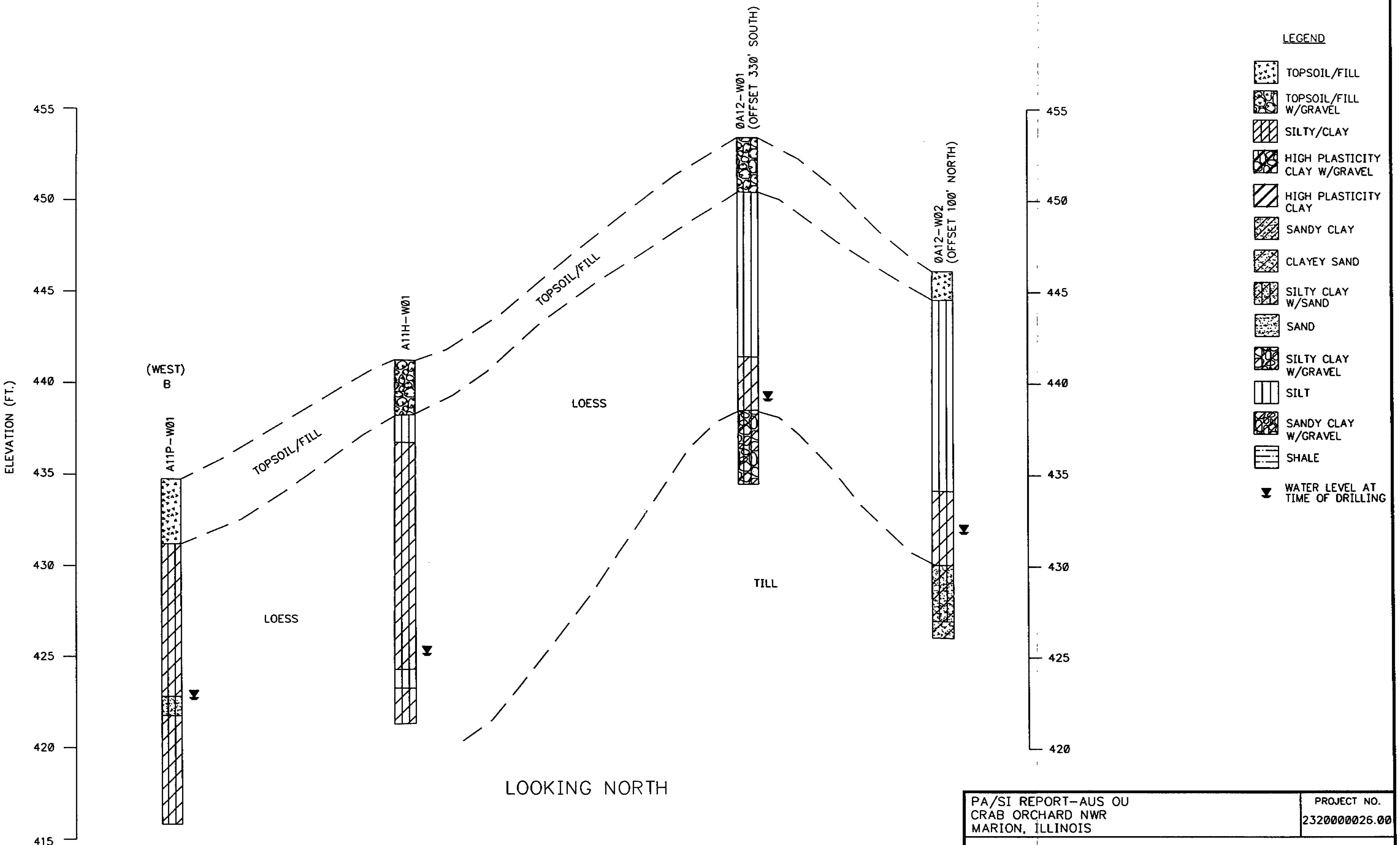
File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG15-3.DWG Last edited: 09/20/01 @ 09:50 a.m. @ WCC-ST.LOUIS



HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 5'

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY:djd 10/17/00 DSGN. BY:ore CHKD. BY:mmf	Geologic Cross-Section A-A' for Area 11 — FIG. NO. 15-10

File: E:\2320000026.00\PA-SI REPORT-AUS OU\FIG15-10.DWG Last edited: JUN. 29, 01 @ 11:15 a.m. URS Corp.

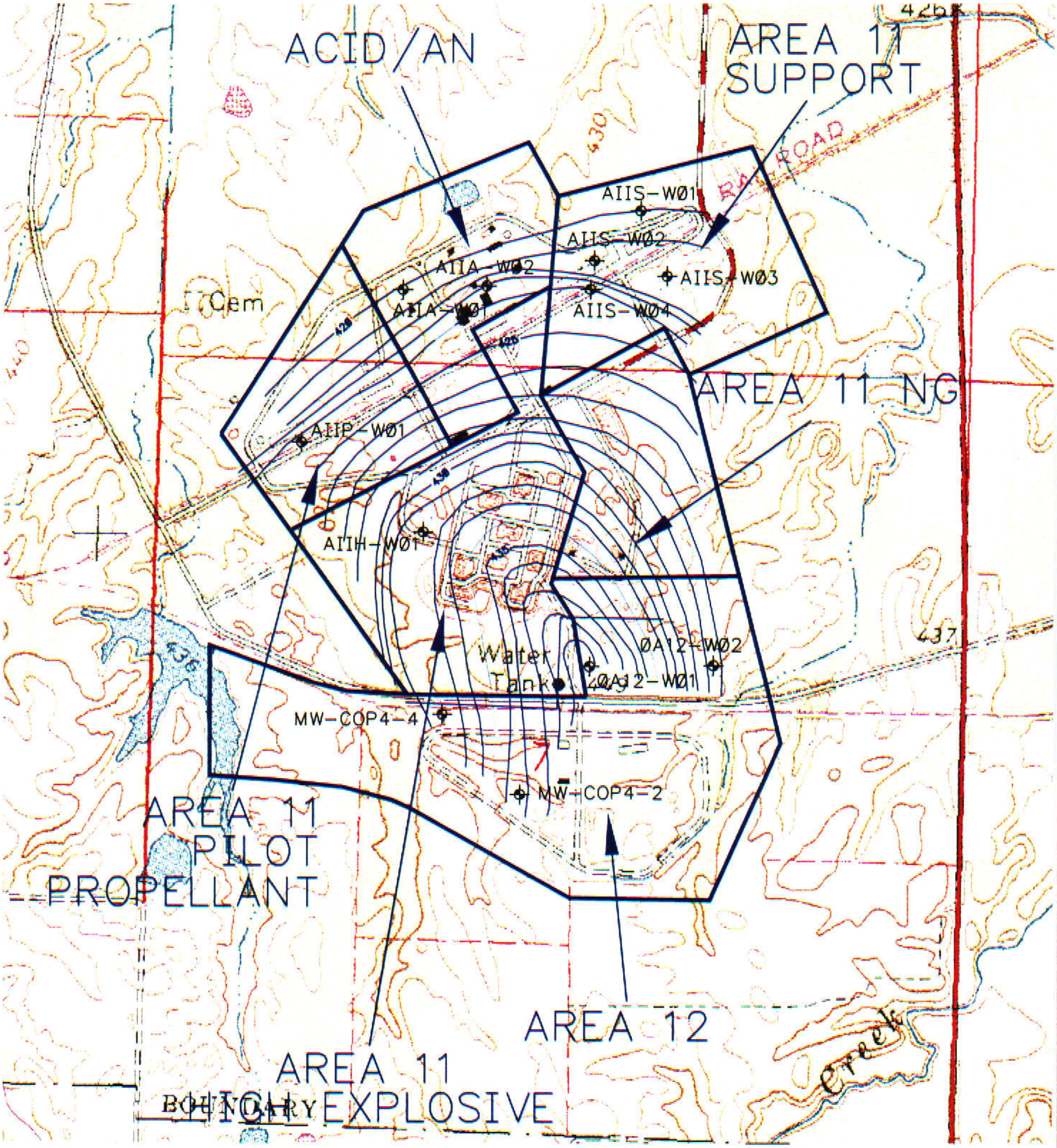


LOOKING NORTH

HORIZONTAL SCALE: 1" = 200'
VERTICAL SCALE: 1" = 5'

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY:djd 10/17/00 DSGN. BY:ore CHKD. BY:mmf	Geologic Cross-Section B-B' for Areas 11 & 12 — FIG. NO. 15-11

File: E:\2320000026.00\PA-SI REPORT-AUS OU\FIG15-11.DWG Last edited: JUL. 16, 01 @ 11:38 a.m. URS Corp.



LEGEND

⌖ MONITORING WELL LOCATION

NOTE: 1-FOOT CONTOUR INTERVAL

N

0 1000

SCALE FEET

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS		PROJECT NO. 2320000026.00
URS		
DRN. BY:djd 11/20/00 DSGN. BY:mam CHKD. BY:cmw	Groundwater Contours for Area 11 & 12 – October, 2000	FIG. NO. 15-12

File: E:\2320000026.00\PA-SI REPORT-AUS OU\CONTOURS 3-8.DWG Last edited: JUN. 29, 01 @ 09:53 a.m. URS Corp.

Site AUS-A11H is located in Area 11 and was used by industrial tenants for manufacturing high explosives from the 1950s to the early 1970s. During World War II, the northern section of Site AUS-A11H was part of the Illinois Ordnance Plant (IOP) Group II Load Line.

See the introduction to Section 15 for a general discussion of Area 11 and its history. Area 11 sites, including AUS-A11H, are shown in Figure 15-1.

AUS Original Site Designations

None of the original sites designated in 1997-1999 by the United States Fish and Wildlife Service (USFWS) as part of the Additional and Uncharacterized Sites Operable Unit (AUS OU) were located within the boundaries of the former High Explosives Area, now Site AUS-A11H.

16.1 HISTORIC SEARCH INFORMATION

16.1.1 Site Description

There are no buildings remaining on this site and it is being allowed to return to its natural condition.

16.1.2 Operational History and Waste Characteristics

16.1.2.1 IOP Load Line II Operations

IOP Buildings II-1-6, II-1-25, II-1-26 and II-1-27 were within what has now been designated as AUS OU Site AUS-A11H.[1] See Figure 15-2.

Change Houses (II-1-25 and II-1-26) /Timekeepers Building (II-1-27)

The Change Houses, which were used for workers to shower and change clothes, contained locker rooms and lunchrooms.[2] The Timekeepers Building contained office space, utility rooms, and time clock rooms.[3]

Melt Loading—Building II-1-6

During the IOP era, this building was used for melting explosives and filling shells. At the eastern end of the building, TNT and ammonium nitrate were heated and mixed in kettles. There were four ammonium nitrate pre-heaters on the third floor and two TNT melting units on the second floor. The mixing kettles were on the second floor.[4]

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[1] A more detailed description of the TNT loading operation is included in Section 12. Much of the detailed information was obtained from a former SWDC Load Line III employee, Kermit Troutman, and, because of the similarity of the load lines, is assumed to be applicable to Load Line II.

[2] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Pages 28 and 29.

[3] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 31.

[4] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 7.

The draw-off room was on the first floor, below the mixing room. The remainder of the first floor was one story only.

Just east of the draw-off room was a cleaning room with a basin.[5] It was reported that this room, also referred to as the "munitions wash room," was used to wash off the explosive material that collected on the outside of the shells.[6] The wash water probably drained to the settling tanks just outside the Melt Loading Building[7]. See Figure 15-2 for the location of the settling tanks.[8] The settling tanks were approximately 12-foot (ft) long by 5-ft wide, and of unknown depth. Overflow from the settling tanks apparently flowed to the evaporating basin, which is shown on the design drawings as approximately 50-ft long by 15-ft wide.[9,10] The evaporating basin was identified as an impoundment on the 1943 aerial photograph.[11] In the 1951 aerial photograph, it no longer appeared to be in use.[12]

West of the draw-off room, from east to west, there were two pouring rooms, a cooling room, and a cooling unit next to a TNT melt unit.[13]

16.1.2.2 Olin Operations

Olin constructed the High Explosives Manufacturing Area, or Dynamite Area, on the open property that was located between the IOP Group II Load Line and the IOP Ammonium Nitrate Plant. Note that the term "dynamite" as used here is a generic term for industrial blasting explosives.[14] Based on available information, it appears that Olin produced nitroglycerin dynamite here, as well as ammonium nitrate fuel oil explosives (ANFO) and water gel and slurry

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[5] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.

[6] ACO 4997. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Page 22.

[7] Assumptions about loading operations are based in part on Kermit Troutman's description of loading bomb casings at the Group III Load Line. See Section 12 for details.

[8] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.

[9] ACO 4989. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Figure 3-3.

[10] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.

[11] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11). The report estimated the size as 70 ft by 30 ft in plan view. The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

[12] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11).

[13] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.

[14] Except for black powder industrial explosives are generically referred to as dynamite even when they contain no nitroglycerin. Reference: Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-131.

explosives, which are the common explosives used in the mining industry.[15] Each of these are discussed below.

All of the mix houses were concrete structures.[16] On aerial photographs, they appear as earthen, bunker type structures with doors and roof vents.[17]

Nitroglycerin Dynamite

The major constituents of nitroglycerin dynamite are nitroglycerin and dope, which is a general term for the porous combustible material that is combined with nitroglycerin to form dynamite. Nitroglycerin was probably piped from the plant in Area 11N. Dope was mixed in Building 7 (the Dope House) and consisted of ground apricot pits, which were stored in Building 67A, sulfur stored in Building 67B, and sodium nitrate.[18,19]

Some other raw materials used in production were ammonium nitrate, nitrocellulose, nitrocotton, ethyl centralite, and dimethyl sebacate (also known as dimethyl ester).[20]

Replacement of part of the nitroglycerin with ammonium nitrate results in a less expensive dynamite with greater heaving rather than shattering effects. Nitrocellulose is used to gelatinize commercial explosives, making them water-resistant. Nitrocotton is used in gelatin dynamite for water resistance and cohesiveness. Ethyl centralite acts as a stabilizer, gelatinizer, and waterproofing agent. The use of dimethyl ester was not determined.[21,22,23]

Nitrocotton was shipped and stored wet and then dried and screened to prepare it for mixing in the mix house.[24] This was likely done in Building 25 (N.C. and TNT Screening House) – this building was not shown on the Olin Map but was shown on the U.S. Powder Map.

Figure 15-3 shows the two mix houses identified on the Olin Map: Building 17, Talley Mix House and Building 12, Mix House. A third mix house, not shown on the Olin Map, was

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[15] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-135.

[16] DPRA Document No. 00005681. Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Table I.

[17] Aerial photograph of High Explosives Area in Area 11, provided to URS by USFWS, date unknown.

[18] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-131 and 8-133.

[19] Building 7-E was a control house likely associated with the Dope House. This building was not found on the Olin Map; however, it was shown on the U.S. Powder Map as Building 7-5.

[20] PRI-00493. Minutes from a meeting between Olin Dynamite and U.S. Powder (Commercial Solvents Corporation), dated September 30, 1963, Page 3.

[21] Dupont Environmental Remediation Services, 1993, Memorandum written by Matthew Champion from Larry Joh to other Dupont employees– Subject: Decontamination Blasting Former Nitroglycerin Plants, dated June 28, 1993.

[22] Kohler, J., and R. Meyer, Explosives, VCH Publishers, 1993.

[23] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-135 and 9-11.

[24] Dupont Environmental Remediation Services, 1993, Memorandum written by Matthew Champion from Larry Joh to other Dupont employees– Subject: Decontamination Blasting Former Nitroglycerin Plants, dated June 28, 1993.

destroyed in an explosion in 1960.[25] It may have been Building 11 which was listed on the U.S. Powder Map as a mix house, but with no location shown.

ANFO

ANFO, also known as ANOIL, was manufactured in Building 23.[26] According to Mr. John Miller, a former Olin chemist and manager, the ANOIL in Area 11 was ammonium nitrate mixed with ground nitrocellulose and diesel fuel.[27] Building 23A, a Heater House, was associated with this building. The 1960 aerial photograph of this area shows definite ground discoloration to the west and southwest of Buildings 23 and 23A.[28] The discoloration appeared to be the result of liquid flows. There was also an open storage area northeast of Building 23, as observed in the 1960 aerial photograph.[29]

WATER GEL AND SLURRY EXPLOSIVES

These explosives consist of ammonium nitrate with or without other oxidizing agents, sensitizers, fuels, and gelatin-forming compounds in an aqueous media.[30] Materials that are commonly used as additives in these explosives which Olin was known to have used in Area 11H, include TNT and smokeless powder.[31] Other common additives that might have been used are pentolite[32], methylamine nitrate, potassium dichromate and pentaerythritol tetranitrate (PETN).[33,34] Potassium dichromate was known to be used by Olin in its explosive gels. In the 1963 Olin/CSC sales agreement, two of the patent applications that were part of the sale were "Potassium Dichromate as a Cross-Linking Agent in Ammonium Nitrate Gels" and "Ammonium Nitrate Explosives Containing Chromates."[35] The sales agreement does not indicate whether these processes were used at Olin's plant at the Refuge, referred to as the Ordill plant.

According to the Olin/CSC sales agreement, Building 18 contained a 50-gallon mixer used for slurry explosive production.[36]

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[25] CRO 000850. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, January through April 1960, Page 24.
[26] PRI-00496. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 3.
[27] Deposition of John Miller, April 9, 1998, Page 31.
[28] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).
[29] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).
[30] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-135.
[31] PRI-00493. Minutes from a meeting between Olin Dynamite and U.S. Powder (Commercial Solvents Corporation), dated September 30, 1963, Page 3.
[32] Pentolite is a mixture of TNT and pentaerythritol tetranitrate (PETN).
[33] Kohler, J., and R. Meyer, Explosives, VCH Publishers, 1993.
[34] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-135.
[35] DOI 004869. Agreement between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated August 28, 1963, Exhibit B, Page 1.
[36] DOI 004857. Agreement between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated August 28, 1963, Page 12, Article V, Paragraph 1.

Building 18 was labeled as a Pack House on the Olin Map. In an Olin Plant Building Directory and Insurance Report, Building 18 was identified as a mix house for MXU 4/A, which is a smokeless powder-filled starter cartridge for jet engines.[37,38]

Associated Buildings

Other buildings associated with the Mix Houses 12 and 17 included Pump House (Building 12P) and Motor House (Building 12M); and Building 12DS, which was used for dinitrotoluene (DNT) Storage. The location of Building 12DS was not determined. There were also Air Conditioning Houses (17E and 12E, respectively) associated with both mix houses.

High Explosives Packing Process

The following information is based on experience at other dynamite manufacturing facilities. The dry dynamite mixture was tamped into paper cartridges or "shells" or the gel was extruded into these cartridges, and then they were sealed. Slurries are used in mining and are often packed in cartridges that can be inserted into boreholes.[39] There were five pack houses at Area 11:

- Building 13 – Hall Pack House – Dynamite Cartridges
- Building 14 – Starrett Pack House
- Building 15 – Pack House (Cil-Vibra Pack)
- Building 16 – Gel Cartridges Pack House[40]
- Building 18 – Pack House

The pack houses were all covered with earth, similar to the mix houses. There were Air Conditioning Buildings (13E, 14E, 15E, 16E and 18E) associated with all of the pack houses to help control the humidity in the pack houses since several of the components were sensitive to moisture. Buildings 14 and 15 had associated Motor Houses (Buildings 14M and 15M, respectively). Three of the pack houses had associated buildings noted as "toilets" (13T, 15T, and 18T).

From the pack houses, the dynamite was taken to the case houses:

- Case House #1 (Building 20) – 8-inch waxers[41]
- Case House #2 (Building 21) – large and 24-inch waxers[42]
- Case House #3 (Building 22) – small waxers[43]

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[37] PRI-00496. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 3.
[38] ACO 5000. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Page 25.
[39] Kohler, J., and R. Meyer, Explosives, VCH Publishers, 1993.
[40] PRI-00496. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 3.
[41] PRI-00496. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 3.
[42] PRI-00496. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 3.
[43] PRI-00496. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 3.

Many explosives are water sensitive and must be sealed in wax, which was apparently done at the case houses. The case houses were surrounded by earthen berms, but they were not covered with earth like the mix and pack houses. There were Electrical Control Houses (Buildings 20E, 21E and 22E) and Wax Houses (Buildings 20W, 21W and 22W) associated with each of the three case houses. The wax houses were used for wax storage.

High Explosives Support Buildings

There were several other support buildings located in the high explosives area:

- Building 7A – Track Shed
- Building 8 – Dynamite Office (IOP Building II-1-25[44, 45])
- Building 19 – Shell House – Used for manufacturing dynamite cartridges or "shells" during CSC operations; probably used for the same purpose during Olin operations.
- Building 19W – Wax House – This building was used for spraying empty convolute and spiral wound shells that were manufactured in the shell house during CSC operations.[46] It was assumed that this building was used for the same purpose during Olin operations.
- Building 24 – Dynamite Maintenance Shop and Research and Development Lab[47] (IOP Building II-1-27[48])
- Building 24A – Dynamite – Use unknown
- Building 24C – Dynamite Parts Cleaning
- Building 26 – Box Assembly House
- Building 27 – Tractor House
- Building 67 – Inert Stores #2 (IOP Building II-1-6[49])
- Building 69 – Warehouse and Research and Development and Change House[50] (IOP Building II-1-26[51])

Based on building locations and descriptions, it is likely that all of these buildings were used for support of the dynamite operations during Olin's tenure.

A high explosives storage magazine in Area 11 exploded in 1959.[52] According to Mr. Harry Stiles, a former Refuge manager, this magazine contained approximately 3,000 to 4,000 lbs of explosives and was located somewhere near Building 14.[53] The exact location of the magazine was not determined.

[44] PRI-00495. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 2.
[45] PRI-00504. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 3.
[46] ACO 000338. IMC, Letter to Mr. Wayne Adams of USFWS regarding a decontamination project at IMC's Marion, Illinois plant, dated February 14, 1979, Page 1.
[47] PRI-00495. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 2.
[48] PRI-00504. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 3.
[49] PRI-00504. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 3.
[50] PRI-00495. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 2.
[51] PRI-00504. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 3.
[52] Deposition of Mr. Harry Stiles, November 18, 1997, Pages 67 and 104.
[53] Deposition of Mr. Harry Stiles, November 18, 1997, Pages 67, 104 and Exhibit 15.

Other Miscellaneous High Explosives Area Concerns

Settling Tanks and Evaporation Basin: The settling tanks may or may not still be in use during this period; however, the evaporation basin or "impoundment" no longer appears in the 1960 aerial photograph.[54]

West Holding Pond: It appears that the West Holding Pond, shown in Figure 15-3, received drainage from the High Explosives Area based on topography, the site reconnaissance, and the 1960 aerial photograph.[55] The 1960 aerial photograph shows no liquid present in the West Holding Pond at that time, however there was evidence of recent liquid inflows.[56]

Above Ground Storage Tanks (ASTs): There were three aboveground storage tanks (ASTs) located between the apricot pit storage area and the Track Shed (Building 7A), as identified on aerial photographs. These tanks were also shown on the Olin map, but they were not identified as such.

16.1.2.3 Commercial Solvents Corporation (CSC) and Successor Operations

CSC and its successors operated the High Explosives Area from 1964 until they shut down the operation between 1968 and 1971.[57]

Dynamite: Buildings 12 and 17 were designated as Mix Houses on the U.S. Powder Map, as they were on the Olin Map. IMC, CSC's successor, identified the following constituents in these two mix houses: nitroglycerin, RDX, dynamite, and TNT.[58] IMC identified nitrocellulose as a contaminant in Building 17 only.[59]

Both the U.S. Powder and Olin maps designate all the dope-associated buildings similarly.

The following CSC building uses differed from Olin's uses: [60]

- Building 18 was used as a Powder Stripping House.[61] IMC identified the explosive contaminants likely to be present in this building as dynamite and PETN.[62] Note that PETN

[54] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3 (Area 11).
[55] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.
[56] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.
[57] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[58] DPRA Document No. 00005649. IMC, Letter to Mr. Walter Franke submitting a progress report regarding the destruction of the various dangerous contaminated buildings located at IMC's Marion, Illinois plant, June 1, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.
[59] DPRA Document No. 00005649. IMC, Letter to Mr. Walter Franke submitting a progress report regarding the destruction of the various dangerous contaminated buildings located at IMC's Marion, Illinois plant, June 1, 1977, Page 1.
[60] Minor building number changes are not discussed, but are shown in Figure 15-3. It is assumed that a building designated by Olin as an "air condition house" serves the same function when it is re-designated by CSC as a "control house."

is a common additive in explosive slurries, which were produced in Building 18 at the time the operation was sold to CSC by Olin.

- CSC used the former Olin Pump House Building (Building 12-P) as a Storage Building (Building 12-2).
- The former Olin Motor House (Building 12-M) and DNT Storage (Building 12DS) were not used by CSC and were no longer on site.
- CSC added a new Water Softener Building (Building 12-3).

ANOIL: -CSC used Building 23 for ANOIL (ANFO) manufacturing, the same as Olin. IMC identified ANFO as the only contaminant in this building.[63] Building 23A was the former Heated House, and it was removed from the site. . This building may have been used to mix the ANOIL.[64] Building 23-5 (new building) was the Control House for the ANOIL manufacturing process. The 1965 aerial photograph showed definite ground discoloration west and southwest of these buildings that appeared to be the result of liquid flows.[65] There also appeared to be a loading dock on the west side of Building 23.[66]

There was also a temporary, unnumbered ANOIL building west of Building 23 (on the other side of the berm). There is no other information regarding this building.

The 1965 aerial photograph showed an area of disturbed ground and deposited material, just east of Building 23 where an open storage area existed during Olin's tenure.[67]

Torpex: According to the U.S. Powder Map and IMC correspondence, Building 22 was used for Storage and for the Torpex Operation.[68] Torpex is composed of about 42 percent RDX, 40 percent TNT, 18 percent aluminum powder and a small amount of wax[69]. It is manufactured by melting TNT in a steam-jacketed kettle equipped with a stirrer, and adding RDX and aluminum powder. The resulting mixture is poured into containers.[70]

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[61] CRO 001705. IMC, Letter to Mr. Wayne Adams of USFWS regarding the decontamination/flashing of various buildings at IMC's Marion, Illinois plant, dated April 9, 1979, Page 1.

[62] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1.

[63] Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.

[64] PRI-00495. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 2.

[65] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11A).

[66] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11A).

[67] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11A).

[68] CRO 001705. IMC, Letter to Mr. Wayne Adams of USFWS regarding the decontamination/flashing of various buildings at IMC's Marion, Illinois plant, dated April 9, 1979, Page 1.

[69] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-128.

[70] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-128.

Building 22 was formerly Case House #3. IMC identified the contaminants likely to be present in this building as Torpex, RDX, nitroglycerin, and TNT.[71] Based on the plant maps, other buildings associated with Building 22 were used by CSC the same as they had been used by Olin. There was an associated Wax House, Building 22-8.

High Explosives Packaging Process

Based on the plant maps, CSC used the remaining four former pack houses the same as Olin except for Building 14 which CSC used as an " "LL" (Long Length Cartridge) Pack House.

CSC identified nitroglycerin, dynamite, RDX and TNT as the contaminants from the dynamite pack houses (Buildings 13, 14 and 15).[72] The contaminants identified in the gelatin pack house (Building 16) were nitroglycerin, nitrocellulose, TNT, and dynamite.[73]

The Motor House, Building 14-M on the Olin Map, was designated as a storage building, 14-6, on the U.S. Powder Map. Two new storage buildings were shown on the U.S. Powder Map: Buildings 15-2 and 16-2, which were associated with Buildings 15 and 16, respectively.

CSC identified nitroglycerin, RDX, TNT, and dynamite as contaminants in Case House #1 (Building 20).[74] There was a Control House, Building 20-5 and a Wax House, Building 20-8 associated with the Case House.

Other Operations in the High Explosives Area

According to the U.S. Powder Map and IMC correspondence, Building 21 was used for the Superprime and Slurry – Primer Operation.[75] These were probably explosive slurries. Super Prime was a registered trademark included in the sale with Olin. The sales agreement lists it under "AN and Dynamite Explosives." The sales agreement included all of Olin's equipment, supplies and raw materials for the production of Super Prime, which, at the time of the sale, were

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[71] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.

[72] DPRA Document No. 00005649. IMC, Letter to Mr. Walter Franke submitting a progress report regarding the destruction of the various dangerous contaminated buildings located at IMC's Marion, Illinois plant, June 1, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.

[73] DPRA Document No. 00005649. IMC, Letter to Mr. Walter Franke submitting a progress report regarding the destruction of the various dangerous contaminated buildings located at IMC's Marion, Illinois plant, June 1, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.

[74] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.

[75] CRO 001705. IMC, Letter to Mr. Wayne Adams of USFWS regarding the decontamination/flashing of various buildings at IMC's Marion, Illinois plant, dated April 9, 1979, Page 1. It is not known what the "primer" is. A primer is usually a primary explosive such as lead azide or styphnate, but neither of these were identified as contaminants in this building by IMC.

at Olin's facility in East Alton, Illinois[76]. See discussion of slurries under Olin operations, above. IMC identified the contaminants likely to be present in this building as dynamite, RDX, TNT, and nitroglycerin.[77] Building 21-5 was a Control House. Wax was pumped from Building 21-8, Wax House, into the Building 21 where each end of the shells was coated with the wax.[78]

Building 25 (N.C. – TNT Screening Building) was designated the same on the Olin Map and the U.S. Powder Map.

High Explosive Area Support Buildings

The following support buildings are shown on the U.S. Powder Map but not on the Olin Map:

- Building 29 – Loading Dock
- Building 29-1 – Storage Building
- Building 67-3 - Bulk Ammonium Nitrate Loading

Another building was identified on the 1965 aerial photograph – the purpose of this building was not found; and it was removed sometime prior to 1971.[79]

All of these buildings were probably used for support of the dynamite operations in this area while CSC was in operation. Contaminants identified by CSC in the three laboratories (Buildings 24, 24-1 and 69) are all of the contaminants CSC identified in Areas 11 and 12 in its petition to the State in connection with the destruction of the contaminated structures.[80]

CSC reported that Building 24-3, the Dynamite Equipment Cleaning House, contained nitroglycerin, RDX, TNT, and dynamite contamination; and Building 25, the Nitrocellulose/TNT Screening House, was contaminated with TNT, nitrocellulose, and nitroglycerin.

Miscellaneous High Explosives Area Features

There was an area of surficial discoloration identified in the 1965 aerial photograph, just south of the Service Area Road, south of Building 7 (Dope House).[81] The discoloration appeared to be associated with a linked pit and trench that were also identified in this area. The trench appeared to lead to a north-flowing drainage ditch.

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[76]DOI 004850, 004852, 004869, and 004870. Agreement between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated August 28, 1963, Pages 5 and 7, Exhibit B, Pages 1 and 2.
[77] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.
[78] ACO 000338. IMC, Letter to Mr. Wayne Adams of USFWS regarding a decontamination project at IMC's Marion, Illinois plant, dated February 14, 1979, Page 1.
[79] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3 (Area 11A).
[80] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1; and Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Exhibit 3, Page 1.
[81] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4 (Area 11).

The 1965 aerial photograph also indicated that the roads in this area had been recently oiled.[82]

The three aboveground storage tanks located between the Apricot Pit Storage Area and the Track Shed, which were noted during Olin's tenure are still visible on aerial photographs during CSC's tenure. These tanks were also shown on the U.S. Powder map, but they were not named.

Decontamination of Area 11 by CSC/IMC

Operations on the "dynamite plant" ended in 1968, and primer and slurry production ended in 1971. In 1971, Trojan Powder Company, a division of CSC/IMC, conducted some limited decontamination for the explosives remaining at the site.[83] This included flashing metal Torpex tubes and "the burning of explosive waste which was collected from contaminated earth at the Torpex operation."[84] Explosives were still stored at the site, for distribution by Trojan.[85] After re-evaluating the site in 1976 and concluding that the buildings on site needed to be decontaminated for explosives, IMC applied for a variance to the Illinois regulations prohibiting open burning.[86]

In 1977, IMC was issued a 6-month variance by the Illinois Pollution Control Board (IPCB) to destroy buildings.[87] Under two subsequent variances, IMC destroyed more buildings, plus unusable explosives.[88] Usable explosive materials stored on site were sent to Trojan's Wolf Lake facility, or were moved to storage in Area 13.[89]

Under the variances, Buildings 12 through 22, 24, 24-1, 24-3, 25, and 69 were decontaminated by burning in 1977 and 1978:[90,91,92,93]

The following procedures were used for decontaminating these buildings[94]:

[82] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Page 10.
[83] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[84] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[85] DPRA Document No. 00005681. Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Page 1.
[86] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[87] ACC 000283. Decontamination History for Trojan Powder Company.
[88] ACC 000283. Decontamination History for Trojan Powder Company.
[89] Charles Kovach, personal interview, as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations and Ownership History, Crab Orchard National Wildlife Refuge, Page B-3.
[90] DPRA Document No. 00005649. IMC, Letter to Mr. Walter Franke submitting a progress report regarding the destruction of the various dangerous contaminated buildings located at IMC's Marion, Illinois plant, June 1, 1977, Page 1.
[91] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1.
[92] CRO 001713. IMC, Letter to Mr. Wayne Adams of USFWS regarding completion of the burning some buildings, dated June 25, 1981.
[93] DPRA Document No. 00005617. IMC, Letter to Walter H. Franke of IEPA submitting IMC's monthly report, dated May 2, 1978.

- The building was treated with a reducing agent such as sodium sulfide (a nitroglycerin killer) and possibly with a caustic solution (for TNT).
- All combustible materials were removed from the building and burned.
- Some buildings were treated a second time with the nitroglycerin killer (sodium sulfide).
- The buildings were lightly flashed with a mixture of fuel oil and straw.

16.1.2.4 U.S. Fish and Wildlife Service Demolition

Olin/U.S. Powder Map Buildings 8, 19, 26, and 27 were included in a USFWS demolition contract in 1983; and Buildings 67 and 7 were included in a 1989 contract.[95,96]

Based on site observations and discussions with Refuge personnel, it was determined that after demolition, the buildings and foundations were buried in place; the building debris was buried adjacent to the buildings.

The November 1983 contract required that all debris be covered with at least 24 inches of fill material, and the September 1989 contract required that the debris be covered with at least 36 inches of fill material.

16.1.3 Area 11H Previous Sampling Results

Parsons Engineering, 1997

Parsons Engineering conducted an ordnance and explosive waste (OEW) investigation at the former Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU) Site COPGII in 1997. COPGII covers all of Area 11, including the AUS-A11A, AUS-A11H, AUS-A11N, AUS-A11P and AUS-A11S. This area is approximately 11,440,000 square ft in size. No chemical investigation was included. The area was divided into 572 grids (100ft by 200ft grids). Eleven 100-ft square grids were investigated at this site and a total of 629 magnetic anomalies were identified.[97] Two hundred and fifty five of these were intrusively investigated and all were non-ordnance scrap.[98]

USEPA Sampling, 1998

United States Environmental Protection Agency (USEPA) sample locations are shown in Figures 16-1, 16-3, and 16-5. The results for all detected constituents are listed in Table 16-1A.

Two soil samples (47-01C and 47-02C) were collected from the original AUS-0047 (Load Line II Evaporation Basin - associated with Melt Pour Building, Building II-1-6). AUS-0047 was

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[94] DPRA Document No. 00005688. USFWS, Memorandum to the USFWS Regional Safety Manager regarding the decontamination of Area 12, U.S. Powder, dated July 16, 1976.
[95] USFWS file for Contract No. 14-16-0003-83-096, Excavating Services – Building Demolition.
[96] USFWS file for Contract No. 14-16-0003-89-0033, White Equipment – Building Demolition.
[97] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-36 through 2-44.
[98] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-36 through 2-44.

incorporated into AUS-A11A; however, these samples were actually located in AUS-A11H and therefore, their discussion is included in this section.

This site was tested for semi-volatile organic compounds (SVOCs) and metals. No SVOC target compounds exceeded preliminary screening levels. Nickel (26 mg/kg) exceeded USEPA SSLs and Refuge background values. [99] Zinc (140 mg/kg) exceeded New Dutchlist Soil Optimum Levels (DSOLs) and Refuge background values.

16.1.4 Observations During Site Visit

Many mounded and ponded areas were observed throughout Site AUS-A11H during the site reconnaissance, which was done in the spring of 1999. Many of these features are visible in Figure 16-1. Most of the mounded areas appear to coincide with the location of former buildings. This is a likely scenario since all of the buildings in this area have been razed and most were probably buried in-place after they were razed.

The former West Holding Pond was identified in the easternmost portion of the site; however, it was dry, with a few drainage ditches that flow through its center. The ditches all appeared to originate from Site AUS-A11H.

Many of the drainage ditches that were constructed and used by former industrial tenants were still visible. In general, most of the surface water in this area drains to the north and east via drainage ways.

Much of this area is tree-covered and contains dense vegetation.

There was a "three stage sump" identified in the northernmost part of the High Explosives Area (near former Building 7) during the site reconnaissance. This sump was probably the settling tanks that were constructed as a part of the IOP Melt Loading Building.

Just northwest of former Building 13, there was an area of brownish-red staining observed on the ground during the site reconnaissance. During the site reconnaissance of the area near former Building 22, several mounds of soil of unknown origin were identified along the roadway to this former building location.

The site reconnaissance also revealed a possible sump located near the northeast corner of former Building 24-3 (Dynamite Parts Cleaning Building). This sump was not previously identified in Olin/CSC records.

There was also an area identified during the site reconnaissance as having several pallets and a crushed drum. This area was located southeast of the former Shell House (Building 19). It is possible that this area could have been used in the past as a drum storage area, although nothing was noted in this area on the historical aerial photographs.

[99] See Table 2-6 of this report for Refuge background soil values used for the PA.

16.1.5 Recommendations Based on Preliminary Assessment

Site AUS-A11H was included in the SI because it is a former industrial area that has not been investigated for chemical contamination, except for the 1998 USEPA sampling.

16.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-A11H from March 23, through May 24, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[100] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 16.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 16-1 through 16-5. Survey coordinates for all sample locations in Area 11H are listed in Table 16-1. Table 16-3 lists the sample locations and the matrix sampled at that location.

16.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. There were several areas of concern investigated during the SI. They are as follows:

IOP Melt Loading Building

The former IOP Melt Loading Building (IOP Building II-1-6 and Olin/CSC Buildings 7 and 67), was later used as a Dope House (Building 7) and Storage (Building 67) by Olin and CSC. Sample A11H-058 (sediment and surface water) was located in a ponded depression within the footprints of former Buildings 7 and 67. Both a 3-inch and a 1-inch pipe appeared to enter this ponded area.

Sample A11H-059 (soil) was located next to a former doorway that previously led to the pouring room. This is a likely location for spillage of explosives. Since there are no present-day features to indicate the location of the doorway, the site was located by survey coordinates that Entech determined from the aerial photographs.[101]

Sample A11H-060 (soil) was also located by survey coordinates that Entech determined from the aerial photograph. This sample was located next to the former machine and equipment cleaning

[100] U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

[101] At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few ft.

rooms that were a part of the IOP Melt Loading Building. It is possible that solvents and oils were dumped in this area.

Sample A11H-057 (sediment and surface water) was located in a ponded area just south of former Olin/CSC Building 67-3 (A.N. Loading Dock). This sample was located along a former railroad line.

Sample A11H-065 (soil) was placed in the location of three former ASTs of unknown contents. These ASTs were present during the Olin and CSC tenures at the site.

Settling Tanks and Evaporation Basin

The former Melt Loading Building (Buildings 7 and 67 as discussed above) was reported to have settling tanks that likely received wash waters from this building. The wash waters from this building would have likely contained explosives and possibly organics. From the settling tanks, it appears that the wash waters overflowed to an evaporation basin.

Test pit location A11H-061 (soil and trench water) was intended to be excavated in the former settling tank location. Survey coordinates for this location were determined from historic aerial photographs. Note that the test pit location shown in Figure 16-1 is about 20 ft north of the former settling tank location shown on the figure. There is some error associated with both the aerial coordinates from historic photographs and from the assumed location, based on site drawings. It is not known precisely where the previous settling tanks were located. In addition, the test pit at A11H-061 was excavated to a depth of 7 ft, deeper than would be expected if it were located on the former building pad as the drawing suggests.

Sample location A11H-063 (soil) was intended to be collected from the former evaporation basin location. This sample location was identified in the field using survey coordinates that were obtained from the historical aerial photographs.

There was a "three stage sump" identified in this area during the site reconnaissance. This sump appears to be related to the evaporation basin. Sample A11H-064 (soil) was collected from inside this "three stage sump".

Sample A11H-062 (sediment and surface water) was collected from a ponded area, south of the former evaporation basin. This sample was located along the former railroad tracks.

All samples were collected in accordance with tables in the Field Sampling Plan with the following exceptions:

- AUS-A11H-062-SW-00 Sample was added to replace sample AUS-A11H-064-SW-00.
- AUS-A11H-064-SW-00 No surface water was present at this location during the field investigation, therefore no sample was taken.
- AUS-A11H-064-SL-01 Sample was added during field investigation.

IOP Change Houses

There were two former IOP Change Houses located in the High Explosives Area: Olin/U.S. Powder Map Buildings 69 (IOP Building II-1-26) and 8 (IOP Building II-1-25).

Olin and CSC used Building 69 as a laboratory. Sample locations A11H-018 (sediment and surface water), A11H-020 (sediment), and A11H-023 (soil) were located in drainage ditches that likely received drainage, dumping and/or spillage from Building 69. Farther downstream of sample location A11H-023 was sample location A11H-055 (sediment).

Building 8 was the former Olin/CSC Dynamite Office and the IOP Change House II-1-25. Sample A11H-056 (soil) was located in a possible former drainage ditch that would likely have received drainage from this area.

Dynamite Mix Houses

There were up to four dynamite mix houses located in the High Explosives Area. Former Buildings 11, 12, 17 and 18 were reportedly used for mixing operations and spillage was very likely in these buildings.

The location of former Building 11 was not positively identified; however, it was probably located north of former Building 12, since the U.S. Powder Map had a number "11" shown in this area. This mix house was destroyed prior to CSC leasing the property, and CSC constructed another building at the same location. Sediment sample locations A11H-041, A11H-043 and A11H-045 were in ponded areas/drainage ditches in the assumed location of former Building 11. Sample location A11A-041 also included a surface water sample. Sample A11H-044 (soil) was located on a soil mound in the assumed location of former Building 11. The soil mound probably contained debris from the building constructed by CSC in the same location.

Sample location A11H-039 (soil) is on the soil mound at the former location of Building 12. Sample location A11H-040 (sediment and surface water) is in a ponded area northeast of the building. Sample A11H-042 (sediment) is located in a drainage ditch, downstream of a culvert that appears to drain the area surrounding former Building 12, on the opposite side (east side) of the roadway.

Sample A11H-032 (soil) is located on a soil mound at the former location of Building 17. Sample location A11H-031 (sediment and surface water) is in a small ponded area on the opposite side (east side) of the roadway, which may have received drainage from the area surrounding this building.

Sample A11H-009 (sediment) is located in a ponded area of the drainage ditch that surrounds former Building 18, and appears to drain the area surrounding this building.

Pack Houses

There were five former Pack Houses located in the High Explosives Area. Former Buildings 13, 14, 15, 16 and 18 (which was also reported to be a mix house) were all former Pack Houses.

Dynamite was tamped into cartridges in these buildings, thus there was potential for spilled explosive materials in these buildings.

Sample location A11H-016 (soil) is on the soil mound at former Building 13. Sample A11H-017 (sediment) is located in the drainage ditch that surrounds former Building 13 and receives drainage from the area surrounding this building and possibly former Building 15. Sample A11H-015 (soil) was collected from an area of brownish-red staining on the ground, just northwest of former Building 13.

Sample location A11H-047 (soil) is on the soil mound at former Building 14. Sample A11H-048 (sediment) is located in the drainage ditch that surrounds former Building 14 and receives drainage from the area surrounding this building and possibly former Building 13.

Sample location A11H-037 (soil) is on the soil mound at former Building 15. Sample A11H-038 (sediment) is located in the drainage ditch that surrounds former Building 15 and receives drainage from the area surrounding this building. Sample A11H-036 (soil) is located in a sewer manhole in the southwest corner of the Building 15 area.

Sample location A11H-034 (soil) is on the soil mound that at the former location of Building 16. Sediment samples A11H-033 and A11H-035 were located in the drainage ditch that surrounds former Building 16 and receives drainage from the area surrounding this building and Building 17.

Case Houses

There were three former Case Houses located in the High Explosives Area: Building 20, Building 21 and Building 22. It is assumed that the dynamite cartridges were packaged into cases or boxes in these buildings.

Sample A11H-024 (soil) was located in a drainage ditch just west of former Building 20. Sample A11H-025 (soil) was collected from a sewer manhole on the east side of the berm that surrounded former Building 20.

Sediment samples A11H-010 and A11H-011 were located in the drainage ditch that likely received any drainage from the area surrounding former Building 21. Surface water was also sampled from location A11H-010. Building 21 reportedly contained the Superprime and Slurry Operations for CSC. Sample location A11H-012 (sediment and surface) is in the drainage ditch on the opposite side of the roadway (west side) of Building 21. This drainage ditch appears to receive drainage from former Buildings 21, 18 and 22.

Sample A11H-006 (soil) was located in a depressed area on the south side of former Building 22 (former Case House as well as a former CSC Torpex Operation). Sample location A11H-007 (sediment) was southwest of former Building 18, in a drainage ditch that appears to have received drainage from the area surrounding former Building 22. Sample A11H-008 (sediment and surface water) was located in a drainage ditch west of former Building 18 on the west side of the roadway. This ditch may have received drainage from former Buildings 18 and 22. During the site reconnaissance of the area near former Building 22, several mounds of soil were identified along the roadway to this former building. Sample A11H-053 (soil) was collected from one of these mounds.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-A11H-008-SW-00 Sample was added
- AUS-A11H-012-SD-0X This sample was not analyzed for nitroglycerin, although it was called for in the FSP.

ANOIL Manufacturing Area

Buildings 23, 23-A, 23-5 and a temporary ANOIL building were all located in the ANOIL manufacturing area. A monitoring well (A11H-W01) was placed in this area, on the north side of Building 23 (ANOIL Manufacturing Building) in the assumed downgradient direction from the building. Both a soil sample and a groundwater sample were taken from this location.

Sample A11H-004 (soil) was planned to be located on the west side of former Building 23 in the area of a possible former loading dock; however, it is located within the footprint of former Building 23. Sample A11H-066 (soil) was planned to be located southwest of former Building 23 in an area of soil discoloration as seen in historical aerial photographs. This sample was actually located within the footprint of former Building 23 and therefore was not located in the area of soil discoloration.

Sample location A11H-003 (sediment) was northwest of former Building 23 in a drainage ditch that likely received drainage from the area surrounding Building 23. Sample A11H-005 (sediment) was located southeast of former Building 23 in another drainage ditch that also likely received drainage from the area surrounding Building 23.

Sample A11H-001 (soil) is located north of the former Temporary ANOIL Building, in an area that appeared scarred in historical aerial photographs. Sample A11H-002 (sediment and surface water) is located in a ponded area northeast of the former Temporary ANOIL Building. This area likely received drainage from the areas surrounding this building.

Soil sample locations A11H-067 and A11H-068 were both located in an area of disturbed ground and former open storage according to historical aerial photographs. Sample A11H-067 was located in an area that also appears to have had materials deposited on it, according to the aerial photograph interpretation.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-A11H-002-SW-00 Sample was added

Former Pit and Trench

A former pit and trench were identified in the 1965 aerial photograph, south of former Building 7, on the south side of the Service Area Road. Soil and trench water samples were taken from a test pit (A11H-021) that was excavated in the location of the former trench. The location was determined from coordinates obtained from the historic aerial photograph.

West Holding Pond

Samples A11H-051 (sediment and surface water) and A11H-052 (soil) were located in the former West Holding Pond. There is currently a north-flowing drainage ditch that flows through the former West Holding Pond and sample A11H-051 is located in this ditch which appears to receive drainage from the High Explosives Area. Sample A11H-052 is located in a portion of the West Holding Pond that was scarred in aerial photographs, possibly due to inflow of liquids from the Nitroglycerin Area.

Miscellaneous High Explosives Support Buildings

Building 24 was the former Dynamite Maintenance Shop and Research and Development Lab. Sample A11H-022 (sediment) was located in the northeast-flowing drainage ditch that appears to originate next to this former building location. It is likely that this ditch received drainage from this building. Sample A11H-026 (sediment) was located downstream of former Building 24, in a drainage ditch that may have received drainage from this building.

Building 24-1 (Dynamite Maintenance Shop/Lab) and Building 24-3 (Dynamite Parts Cleaning) appeared to have been two buildings that were adjacent to each other, based on the foundations identified in this area during the site reconnaissance. The site reconnaissance also revealed a possible sump located near the northeast corner of former Building 24-3. A soil sample was taken from a test pit (A11H-028) that was excavated next to this sump. Sample location A11H-027 (soil) was just north of former Building 24-1 to identify any potential contamination resulting from spillage or dumping of materials from this building. Sample A11H-029 (soil) was collected from a sewer manhole north of the former sump. Sample A11H-030 (sediment) was collected from a northeast-flowing drainage ditch that runs along the east side of former Building 24-3. This ditch likely received runoff from the area surrounding this building.

Sample A11H-046 (sediment) was located in a drainage ditch that flows northward along the east side of former Building 25 (N.C. and TNT Screening House). There is the potential for residual spilled explosives in this location from wash waters.

Sample A11H-049 (soil) was located on an area was identified during the site reconnaissance as having several pallets and a crushed drum. It is possible that this area could have been used in the past as a drum storage area, although nothing was noted in this area on the historical aerial photographs.

Sample A11H-050 (soil) was located in a drainage ditch that ran next to the northeast corner of former Building 27 (Tractor House). The ditch was dry at the time of the site reconnaissance.

Sample A11H-013 (soil) was located just to the west of former Loading Dock 29, across the roadway from water valves. Sample A11H-014 (sediment) was located in a north-flowing drainage ditch, just downstream of the former loading dock. This drainage ditch also appears to have received drainage from former Buildings 18, 21 and 22.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-A11H-028-SS-?? This sample supposed to be collected from this test pit at a depth greater than 5 feet. This sample was not collected because it was dangerous to excavate any deeper at this location since this location was situated on a steep slope next to the former Building 24-3.
- AUS-A11H-028-GW-00 No groundwater encountered during excavation, therefore a sample was not taken.
- AUS-A11H-030-SW-00 No surface water was present at this location during the field investigation, therefore a sample was not taken.

Miscellaneous Drainage in AUS-A11H

Sample A11H-019 (sediment) is located southwest of former Building 69. It does not appear that this drainage ditch received drainage from this building since it appears to be upstream of this building, however it is possible. Sample A11H-054 (sediment) is located to the north of the former West Holding Pond, in an east-flowing ditch that appears to received drainage from the High Explosives Area. This ditch received drainage from both the East and West Holding Ponds, downstream of this point. This ditch flows into the Nitroglycerin Area and then off site.

16.2.2 Field Results

16.2.2.1 <u>Site Conditions</u>

16.2.2.1.1 Geologic Conditions

There were a total of eight wells installed in Area 11, including one well in AUS-A11H. A geologic cross-section (Figure 15-11) was made for the site using the soil boring information obtained from the monitoring wells. Boring logs and monitoring well construction diagrams are included in Appendices A and B, respectively.

The geologic cross-section, Figure 15-11, that includes A11H-W01 shows that there is 3 ft of fill material (topsoil, debris, 2" rock, etc.) that overlays AUS-A11H. Below the fill from 3 to 4.5 ft below ground surface (bgs) is clayey silt material. Below this clayey silt material is 12.5 ft of loess (low to medium plastic, silty clay). At 17 ft the boring encountered a 1-ft layer of medium dense silt. From 18 ft bgs to the bottom of the boring at 20 ft bgs was a loess material (medium plastic clay). In addition to the well that was installed at AUS-A11H there were also three test pits excavated in this area. Test pit A11H-021, which was located in the northern portion of the site (see Figure 15-11), had a 1 ft thick layer of fill (topsoil), over loess (clayey silt) that continued to the bottom of the pit at 7 ft bgs. The second test pit A11H-028, which was located in the eastern portion of the site (see Figure 15-11), was installed below an open sump. Beneath the sump was a fill material that continued to the bottom of the pit at 12 ft bgs. At 10 ft bgs the fill material appeared to become olive green in color, this changed occurred above a 6" I.D. clay pipe that was located 11 ft bgs. The final test pit in this area A11H-061, which was located north-northwest of A11H-061 (see Figure 15-11) had a 2 ft thick layer of fill (topsoil with wood debris), over a 4 ft thick layer of 2 inch minus rock with fine, and then a low plastic clay that continued to the bottom of the pit at 8 ft bgs. Test pit logs are included in Appendix A.

16.2.2.1.2 Hydrogeologic Conditions

Groundwater was encountered at AUS-A11H at a depth of 16 ft bgs as shown on Figure 15-11. A groundwater contour map (Figure 15-12) was made for Area 11 using groundwater elevations obtained from October 2000. The groundwater elevations taken at Area 11H are presented on Table 15-4. As seen in the groundwater contour map, the overall flow direction of the groundwater appears to be toward the north-northwest. Groundwater elevations were collected several different times during this investigation as shown in Table 15-4, and the flow direction was generally the same each time. Slug tests were performed on the well that was installed in Area 11H during the AUS OU investigation, resulting in a hydraulic conductivity of 8.73E-06 centimeters per second (cm/sec). Slug tests are presented in Table 16-2. Slug tests are included in Appendix C.

Hydraulic conductivity values from slug tests are less than the trigger values for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)). Based on the borings at the site, the aquifer does not appear to meet any of the other criteria for Class I Groundwater (35 IAC 620), although one trigger criterion has not been measured. That criterion is "sustained groundwater yield, from up to a 12-inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less" (35 IAC 620.210(a)(4)(A)). Based on the slow recovery of wells at this site, yields that would indicate Class I groundwater by that criterion would definitely not be expected. In accordance with 35 IAC 620.220, groundwater that does not meet the criteria for Class I, III, or IV is classified as Class II. Based on the available data, the groundwater at this site appears to be Class II as defined by the State of Illinois. This classification could change based on additional data.

16.2.2.1.3 Hydrologic Conditions

Based on the topographic map that was created for A11H using aerial photographs, the overall surface flow at the site appears to be towards the north and east. There are three main ditches in this area, with multiple small drainage ditches, which feed the three main ditches, that flow around the many berms and roadways within this area. The three main ditches include: one that flows north along the eastern side of the site (parallel to the most western roadway) into the west holding pond (currently a depressed area which is now mostly dry), one that flows north along the western side of the site, and the these two combine into one main ditch that flows east off the site along the Dynamite Area Road. Additionally, there are several ponded areas within the main part of the site (near both berms and roads) and several along the former railroad beds in the most northern portion of the site.

16.2.2.2 Chemical Results

The sample analytical results are summarized as follows:

- Table 16-4 – soil samples results,
- Table 16-5 – sediment samples results,
- Table 16-6 – groundwater samples results,
- Table 16-7 – trench water samples results, and
- Table 16-8 – surface water samples results.

These tables list all the chemicals detected in Area 11H during this investigation, along with the frequency and range of detections.

Tetrachlorodibenzo-p-Dioxin (TCDD) equivalent results for Area 11H are not shown in the screening tables. They are instead included in Table 16-16, and are discussed in the following human health and ecological risk sections.

Sample results are presented on figures as follows:

- Figure 16-1 – Section 1 – organic results for soil and sediment samples,
- Figure 16-2 – Section 2 – organic results for soil and sediment samples,
- Figure 16-3 – Section 1 – inorganic results for soil and sediment samples,
- Figure 16-4 – Section 2 – inorganic results for soil and sediment samples, and
- Figure 16-5 – all results for surface water, trench water, and groundwater samples at this site.

16.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 16-9 through 16-15 as follows:

- Table 16-9—human health risk screening for soils,
- Table 16-10—human health risk screening for sediment,
- Table 16-11—human health risk screening for groundwater and trench water,
- Table 16-12—human health risk screening for surface water,
- Table 16-13—ecological risk screening for soils,
- Table 16-14—ecological risk screening for sediment, and
- Table 16-15—ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 11H. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criteria is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk). The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed for but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they also are not shaded. These constituents are not identified as COPCs, but rather as uncertainties.

In Figures 16-1 through 16-5, COPCs are shaded, using the same criteria as for the tables described above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

16.3.1 Human Health Risk

16.3.1.1 Soil/Sediment

Human health screening results for soil and sediment samples are presented in Tables 16-9 and 16-10, respectively. Soil screening values were conservatively used to screen the sediment samples.

For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6}. In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

Dioxin/furan congener concentrations were converted to 2,3,7,8-TCDD equivalents, for comparison against a 2,3,7,8-TCDD screening value. A toxic equivalency (TEQ) was calculated for each dioxin/furan congener by multiplying a congener-specific toxic equivalency factor (TEF) value by the congener's observed concentration. The TEQs for all congeners in a sample were summed. The summed TEQ values were then compared to the 2,3,7,8-TCDD screening value of 1 ppb. Refer to Table 16-16.

There were two soil samples analyzed for dioxin/furan congeners with detections noted in both samples. However, none of the TEQ values calculated for the congeners exceeded the 2,3,7,8-TCDD screening level. Therefore, none of the dioxin/furan congeners detected within Area 11H are assumed to pose potential risk to human health.

16.3.1.2 Trench Water and Groundwater

Human health screening results for trench water and groundwater are presented in Table 16-11. The maximum groundwater and trench water concentrations from Area 11H were screened against maximum contaminant levels (MCLs) and Illinois Class I groundwater standards.

16.3.1.3 Surface Water

Human health risk screening results for chemicals in surface water from Area 11H are presented in Table 16-12. The maximum concentrations from Area 11H were screened against the Illinois EPA General Use Surface Water Quality Criteria – Human Health.

16.3.2 Ecological Risk

16.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 16-13. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[102]
- Environment Canada (1995)[103]
- Talmage *et al.* (1999)[104]
- Efroymson *et al.* (1997a, 1997b)[105]
- CCME (1999)[106]
- MHSPE (1994)[107]
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)[108] used a log K_{ow} of 3.5 as a target threshold value indicative of

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[102] USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

[103] Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

[104] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. Rev Environ. Contam. Toxicol 161:1-156.

[105] Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

[106] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

[107] Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards.* Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

[108] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

Direct exposure screening concentrations in soils were available for 2,3,7,8-TCDD, but not for other dioxin/furan congeners. Therefore, the potential for direct exposure effects were only screened in conjunction with 2,3,7,8-TCDD (Table 16-13). Based on the screening results in Table 16-13, 2,3,7,8-TCDD is not a concern relative to direct exposures (it was not detected). Other congeners, if detected, were retained as potentially bioaccumulative COPECs. Results of the dioxin/furan analyses are presented in Table 16-16. Congeners detected are summarized below:

Dioxins/Furans Detected in Soils (AUS-A11H)	
1,2,3,4,6,7,8-HpCDD	2,3,7,8—TCDF
OCDD	1,2,3,4,6,7,8-HpCDF
	OCDF

Each of these congeners is retained as a COPEC (note the individual congeners are not included in the COPEC summary of Table 16-18).

16.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 16-14. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)[109]
- USEPA (1996 – summarized by Ingersoll *et al.* 1996)[110]
- Ontario Ministry of the Environment and Energy (1995)[111]
- NOAA (1999)[112]
- Ecotox (USEPA 1996)[113]
- Long *et al.* (1995)[114]

[109] MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. MacDonald Environmental Services Ltd., British Columbia, Canada.

[110] Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfirld, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22(3):602-623.

[111] Ontario Ministry of Environment and Energy. 1995. Ontario's Approach to Sediment Assessment and Remediation. Second SETAC World Congress (16TH Annual Meeting). Vancouver, British Columbia, Canada.

[112] NOAA. 1999. Screening quick Reference Tables. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

[113] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

[114] Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management. 19(1): 81-97.

- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed "consensus-based" freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the "equilibrium-partitioning" (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 16.3.2.1.

16.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 16-15. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)[115]
- EcoTox (USEPA 1996)[116]
- USEPA Region IV Freshwater Screening Values (1999b)[117]

[115] USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.
[116] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)[118]
- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 16.3.2.1.

16.4 SCIENTIFIC MANAGEMENT DECISION POINT

A Remedial Investigation (RI) is recommended for Site AUS-A11H, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 16-17; and on the COPEC list, Table 16-18. COPCs in this category include antimony and silver in sediment, and selenium in soil. COPECs coded with "D" on Table 16-18 include cadmium in surface water; manganese, mercury, and silver in sediment; and, cobalt, manganese, and selenium in soil. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be evaluated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 16-19.

Note that a number of the human heath COPCs exceed migration to groundwater screening criteria. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site and media and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

[117] USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at http://www.epa.gov/region4/waste/oftecser/ecolbul.htm.
[118] ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

TABLE 16-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11H

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11H-001	365156.8	781187.3	440.84	NA	
A11H-002	365321.1	781339.1	437.62	NA	
A11H-003	365111.5	781359.3	439.81	NA	
A11H-004	365076.7	781375.7	441.14	NA	
A11H-005	364894.7	781556.6	441.46	NA	
A11H-006	364488.7	781924.3	446.85	NA	
A11H-007	364587.3	781649.7	440.04	NA	
A11H-008	364687.8	781615.0	429.70	NA	
A11H-009	364756.6	781865.2	442.85	NA	
A11H-010	365037.9	781737.7	440.77	NA	
A11H-011	365047.1	781923.2	439.35	NA	
A11H-012	365118.9	781706.5	438.34	NA	
A11H-013	365251.7	781680.1	441.08	NA	
A11H-014	365325.6	781730.2	437.20	NA	
A11H-015	365249.7	781799.5	443.88	NA	
A11H-016	365159.9	781912.2	453.85	NA	
A11H-017	365209.6	782022.7	439.52	NA	
A11H-018	365727.1	781478.9	432.26	NA	
A11H-019	365454.7	781553.3	435.51	NA	
A11H-020	365501.0	781601.9	434.80	NA	
A11H-021	366219.3	782173.6	436.76	NA	
A11H-022	365456.9	781677.8	434.50	NA	
A11H-023	365583.8	781787.4	434.53	NA	
A11H-024	365381.5	781886.7	442.24	NA	
A11H-025	365366.4	782035.0	446.72	NA	
A11H-026	365603.6	781946.2	435.99	NA	
A11H-027	365573.3	782032.0	443.46	NA	
A11H-028	365582.7	782076.4	442.27	NA	
A11H-029	365604.7	782078.5	443.70	NA	
A11H-030	365592.5	782097.8	435.90	NA	
A11H-031	364451.9	782223.8	442.75	NA	
A11H-032	364539.1	782126.3	453.81	NA	
A11H-033	364631.8	782092.1	442.00	NA	
A11H-034	364731.4	781963.2	453.22	NA	
A11H-035	364825.7	782009.2	440.66	NA	
A11H-036	364890.1	781938.3	440.77	NA	
A11H-037	364966.9	782073.1	453.38	NA	
A11H-038	364997.7	782180.0	447.09	NA	
A11H-039	364748.5	782248.2	455.33	NA	
A11H-040	364801.4	782322.3	442.56	NA	
A11H-041	364964.9	782238.1	441.91	NA	
A11H-042	364868.2	782366.5	442.78	NA	
A11H-043	365081.6	782249.7	448.74	NA	

Sheet 1 of 2

TABLE 16-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11H

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11H-044	365056.8	782315.3	451.19	NA	
A11H-045	365117.7	782383.3	442.21	NA	
A11H-046	365364.7	782500.1	438.65	NA	
A11H-047	365254.0	782156.8	453.07	NA	
A11H-048	365332.1	782257.4	442.11	NA	
A11H-049	365427.6	782420.6	443.17	NA	
A11H-050	365561.2	782374.8	437.96	NA	
A11H-051	365662.2	782529.1	436.52	NA	
A11H-052	365743.4	782536.9	436.15	NA	
A11H-053	364465.1	781839.1	447.91	NA	
A11H-054	365828.1	782403.2	434.00	NA	
A11H-055	365786.8	782159.1	436.76	NA	
A11H-056	365924.5	782400.2	437.43	NA	
A11H-057				NA	Location is approximate
A11H-058	366407.6	781797.1	435.27	NA	
A11H-059	366378.6	781936.3	437.38	NA	
A11H-060	366465.2	781944.3	436.95	NA	
A11H-061	366408.5	782013.0	436.94	NA	
A11H-062	366401.1	782112.2	434.30	NA	
A11H-063	366456.2	782100.1	435.78	NA	
A11H-064	366437.3	782095.1	436.77	NA	
A11H-065	366472.7	782052.6	436.99	NA	
A11H-066	364992.8	781394.9	442.60	NA	
A11H-067	364974.6	781541.0	444.08	NA	
A11H-068	365193.1	781597.3	440.89	NA	
A11H-W01	365027.2	781387.7	441.90	444.62	New monitoring well

Sheet 2 of 2

NA = Not Applicable

TABLE 16-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
47-01C	Aluminum	9,800
	Barium	170
	Beryllium	0.8
	Calcium	11,000
	Chromium	17
	Cobalt	8.9
	Copper	31
	Iron	25,000
	Lead	19
	Magnesium	4,500
	Manganese	560
	Mercury	0.05
	Nickel	25
	Potassium	910
	Vanadium	25
	Zinc	78
47-02C	Benzo[b]fluoranthene	0.16J
	Bis(2-Ethylhexyl)phthalate	0.12J
	Aluminum	12,000
	Barium	100
	Beryllium	0.6
	Calcium	29,000
	Chromium	16
	Cobalt	6
	Copper	11
	Iron	16,000
	Lead	19
	Magnesium	15,000
	Manganese	470
	Mercury	0.04
	Nickel	26
	Potassium	960
	Vanadium	33
	Zinc	140

Sheet 1 of 1

mg/kg = milligrams per kilogram
J = Estimated

TABLE 16-2
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
A11H-W01	8.73E-06

Sheet 1 of 1

cm/sec = centimeters per second

TABLE 16-3
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-A11H

Soil	Sediment	Groundwater	Trench Water	Surface Water
AUS-A11H-001	AUS-A11H-002	AUS-A11H-W01	AUS-A11H-021[2]	AUS-A11H-002
AUS-A11H-004	AUS-A11H-003		AUS-A11H-061[2]	AUS-A11H-008
AUS-A11H-006	AUS-A11H-005			AUS-A11H-010
AUS-A11H-013	AUS-A11H-007			AUS-A11H-012
AUS-A11H-015	AUS-A11H-008			AUS-A11H-018
AUS-A11H-016	AUS-A11H-009			AUS-A11H-031
AUS-A11H-021	AUS-A11H-010			AUS-A11H-040
AUS-A11H-023[1]	AUS-A11H-011			AUS-A11H-041
AUS-A11H-024[1]	AUS-A11H-012			AUS-A11H-051
AUS-A11H-025	AUS-A11H-014			AUS-A11H-057
AUS-A11H-027	AUS-A11H-017			AUS-A11H-058
AUS-A11H-028	AUS-A11H-018			AUS-A11H-062
AUS-A11H-029	AUS-A11H-019			
AUS-A11H-032	AUS-A11H-020			
AUS-A11H-034	AUS-A11H-022			
AUS-A11H-036[1]	AUS-A11H-026			
AUS-A11H-037	AUS-A11H-030			
AUS-A11H-039	AUS-A11H-031			
AUS-A11H-044	AUS-A11H-033			
AUS-A11H-047	AUS-A11H-035			
AUS-A11H-049	AUS-A11H-038			
AUS-A11H-050[1]	AUS-A11H-040			
AUS-A11H-052	AUS-A11H-041			
AUS-A11H-053	AUS-A11H-042			
AUS-A11H-056[1]	AUS-A11H-043			
AUS-A11H-059	AUS-A11H-045			
AUS-A11H-060	AUS-A11H-046			
AUS-A11H-061	AUS-A11H-048			
AUS-A11H-063[1]	AUS-A11H-051			
AUS-A11H-064	AUS-A11H-054			
AUS-A11H-065	AUS-A11H-055			
AUS-A11H-066	AUS-A11H-057			
AUS-A11H-067	AUS-A11H-058			
AUS-A11H-068	AUS-A11H-062			
AUS-A11H-W01				

Sheet 1 of 1

[1] Note that the samples at this location were originally designated as sediment, but are actually soil samples.

[2] These samples were originally designated as groundwater ("GW"), but are actually trench water samples.

TABLE 16-4
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compound		
cis-1,2-Dichloroethene	1/20	24 ug/kg
Tetrachloroethylene(PCE)	2/20	150 ug/kg to 530 ug/kg
total 1,2-Dichloroethene	1/20	25 ug/kg
Trichloroethylene (TCE)	3/20	4 ug/kg to 92 ug/kg
Semivolatile Organic Compounds		
1-Methylnaphthalene	2/5	71 ug/kg to 73 ug/kg
2-Methylnaphthalene	10/34	39 ug/kg to 1,800 ug/kg
4-Chloroaniline	1/29	1,300 ug/kg
Acenaphthylene	4/34	50 ug/kg to 450 ug/kg
Anthracene	3/34	41 ug/kg to 330 ug/kg
Benzo(a)anthracene	8/34	13 ug/kg to 1,500 ug/kg
Benzo(a)pyrene	9/34	8.3 ug/kg to 1,800 ug/kg
Benzo(b)fluoranthene	9/34	20 ug/kg to 2,500 ug/kg
Benzo(g,h,i)perylene	8/34	18 ug/kg to 1,000 ug/kg
Benzo(k)fluoranthene	7/34	13 ug/kg to 2,300 ug/kg
Bis(2-ethylhexyl) phthalate	8/29	43 ug/kg to 2,000 ug/kg
Carbazole	2/29	73 ug/kg to 130 ug/kg
Chrysene	9/34	31 ug/kg to 1,900 ug/kg
Dibenz(a,h)anthracene	4/34	10 ug/kg to 340 ug/kg
Dibenzofuran	9/29	44 ug/kg to 440 ug/kg
Di-n-butyl phthalate	6/29	47 ug/kg to 2,100 ug/kg
Fluoranthene	9/34	29 ug/kg to 1,600 ug/kg
Indeno(1,2,3-c,d)pyrene	6/34	34 ug/kg to 980 ug/kg
Naphthalene	8/34	55 ug/kg to 810 ug/kg
n-Nitrosodiphenylamine	1/29	330 ug/kg
Pentachlorophenol	1/29	130 ug/kg
Phenanthrene	15/34	39 ug/kg to 830 ug/kg
Pyrene	10/34	29 ug/kg to 2,300 ug/kg
Explosives		
2,4-Dinitrotoluene	1/43	500 ug/kg
4-Amino-2,6-dinitrotoluene	1/43	280 ug/kg
4-Nitrotoluene	1/43	250 ug/kg
HMX	1/43	720 ug/kg
Nitroglycerin	2/26	11,000 ug/kg to 16,000 ug/kg
RDX	1/43	1,300 ug/kg
Metals		
Aluminum	39/39	703 mg/kg to 16,500 mg/kg
Antimony	20/39	0.22 mg/kg to 6 mg/kg
Arsenic	39/39	1.9 mg/kg to 14.6 mg/kg
Barium	39/39	30.6 mg/kg to 445 mg/kg
Beryllium	23/39	0.13 mg/kg to 0.96 mg/kg
Boron	7/39	1.7 ug/kg to 29.1 ug/kg

Sheet 1 of 2

TABLE 16-4
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Cadmium	9/39	0.14 mg/kg to 204 mg/kg
Calcium	39/39	984 mg/kg to 324,000 mg/kg
Chromium, Total	38/39	1.7 mg/kg to 585 mg/kg
Cobalt	28/39	3 mg/kg to 21 mg/kg
Copper	37/39	4.8 mg/kg to 123 mg/kg
Iron	39/39	6,070 mg/kg to 35,000 mg/kg
Lead	38/39	2 mg/kg to 287 mg/kg
Magnesium	39/39	1,300 mg/kg to 12,500 mg/kg
Manganese	39/39	85.6 mg/kg to 3,450 mg/kg
Mercury	21/39	0.0094 mg/kg to 2 mg/kg
Nickel	38/39	6.1 mg/kg to 35.6 mg/kg
Potassium	38/39	166 mg/kg to 1,050 mg/kg
Selenium	19/39	0.18 mg/kg to 1.9 mg/kg
Silver	3/39	0.24 mg/kg to 53.5 mg/kg
Sodium	21/39	44.2 mg/kg to 411 mg/kg
Thallium	2/39	0.54 mg/kg to 0.9 mg/kg
Vanadium	37/39	3.7 mg/kg to 55.9 mg/kg
Zinc	38/39	21.5 mg/kg to 374 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/25/01

TABLE 16-5
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
1-Methylnaphthalene	1/4	51 ug/kg
2-Methylnaphthalene	2/25	110 ug/kg to 180 ug/kg
Benzo(a)anthracene	2/25	9.6 ug/kg to 59 ug/kg
Benzo(a)pyrene	5/25	7.4 ug/kg to 87 ug/kg
Benzo(b)fluoranthene	6/25	10 ug/kg to 94 ug/kg
Benzo(g,h,i)perylene	4/25	11 ug/kg to 320 ug/kg
Benzo(k)fluoranthene	2/25	46 ug/kg to 93 ug/kg
Bis(2-ethylhexyl) phthalate	6/21	59 ug/kg to 230 ug/kg
Chrysene	6/25	12 ug/kg to 79 ug/kg
Di-N-butyl phthalate	6/21	76 ug/kg to 53,000 ug/kg
Fluoranthene	6/25	10 ug/kg to 73 ug/kg
Indeno(1,2,3-c,d)pyrene	2/25	8.3 ug/kg to 91 ug/kg
n-Nitrosodiphenylamine	3/21	2,200 ug/kg to 7,800 ug/kg
Phenanthrene	4/25	11 ug/kg to 35 ug/kg
Pyrene	5/25	13 ug/kg to 87 ug/kg
Explosives		
1,3,5-Trinitrobenzene	1/31	490 ug/kg
1,3-Dinitrobenzene	1/31	460 ug/kg
2,4,6-Trinitrotoluene	1/31	1,800 ug/kg
2,4-Dinitrotoluene	4/31	140 ug/kg to 210,000 ug/kg
2,6-Dinitrotoluene	2/31	430 ug/kg to 15,000 ug/kg
HMX	1/31	10,000 ug/kg
Nitrobenzene	1/31	540 ug/kg
Nitroglycerin	1/31	13,000 ug/kg
Metals		
Aluminum	26/26	4,850 mg/kg to 18,600 mg/kg
Antimony	13/26	0.23 mg/kg to 0.75 mg/kg
Arsenic	26/26	2.6 mg/kg to 25 mg/kg
Barium	26/26	69.3 mg/kg to 770 mg/kg
Beryllium	14/26	0.24 mg/kg to 1.8 mg/kg
Boron	6/26	0.9 mg/kg to 3.1 mg/kg
Cadmium	6/26	0.09 mg/kg to 30.9 mg/kg
Calcium	26/26	1,370 mg/kg to 44,100 mg/kg
Chromium, Total	26/26	7.4 mg/kg to 57 mg/kg
Cobalt	26/26	3.9 mg/kg to 21.1 mg/kg
Copper	26/26	5.4 mg/kg to 37.7 mg/kg
Iron	26/26	10,300 mg/kg to 63,400 mg/kg
Lead	26/26	9.3 mg/kg to 354 mg/kg
Magnesium	26/26	1,040 mg/kg to 26,300 mg/kg
Manganese	26/26	75.6 mg/kg to 999 mg/kg
Mercury	15/26	0.0088 mg/kg to 0.071 mg/kg

Sheet 1 of 2

TABLE 16-5
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Nickel	26/26	7.1 mg/kg to 29.2 mg/kg
Potassium	26/26	273 mg/kg to 1,270 mg/kg
Selenium	8/26	0.38 mg/kg to 1.9 mg/kg
Silver	2/26	0.24 mg/kg to 1.7 mg/kg
Sodium	15/26	48.4 mg/kg to 212 mg/kg
Vanadium	26/26	14.6 mg/kg to 66 mg/kg
Zinc	26/26	28.9 mg/kg to 437 mg/kg
Other Parameters		
Total Organic Carbon	2/2	26,800 mg/kg to 59,400 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/26/01

TABLE 16-6
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Metals		
Aluminum	1/1	2,150 ug/L
Barium	1/1	271 ug/L
Calcium	1/1	205,000 ug/L
Chromium, Total	1/1	3.4 ug/L
Iron	1/1	2,030 ug/L
Magnesium	1/1	102,000 ug/L
Manganese	1/1	243 ug/L
Nickel	1/1	4.4 ug/L
Potassium	1/1	1,910 ug/L
Sodium	1/1	357,000 ug/L
Vanadium	1/1	4.1 ug/L
Zinc	1/1	9.7 ug/L
Explosives		
RDX	1/1	0.53 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	1/1	271 mg/L
Nitrogen, Ammonia (as N)	1/1	1.4 mg/L
Nitrogen, Nitrate-Nitrite	1/1	432 mg/L
Phosphorus, Total (as P)	1/1	0.15 mg/L
Sulfate (as SO4)	1/1	38,000 ug/L
Suspended Solids (Residue, Non-Filterable)	1/1	168 mg/L
Total Dissolved Solids (Residue, Filterable)	1/1	2,790 mg/L

Sheet 1 of 1

mg/l = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 16-7
TRENCH WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Benzo(a)anthracene	1/2	1.9 ug/L
Benzo(a)pyrene	1/2	2 ug/L
Benzo(b)fluoranthene	1/2	2.6 ug/L
Benzo(g,h,i)perylene	1/2	1.3 ug/L
Benzo(k)fluoranthene	1/2	2.6 ug/L
Chrysene	1/2	3.2 ug/L
Fluoranthene	1/2	2.4 ug/L
Indeno(1,2,3-c,d)pyrene	1/2	1.3 ug/L
Pyrene	1/2	2.3 ug/L
Explosives		
RDX	1/2	3 ug/L
Metals		
Aluminum	2/2	44,500 ug/L to 144,000 ug/L
Antimony	2/2	1.5 ug/L to 10 ug/L
Arsenic	2/2	26.6 ug/L to 54.9 ug/L
Barium	2/2	284 ug/L to 1,330 ug/L
Cadmium	1/2	1.7 ug/L
Calcium	2/2	102,000 ug/L to 333,000 ug/L
Chromium, Total	2/2	27.1 ug/L to 131 ug/L
Copper	2/2	54.8 ug/L to 112 ug/L
Iron	2/2	30,300 ug/L to 123,000 ug/L
Lead	2/2	45.6 ug/L to 77.2 ug/L
Magnesium	2/2	45,500 ug/L to 48,600 ug/L
Manganese	2/2	738 ug/L to 2,570 ug/L
Mercury	1/2	0.52 ug/L
Nickel	2/2	112 ug/L to 128 ug/L
Potassium	2/2	7,530 ug/L to 7,680 ug/L
Selenium	2/2	3.4 ug/L to 3.7 ug/L
Silver	1/2	6.3 ug/L
Sodium	2/2	7,420 ug/L to 22,700 ug/L
Vanadium	2/2	73.5 ug/L to 176 ug/L
Zinc	2/2	423 ug/L to 576 ug/L

Sheet 1 of 2

TABLE 16-7
TRENCH WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Other Inorganics		
Alkalinity, Total (as CaCO3)	1/1	140 mg/L
Nitrogen, Ammonia (as N)	2/2	0.27 mg/L to 0.88 mg/L
Nitrogen, Nitrate-Nitrite	1/2	3.9 mg/L

Sheet 2 of 2

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 16-8
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Explosives		
HMX	2/11	0.52 ug/L to 3.2 ug/L
RDX	2/11	1 ug/L to 1.8 ug/L
Metals		
Aluminum	9/10	48.8 ug/L to 6,520 ug/L
Antimony	1/10	2.2 ug/L
Barium	10/10	30.2 ug/L to 167 ug/L
Boron	9/10	11.4 ug/L to 76.9 ug/L
Cadmium	1/10	3.3 ug/L
Calcium	10/10	14,700 ug/L to 65,200 ug/L
Chromium, Total	5/10	0.96 ug/L to 6.4 ug/L
Copper	4/10	1.7 ug/L to 6.2 ug/L
Iron	10/10	83.9 ug/L to 7,440 ug/L
Lead	6/10	1.7 ug/L to 8.3 ug/L
Magnesium	10/10	3,740 ug/L to 16,800 ug/L
Manganese	10/10	53.8 ug/L to 692 ug/L
Mercury	3/10	0.13 ug/L to 0.33 ug/L
Nickel	7/10	1.3 ug/L to 7.6 ug/L
Potassium	10/10	1,870 ug/L to 3,790 ug/L
Sodium	10/10	3,290 ug/L to 20,400 ug/L
Vanadium	3/10	3.5 ug/L to 13.1 ug/L
Zinc	1/10	38.9 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	3/3	113 mg/L to 151 mg/L
Nitrogen, Ammonia (as N)	6/7	0.14 mg/L to 1.6 mg/L
Nitrogen, Nitrate-Nitrite	3/10	0.052 mg/L to 0.14 mg/L
Phosphorus, Total (as P)	4/4	0.12 mg/L to 0.25 mg/L
Sulfate (as SO4)	3/4	7,800 ug/L to 11,000 ug/L
Suspended Solids (Residue, Non-Filterable)	2/2	6 mg/L to 34 mg/L
Total Dissolved Solids (Residue, Filterable)	7/7	151 mg/L to 301 ug/L

Sheet 1 of 1

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	8	U	UG/KG			2.40E-06	8.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG		8.91E-09	2.05E-06	4.00E+01
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG		4.21E-09	5.26E-05	8.89E+00
75-34-3	1,1-Dichloroethane	8	U	UG/KG			3.88E-06	8.00E-03
75-35-4	1,1-Dichloroethene	8	U	UG/KG		6.74E-08	1.19E-04	2.67E+00
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG		1.05E-08	2.27E-04	8.00E+00
540-59-0	1,2-Dichloroethene (total)	25		UG/KG			1.70E-04	1.25E+00
78-87-5	1,2-Dichloropropane	8	U	UG/KG		1.04E-08	3.76E-04	8.00E+00
78-93-3	2-Butanone (MEK)	16	U	UG/KG			5.77E-07	
591-78-6	2-Hexanone	16	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			5.54E-06	
67-64-1	Acetone	16	U	UG/KG			2.57E-06	2.00E-02
71-43-2	Benzene	8	U	UG/KG		5.46E-09	3.30E-04	4.00E+00
75-27-4	Bromodichloromethane	8	U	UG/KG		3.39E-09	7.66E-06	2.67E-01
75-25-2	Bromoform	8	U	UG/KG		2.56E-11	4.54E-07	2.00E-01
74-83-9	Bromomethane	8	U	UG/KG			6.09E-04	8.00E-01
75-15-0	Carbon disulfide	8	U	UG/KG			6.62E-06	4.00E-03
56-23-5	Carbon tetrachloride	8	U	UG/KG		1.51E-08	1.14E-03	2.67E+00
108-90-7	Chlorobenzene	8	U	UG/KG			1.47E-05	1.14E-01
75-00-3	Chloroethane	8	U	UG/KG		1.23E-09	4.24E-07	
67-66-3	Chloroform	8	U	UG/KG		1.54E-08	6.21E-03	2.67E-01
74-87-3	Chloromethane	8	U	UG/KG		3.01E-09		
156-59-2	cis-1,2-Dichloroethene	24		UG/KG			1.63E-04	1.20E+00
10061-01-5	cis-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	8	U	UG/KG		3.01E-09	5.02E-06	4.00E-01
100-41-4	Ethylbenzene	8	U	UG/KG			1.34E-06	1.14E-02
75-09-2	Methylene chloride	8	U	UG/KG		3.90E-10	8.18E-07	8.00E+00
110-54-3	N-Hexane	8	U	UG/KG			1.98E-05	
100-42-5	Styrene	8	U	UG/KG			3.91E-07	4.00E-02
127-18-4	Tetrachloroethylene (PCE)	530	J	UG/KG		2.84E-08	3.11E-04	1.77E+02
108-88-3	Toluene	8	U	UG/KG			4.03E-06	1.33E-02
1330-20-7	total Xylenes	8	U	UG/KG			1.80E-06	8.00E-04
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG			3.74E-05	2.67E-01
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	
79-01-6	Trichloroethylene (TCE)	92		UG/KG		1.50E-08	1.16E-03	3.07E+01
75-01-4	Vinyl chloride	8	U	UG/KG		1.64E-07		1.14E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	510	U	UG/KG			6.70E-05	1.70E+00
95-50-1	1,2-Dichlorobenzene	510	U	UG/KG			1.54E-04	5.67E-01
541-73-1	1,3-Dichlorobenzene	510	U	UG/KG			9.85E-03	
106-46-7	1,4-Dichlorobenzene	510	U	UG/KG		6.27E-08	2.65E-04	5.10E+00
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG			2.95E-05	2.60E-01
88-06-2	2,4,6-Trichlorophenol	510	U	UG/KG		2.27E-09		6.38E+01
120-83-2	2,4-Dichlorophenol	510	U	UG/KG			1.93E-04	1.02E+01
105-67-9	2,4-Dimethylphenol	510	U	UG/KG			2.89E-05	1.28E+00
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG			1.48E-03	2.60E+02
91-58-7	2-Chloronaphthalene	510	U	UG/KG			1.87E-05	
95-57-8	2-Chlorophenol	510	U	UG/KG			2.11E-03	2.55E+00
90-12-0	1-Methylnaphthalene	73		UG/KG			3.87E-04	1.83E-02

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
91-57-6	2-Methylnaphthalene	1800		UG/KG			3.32E-05	9.00E-03
95-48-7	2-Methylphenol	510	U	UG/KG			1.16E-05	6.38E-01
88-74-4	2-Nitroaniline	2600	U	UG/KG			5.17E-02	
88-75-5	2-Nitrophenol	510	U	UG/KG			7.24E-05	
91-94-1	3,3'-Dichlorobenzidine	510	U	UG/KG		9.30E-08		1.70E+03
99-09-2	3-Nitroaniline	2600	U	UG/KG			5.17E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	510	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	510	U	UG/KG			1.16E-05	
106-47-8	4-Chloroaniline	1300		UG/KG			3.69E-04	4.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	510	U	UG/KG				
106-44-5	4-Methylphenol	510	U	UG/KG			1.16E-04	
100-01-6	4-Nitroaniline	2600	U	UG/KG			5.17E-02	
100-02-7	4-Nitrophenol	2600	U	UG/KG			3.69E-04	
83-32-9	Acenaphthene	510	U	UG/KG			1.33E-05	1.70E-02
208-96-8	Acenaphthylene	450		UG/KG			8.30E-06	2.25E-03
120-12-7	Anthracene	330	J	UG/KG			8.47E-07	5.50E-04
56-55-3	Benzo(a)anthracene	1500		UG/KG		5.20E-07		1.88E+01
50-32-8	Benzo(a)pyrene	1800		UG/KG		6.24E-06		4.50E+00
205-99-2	Benzo(b)fluoranthene	2500		UG/KG		8.66E-07		1.25E+01
191-24-2	Benzo(g,h,i)perylene	1000		UG/KG			1.84E-05	5.00E-03
207-08-9	Benzo(k)fluoranthene	2300		UG/KG		7.97E-08		1.15E+00
111-91-1	bis(2-Chloroethoxy)methane	510	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	510	U	UG/KG		8.23E-07		2.55E+04
108-60-1	bis(2-Chloroisopropyl) ether	510	U	UG/KG		6.31E-08	1.20E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	2000		UG/KG		1.14E-08	1.14E-04	
85-68-7	Butyl benzyl phthalate	510	U	UG/KG			2.89E-06	6.38E-04
86-74-8	Carbazole	130	J	UG/KG		1.05E-09		4.33E+00
218-01-9	Chrysene	1900		UG/KG		6.58E-09		2.38E-01
84-74-2	Di-n-butyl phthalate	2100		UG/KG			2.38E-05	7.00E-03
117-84-0	Di-n-octyl phthalate	510	U	UG/KG			2.89E-05	5.10E-05
53-70-3	Dibenz(a,h)anthracene	340	J	UG/KG		1.18E-06		4.25E+00
132-64-9	Dibenzofuran	440		UG/KG			8.69E-05	
84-66-2	Diethyl phthalate	510	U	UG/KG			7.24E-07	
131-11-3	Dimethyl phthalate	510	U	UG/KG			5.79E-08	
206-44-0	Fluoranthene	1600		UG/KG			5.32E-05	8.00E-03
86-73-7	Fluorene	510	U	UG/KG			1.54E-05	1.70E-02
118-74-1	Hexachlorobenzene	510	U	UG/KG		3.31E-07	7.24E-04	5.10E+00
87-68-3	Hexachlorobutadiene	510	U	UG/KG		1.61E-08	2.89E-03	5.10E+00
77-47-4	Hexachlorocyclopentadiene	510	U	UG/KG			8.65E-05	2.55E-02
67-72-1	Hexachloroethane	510	U	UG/KG		2.89E-09	5.79E-04	2.55E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	980		UG/KG		3.40E-07		1.40E+00
78-59-1	Isophorone	510	U	UG/KG		1.96E-10	2.89E-06	1.70E+01
621-64-7	N-Nitroso-di-n-propylamine	510	U	UG/KG		1.45E-06		2.55E+05
86-30-6	N-Nitrosodiphenylamine	330	J	UG/KG		6.56E-10		5.50E+00
91-20-3	Naphthalene	810		UG/KG			4.30E-03	2.03E-01
98-95-3	Nitrobenzene	440	U	UG/KG			3.84E-03	
87-86-5	Pentachlorophenol	130	J	UG/KG		1.17E-08	9.12E-06	1.30E+02
85-01-8	Phenanthrene	830		UG/KG			1.53E-05	4.15E-03
108-95-2	Phenol	510	U	UG/KG			9.65E-07	1.02E-01

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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
129-00-0	Pyrene	2300		UG/KG			4.24E-05	1.15E-02
Explosives								
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			1.44E-05	
99-65-0	1,3-Dinitrobenzene	380	UJ	UG/KG			4.31E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	770	UJ	UG/KG		9.37E-09	1.75E-03	
121-14-2	2,4-Dinitrotoluene	500	J	UG/KG			2.84E-04	1.25E+04
606-20-2	2,6-Dinitrotoluene	690	UJ	UG/KG			7.83E-04	2.30E+04
	Dinitrotoluene Mixture	500		UG/KG		1.39E-07		1.25E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	770	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	770	UJ	UG/KG				
99-08-1	3-Nitrotoluene	770	UJ	UG/KG			3.79E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	280	J	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	250	J	UG/KG			1.23E-04	
2691-41-0	HMX	720	J	UG/KG			1.63E-05	
55-63-0	Nitroglycerin	16000	J	UG/KG		9.08E-08		
78-11-5	Pentaerythritol tetranitrate (PETN)	2800	U	UG/KG				
121-82-4	RDX	1300	J	UG/KG		5.80E-08	4.92E-04	
479-45-8	Tetryl	1200	UJ	UG/KG			1.36E-04	
Metals								
7429-90-5	Aluminum	16500		MG/KG	5.73E-01		9.84E-03	
7440-36-0	Antimony	6		MG/KG	7.23E+00		7.34E-03	2.00E+01
7440-38-2	Arsenic	14.6	J	MG/KG	1.08E+00	5.35E-06	3.32E-02	1.46E+01
7440-39-3	Barium	445		MG/KG	2.28E+00		3.57E-03	5.56E+00
7440-41-7	Beryllium	0.96		MG/KG	1.26E+00	4.28E-10	2.60E-04	3.20E-01
7440-42-8	Boron	29.1		MG/KG	5.49E+00		3.68E-04	

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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-43-9	Cadmium	204		MG/KG	1.07E+03	6.83E-08	2.52E-01	5.10E+02
7440-70-2	Calcium	324000		MG/KG	1.30E+02			
7440-47-3	Chromium	585		MG/KG	2.32E+01	1.30E-06		2.93E+02
7440-48-4	Cobalt	21		MG/KG	9.68E-01		1.71E-04	
7440-50-8	Copper	123		MG/KG	1.09E+01		1.62E-03	
7439-89-6	Iron	35000		MG/KG	1.81E+00		5.71E-02	
7439-92-1	Lead	287		MG/KG	1.23E+01			
7439-95-4	Magnesium	12500		MG/KG	8.05E+00			
7439-96-5	Manganese	3450		MG/KG	9.48E-01		1.07E-01	
7439-97-6	Mercury	2	J	MG/KG	3.33E+01			
7440-02-0	Nickel	35.6		MG/KG	1.88E+00		8.71E-04	5.09E+00
2023695	Potassium	1050		MG/KG	1.68E+00			
7782-49-2	Selenium	1.9		MG/KG	8.12E-01		1.86E-04	6.33E+00
7440-22-4	Silver	53.5		MG/KG	9.22E+01		5.23E-03	2.68E+01
7440-23-5	Sodium	411		MG/KG	2.42E+00			
7440-28-0	Thallium	0.9	J	MG/KG	2.20E+00		6.29E-06	
7440-62-2	Vanadium	55.9		MG/KG	1.18E+00		3.91E-03	1.86E-01
7440-66-6	Zinc	374		MG/KG	7.28E+00		6.11E-04	6.23E-01
Dioxins								
1746-01-6	2,3,7,8-TCDD	0.000251	U	UG/KG				

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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	8	U	UG/KG			4.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG	9.76E-07	9.76E-07	4.00E-01
75-34-3	1,1-Dichloroethane	8	U	UG/KG	4.00E-08	4.00E-08	3.48E-04
75-35-4	1,1-Dichloroethene	8	U	UG/KG	4.44E-07	4.44E-06	1.33E-01
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG	1.27E-04	5.71E-06	4.00E-01
540-59-0	1,2-Dichloroethene (total)	25		UG/KG	1.25E-06	1.25E-06	6.25E-02
78-87-5	1,2-Dichloropropane	8	U	UG/KG	9.52E-05	4.44E-06	2.67E-01
78-93-3	2-Butanone (MEK)	16	U	UG/KG			
591-78-6	2-Hexanone	16	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			
67-64-1	Acetone	16	U	UG/KG	8.00E-08	8.00E-08	1.00E-03
71-43-2	Benzene	8	U	UG/KG	4.00E-05	1.86E-06	2.67E-01
75-27-4	Bromodichloromethane	8	U	UG/KG	8.70E-05	4.00E-06	1.33E-02
75-25-2	Bromoform	8	U	UG/KG	1.11E-05	5.00E-07	1.00E-02
74-83-9	Bromomethane	8	U	UG/KG	2.76E-06	8.00E-06	4.00E-02
75-15-0	Carbon disulfide	8	U	UG/KG	4.00E-08	4.00E-07	2.50E-04
56-23-5	Carbon tetrachloride	8	U	UG/KG	1.82E-04	1.95E-05	1.14E-01
108-90-7	Chlorobenzene	8	U	UG/KG	1.95E-07	1.95E-06	8.00E-03
75-00-3	Chloroethane	8	U	UG/KG			
67-66-3	Chloroform	8	U	UG/KG	8.51E-06	4.00E-06	1.33E-02
74-87-3	Chloromethane	8	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	24		UG/KG	1.20E-06	1.20E-06	6.00E-02
10061-01-5	cis-1,3-Dichloropropene	8	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	8	U	UG/KG	1.95E-07	1.95E-07	2.00E-02
100-41-4	Ethylbenzene	8	U	UG/KG	4.00E-08	4.00E-07	6.15E-04
75-09-2	Methylene chloride	8	U	UG/KG	1.05E-05	6.67E-07	4.00E-01
110-54-3	N-Hexane	8	U	UG/KG			
100-42-5	Styrene	8	U	UG/KG	1.95E-08	1.95E-07	2.00E-03
127-18-4	Tetrachloroethylene (PCE)	530	J	UG/KG	4.82E-03	2.21E-04	8.83E+00
108-88-3	Toluene	8	U	UG/KG	1.95E-08	1.95E-08	6.67E-04
1330-20-7	total Xylenes	8	U	UG/KG	8.00E-09	1.95E-08	5.33E-05
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG	1.95E-07	1.95E-07	1.14E-02
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	92		UG/KG	1.77E-04	7.67E-05	1.53E+00
75-01-4	Vinyl chloride	8	U	UG/KG	2.67E-03	1.23E-04	8.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	510	U	UG/KG	2.55E-05	2.55E-04	1.02E-01
95-50-1	1,2-Dichlorobenzene	510	U	UG/KG	2.83E-06	2.83E-05	3.00E-02
541-73-1	1,3-Dichlorobenzene	510	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	510	U	UG/KG			2.55E-01
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG	1.30E-05	1.30E-05	9.63E-03
88-06-2	2,4,6-Trichlorophenol	510	U	UG/KG	9.81E-04	4.64E-05	2.55E+00
120-83-2	2,4-Dichlorophenol	510	U	UG/KG	8.36E-05	8.36E-04	5.10E-01
105-67-9	2,4-Dimethylphenol	510	U	UG/KG	1.24E-05	1.24E-05	5.67E-02
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG	6.34E-04	6.34E-03	1.30E+01
91-58-7	2-Chloronaphthalene	510	U	UG/KG			
95-57-8	2-Chlorophenol	510	U	UG/KG	5.10E-05	5.10E-05	1.28E-01
90-12-0	1-Methylnaphthalene	73		UG/KG	8.90E-07	8.90E-06	8.69E-04

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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
91-57-6	2-Methylnaphthalene	1800		UG/KG	2.95E-05	2.95E-05	4.29E-04
95-48-7	2-Methylphenol	510	U	UG/KG	5.10E-06	5.10E-06	3.40E-02
88-74-4	2-Nitroaniline	2600	U	UG/KG			
88-75-5	2-Nitrophenol	510	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	510	U	UG/KG	3.92E-02	1.82E-03	7.29E+01
99-09-2	3-Nitroaniline	2600	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	510	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	510	U	UG/KG			
106-47-8	4-Chloroaniline	1300		UG/KG	1.59E-04	1.59E-03	1.86E+00
7005-72-3	4-Chlorophenyl phenyl ether	510	U	UG/KG			
106-44-5	4-Methylphenol	510	U	UG/KG			
100-01-6	4-Nitroaniline	2600	U	UG/KG			
100-02-7	4-Nitrophenol	2600	U	UG/KG			
83-32-9	Acenaphthene	510	U	UG/KG	4.25E-06	4.25E-06	8.95E-04
208-96-8	Acenaphthylene	450		UG/KG	7.38E-06	7.38E-06	1.07E-04
120-12-7	Anthracene	330	J	UG/KG	5.41E-07	5.41E-07	2.75E-05
56-55-3	Benzo(a)anthracene	1500		UG/KG	1.88E-01	8.82E-03	7.50E-01
50-32-8	Benzo(a)pyrene	1800		UG/KG	2.25E+00	1.06E-01	2.25E-01
205-99-2	Benzo(b)fluoranthene	2500		UG/KG	3.13E-01	1.47E-02	5.00E-01
191-24-2	Benzo(g,h,i)perylene	1000		UG/KG	1.64E-05	1.64E-05	2.38E-04
207-08-9	Benzo(k)fluoranthene	2300		UG/KG	2.95E-02	1.35E-03	4.69E-02
111-91-1	bis(2-Chloroethoxy)methane	510	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	510	U	UG/KG	1.02E-01	6.80E-03	1.28E+03
108-60-1	bis(2-Chloroisopropyl) ether	510	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	2000		UG/KG	4.88E-03	4.88E-04	5.56E-04
85-68-7	Butyl benzyl phthalate	510	U	UG/KG	1.24E-06	1.24E-06	5.48E-04
86-74-8	Carbazole	130	J	UG/KG	4.48E-04	2.10E-05	2.17E-01
218-01-9	Chrysene	1900		UG/KG	2.44E-03	1.12E-04	1.19E-02
84-74-2	Di-n-butyl phthalate	2100		UG/KG	1.05E-05	1.05E-05	9.13E-04
117-84-0	Di-n-octyl phthalate	510	U	UG/KG	1.24E-05	1.24E-04	5.10E-05
53-70-3	Dibenz(a,h)anthracene	340	J	UG/KG	4.25E-01	2.00E-02	1.70E-01
132-64-9	Dibenzofuran	440		UG/KG			
84-66-2	Diethyl phthalate	510	U	UG/KG	5.10E-07	5.10E-07	1.09E-03
131-11-3	Dimethyl phthalate	510	U	UG/KG			
206-44-0	Fluoranthene	1600		UG/KG	1.95E-05	1.95E-05	3.72E-04
86-73-7	Fluorene	510	U	UG/KG	6.22E-06	6.22E-06	9.11E-04
118-74-1	Hexachlorobenzene	510	U	UG/KG	1.28E-01	6.54E-03	2.55E-01
87-68-3	Hexachlorobutadiene	510	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	510	U	UG/KG	3.64E-05	3.64E-05	1.28E-03
67-72-1	Hexachloroethane	510	U	UG/KG	2.55E-04	2.55E-04	1.02E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	980		UG/KG	1.23E-01	5.76E-03	7.00E-02
78-59-1	Isophorone	510	U	UG/KG	1.24E-06	1.24E-06	6.38E-02
621-64-7	N-Nitroso-di-n-propylamine	510	U	UG/KG	6.38E-01	2.83E-02	1.02E+04
86-30-6	N-Nitrosodiphenylamine	330	J	UG/KG	2.75E-04	1.32E-05	3.30E-01
91-20-3	Naphthalene	810		UG/KG	9.88E-06	9.88E-05	9.64E-03
98-95-3	Nitrobenzene	440	U	UG/KG	4.40E-04	4.40E-04	4.40E+00
87-86-5	Pentachlorophenol	130	J	UG/KG	5.42E-03	2.50E-04	4.33E+00
85-01-8	Phenanthrene	830		UG/KG	1.36E-05	1.36E-05	1.98E-04
108-95-2	Phenol	510	U	UG/KG	5.10E-07	4.25E-06	5.10E-03

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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
129-00-0	Pyrene	2300		UG/KG	3.77E-05	3.77E-05	5.48E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	380	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	770	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	500	J	UG/KG	5.95E-02	2.78E-03	6.25E+02
606-20-2	2,6-Dinitrotoluene	690	UJ	UG/KG	8.21E-02	3.83E-03	9.86E+02
	Dinitrotoluene Mixture	500		UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	770	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	770	UJ	UG/KG			
99-08-1	3-Nitrotoluene	770	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	280	J	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	250	J	UG/KG			
2691-41-0	HMX	720	J	UG/KG			
55-63-0	Nitroglycerin	16000	J	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	2800	U	UG/KG			
121-82-4	RDX	1300	J	UG/KG			
479-45-8	Tetryl	1200	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	16500		MG/KG			
7440-36-0	Antimony	6		MG/KG	7.32E-03	7.32E-02	1.20E+00
7440-38-2	Arsenic	14.6	J	MG/KG	4.87E+00	2.39E-01	5.21E-01
7440-39-3	Barium	445		MG/KG	3.18E-03	3.18E-02	3.71E-01
7440-41-7	Beryllium	0.96		MG/KG	9.60E-01	3.31E-02	1.45E-01
7440-42-8	Boron	29.1		MG/KG	1.62E-04	1.62E-03	

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TABLE 16-9
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-43-9	Cadmium	204		MG/KG	1.02E-01	1.02E+00	5.51E+01
7440-70-2	Calcium	324000		MG/KG			
7440-47-3	Chromium	585		MG/KG	5.85E-02	1.43E-01	2.09E+01
7440-48-4	Cobalt	21		MG/KG	1.75E-04	1.75E-03	
7440-50-8	Copper	123		MG/KG	1.50E-03	1.50E-02	1.12E-02
7439-89-6	Iron	35000		MG/KG			
7439-92-1	Lead	287		MG/KG	7.18E-01	7.18E-01	
7439-95-4	Magnesium	12500		MG/KG			
7439-96-5	Manganese	3450		MG/KG	3.59E-02	3.59E-01	
7439-97-6	Mercury	2	J	MG/KG	3.28E-03	3.28E-02	1.33E+01
7440-02-0	Nickel	35.6		MG/KG	8.68E-04	8.68E-03	4.68E-01
2023695	Potassium	1050		MG/KG			
7782-49-2	Selenium	1.9		MG/KG	1.90E-04	1.90E-03	7.92E-01
7440-22-4	Silver	53.5		MG/KG	5.35E-03	5.35E-02	3.57E+01
7440-23-5	Sodium	411		MG/KG			
7440-28-0	Thallium	0.9	J	MG/KG	5.63E-03	5.63E-03	3.75E-01
7440-62-2	Vanadium	55.9		MG/KG	3.99E-03	3.99E-02	5.70E-02
7440-66-6	Zinc	374		MG/KG	6.13E-04	6.13E-03	1.04E-01
Dioxins							
1746-01-6	2,3,7,8-TCDD	0.000251	U	UG/KG			

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	8	U	UG/KG			2.40E-06	8.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG		8.91E-09	2.05E-06	4.00E+01
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG		4.21E-09	5.26E-05	8.89E+00
75-34-3	1,1-Dichloroethane	8	U	UG/KG			3.88E-06	8.00E-03
75-35-4	1,1-Dichloroethene	8	U	UG/KG		6.74E-08	1.19E-04	2.67E+00
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG		1.05E-08	2.27E-04	8.00E+00
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG			5.43E-05	4.00E-01
78-87-5	1,2-Dichloropropane	8	U	UG/KG		1.04E-08	3.76E-04	8.00E+00
78-93-3	2-Butanone (MEK)	16	U	UG/KG			5.77E-07	
591-78-6	2-Hexanone	16	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			5.54E-06	
67-64-1	Acetone	16	U	UG/KG			2.57E-06	2.00E-02
71-43-2	Benzene	8	U	UG/KG		5.46E-09	3.30E-04	4.00E+00
75-27-4	Bromodichloromethane	8	U	UG/KG		3.39E-09	7.66E-06	2.67E-01
75-25-2	Bromoform	8	U	UG/KG		2.56E-11	4.54E-07	2.00E-01
74-83-9	Bromomethane	8	U	UG/KG			6.09E-04	8.00E-01
75-15-0	Carbon disulfide	8	U	UG/KG			6.62E-06	4.00E-03
56-23-5	Carbon tetrachloride	8	U	UG/KG		1.51E-08	1.14E-03	2.67E+00
108-90-7	Chlorobenzene	8	U	UG/KG			1.47E-05	1.14E-01
75-00-3	Chloroethane	8	U	UG/KG		1.23E-09	4.24E-07	
67-66-3	Chloroform	8	U	UG/KG		1.54E-08	6.21E-03	2.67E-01
74-87-3	Chloromethane	8	U	UG/KG		3.01E-09		
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG			5.43E-05	4.00E-01
10061-01-5	cis-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	8	U	UG/KG		3.01E-09	5.02E-06	4.00E-01
100-41-4	Ethylbenzene	8	U	UG/KG			1.34E-06	1.14E-02
75-09-2	Methylene chloride	8	U	UG/KG		3.90E-10	8.18E-07	8.00E+00
110-54-3	N-Hexane	8	U	UG/KG			1.98E-05	
100-42-5	Styrene	8	U	UG/KG			3.91E-07	4.00E-02
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG		4.29E-10	4.70E-06	2.67E+00
108-88-3	Toluene	8	U	UG/KG			4.03E-06	1.33E-02
1330-20-7	total Xylenes	8	U	UG/KG			1.80E-06	8.00E-04
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG			3.74E-05	2.67E-01
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG		1.31E-09	1.01E-04	2.67E+00
75-01-4	Vinyl chloride	8	U	UG/KG		1.64E-07		1.14E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	630	U	UG/KG			8.27E-05	2.10E+00
95-50-1	1,2-Dichlorobenzene	630	U	UG/KG			1.90E-04	7.00E-01
541-73-1	1,3-Dichlorobenzene	630	U	UG/KG			1.22E-02	
106-46-7	1,4-Dichlorobenzene	630	U	UG/KG		7.75E-08	3.28E-04	6.30E+00
95-95-4	2,4,5-Trichlorophenol	3100	U	UG/KG			3.52E-05	3.10E-01
88-06-2	2,4,6-Trichlorophenol	630	U	UG/KG		2.81E-09		7.88E+01
120-83-2	2,4-Dichlorophenol	630	U	UG/KG			2.38E-04	1.26E+01
105-67-9	2,4-Dimethylphenol	630	U	UG/KG			3.58E-05	1.58E+00
51-28-5	2,4-Dinitrophenol	3100	U	UG/KG			1.76E-03	3.10E+02
91-58-7	2-Chloronaphthalene	630	U	UG/KG			2.31E-05	
95-57-8	2-Chlorophenol	630	U	UG/KG			2.61E-03	3.15E+00
90-12-0	1-Methylnaphthalene	51		UG/KG			2.70E-04	1.28E-02

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
91-57-6	2-Methylnaphthalene	180		UG/KG			3.32E-06	9.00E-04
95-48-7	2-Methylphenol	630	U	UG/KG			1.43E-05	7.88E-01
88-74-4	2-Nitroaniline	3100	U	UG/KG			6.16E-02	
88-75-5	2-Nitrophenol	630	U	UG/KG			8.94E-05	
91-94-1	3,3'-Dichlorobenzidine	630	U	UG/KG		1.15E-07		2.10E+03
99-09-2	3-Nitroaniline	3100	U	UG/KG			6.16E-02	
534-52-1	4,6-Dinitro-2-methylphenol	3100	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	630	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	630	U	UG/KG			1.43E-05	
106-47-8	4-Chloroaniline	1300	U	UG/KG			3.69E-04	4.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	630	U	UG/KG				
106-44-5	4-Methylphenol	630	U	UG/KG			1.43E-04	
100-01-6	4-Nitroaniline	3100	U	UG/KG			6.16E-02	
100-02-7	4-Nitrophenol	3100	U	UG/KG			4.40E-04	
83-32-9	Acenaphthene	630	U	UG/KG			1.64E-05	2.10E-02
208-96-8	Acenaphthylene	630	U	UG/KG			1.16E-05	3.15E-03
120-12-7	Anthracene	630	U	UG/KG			1.62E-06	1.05E-03
56-55-3	Benzo(a)anthracene	59	J	UG/KG		2.04E-08		7.38E-01
50-32-8	Benzo(a)pyrene	87	J	UG/KG		3.01E-07		2.18E-01
205-99-2	Benzo(b)fluoranthene	94	J	UG/KG		3.26E-08		4.70E-01
191-24-2	Benzo(g,h,i)perylene	320	J	UG/KG			5.90E-06	1.60E-03
207-08-9	Benzo(k)fluoranthene	93	J	UG/KG		3.22E-09		4.65E-02
111-91-1	bis(2-Chloroethoxy)methane	630	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	630	U	UG/KG		1.02E-06		3.15E+04
108-60-1	bis(2-Chloroisopropyl) ether	630	U	UG/KG		7.80E-08	1.48E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	230	J	UG/KG		1.31E-09	1.31E-05	
85-68-7	Butyl benzyl phthalate	630	U	UG/KG			3.58E-06	7.88E-04
86-74-8	Carbazole	630	U	UG/KG		5.11E-09		2.10E+01
218-01-9	Chrysene	79	J	UG/KG		2.74E-10		9.88E-03
84-74-2	Di-n-butyl phthalate	53000		UG/KG			6.02E-04	1.77E-01
117-84-0	Di-n-octyl phthalate	630	U	UG/KG			3.58E-05	6.30E-05
53-70-3	Dibenz(a,h)anthracene	630	U	UG/KG		2.18E-06		7.88E+00
132-64-9	Dibenzofuran	630	U	UG/KG			1.24E-04	
84-66-2	Diethyl phthalate	630	U	UG/KG			8.94E-07	
131-11-3	Dimethyl phthalate	630	U	UG/KG			7.15E-08	
206-44-0	Fluoranthene	73	J	UG/KG			2.43E-06	3.65E-04
86-73-7	Fluorene	630	U	UG/KG			1.90E-05	2.10E-02
118-74-1	Hexachlorobenzene	630	U	UG/KG		4.09E-07	8.94E-04	6.30E+00
87-68-3	Hexachlorobutadiene	630	U	UG/KG		1.99E-08	3.58E-03	6.30E+00
77-47-4	Hexachlorocyclopentadiene	630	U	UG/KG			1.07E-04	3.15E-02
67-72-1	Hexachloroethane	630	U	UG/KG		3.58E-09	7.15E-04	3.15E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	91	J	UG/KG		3.15E-08		1.30E-01
78-59-1	Isophorone	630	U	UG/KG		2.43E-10	3.58E-06	2.10E+01
621-64-7	N-Nitroso-di-n-propylamine	630	U	UG/KG		1.79E-06		3.15E+05
86-30-6	N-Nitrosodiphenylamine	7800		UG/KG		1.55E-08		1.30E+02
91-20-3	Naphthalene	630	U	UG/KG			3.34E-03	1.58E-01
87-86-5	Pentachlorophenol	3100	U	UG/KG		2.80E-07	2.17E-04	3.10E+03
85-01-8	Phenanthrene	35		UG/KG			6.45E-07	1.75E-04
108-95-2	Phenol	630	U	UG/KG			1.19E-06	1.26E-01
129-00-0	Pyrene	87	J	UG/KG			1.60E-06	4.35E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	490	J	UG/KG			1.85E-05	
99-65-0	1,3-Dinitrobenzene	460	J	UG/KG			5.22E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	1800	J	UG/KG		2.19E-08	4.09E-03	
121-14-2	2,4-Dinitrotoluene	210000	J	UG/KG			1.19E-01	5.25E+06
606-20-2	2,6-Dinitrotoluene	15000	J	UG/KG			1.70E-02	5.00E+05
	Dinitrotoluene Mixture	225000	J	UG/KG		6.25E-05		5.63E+06
35572-78-2	2-Amino-4,6-Dinitrotoluene	7100	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	7100	UJ	UG/KG				
99-08-1	3-Nitrotoluene	7100	UJ	UG/KG			3.49E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	7100	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	7100	UJ	UG/KG			3.49E-03	
2691-41-0	HMX	10000	J	UG/KG			2.27E-04	
98-95-3	Nitrobenzene	540	J	UG/KG			4.72E-03	
55-63-0	Nitroglycerin	13000	J	UG/KG		7.38E-08		
78-11-5	Pentaerythritol tetranitrate (PETN)	3700	UJ	UG/KG				
121-82-4	RDX	7100	UJ	UG/KG		3.17E-07	2.69E-03	
479-45-8	Tetryl	11000	UJ	UG/KG			1.25E-03	
Metals								
7429-90-5	Aluminum	18600		MG/KG	1.65E+00		1.11E-02	
7440-36-0	Antimony	0.75	J	MG/KG	3.95E-01		9.17E-04	2.50E+00
7440-38-2	Arsenic	25		MG/KG	2.43E+00	9.17E-06	5.69E-02	2.50E+01
7440-39-3	Barium	770		MG/KG	3.93E+00		6.18E-03	9.63E+00
7440-41-7	Beryllium	1.8		MG/KG	1.13E+00	8.03E-10	4.87E-04	6.00E-01
7440-42-8	Boron	3.1	J	MG/KG			3.92E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-43-9	Cadmium	30.9		MG/KG	1.93E+01	1.03E-08	3.81E-02	7.73E+01
7440-70-2	Calcium	44100		MG/KG	3.05E+01			
7440-47-3	Chromium	57		MG/KG	3.31E+00	1.27E-07		2.85E+01
7440-48-4	Cobalt	21.1		MG/KG	2.32E+00		1.72E-04	
7440-50-8	Copper	37.7		MG/KG	2.24E+00		4.97E-04	
7439-89-6	Iron	63400		MG/KG	3.06E+00		1.04E-01	
7439-92-1	Lead	354		MG/KG	1.48E+01			
7439-95-4	Magnesium	26300		MG/KG	1.38E+01			
7439-96-5	Manganese	999		MG/KG	9.58E-01		3.10E-02	
7439-97-6	Mercury	0.071	J	MG/KG	4.73E-01			
7440-02-0	Nickel	29.2		MG/KG	1.73E+00		7.14E-04	4.17E+00
2023695	Potassium	1270		MG/KG	8.94E-01			
7782-49-2	Selenium	1.9	J	MG/KG	2.97E+00		1.86E-04	6.33E+00
7440-22-4	Silver	1.7		MG/KG	5.67E-01		1.66E-04	8.50E-01
7440-23-5	Sodium	212		MG/KG	1.46E-01			
7440-28-0	Thallium	1.8	U	MG/KG	5.81E+00		1.26E-05	
7440-62-2	Vanadium	66		MG/KG	2.36E+00		4.61E-03	2.20E-01
7440-66-6	Zinc	437		MG/KG	7.65E+00		7.14E-04	7.28E-01
Other Parameters								
7601-90-3	Perchlorate	6900	U	UG/KG			6.75E-03	
TOC	TOC	59400		MG/KG	9.46E-01			

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	8	U	UG/KG			4.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG	9.76E-07	9.76E-07	4.00E-01
75-34-3	1,1-Dichloroethane	8	U	UG/KG	4.00E-08	4.00E-08	3.48E-04
75-35-4	1,1-Dichloroethene	8	U	UG/KG	4.44E-07	4.44E-06	1.33E-01
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG	1.27E-04	5.71E-06	4.00E-01
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02
78-87-5	1,2-Dichloropropane	8	U	UG/KG	9.52E-05	4.44E-06	2.67E-01
78-93-3	2-Butanone (MEK)	16	U	UG/KG			
591-78-6	2-Hexanone	16	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			
67-64-1	Acetone	16	U	UG/KG	8.00E-08	8.00E-08	1.00E-03
71-43-2	Benzene	8	U	UG/KG	4.00E-05	1.86E-06	2.67E-01
75-27-4	Bromodichloromethane	8	U	UG/KG	8.70E-05	4.00E-06	1.33E-02
75-25-2	Bromoform	8	U	UG/KG	1.11E-05	5.00E-07	1.00E-02
74-83-9	Bromomethane	8	U	UG/KG	2.76E-06	8.00E-06	4.00E-02
75-15-0	Carbon disulfide	8	U	UG/KG	4.00E-08	4.00E-07	2.50E-04
56-23-5	Carbon tetrachloride	8	U	UG/KG	1.82E-04	1.95E-05	1.14E-01
108-90-7	Chlorobenzene	8	U	UG/KG	1.95E-07	1.95E-06	8.00E-03
75-00-3	Chloroethane	8	U	UG/KG			
67-66-3	Chloroform	8	U	UG/KG	8.51E-06	4.00E-06	1.33E-02
74-87-3	Chloromethane	8	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02
10061-01-5	cis-1,3-Dichloropropene	8	U	UG/KG			

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	8	U	UG/KG	1.95E-07	1.95E-07	2.00E-02
100-41-4	Ethylbenzene	8	U	UG/KG	4.00E-08	4.00E-07	6.15E-04
75-09-2	Methylene chloride	8	U	UG/KG	1.05E-05	6.67E-07	4.00E-01
110-54-3	N-Hexane	8	U	UG/KG			
100-42-5	Styrene	8	U	UG/KG	1.95E-08	1.95E-07	2.00E-03
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG	7.27E-05	3.33E-06	1.33E-01
108-88-3	Toluene	8	U	UG/KG	1.95E-08	1.95E-08	6.67E-04
1330-20-7	total Xylenes	8	U	UG/KG	8.00E-09	1.95E-08	5.33E-05
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG	1.95E-07	1.95E-07	1.14E-02
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG	1.54E-05	6.67E-06	1.33E-01
75-01-4	Vinyl chloride	8	U	UG/KG	2.67E-03	1.23E-04	8.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	630	U	UG/KG	3.15E-05	3.15E-04	1.26E-01
95-50-1	1,2-Dichlorobenzene	630	U	UG/KG	3.50E-06	3.50E-05	3.71E-02
541-73-1	1,3-Dichlorobenzene	630	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	630	U	UG/KG			3.15E-01
95-95-4	2,4,5-Trichlorophenol	3100	U	UG/KG	1.55E-05	1.55E-05	1.15E-02
88-06-2	2,4,6-Trichlorophenol	630	U	UG/KG	1.21E-03	5.73E-05	3.15E+00
120-83-2	2,4-Dichlorophenol	630	U	UG/KG	1.03E-04	1.03E-03	6.30E-01
105-67-9	2,4-Dimethylphenol	630	U	UG/KG	1.54E-05	1.54E-05	7.00E-02
51-28-5	2,4-Dinitrophenol	3100	U	UG/KG	7.56E-04	7.56E-03	1.55E+01
91-58-7	2-Chloronaphthalene	630	U	UG/KG			
95-57-8	2-Chlorophenol	630	U	UG/KG	6.30E-05	6.30E-05	1.58E-01
90-12-0	1-Methylnaphthalene	51		UG/KG	6.22E-07	6.22E-06	6.07E-04

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
91-57-6	2-Methylnaphthalene	180		UG/KG	2.95E-06	2.95E-06	4.29E-05
95-48-7	2-Methylphenol	630	U	UG/KG	6.30E-06	6.30E-06	4.20E-02
88-74-4	2-Nitroaniline	3100	U	UG/KG			
88-75-5	2-Nitrophenol	630	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	630	U	UG/KG	4.85E-02	2.25E-03	9.00E+01
99-09-2	3-Nitroaniline	3100	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	3100	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	630	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	630	U	UG/KG			
106-47-8	4-Chloroaniline	1300	U	UG/KG	1.59E-04	1.59E-03	1.86E+00
7005-72-3	4-Chlorophenyl phenyl ether	630	U	UG/KG			
106-44-5	4-Methylphenol	630	U	UG/KG			
100-01-6	4-Nitroaniline	3100	U	UG/KG			
100-02-7	4-Nitrophenol	3100	U	UG/KG			
83-32-9	Acenaphthene	630	U	UG/KG	5.25E-06	5.25E-06	1.11E-03
208-96-8	Acenaphthylene	630	U	UG/KG	1.03E-05	1.03E-05	1.50E-04
120-12-7	Anthracene	630	U	UG/KG	1.03E-06	1.03E-06	5.25E-05
56-55-3	Benzo(a)anthracene	59	J	UG/KG	7.38E-03	3.47E-04	2.95E-02
50-32-8	Benzo(a)pyrene	87	J	UG/KG	1.09E-01	5.12E-03	1.09E-02
205-99-2	Benzo(b)fluoranthene	94	J	UG/KG	1.18E-02	5.53E-04	1.88E-02
191-24-2	Benzo(g,h,i)perylene	320	J	UG/KG	5.25E-06	5.25E-06	7.62E-05
207-08-9	Benzo(k)fluoranthene	93	J	UG/KG	1.19E-03	5.47E-05	1.90E-03
111-91-1	bis(2-Chloroethoxy)methane	630	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	630	U	UG/KG	1.26E-01	8.40E-03	1.58E+03
108-60-1	bis(2-Chloroisopropyl) ether	630	U	UG/KG			

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	230	J	UG/KG	5.61E-04	5.61E-05	6.39E-05
85-68-7	Butyl benzyl phthalate	630	U	UG/KG	1.54E-06	1.54E-06	6.77E-04
86-74-8	Carbazole	630	U	UG/KG	2.17E-03	1.02E-04	1.05E+00
218-01-9	Chrysene	79	J	UG/KG	1.01E-04	4.65E-06	4.94E-04
84-74-2	Di-n-butyl phthalate	53000		UG/KG	2.65E-04	2.65E-04	2.30E-02
117-84-0	Di-n-octyl phthalate	630	U	UG/KG	1.54E-05	1.54E-04	6.30E-05
53-70-3	Dibenz(a,h)anthracene	630	U	UG/KG	7.88E-01	3.71E-02	3.15E-01
132-64-9	Dibenzofuran	630	U	UG/KG			
84-66-2	Diethyl phthalate	630	U	UG/KG	6.30E-07	6.30E-07	1.34E-03
131-11-3	Dimethyl phthalate	630	U	UG/KG			
206-44-0	Fluoranthene	73	J	UG/KG	8.90E-07	8.90E-07	1.70E-05
86-73-7	Fluorene	630	U	UG/KG	7.68E-06	7.68E-06	1.13E-03
118-74-1	Hexachlorobenzene	630	U	UG/KG	1.58E-01	8.08E-03	3.15E-01
87-68-3	Hexachlorobutadiene	630	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	630	U	UG/KG	4.50E-05	4.50E-05	1.58E-03
67-72-1	Hexachloroethane	630	U	UG/KG	3.15E-04	3.15E-04	1.26E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	91	J	UG/KG	1.14E-02	5.35E-04	6.50E-03
78-59-1	Isophorone	630	U	UG/KG	1.54E-06	1.54E-06	7.88E-02
621-64-7	N-Nitroso-di-n-propylamine	630	U	UG/KG	7.88E-01	3.50E-02	1.26E+04
86-30-6	N-Nitrosodiphenylamine	7800		UG/KG	6.50E-03	3.12E-04	7.80E+00
91-20-3	Naphthalene	630	U	UG/KG	7.68E-06	7.68E-05	7.50E-03
87-86-5	Pentachlorophenol	3100	U	UG/KG	1.29E-01	5.96E-03	1.03E+02
85-01-8	Phenanthrene	35		UG/KG	5.74E-07	5.74E-07	8.33E-06
108-95-2	Phenol	630	U	UG/KG	6.30E-07	5.25E-06	6.30E-03
129-00-0	Pyrene	87	J	UG/KG	1.43E-06	1.43E-06	2.07E-05

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TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	490	J	UG/KG			
99-65-0	1,3-Dinitrobenzene	460	J	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	1800	J	UG/KG			
121-14-2	2,4-Dinitrotoluene	210000	J	UG/KG	2.50E+01	1.17E+00	2.63E+05
606-20-2	2,6-Dinitrotoluene	15000	J	UG/KG	1.79E+00	8.33E-02	2.14E+04
	Dinitrotoluene Mixture	225000	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	7100	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	7100	UJ	UG/KG			
99-08-1	3-Nitrotoluene	7100	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	7100	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	7100	UJ	UG/KG			
2691-41-0	HMX	10000	J	UG/KG			
98-95-3	Nitrobenzene	540	J	UG/KG	5.40E-04	5.40E-04	5.40E+00
55-63-0	Nitroglycerin	13000	J	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	3700	UJ	UG/KG			
121-82-4	RDX	7100	UJ	UG/KG			
479-45-8	Tetryl	11000	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	18600		MG/KG			
7440-36-0	Antimony	0.75	J	MG/KG	9.15E-04	9.15E-03	1.50E-01
7440-38-2	Arsenic	25		MG/KG	8.33E+00	4.10E-01	8.93E-01
7440-39-3	Barium	770		MG/KG	5.50E-03	5.50E-02	6.42E-01
7440-41-7	Beryllium	1.8		MG/KG	1.80E+00	6.21E-02	2.73E-01
7440-42-8	Boron	3.1	J	MG/KG	1.72E-05	1.72E-04	

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J = Estimated U = Nondetect

TABLE 16-10
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-43-9	Cadmium	30.9		MG/KG	1.55E-02	1.55E-01	8.35E+00
7440-70-2	Calcium	44100		MG/KG			
7440-47-3	Chromium	57		MG/KG	5.70E-03	1.39E-02	2.04E+00
7440-48-4	Cobalt	21.1		MG/KG	1.76E-04	1.76E-03	
7440-50-8	Copper	37.7		MG/KG	4.60E-04	4.60E-03	3.43E-03
7439-89-6	Iron	63400		MG/KG			
7439-92-1	Lead	354		MG/KG	8.85E-01	8.85E-01	
7439-95-4	Magnesium	26300		MG/KG			
7439-96-5	Manganese	999		MG/KG	1.04E-02	1.04E-01	
7439-97-6	Mercury	0.071	J	MG/KG	1.16E-04	1.16E-03	4.73E-01
7440-02-0	Nickel	29.2		MG/KG	7.12E-04	7.12E-03	3.84E-01
2023695	Potassium	1270		MG/KG			
7782-49-2	Selenium	1.9	J	MG/KG	1.90E-04	1.90E-03	7.92E-01
7440-22-4	Silver	1.7		MG/KG	1.70E-04	1.70E-03	1.13E+00
7440-23-5	Sodium	212		MG/KG			
7440-28-0	Thallium	1.8	U	MG/KG	1.13E-02	1.13E-02	7.50E-01
7440-62-2	Vanadium	66		MG/KG	4.71E-03	4.71E-02	6.73E-02
7440-66-6	Zinc	437		MG/KG	7.16E-04	7.16E-03	1.21E-01
Other Parameters							
7601-90-3	Perchlorate	6900	U	UG/KG			
TOC	TOC	59400		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-11
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		1.26E-03	5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L	1.81E-05	2.74E-03	
79-00-5	1,1,2-Trichloroethane	1	U	UG/L	5.01E-06	4.11E-02	2.00E-01
75-34-3	1,1-Dichloroethane	1	U	UG/L		1.23E-03	
75-35-4	1,1-Dichloroethene	1	U	UG/L	2.19E-05	1.83E-02	1.43E-01
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L	8.12E-06	9.88E-02	2.00E-01
78-87-5	1,2-Dichloropropane	1	U	UG/L	6.07E-06	1.45E-01	2.00E-01
78-93-3	2-Butanone (MEK)	5	U	UG/L		2.63E-03	
591-78-6	2-Hexanone	5	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		3.17E-02	
67-64-1	Acetone	5	U	UG/L		8.22E-03	
71-43-2	Benzene	1	U	UG/L	2.44E-06	8.92E-02	2.00E-01
75-27-4	Bromodichloromethane	1	U	UG/L	5.53E-06	8.22E-03	
75-25-2	Bromoform	1	U	UG/L	1.18E-07	1.37E-03	
74-83-9	Bromomethane	1	U	UG/L		1.15E-01	
75-15-0	Carbon disulfide	1	U	UG/L		9.59E-04	
56-23-5	Carbon tetrachloride	1	U	UG/L	5.84E-06	2.35E-01	2.00E-01
108-90-7	Chlorobenzene	1	U	UG/L		9.43E-03	1.00E-02
75-00-3	Chloroethane	1	U	UG/L	2.16E-07	1.16E-04	
67-66-3	Chloroform	1	U	UG/L	6.08E-06	1.60E+00	
74-87-3	Chloromethane	1	U	UG/L	6.62E-07		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		1.64E-02	1.43E-02
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
124-48-1	Dibromochloromethane	1	U	UG/L	7.50E-06	8.22E-03	
100-41-4	Ethylbenzene	1	U	UG/L		7.46E-04	1.43E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-11

HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
75-09-2	Methylene chloride	1	U	UG/L	2.34E-07	6.16E-04	2.00E-01
110-54-3	N-Hexane	1	U	UG/L		2.85E-03	
100-42-5	Styrene	1	U	UG/L		6.09E-04	1.00E-02
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L	9.24E-07	3.94E-03	2.00E-01
108-88-3	Toluene	1	U	UG/L		1.38E-03	1.00E-03
1330-20-7	total Xylenes	1	U	UG/L		6.99E-04	1.00E-04
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		8.22E-03	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
79-01-6	Trichloroethylene (TCE)	1	U	UG/L	6.10E-07	2.74E-02	2.00E-01
75-01-4	Vinyl chloride	1	U	UG/L	5.06E-05		5.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		1.37E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	50	U	UG/L		6.85E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
90-12-0	1-Methylnaphthalene	1	U	UG/L		1.61E-01	
91-57-6	2-Methylnaphthalene	10	U	UG/L		5.48E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	
88-74-4	2-Nitroaniline	50	U	UG/L		2.40E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect

J = Estimated U = Nondetect

TABLE 16-11
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L	1.34E-04		
99-09-2	3-Nitroaniline	50	U	UG/L		2.40E+01	
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	20	U	UG/L		1.37E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	50	U	UG/L		2.40E+01	
100-02-7	4-Nitrophenol	50	U	UG/L		1.71E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	10	U	UG/L		5.48E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	1.9	J	UG/L	2.06E-05		
50-32-8	Benzo(a)pyrene	2	J	UG/L	2.17E-04		1.00E+01
205-99-2	Benzo(b)fluoranthene	2.6	J	UG/L	2.82E-05		
191-24-2	Benzo(g,h,i)perylene	1.3	J	UG/L		7.12E-03	
207-08-9	Benzo(k)fluoranthene	2.6	J	UG/L	2.82E-06		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	U	UG/L	2.08E-06	1.37E-02	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	3.2	J	UG/L	3.47E-07		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-11
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
84-74-2	Di-n-butyl phthalate	10	U	UG/L		2.74E-03	
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	10	U	UG/L		3.42E-04	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	2.4	J	UG/L		1.64E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	1.3	J	UG/L	1.41E-05		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	10	U	UG/L		1.61E+00	
87-86-5	Pentachlorophenol	50	U	UG/L	8.92E-05	4.57E-02	5.00E+01
85-01-8	Phenanthrene	10	U	UG/L		5.48E-02	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	2.3	J	UG/L		1.26E-02	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		2.28E-04	
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L	2.23E-07	2.74E-02	
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		3.42E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-11
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		1.37E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		8.22E-03	
2691-41-0	HMX	0.5	UJ	UG/L		2.74E-04	
98-95-3	Nitrobenzene	0.25	UJ	UG/L		7.36E-02	
55-63-0	Nitroglycerin	1	UJ	UG/L	2.08E-07		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	UJ	UG/L			
121-82-4	RDX	3	J	UG/L	4.91E-06	2.74E-02	
479-45-8	Tetryl	0.75	UJ	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	144000		UG/L		3.95E+00	
7440-36-0	Antimony	10		UG/L		6.85E-01	1.67E+00
7440-38-2	Arsenic	54.9	J	UG/L	1.22E-03	5.01E+00	1.10E+00
7440-39-3	Barium	1330		UG/L		5.21E-01	6.65E-01
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	100	U	UG/L		3.04E-02	5.00E-02
7440-43-9	Cadmium	1.7	J	UG/L		9.32E-02	3.40E-01
7440-70-2	Calcium	781000	J	UG/L			
7440-47-3	Chromium	131		UG/L			1.31E+00
7440-48-4	Cobalt	50	U	UG/L		2.28E-02	5.00E-02
7440-50-8	Copper	122	J	UG/L		9.00E-02	1.88E-01
7439-89-6	Iron	123000		UG/L		1.12E+01	2.46E+01
7439-92-1	Lead	94.1	J	UG/L			1.25E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-11
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7439-95-4	Magnesium	102000		UG/L			
7439-96-5	Manganese	2570		UG/L		2.93E+00	1.71E+01
7439-97-6	Mercury	0.52		UG/L			2.60E-01
7440-02-0	Nickel	128	J	UG/L		1.75E-01	1.28E+00
2023695	Potassium	11400	J	UG/L			
7782-49-2	Selenium	29.5	J	UG/L		1.62E-01	5.90E-01
7440-22-4	Silver	6.3	J	UG/L		3.45E-02	1.26E-01
7440-23-5	Sodium	367000		UG/L			
7440-28-0	Thallium	10	U	UG/L		3.91E+00	5.00E+00
7440-62-2	Vanadium	176		UG/L		6.89E-01	
7440-66-6	Zinc	1210	J	UG/L		1.11E-01	2.42E-01
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	271		MG/L			
7664-41-7	Nitrogen, Ammonia (as N)	5.3	J	MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	432	J	MG/L		4.32E+02	4.32E+02
7723-14-0	Phosphorus, Total (as P)	0.21		MG/L		2.88E+02	
14808-79-8	Sulfate (as SO4)	38000		UG/L			9.50E-02
TDS	TDS	2790	J	MG/L			2.33E+00
TSS	TSS	168		MG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-12
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	2	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	2	U	UG/L		
67-64-1	Acetone	5	UJ	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	UJ	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	1	U	UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1	U	UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-12
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
90-12-0	1-Methylnaphthalene	1	UJ	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	U	UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	10	U	UG/L	1.00E+00	1.00E-01
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	U	UG/L		
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	U	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	U	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L		
99-08-1	3-Nitrotoluene	0.5	U	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		
2691-41-0	HMX	3.2		UG/L		
98-95-3	Nitrobenzene	0.25	U	UG/L		
55-63-0	Nitroglycerin	1	U	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	UJ	UG/L		
121-82-4	RDX	1.8	J	UG/L		
479-45-8	Tetryl	0.75	U	UG/L		
Metals						
7429-90-5	Aluminum	6520		UG/L	3.26E+01	
7440-36-0	Antimony	2.2	J	UG/L	3.67E-01	
7440-38-2	Arsenic	10	U	UG/L	1.00E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-12
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7440-39-3	Barium	167	J	UG/L	7.36E+00	3.34E-02
7440-41-7	Beryllium	5	U	UG/L	1.00E+00	
7440-42-8	Boron	76.9	J	UG/L		7.69E-02
7440-43-9	Cadmium	3.3	J	UG/L	6.60E-01	
7440-70-2	Calcium	65600		UG/L	9.11E+00	
7440-47-3	Chromium	6.4	J	UG/L	6.40E-01	
7440-48-4	Cobalt	50	U	UG/L	1.00E+00	
7440-50-8	Copper	6.2	J	UG/L	6.20E-01	
7439-89-6	Iron	7440		UG/L	7.44E+01	7.44E+00
7439-92-1	Lead	8.3		UG/L	4.15E+00	
7439-95-4	Magnesium	16800		UG/L	6.63E+00	
7439-96-5	Manganese	692		UG/L	1.19E+00	6.92E-01
7439-97-6	Mercury	0.33		UG/L	1.65E+00	2.75E+01
7440-02-0	Nickel	7.6	J	UG/L	7.60E-01	7.60E-03
2023695	Potassium	3790	J	UG/L	2.35E+00	
7782-49-2	Selenium	5	U	UG/L	1.85E+00	5.00E-03
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	20400		UG/L	6.44E+00	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	13.1	J	UG/L	2.62E-01	
7440-66-6	Zinc	38.9		UG/L	1.95E+00	3.89E-02
Other Parameters						
ALK	Alkalinity, Total (as CaCO3)	151	J	MG/L	4.92E+00	
7664-41-7	Nitrogen, Ammonia (as N)	1.6		MG/L	6.15E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.14		MG/L	2.80E+00	
7601-90-3	Perchlorate	500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.25		MG/L	5.00E+00	
14808-79-8	Sulfate (as SO4)	11000		UG/L		2.20E-02
TDS	TDS	305		MG/L	4.25E+00	3.05E-01
TSS	TSS	34		MG/L	4.25E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-13
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		8	U	UG/KG	2.68E-04	
79-34-5	1,1,2,2-Tetrachloroethane		8	U	UG/KG	6.29E-02	
79-00-5	1,1,2-Trichloroethane		8	U	UG/KG	2.80E-04	
75-34-3	1,1-Dichloroethane		8	U	UG/KG	3.98E-04	
75-35-4	1,1-Dichloroethene		8	U	UG/KG	9.66E-04	
107-06-2	1,2-Dichloroethane (EDC)		8	U	UG/KG	3.77E-04	
540-59-0	1,2-Dichloroethene (total)		25		UG/KG	3.18E-02	
78-87-5	1,2-Dichloropropane		8	U	UG/KG	1.14E-05	
78-93-3	2-Butanone (MEK)		16	U	UG/KG	1.79E-04	
591-78-6	2-Hexanone		16	U	UG/KG	1.27E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		16	U	UG/KG	3.61E-05	
67-64-1	Acetone		16	U	UG/KG	6.40E-03	
71-43-2	Benzene		8	U	UG/KG	5.00E-04	
75-27-4	Bromodichloromethane		8	U	UG/KG	1.48E-02	
75-25-2	Bromoform		8	U	UG/KG	5.03E-04	
74-83-9	Bromomethane		8	U	UG/KG	3.40E-02	
75-15-0	Carbon disulfide		8	U	UG/KG	8.50E-02	
56-23-5	Carbon tetrachloride		8	U	UG/KG	8.00E-06	
108-90-7	Chlorobenzene		8	U	UG/KG	2.00E-04	
75-00-3	Chloroethane		8	U	UG/KG		
67-66-3	Chloroform		8	U	UG/KG	6.72E-03	
74-87-3	Chloromethane		8	U	UG/KG	7.69E-04	
156-59-2	cis-1,2-Dichloroethene		24		UG/KG	3.05E-02	
10061-01-5	cis-1,3-Dichloropropene		8	U	UG/KG	2.01E-02	
124-48-1	Dibromochloromethane		8	U	UG/KG	3.90E-03	
100-41-4	Ethylbenzene		8	U	UG/KG	1.60E-03	
75-09-2	Methylene chloride		8	U	UG/KG	1.98E-03	
110-54-3	N-Hexane		8	U	UG/KG		
100-42-5	Styrene		8	U	UG/KG	2.67E-05	
127-18-4	Tetrachloroethylene (PCE)		530	J	UG/KG	4.08E-02	
108-88-3	Toluene		8	U	UG/KG	2.67E-03	
1330-20-7	total Xylenes		8	U	UG/KG	1.33E-02	
156-60-5	trans-1,2-Dichloroethene		8	U	UG/KG	1.02E-02	
10061-02-6	trans-1,3-Dichloropropene		8	U	UG/KG	2.01E-02	
79-01-6	Trichloroethylene (TCE)		92		UG/KG	1.02E-02	
75-01-4	Vinyl chloride		8	U	UG/KG	1.24E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		510	U	UG/KG	2.55E-02	
95-50-1	1,2-Dichlorobenzene		510	U	UG/KG	1.72E-01	
541-73-1	1,3-Dichlorobenzene		510	U	UG/KG	1.35E-02	
106-46-7	1,4-Dichlorobenzene		510	U	UG/KG	2.55E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-13
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2600	U	UG/KG	6.50E-01	
88-06-2	2,4,6-Trichlorophenol		510	U	UG/KG	5.10E-02	
120-83-2	2,4-Dichlorophenol		510	U	UG/KG	5.83E-03	
105-67-9	2,4-Dimethylphenol		510	U	UG/KG	5.10E+01	
51-28-5	2,4-Dinitrophenol		2600	U	UG/KG	1.30E-01	
91-58-7	2-Chloronaphthalene		510	U	UG/KG	4.19E+01	
95-57-8	2-Chlorophenol		510	U	UG/KG	2.10E+00	
90-12-0	1-Methylnaphthalene		73		UG/KG		
91-57-6	2-Methylnaphthalene		1800		UG/KG	5.56E-01	YES
95-48-7	2-Methylphenol		510	U	UG/KG	1.26E-02	
88-74-4	2-Nitroaniline		2600	U	UG/KG	3.51E-02	
88-75-5	2-Nitrophenol		510	U	UG/KG	3.19E-01	
91-94-1	3,3'-Dichlorobenzidine		510	U	UG/KG	7.89E-01	
99-09-2	3-Nitroaniline		2600	U	UG/KG	8.23E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2600	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		510	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		510	U	UG/KG	6.42E-02	
106-47-8	4-Chloroaniline		1300		UG/KG	1.18E+00	
7005-72-3	4-Chlorophenyl phenyl ether		510	U	UG/KG		
106-44-5	4-Methylphenol		510	U	UG/KG	3.13E-03	
100-01-6	4-Nitroaniline		2600	U	UG/KG	1.19E-01	
100-02-7	4-Nitrophenol		2600	U	UG/KG	3.71E-01	
83-32-9	Acenaphthene		510	U	UG/KG	7.47E-04	
208-96-8	Acenaphthylene		450		UG/KG	6.59E-04	
120-12-7	Anthracene		330	J	UG/KG	2.23E-04	YES
56-55-3	Benzo(a)anthracene		1500		UG/KG	2.88E-01	YES
50-32-8	Benzo(a)pyrene		1800		UG/KG	4.09E-04	YES
205-99-2	Benzo(b)fluoranthene		2500		UG/KG	4.18E-02	YES
191-24-2	Benzo(g,h,i)perylene		1000		UG/KG	8.40E-03	YES
207-08-9	Benzo(k)fluoranthene		2300		UG/KG	3.85E-02	YES
111-91-1	bis(2-Chloroethoxy)methane		510	U	UG/KG	1.68E+00	
111-44-4	bis(2-Chloroethyl) ether		510	U	UG/KG	2.15E-02	
108-60-1	bis(2-Chloroisopropyl) ether		510	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		2000		UG/KG	2.16E+00	YES
85-68-7	Butyl benzyl phthalate		510	U	UG/KG	2.13E+00	
86-74-8	Carbazole		130	J	UG/KG		YES
218-01-9	Chrysene		1900		UG/KG	4.02E-01	YES
84-74-2	Di-n-butyl phthalate		2100		UG/KG	1.05E-02	YES
117-84-0	Di-n-octyl phthalate		510	U	UG/KG	7.19E-04	
53-70-3	Dibenz(a,h)anthracene		340	J	UG/KG	1.85E-02	YES
132-64-9	Dibenzofuran		440		UG/KG		YES
84-66-2	Diethyl phthalate		510	U	UG/KG	5.10E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-13
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		510	U	UG/KG	2.55E-03	
206-44-0	Fluoranthene		1600		UG/KG	1.31E-02	YES
86-73-7	Fluorene		510	U	UG/KG	1.70E-02	
118-74-1	Hexachlorobenzene		510	U	UG/KG	5.10E-04	
87-68-3	Hexachlorobutadiene		510	U	UG/KG	1.28E+01	
77-47-4	Hexachlorocyclopentadiene		510	U	UG/KG	5.10E-02	
67-72-1	Hexachloroethane		510	U	UG/KG	8.55E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		980		UG/KG	8.99E-03	YES
78-59-1	Isophorone		510	U	UG/KG	3.67E-03	
621-64-7	N-Nitroso-di-n-propylamine		510	U	UG/KG	9.38E-01	
86-30-6	N-Nitrosodiphenylamine		330	J	UG/KG	1.65E-02	
91-20-3	Naphthalene		810		UG/KG	3.25E-03	
87-86-5	Pentachlorophenol		130	J	UG/KG	2.17E-02	YES
85-01-8	Phenanthrene		830		UG/KG	1.82E-02	YES
108-95-2	Phenol		510	U	UG/KG	1.28E-02	
129-00-0	Pyrene		2300		UG/KG	2.93E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		380	U	UG/KG	1.01E+00	
99-65-0	1,3-Dinitrobenzene		380	UJ	UG/KG	5.80E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		770	UJ	UG/KG	2.57E-02	
121-14-2	2,4-Dinitrotoluene		500	J	UG/KG	3.91E-01	
606-20-2	2,6-Dinitrotoluene		690	UJ	UG/KG	2.10E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		770	UJ	UG/KG	9.63E-03	
88-72-2	2-Nitrotoluene (ONT)		770	UJ	UG/KG		
99-08-1	3-Nitrotoluene		770	UJ	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		280	J	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		250	J	UG/KG		
2691-41-0	HMX		720	J	UG/KG	2.88E-02	
98-95-3	Nitrobenzene		440	U	UG/KG	1.10E-02	
55-63-0	Nitroglycerin		16000	J	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		2800	U	UG/KG		
121-82-4	RDX		1300	J	UG/KG	1.30E-02	
479-45-8	Tetryl		1200	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	16500		MG/KG		
7440-36-0	Antimony	0.83	6		MG/KG	1.20E+00	
7440-38-2	Arsenic	13.5	14.6	J	MG/KG	1.62E+00	
7440-39-3	Barium	195	445		MG/KG	8.90E-01	
7440-41-7	Beryllium	0.76	0.96		MG/KG	9.60E-02	
7440-42-8	Boron	5.3	29.1		MG/KG	5.82E+01	
7440-43-9	Cadmium	0.19	204		MG/KG	7.03E+00	
7440-70-2	Calcium	2497	324000		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-13
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-47-3	Chromium	25.2	585		MG/KG	1.17E+02	
7440-48-4	Cobalt	21.7	21		MG/KG	1.05E+00	
7440-50-8	Copper	11.3	123		MG/KG	3.97E+00	
7439-89-6	Iron	19306	35000		MG/KG	1.75E+02	
7439-92-1	Lead	23.4	287		MG/KG	6.63E-01	
7439-95-4	Magnesium	1552	12500		MG/KG		
7439-96-5	Manganese	3640	3450		MG/KG	3.45E+01	
7439-97-6	Mercury	0.06	2	J	MG/KG	2.86E-01	YES
7440-02-0	Nickel	18.9	35.6		MG/KG	1.19E+00	
2023695	Potassium	625	1050		MG/KG		
7782-49-2	Selenium	2.34	1.9		MG/KG	1.90E+00	YES
7440-22-4	Silver	0.58	53.5		MG/KG	2.68E+01	
7440-23-5	Sodium	170	411		MG/KG		
7440-28-0	Thallium	0.41	0.9	J	MG/KG	9.00E-01	
7440-62-2	Vanadium	47.2	55.9		MG/KG	1.22E+00	
7440-66-6	Zinc	51.4	374		MG/KG	3.12E+00	
Dioxins							
1746-01-6	2,3,7,8-TCDD		0.000251	U	UG/KG	5.02E-08	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-14
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		8	U	UG/KG	4.71E-02	
79-34-5	1,1,2,2-Tetrachloroethane		8	U	UG/KG	8.51E-03	
79-00-5	1,1,2-Trichloroethane		8	U	UG/KG	7.52E-03	
75-34-3	1,1-Dichloroethane		8	U	UG/KG	8.53E-02	
75-35-4	1,1-Dichloroethene		8	U	UG/KG	7.50E-02	
107-06-2	1,2-Dichloroethane (EDC)		8	U	UG/KG	6.52E-03	
540-59-0	1,2-Dichloroethene (total)		8	U	UG/KG	3.23E-02	
78-87-5	1,2-Dichloropropane		8	U	UG/KG	5.80E-03	
78-93-3	2-Butanone (MEK)		16	U	UG/KG	3.64E-03	
591-78-6	2-Hexanone		16	U	UG/KG	1.21E-01	
108-10-1	4-Methyl-2-pentanone (MIBK)		16	U	UG/KG	7.65E-02	
67-64-1	Acetone		16	U	UG/KG	1.90E-01	
71-43-2	Benzene		8	U	UG/KG	1.40E-01	
75-27-4	Bromodichloromethane		8	U	UG/KG	4.56E-04	
75-25-2	Bromoform		8	U	UG/KG	6.40E-03	
74-83-9	Bromomethane		8	U	UG/KG	7.64E-04	
75-15-0	Carbon disulfide		8	U	UG/KG	4.00E+00	
56-23-5	Carbon tetrachloride		8	U	UG/KG	1.03E-01	
108-90-7	Chlorobenzene		8	U	UG/KG	9.76E-03	
75-00-3	Chloroethane		8	U	UG/KG	5.53E-04	
67-66-3	Chloroform		8	U	UG/KG	1.14E-01	
74-87-3	Chloromethane		8	U	UG/KG	1.67E-04	
156-59-2	cis-1,2-Dichloroethene		8	U	UG/KG	6.80E-03	
10061-01-5	cis-1,3-Dichloropropene		8	U	UG/KG	3.20E+01	
124-48-1	Dibromochloromethane		8	U	UG/KG	2.60E-04	
100-41-4	Ethylbenzene		8	U	UG/KG	2.22E-03	
75-09-2	Methylene chloride		8	U	UG/KG	8.66E-03	
110-54-3	N-Hexane		8	U	UG/KG		
100-42-5	Styrene		8	U	UG/KG	3.70E-04	
127-18-4	Tetrachloroethylene (PCE)		8	U	UG/KG	1.50E-02	
108-88-3	Toluene		8	U	UG/KG	1.19E-02	
1330-20-7	total Xylenes		8	U	UG/KG	3.20E-01	
156-60-5	trans-1,2-Dichloroethene		8	U	UG/KG	6.80E-03	
10061-02-6	trans-1,3-Dichloropropene		8	U	UG/KG	1.64E-01	
79-01-6	Trichloroethylene (TCE)		8	U	UG/KG	5.00E-03	
75-01-4	Vinyl chloride		8	U	UG/KG	3.03E-04	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		630	U	UG/KG	6.85E-02	
95-50-1	1,2-Dichlorobenzene		630	U	UG/KG	1.85E+00	
541-73-1	1,3-Dichlorobenzene		630	U	UG/KG	3.71E-01	
106-46-7	1,4-Dichlorobenzene		630	U	UG/KG	1.80E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-14
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		3100	U	UG/KG	2.14E+00	
88-06-2	2,4,6-Trichlorophenol		630	U	UG/KG	3.43E+01	
120-83-2	2,4-Dichlorophenol		630	U	UG/KG	1.73E+00	
105-67-9	2,4-Dimethylphenol		630	U	UG/KG	1.40E+01	
51-28-5	2,4-Dinitrophenol		3100	U	UG/KG	2.50E+02	
91-58-7	2-Chloronaphthalene		630	U	UG/KG	1.80E-01	
95-57-8	2-Chlorophenol		630	U	UG/KG	2.85E+00	
90-12-0	1-Methylnaphthalene		51		UG/KG		
91-57-6	2-Methylnaphthalene		180		UG/KG	2.57E+00	YES
95-48-7	2-Methylphenol		630	U	UG/KG	1.38E+02	
88-74-4	2-Nitroaniline		3100	U	UG/KG	6.42E-02	
88-75-5	2-Nitrophenol		630	U	UG/KG	1.98E-01	
91-94-1	3,3'-Dichlorobenzidine		630	U	UG/KG	3.15E-01	
99-09-2	3-Nitroaniline		3100	U	UG/KG	5.21E-02	
534-52-1	4,6-Dinitro-2-methylphenol		3100	U	UG/KG	3.70E+02	
101-55-3	4-Bromophenyl phenyl ether		630	U	UG/KG	4.85E-01	
59-50-7	4-Chloro-3-methylphenol		630	U	UG/KG	4.20E+03	
106-47-8	4-Chloroaniline		1300	U	UG/KG	7.93E-02	
7005-72-3	4-Chlorophenyl phenyl ether		630	U	UG/KG	4.58E-01	
106-44-5	4-Methylphenol		630	U	UG/KG	1.57E-01	
100-01-6	4-Nitroaniline		3100	U	UG/KG	8.56E-02	
100-02-7	4-Nitrophenol		3100	U	UG/KG	7.47E+01	
83-32-9	Acenaphthene		630	U	UG/KG	3.94E+01	
208-96-8	Acenaphthylene		630	U	UG/KG	1.43E+01	
120-12-7	Anthracene		630	U	UG/KG	1.11E+01	
56-55-3	Benzo(a)anthracene		59	J	UG/KG	5.46E-01	YES
50-32-8	Benzo(a)pyrene		87	J	UG/KG	5.80E-01	YES
205-99-2	Benzo(b)fluoranthene		94	J	UG/KG	3.48E+00	YES
191-24-2	Benzo(g,h,i)perylene		320	J	UG/KG	2.00E+01	YES
207-08-9	Benzo(k)fluoranthene		93	J	UG/KG	3.44E+00	YES
111-91-1	bis(2-Chloroethoxy)methane		630	U	UG/KG	4.85E-01	
111-44-4	bis(2-Chloroethyl) ether		630	U	UG/KG	2.21E-01	
108-60-1	bis(2-Chloroisopropyl) ether		630	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		230	J	UG/KG	3.07E-01	YES
85-68-7	Butyl benzyl phthalate		630	U	UG/KG	5.73E-02	
86-74-8	Carbazole		630	U	UG/KG	1.91E-01	
218-01-9	Chrysene		79	J	UG/KG	4.76E-01	YES
84-74-2	Di-n-butyl phthalate		53000		UG/KG	4.82E+00	YES
117-84-0	Di-n-octyl phthalate		630	U	UG/KG	8.90E-04	
53-70-3	Dibenz(a,h)anthracene		630	U	UG/KG	1.91E+01	
132-64-9	Dibenzofuran		630	U	UG/KG	3.15E-01	
84-66-2	Diethyl phthalate		630	U	UG/KG	1.00E+00	

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TABLE 16-14
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		630	U	UG/KG	1.20E-03	
206-44-0	Fluoranthene		73	J	UG/KG	1.73E-01	YES
86-73-7	Fluorene		630	U	UG/KG	8.14E+00	
118-74-1	Hexachlorobenzene		630	U	UG/KG	6.30E+00	
87-68-3	Hexachlorobutadiene		630	U	UG/KG	1.32E+01	
77-47-4	Hexachlorocyclopentadiene		630	U	UG/KG	2.11E+02	
67-72-1	Hexachloroethane		630	U	UG/KG	9.27E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		91	J	UG/KG	5.35E+00	YES
78-59-1	Isophorone		630	U	UG/KG	5.50E-01	
621-64-7	N-Nitroso-di-n-propylamine		630	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		7800		UG/KG	1.11E+01	
91-20-3	Naphthalene		630	U	UG/KG	3.58E+00	
87-86-5	Pentachlorophenol		3100	U	UG/KG	4.19E+01	
85-01-8	Phenanthrene		35		UG/KG	1.72E-01	YES
108-95-2	Phenol		630	U	UG/KG	1.31E+01	
129-00-0	Pyrene		87	J	UG/KG	4.46E-01	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		490	J	UG/KG	1.20E+01	
99-65-0	1,3-Dinitrobenzene		460	J	UG/KG	9.20E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		1800	J	UG/KG	3.10E+00	
121-14-2	2,4-Dinitrotoluene		210000	J	UG/KG	3.24E+02	
606-20-2	2,6-Dinitrotoluene		15000	J	UG/KG	1.75E+02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		7100	UJ	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		7100	UJ	UG/KG	4.23E-01	
99-08-1	3-Nitrotoluene		7100	UJ	UG/KG	5.97E-01	
19406-51-0	4-Amino-2,6-Dinitrotoluene		7100	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		7100	UJ	UG/KG	3.80E-01	
2691-41-0	HMX		10000	J	UG/KG	1.00E+03	
98-95-3	Nitrobenzene		540	J	UG/KG	9.23E-01	
55-63-0	Nitroglycerin		13000	J	UG/KG	3.94E+01	
78-11-5	Pentaerythritol tetranitrate (PETN)		3700	UJ	UG/KG	7.84E-03	
121-82-4	RDX		7100	UJ	UG/KG	3.55E+01	
479-45-8	Tetryl		11000	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	11241	18600		MG/KG	7.15E-01	
7440-36-0	Antimony	1.9	0.75	J	MG/KG	2.50E-01	
7440-38-2	Arsenic	10.3	25		MG/KG	2.55E+00	
7440-39-3	Barium	196	770		MG/KG		
7440-41-7	Beryllium	1.6	1.8		MG/KG		
7440-42-8	Boron		3.1	J	MG/KG		
7440-43-9	Cadmium	1.6	30.9		MG/KG	3.12E+01	
7440-70-2	Calcium	1448	44100		MG/KG		

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TABLE 16-14
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-47-3	Chromium	17.2	57		MG/KG	1.31E+00	
7440-48-4	Cobalt	9.1	21.1		MG/KG	4.22E-01	
7440-50-8	Copper	16.8	37.7		MG/KG	1.19E+00	
7439-89-6	Iron	20750	63400		MG/KG	3.34E-01	
7439-92-1	Lead	24	354		MG/KG	9.89E+00	
7439-95-4	Magnesium	1909	26300		MG/KG		
7439-96-5	Manganese	1043	999		MG/KG	1.59E+00	
7439-97-6	Mercury	0.15	0.071	J	MG/KG	3.94E-01	YES
7440-02-0	Nickel	16.9	29.2		MG/KG	1.29E+00	
2023695	Potassium	1421	1270		MG/KG		
7782-49-2	Selenium	0.64	1.9	J	MG/KG		YES
7440-22-4	Silver	3	1.7		MG/KG	1.70E+00	
7440-23-5	Sodium	1450	212		MG/KG		
7440-28-0	Thallium	0.31	1.8	U	MG/KG		
7440-62-2	Vanadium	28	66		MG/KG		
7440-66-6	Zinc	57.1	437		MG/KG	3.61E+00	
Other Parameters							
7601-90-3	Perchlorate		6900	U	UG/KG		
TOC	TOC	62778	59400		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-15
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		2	U	UG/L	1.43E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		2	U	UG/L	1.18E-02	
67-64-1	Acetone		5	UJ	UG/L	9.86E-03	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	UJ	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		1	U	UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1	U	UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-15
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
90-12-0	1-Methylnaphthalene		1	UJ	UG/L		
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		10	U	UG/L	3.33E+00	
85-68-7	Butyl benzyl phthalate		10	U	UG/L	5.26E-01	
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-15
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	10	U	UG/L	1.00E-01	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	UJ	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	UJ	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	U	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	UJ	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	U	UG/L	1.19E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	U	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		0.5	UJ	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	U	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	U	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	U	UG/L	7.14E-05	
2691-41-0	HMX		3.2		UG/L	9.70E-03	
98-95-3	Nitrobenzene		0.25	U	UG/L	9.26E-04	
55-63-0	Nitroglycerin		1	U	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		2	UJ	UG/L	2.35E-05	
121-82-4	RDX		1.8	J	UG/L	9.47E-03	
479-45-8	Tetryl		0.75	U	UG/L		
Metals							
7429-90-5	Aluminum	200	6520		UG/L	7.49E+01	
7440-36-0	Antimony	6	2.2	J	UG/L	7.33E-02	
7440-38-2	Arsenic	10	10	U	UG/L	5.26E-02	
7440-39-3	Barium	22.7	167	J	UG/L	3.34E-02	
7440-41-7	Beryllium	5	5	U	UG/L	9.43E+00	
7440-42-8	Boron		76.9	J	UG/L	7.69E-02	
7440-43-9	Cadmium	5	3.3	J	UG/L	3.00E+00	
7440-70-2	Calcium	7197	65600		UG/L	5.66E-01	
7440-47-3	Chromium	10	6.4	J	UG/L	3.09E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-15
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7440-48-4	Cobalt	50	50	U	UG/L	2.17E+01	
7440-50-8	Copper	10	6.2	J	UG/L	5.25E-01	
7439-89-6	Iron	100	7440		UG/L	7.44E+00	
7439-92-1	Lead	2	8.3		UG/L	4.13E-01	
7439-95-4	Magnesium	2534	16800		UG/L	2.05E-01	
7439-96-5	Manganese	582	692		UG/L	6.92E-01	
7439-97-6	Mercury	0.2	0.33		UG/L	2.54E-01	YES
7440-02-0	Nickel	10	7.6	J	UG/L	7.60E-03	
2023695	Potassium	1613	3790	J	UG/L	7.15E-02	
7782-49-2	Selenium	2.7	5	U	UG/L	5.00E-03	
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	20400		UG/L	3.00E-02	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	13.1	J	UG/L	6.89E-01	
7440-66-6	Zinc	20	38.9		UG/L	3.89E-02	
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	30.7	151	J	MG/L		
7664-41-7	Nitrogen, Ammonia (as N)	0.26	1.6		MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	0.14		MG/L		
7601-90-3	Perchlorate		500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.05	0.25		MG/L		
14808-79-8	Sulfate (as SO4)		11000		UG/L		
TDS	TDS	71.7	305		MG/L		
TSS	TSS	8	34		MG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 16-16

DIOXIN/FURAN TOXICITY EQUIVALENTS FOR SOIL SAMPLES FROM AREA 11H (AUS-A11H)

ADDITIONAL AND UNCHARACTERIZED SITES OU

FIELD ID	TEF	AUS-A11H-016-SS-05			AUS-A11H-039-SS-02		
		Result	Qual	*TEQ*	Result	Qual	*TEQ*
DIOXINS / FURANS (ng/kg)							
2,3,7,8-TCDD	**1.000**	<	U		<	U	
1,2,3,7,8-PeCDD	**1.000**	<	U		<	U	
1,2,3,4,7,8-HxCDD	**0.100**	<	U		<	U	
1,2,3,6,7,8-HxCDD	**0.100**	<	U		<	U	
1,2,3,7,8,9-HxCDD	**0.100**	<	U		<	U	
1,2,3,4,6,7,8-HpCDD	**0.010**	3.55		*0.0355*	5.24		*0.0524*
OCDD	**0.0001**	424.		*0.0424*	265.		*0.0265*
2,3,7,8--TCDF	**0.100**	<	U		.271	XJ	*0.0271*
1,2,3,7,8-PeCDF	**0.050**	<	U		<	U	
2,3,4,7,8-PeCDF	**0.500**	<	U		<	U	
1,2,3,4,7,8-HxCDF	**0.100**	<	U		<	U	
1,2,3,6,7,8-HxCDF	**0.100**	<	U		<	U	
2,3,4,6,7,8-HxCDF	**0.100**	<	U		<	U	
1,2,3,7,8,9-HxCDF	**0.100**	<	U		<	U	
1,2,3,4,6,7,8-HpCDF	**0.010**	<	U		.533	J	*0.0053*
1,2,3,4,7,8,9-HpCDF	**0.010**	<	U		<	U	
OCDF	**0.0001**	<	U		1.87	XJ	*0.0002*
Total TCDDs		<	U		<	U	
Total PeCDDs		<	U		<	U	
Total HxCDDs		.375	J		.537	J	
Total HpCDDs		7.42			11.		
Total TCDFs		<	U		<	U	
Total PeCDFs		<	U		<	U	
Total HxCDFs		<	U		<	U	
Total HpCDFs		<	U		1.61	J	
TOTAL TEQ				***0.0779***			***0.111517***

Diluted sample results were used, if available.
E = Value exceeds linear range
EDL = Estimated Detection Limit
J = Estimated
ND = Not Detected
Qual = Qualifier
TEF = Toxic Equivalency Factor
TEQ = Toxicity Equivalent
U = Nondetect
UJ = Estimated Nondetect
X = Estimated Maximum Possible Concentration (EMPC)

TABLE 16-17, AUS-A11H
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	No	A	No	A	No	A
1,1,2,2-Tetrachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,1,2-Trichloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,1-Dichloroethane	No	C	No	A	No	A	No	A
1,1-Dichloroethene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A	Yes	E
1,2-Dichloropropane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2-Butanone (MEK)	No	C	No	A	No	A	No	A
2-Hexanone	No	C	No	C	No	C	No	C
4-Methyl-2-pentanone (MIBK)	No	C	No	A	No	A	No	A
Acetone	No	C	No	A	No	A	No	A
Benzene	No	A	Uncertainty	B	Uncertainty	B	Uncertainty	B
Bromodichloromethane	No	C	Uncertainty	B	No	A	No	A
Bromoform	No	C	No	A	No	A	No	A
Bromomethane	No	C	No	A	No	A	No	A
Carbon disulfide	No	C	No	A	No	A	No	A
Carbon tetrachloride	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Chlorobenzene	No	C	No	A	No	A	No	A
Chloroethane	No	C	No	A	No	A	No	A
Chloroform	No	C	Uncertainty	B	No	A	No	A
Chloromethane	No	C	No	A	No	A	No	A
cis-1,2-Dichloroethene	No	C	No	A	No	A	Yes	E
cis-1,3-Dichloropropene	No	C	Uncertainty	B	No	A	No	A
Dibromochloromethane	No	C	Uncertainty	B	No	A	No	A
Ethylbenzene	No	A	No	A	No	A	No	A
Methylene chloride	No	A	No	A	Uncertainty	B	Uncertainty	B
N-Hexane	No	C	No	A	No	A	No	A
Styrene	No	C	No	A	No	A	No	A
Tetrachloroethylene (PCE)	No	C	No	A	Uncertainty	B	Yes	E
Toluene	No	A	No	A	No	A	No	A
total Xylenes	No	A	No	A	No	A	No	A
trans-1,2-Dichloroethene	No	C	No	A	No	A	No	A
trans-1,3-Dichloropropene	No	C	Uncertainty	B	No	A	No	A
Trichloroethylene (TCE)	No	C	No	A	Uncertainty	B	Yes	E
Vinyl chloride	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	No	A	No	A	No	A
1,3-Dichlorobenzene	No	C	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	No	A	No	A	No	A

TABLE 16-17, AUS-A11H
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	No	A	No	A	No	A
2-Chlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	No	C	No	A	No	F	No	F
2-Methylnaphthalene	No	A	No	A	No	F	No	F
2-Methylphenol	No	C	No	A	No	A	No	A
2-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
2-Nitrophenol	No	C	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	No	C	No	C	No	C
4-Bromophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Chloro-3-methylphenol	No	C	No	A	No	A	No	A
4-Chloroaniline	No	C	No	A	Uncertainty	B	Yes	E
4-Chlorophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Methylphenol	No	C	No	A	No	A	No	A
4-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4-Nitrophenol	No	C	No	A	No	A	No	A
Acenaphthene	No	C	No	A	No	A	No	A
Acenaphthylene	No	A	No	A	No	A	No	F
Anthracene	No	A	No	A	No	A	No	F
Benzo(a)anthracene	Uncertainty	B	Yes	E	No	F	Yes	E
Benzo(a)pyrene	Uncertainty	B	Yes	E	No	F	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	No	F	Yes	E
Benzo(g,h,i)perylene	No	A	No	F	No	F	No	F
Benzo(k)fluoranthene	No	C	Yes	E	No	F	Yes	E
bis(2-Chloroethoxy)methane	No	C	No	C	No	C	No	C
bis(2-Chloroethyl) ether	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	No	C	Uncertainty	B	No	F	No	F
Butyl benzyl phthalate	No	C	No	A	No	A	No	A
Carbazole	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Chrysene	Uncertainty	B	No	F	No	F	No	F
Di-n-butyl phthalate	No	C	No	A	No	F	No	F
Di-n-octyl phthalate	No	C	No	A	No	A	No	A
Dibenz(a,h)anthracene	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	No	C	No	A	No	A	No	F
Diethyl phthalate	No	C	No	A	No	A	No	A
Dimethyl phthalate	No	C	No	A	No	A	No	A
Fluoranthene	No	A	No	F	No	F	No	F

TABLE 16-17, AUS-A11H
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	No	A	No	A	No	A
Hexachlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	No	A	No	A	No	A
Hexachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Yes	E	No	F	Yes	E
Isophorone	No	C	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	No	A	Yes	E	Yes	E
Naphthalene	No	C	Uncertainty	B	No	A	No	F
Pentachlorophenol	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Phenanthrene	No	A	No	A	No	F	No	F
Phenol	No	A	No	A	No	A	No	A
Pyrene	No	A	No	F	No	F	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	Yes	E	No	F	No	F
Antimony	Uncertainty	G	Yes	E	Yes	D	Yes	E
Arsenic	No	C	Yes	E	Yes	E	Yes	E
Barium	No	F	No	F	Yes	E	Yes	E
Beryllium	No	C	Uncertainty	B	Yes	E	No	F
Boron	No	F	No	A	No	F	No	F
Cadmium	Uncertainty	G	No	F	Yes	E	Yes	E
Calcium	No	H	No	H	No	H	No	H
Chromium	Uncertainty	G	Yes	E	Yes	E	Yes	E
Cobalt	No	C	No	A	No	F	No	F
Copper	Uncertainty	G	No	F	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	Yes	E	No	F	No	F
Lead	Uncertainty	G	Yes	E	No	F	No	F
Magnesium	No	H	No	H	No	H	No	H
Manganese	No	F	Yes	E	No	F	No	F
Mercury	Yes	E	No	F	No	F	Yes	E
Nickel	No	F	Yes	E	Yes	E	Yes	E
Potassium	No	H	No	H	No	H	No	H
Selenium	No	A	No	F	Yes	E	Yes	D
Silver	Uncertainty	B	No	F	Yes	D	Yes	E
Sodium	No	H	No	H	No	H	No	H
Thallium	No	C	Uncertainty	B	No	A	No	F
Vanadium	Uncertainty	G	No	F	No	F	No	F
Zinc	No	F	No	F	No	F	No	F
Explosives								
1,3,5-Trinitrobenzene	No	C	No	A	No	F	No	A
1,3-Dinitrobenzene	No	C	No	A	No	F	No	A

TABLE 16-17, AUS-A11H
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	No	A	No	F	No	A
2,4-Dinitrotoluene	No	C	No	A	Yes	E	Yes	E
2,6-Dinitrotoluene	No	C	No	A	Yes	E	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	C	No	C	No	C	No	C
2-Nitrotoluene (ONT)	No	C	No	C	No	C	No	C
3-Nitrotoluene	No	C	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	No	C	No	C	Uncertainty	G
4-Nitrotoluene (PNT)	No	C	No	A	No	A	No	F
HMX	Uncertainty	G	No	A	No	F	No	F
Nitrobenzene	No	C	No	A	Yes	E	Uncertainty	B
Nitroglycerin	No	C	No	A	No	F	No	F
Pentaerythritol tetranitrate (PETN)	No	C	No	C	No	C	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	Uncertainty	G	Yes	E	No	A	No	F
Tetryl	No	C	No	A	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	Uncertainty	G	Yes	E	NA	NA	NA	NA
Phosphorus, Total (as P)	Uncertainty	G	Yes	E	NA	NA	NA	NA
Dioxins								
2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA	No	C

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 16-18, AUS-A11H
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	No	A	No	A
1,1,2,2-Tetrachloroethane	No	A	No	A	No	A
1,1,2-Trichloroethane	No	A	No	A	No	A
1,1-Dichloroethane	No	A	No	A	No	A
1,1-Dichloroethene	No	A	No	A	No	A
1,2-Dichloroethane (EDC)	No	A	No	A	No	A
1,2-Dichloroethene (total)	NA	NA	No	A	No	F
1,2-Dichloropropane	No	A	No	A	No	A
2-Butanone (MEK)	No	A	No	A	No	A
2-Hexanone	No	A	No	A	No	A
4-Methyl-2-pentanone (MIBK)	No	A	No	A	No	A
Acetone	No	A	No	A	No	A
Benzene	No	A	No	A	No	A
Bromodichloromethane	No	A	No	A	No	A
Bromoform	No	A	No	A	No	A
Bromomethane	No	A	No	A	No	A
Carbon disulfide	Uncertainty	B	Uncertainty	B	No	A
Carbon tetrachloride	No	A	No	A	No	A
Chlorobenzene	No	A	No	A	No	A
Chloroethane	No	A	No	A	No	C
Chloroform	No	A	No	A	No	A
Chloromethane	No	A	No	A	No	A
cis-1,2-Dichloroethene	No	A	No	A	No	F
cis-1,3-Dichloropropene	Uncertainty	B	Uncertainty	B	No	A
Dibromochloromethane	No	A	No	A	No	A
Ethylbenzene	No	A	No	A	No	A
Methylene chloride	No	A	No	A	No	A
N-Hexane	No	C	No	C	No	C
Styrene	No	A	No	A	No	A
Tetrachloroethylene (PCE)	No	A	No	A	No	F
Toluene	No	A	No	A	No	A
total Xylenes	No	A	No	A	No	A
trans-1,2-Dichloroethene	No	A	No	A	No	A
trans-1,3-Dichloropropene	No	A	No	A	No	A
Trichloroethylene (TCE)	No	A	No	A	No	F
Vinyl chloride	No	A	No	A	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	No	A	No	A
1,2-Dichlorobenzene	No	A	Uncertainty	B	No	A
1,3-Dichlorobenzene	No	A	No	A	No	A
1,4-Dichlorobenzene	No	A	Uncertainty	B	No	A
2,4,5-Trichlorophenol	No	A	Uncertainty	B	No	A

TABLE 16-18, AUS-A11H
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	Uncertainty	B	No	A
2,4-Dichlorophenol	No	A	Uncertainty	B	No	A
2,4-Dimethylphenol	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	Uncertainty	B	No	A
2-Chloronaphthalene	No	A	No	A	Uncertainty	B
2-Chlorophenol	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	No	A	Uncertainty	G	Uncertainty	G
2-Methylnaphthalene	No	A	Yes	E	Yes	E
2-Methylphenol	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	A	No	A	No	A
2-Nitrophenol	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	A	No	A	No	A
3-Nitroaniline	No	A	No	A	No	A
4,6-Dinitro-2-methylphenol	Uncertainty	B	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	No	A	No	C
4-Chloro-3-methylphenol	Uncertainty	B	Uncertainty	B	No	A
4-Chloroaniline	No	A	No	A	Yes	E
4-Chlorophenyl phenyl ether	No	A	No	A	No	C
4-Methylphenol	No	A	No	A	No	A
4-Nitroaniline	No	A	No	A	No	A
4-Nitrophenol	No	A	Uncertainty	B	No	A
Acenaphthene	No	A	Uncertainty	B	No	A
Acenaphthylene	No	A	Uncertainty	B	No	F
Anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Benzo(a)anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Yes	E	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	Yes	E	Yes	E
bis(2-Chloroethoxy)methane	No	A	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	No	A	No	A
bis(2-Chloroisopropyl) ether	No	C	No	C	No	C
bis(2-Ethylhexyl) phthalate	Uncertainty	B	Yes	E	Yes	E
Butyl benzyl phthalate	No	A	No	A	Uncertainty	B
Carbazole	No	A	No	A	Yes	E
Chrysene	No	A	Yes	E	Yes	E
Di-n-butyl phthalate	Uncertainty	B	Yes	E	Yes	E
Di-n-octyl phthalate	No	A	No	A	No	A
Dibenz(a,h)anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	Uncertainty	B	No	A	Yes	E
Diethyl phthalate	No	A	Uncertainty	B	No	A
Dimethyl phthalate	No	A	No	A	No	A
Fluoranthene	Uncertainty	B	Yes	E	Yes	E

TABLE 16-18, AUS-A11H
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobenzene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobutadiene	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	Uncertainty	B	No	A
Hexachloroethane	Uncertainty	B	Uncertainty	B	No	A
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Yes	E	Yes	E
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	No	A
N-Nitrosodiphenylamine	No	A	Yes	E	No	F
Naphthalene	No	A	Uncertainty	B	No	F
Pentachlorophenol	Uncertainty	B	Uncertainty	B	Yes	E
Phenanthrene	Uncertainty	B	Yes	E	Yes	E
Phenol	No	A	Uncertainty	B	No	A
Pyrene	No	A	Yes	E	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	F	No	F	Yes	E
Arsenic	No	A	Yes	E	Yes	E
Barium	No	F	Uncertainty	G	No	F
Beryllium	Uncertainty	B	Uncertainty	G	No	F
Boron	No	F	Uncertainty	G	Yes	E
Cadmium	Yes	D	Yes	E	Yes	E
Calcium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	Yes	E	Yes	E
Cobalt	Uncertainty	B	No	F	Yes	D
Copper	No	F	Yes	E	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	Yes	E
Lead	No	F	Yes	E	No	F
Magnesium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	No	F	Yes	D	Yes	D
Mercury	Yes	E	Yes	D	Yes	E
Nickel	No	F	Yes	E	Yes	E
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	No	A	Yes	E	Yes	D
Silver	Uncertainty	B	Yes	D	Yes	E
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Uncertainty	B	No	C	No	F
Vanadium	No	F	Uncertainty	G	Yes	E
Zinc	No	F	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	No	A	Yes	E	Uncertainty	B
1,3-Dinitrobenzene	No	A	Yes	E	No	A

TABLE 16-18, AUS-A11H
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Yes	E	No	A
2,4-Dinitrotoluene	No	A	Yes	E	No	F
2,6-Dinitrotoluene	No	A	Yes	E	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	A	No	C	No	A
2-Nitrotoluene (ONT)	No	A	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	A	No	C	Uncertainty	G
4-Nitrotoluene (PNT)	No	A	No	A	Uncertainty	G
HMX	No	F	Yes	E	No	F
Nitrobenzene	No	A	No	F	No	A
Nitroglycerin	No	A	Yes	E	Uncertainty	G
Pentaerythritol tetranitrate (PETN)	No	A	No	A	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	F	Uncertainty	B	No	F
Tetryl	No	C	No	C	No	C
Dioxins						
2,3,7,8-TCDD	NA	NA	NA	NA	No	A

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 16-19
AUS-A11H - IOP GROUP II MELT LOADING LINE
(HIGH EXPLOSIVES AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Groundwater & Trench Water	Surface Water
VOCs					
1,2-Dichloroethene (total)		H		NA	NA
cis-1,2-Dichloroethene		H			
Tetrachloroethylene (PCE)		H			
Trichloroethylene (TCE)		H			
SVOCs					
2-Methylnaphthalene		E	E		
4-Chloroaniline		H,E			
Anthracene		E			
Benzo(a)anthracene		H,E	E	H	
Benzo(a)pyrene		H,E	E	H	
Benzo(b)fluoranthene		H,E	E	H	
Benzo(g,h,i)perylene		E	E		
Benzo(k)fluoranthene		H,E	E	H	
bis(2-Ethylhexyl)phthalate (DEHP)		E	E		
Carbazole		H,E			
Chrysene		E	E		
Di-n-butyl phthalate		E	E		
Dibenz(a,h)anthracene		H,E			
Dibenzofuran		E			
Fluoranthene		E	E		
Indeno(1,2,3-c,d)pyrene		H,E	E	H	
N-Nitrosodiphenylamine		H	H,E		
Pentachlorophenol		H,E			
Phenanthrene		E	E		
Pyrene		E	E		
Metals					
Aluminum				H	E
Antimony		H,E		H	
Arsenic		H,E	H,E	H	
Barium		H	H		
Beryllium			H		
Boron		E			
Cadmium		H,E	H,E		
Chromium		H,E	H,E	H	
Copper		E	E		
Iron		E		H	H,E
Lead			E	H	
Manganese				H	
Mercury		H,E			H,E
Nickel		H,E	H,E	H	
Selenium			H,E		

TABLE 16-19

AUS-A11H - IOP GROUP II MELT LOADING LINE

(HIGH EXPLOSIVES AREA)

CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND

(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Groundwater & Trench Water	Surface Water
Silver		H,E			
Vanadium		E			
Zinc		E	E		
Explosives					
1,3,5-Trinitrobenzene			E		
1,3-Dinitrobenzene			E		
2,4,6-Trinitrotoluene (TNT)			E		
2,4-Dinitrotoluene		H	H,E		
2,6-Dinitrotoluene			H,E		
HMX			E		
Nitrobenzene			H		
Nitroglycerin			E		
RDX				H	
Other Parameters					
Nitrogen, Nitrate-Nitrite		NA	NA	H	
Phosphorus, Total (as P)		NA	NA	H	

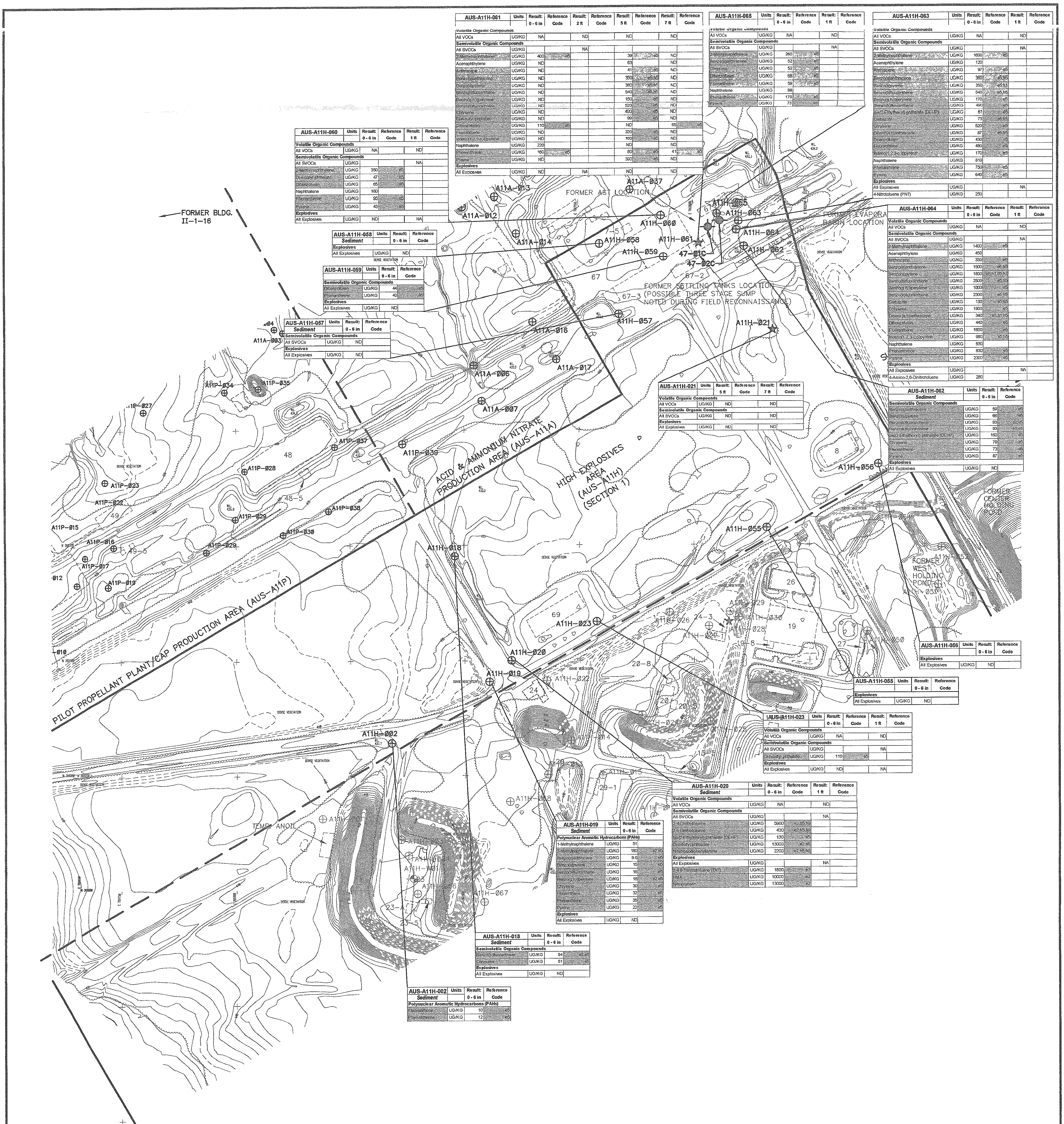
Key:

[1] Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded



AUS-A11H-061	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code	Result: 7 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA					
2-Methylnaphthalene	UG/KG	400	e5			39	e5	ND	
Acenaphthylene	UG/KG	ND				63		ND	
Anthracene	UG/KG	ND				41	e5	ND	
Benzo(a)anthracene	UG/KG	ND				350	e5,h5	ND	
Benzo(a)pyrene	UG/KG	ND				380	e5,h1	ND	
Benzo(b)fluoranthene	UG/KG	ND				540	e5,h5	ND	
Benzo(g,h,i)perylene	UG/KG	ND				150	e5	ND	
Benzo(k)fluoranthene	UG/KG	ND				520	e5	ND	
Chrysene	UG/KG	ND				400	e5	ND	
Di-n-butyl phthalate	UG/KG	ND				99	e5	ND	
Dibenzofuran	UG/KG	110	e5			ND		65	e5
Fluoranthene	UG/KG	ND				320	e5	ND	
Indeno(1,2,3-c,d)pyrene	UG/KG	ND				160	e5	ND	
Naphthalene	UG/KG	220				ND		ND	
Phenanthrene	UG/KG	160	e5			80	e5	41	e5
Pyrene	UG/KG	ND				390	e5	ND	
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

AUS-A11H-065	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	260	e5		
Benzo(a)anthracene	UG/KG	52	e5		
Chrysene	UG/KG	52	e5		
Dibenzofuran	UG/KG	68	e5		
Fluoranthene	UG/KG	59	e5		
Naphthalene	UG/KG	98			
Phenanthrene	UG/KG	170	e5		
Pyrene	UG/KG	73	e5		

AUS-A11H-063	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	1800	e5		
Acenaphthylene	UG/KG	120			
Anthracene	UG/KG	97	e5		
Benzo(a)anthracene	UG/KG	360	e5,h5		
Benzo(a)pyrene	UG/KG	350	e5,h1		
Benzo(b)fluoranthene	UG/KG	540	e5,h5		
Benzo(g,h,i)perylene	UG/KG	170	e5		
Benzo(k)fluoranthene	UG/KG	490	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	61	e5		
Carbazole	UG/KG	73	e5,h5		
Chrysene	UG/KG	520	e5		
Dibenz(a,h)anthracene	UG/KG	87	e5,h5		
Dibenzofuran	UG/KG	430	e5		
Fluoranthene	UG/KG	480	e5		
Indeno(1,2,3-c,d)pyrene	UG/KG	170	e5		
Naphthalene	UG/KG	810			
Phenanthrene	UG/KG	750	e5		
Pyrene	UG/KG	640	e5		
Explosives					
All Explosives	UG/KG			NA	
4-Nitrotoluene (PNT)	UG/KG	250			

AUS-A11H-060	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	350	e5		
Di-n-butyl phthalate	UG/KG	47	e5		
Dibenzofuran	UG/KG	65	e5		
Naphthalene	UG/KG	180			
Phenanthrene	UG/KG	95	e5		
Pyrene	UG/KG	43	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-A11H-058 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-059	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Dibenzofuran	UG/KG	44	e5
Phenanthrene	UG/KG	40	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-057 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-064	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	1400	e5		
Acenaphthylene	UG/KG	450			
Anthracene	UG/KG	330	e5		
Benzo(a)anthracene	UG/KG	1500	e5,h5		
Benzo(a)pyrene	UG/KG	1800	e5,h1,h5,h7		
Benzo(b)fluoranthene	UG/KG	2500	e5,h5		
Benzo(g,h,i)perylene	UG/KG	1000	e5		
Benzo(k)fluoranthene	UG/KG	2300	e5,h5		
Carbazole	UG/KG	130	e5,h5		
Chrysene	UG/KG	1900	e5		
Dibenz(a,h)anthracene	UG/KG	340	e5,h1,h5		
Dibenzofuran	UG/KG	440	e5		
Fluoranthene	UG/KG	1600	e5		
Indeno(1,2,3-c,d)pyrene	UG/KG	980	e5,h5		
Naphthalene	UG/KG	630			
Phenanthrene	UG/KG	830	e5		
Pyrene	UG/KG	2300	e5		
Explosives					
All Explosives	UG/KG			NA	
4-Amino-2,6-Dinitrotoluene	UG/KG	280			

AUS-A11H-062 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Benzo(a)anthracene	UG/KG	59	e5
Benzo(a)pyrene	UG/KG	66	e5
Benzo(b)fluoranthene	UG/KG	93	e2,e5
Benzo(k)fluoranthene	UG/KG	93	e2,e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	160	e5
Chrysene	UG/KG	79	e5
Fluoranthene	UG/KG	73	e5
Pyrene	UG/KG	87	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-021	Units	Result: 5 ft	Reference Code	Result: 7 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	ND		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		ND	
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-A11H-056	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-055	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-023	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
Di-n-butyl phthalate	UG/KG	110	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-A11H-020 *Sediment*	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2,4-Dinitrotoluene	UG/KG	5900	e2,h5,h9		
2,6-Dinitrotoluene	UG/KG	430	e2,h5,h9		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	130	e5		
Di-n-butyl phthalate	UG/KG	13000	e2,e5		
N-Nitrosodiphenylamine	UG/KG	2200	e2,h5,h9		
Explosives					
All Explosives	UG/KG			NA	
2,4,6-Trinitrotoluene (TNT)	UG/KG	1800	e2		
HMX	UG/KG	10000	e2		
Nitroglycerin	UG/KG	13000	e2		

AUS-A11H-019 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
1-Methylnaphthalene	UG/KG	51	
2-Methylnaphthalene	UG/KG	180	e2,e5
Benzo(a)anthracene	UG/KG	9.6	e5
Benzo(a)pyrene	UG/KG	15	e5
Benzo(b)fluoranthene	UG/KG	18	e5
Benzo(g,h,i)perylene	UG/KG	18	e2,e5
Chrysene	UG/KG	30	e5
Fluoranthene	UG/KG	32	e5
Phenanthrene	UG/KG	35	e5
Pyrene	UG/KG	22	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-018 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Benzo(b)fluoranthene	UG/KG	94	e2,e5
Chrysene	UG/KG	51	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-002 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
Fluoranthene	UG/KG	10	e5
Phenanthrene	UG/KG	12	e5

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

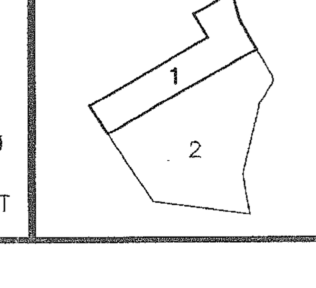
3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

N

100 0 100
SCALE FEET

AREA 11H-SECTION LOCATION MAP



PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11H-Section 1-Sample Locations and Detections of Organic Compounds in Soils/Sediments

Date:	Project Number:	Figure Number:
12/26/00	2320000026.00	16-1
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

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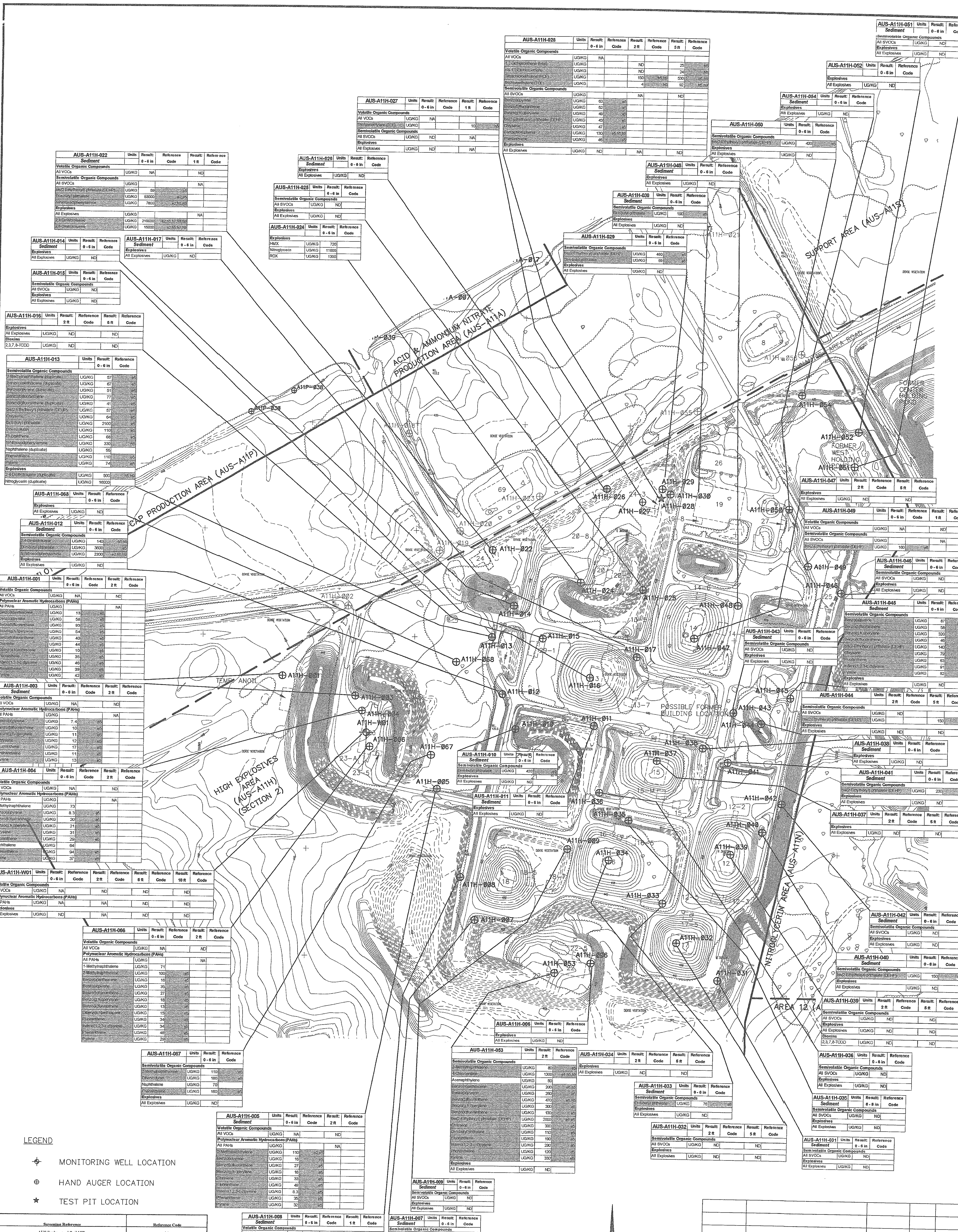
AREA 11H-HIGH EXPLOSIVES AREA

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11&12\AUS-0-A11H 16-1&2A.DWG Last edited: SEP. 21, 01 @ 1:13 p.m. URS Corp.



AUS-A11H-022 Sediment	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	59	e5		
Di-n-butyl phthalate	UG/KG	53000	e2,e5		
N-Nitrosodiphenylamine	UG/KG	7800	e2,h5,h9		
Explosives					
All Explosives	UG/KG			NA	
2,4-Dinitrotoluene	UG/KG	210000	e2,h5,h7,h8,h9		
2,6-Dinitrotoluene	UG/KG	15000	e2,h5,h7,h9		

AUS-A11H-014 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-017 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-015	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-016	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Explosives					
All Explosives	UG/KG	ND		ND	
Dioxins					
2,3,7,8-TCDD	UG/KG	ND		ND	

AUS-A11H-013	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
2-Methylnaphthalene (duplicate)	UG/KG	57	e5
Benzo(a)anthracene (duplicate)	UG/KG	67	e5
Benzo(a)pyrene (duplicate)	UG/KG	51	e5
Benzo(b)fluoranthene	UG/KG	77	e5
Benzo(k)fluoranthene (duplicate)	UG/KG	41	e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	57	e5
Chrysene	UG/KG	64	e5
Di-n-butyl phthalate	UG/KG	2100	e5
Dibenzofuran	UG/KG	110	e5
Fluoranthene	UG/KG	68	e5
N-Nitrosodiphenylamine	UG/KG	330	h5
Naphthalene (duplicate)	UG/KG	55	
Phenanthrene	UG/KG	110	e5
Pyrene	UG/KG	74	e5
Explosives			
2,4-Dinitrotoluene (duplicate)	UG/KG	500	h5,h9
Nitroglycerin (duplicate)	UG/KG	16000	

AUS-A11H-068	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-012 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
2,4-Dinitrotoluene	UG/KG	140	h5,h9
Di-n-butyl phthalate	UG/KG	3600	e5
N-Nitrosodiphenylamine	UG/KG	2300	e2,h5,h9
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-001	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)					
All PAHs	UG/KG			NA	
Benzo(a)anthracene	UG/KG	13	e5		
Benzo(a)pyrene	UG/KG	58	e5		
Benzo(b)fluoranthene	UG/KG	93	e5		
Benzo(g,h,i)perylene	UG/KG	54	e5		
Benzo(k)fluoranthene	UG/KG	40	e5		
Chrysene	UG/KG	44	e5		
Dibenz(a,h)anthracene	UG/KG	10	e5		
Fluoranthene	UG/KG	35	e5		
Indeno(1,2,3-c,d)pyrene	UG/KG	46	e5		
Phenanthrene	UG/KG	39	e5		
Pyrene	UG/KG	42	e5		

AUS-A11H-003 Sediment	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)					
All PAHs	UG/KG			NA	
Benzo(a)pyrene	UG/KG	7.4	e5		
Benzo(b)fluoranthene	UG/KG	10	e5		
Benzo(g,h,i)perylene	UG/KG	11	e5		
Chrysene	UG/KG	12	e5		
Fluoranthene	UG/KG	17	e5		
Phenanthrene	UG/KG	11	e5		
Pyrene	UG/KG	13	e5		

AUS-A11H-004	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)					
All PAHs	UG/KG			NA	
1-Methylnaphthalene	UG/KG	73			
Benzo(a)pyrene	UG/KG	8.3	e5		
Benzo(b)fluoranthene	UG/KG	20	e5		
Benzo(g,h,i)perylene	UG/KG	21	e5		
Chrysene	UG/KG	31	e5		
Fluoranthene	UG/KG	29	e5		
Naphthalene	UG/KG	64			
Phenanthrene	UG/KG	94	e5		
Pyrene	UG/KG	37	e5		

AUS-A11H-W01	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code	Result: 18 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)									
All PAHs	UG/KG	NA		NA		ND		ND	
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

AUS-A11H-066	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)					
All PAHs	UG/KG			NA	
1-Methylnaphthalene	UG/KG	71			
2-Methylnaphthalene	UG/KG	100	e5		
Benzo(a)anthracene	UG/KG	16	e5		
Benzo(a)pyrene	UG/KG	35	e5		
Benzo(b)fluoranthene	UG/KG	27	e5		
Benzo(g,h,i)perylene	UG/KG	18	e5		
Benzo(k)fluoranthene	UG/KG	13	e5		
Dibenz(a,h)anthracene	UG/KG	15	e5		
Fluoranthene	UG/KG	34	e5		
Indeno(1,2,3-c,d)pyrene	UG/KG	34	e5		
Phenanthrene	UG/KG	48	e5		
Pyrene	UG/KG	29	e5		

AUS-A11H-067	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	110	e5
Dibenzofuran	UG/KG	180	e5
Naphthalene	UG/KG	70	
Phenanthrene	UG/KG	160	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-005 Sediment	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)					
All PAHs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	110	e2,e5		
Benzo(a)pyrene	UG/KG	16	e5		
Benzo(b)fluoranthene	UG/KG	27	e5		
Benzo(g,h,i)perylene	UG/KG	16	e5		
Chrysene	UG/KG	33	e5		
Fluoranthene	UG/KG	49	e5		
Indeno(1,2,3-c,d)pyrene	UG/KG	8.3	e5		
Phenanthrene	UG/KG	35	e5		
Pyrene	UG/KG	32	e5		

AUS-A11H-008 Sediment	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG			NA	
1,3,5-Trinitrobenzene	UG/KG	490	e2		
1,3-Dinitrobenzene	UG/KG	460	e2		
2,4-Dinitrotoluene	UG/KG	510	h5,h9		
Nitrobenzene	UG/KG	540	h9		

AUS-A11H-009 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-007 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-006	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-053	Units	Result: 2 ft	Reference Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	80	e5
4-Chloroaniline	UG/KG	1300	e1,h5,h9
Acenaphthylene	UG/KG	50	
Benzo(a)anthracene	UG/KG	200	e5,h5
Benzo(a)pyrene	UG/KG	260	e5
Benzo(b)fluoranthene	UG/KG	470	e5,h5
Benzo(g,h,i)perylene	UG/KG	300	e5
Benzo(k)fluoranthene	UG/KG	130	e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	2000	e1,e5
Chrysene	UG/KG	300	e5
Di-n-butyl phthalate	UG/KG	110	e5
Fluoranthene	UG/KG	190	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	290	e5
Phenanthrene	UG/KG	120	e5
Pyrene	UG/KG	330	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-034	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-A11H-033 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Di-n-butyl phthalate	UG/KG	76	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-032	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		ND	
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-A11H-031 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-035 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-036	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-039	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		ND	
Explosives					
All Explosives	UG/KG	ND		ND	
Dioxins					
2,3,7,8-TCDD	UG/KG	ND		ND	

AUS-A11H-040 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	150	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-042 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-037	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-A11H-041 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	230	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-038 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-044	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG			150	e5
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-A11H-043 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-045 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Benzo(a)pyrene	UG/KG	87	e5
Benzo(b)fluoranthene	UG/KG	58	e2,e5
Benzo(g,h,i)perylene	UG/KG	320	e2,e5
Benzo(k)fluoranthene	UG/KG	46	e2,e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	140	e5
Chrysene	UG/KG	79	e5
Fluoranthene	UG/KG	63	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	91	e2,e5
Pyrene	UG/KG	82	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-046 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-049	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	160	e5		

AUS-A11H-047	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-A11H-051 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-052	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-054 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-050	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	420	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-048 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-030 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Di-n-butyl phthalate	UG/KG	190	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-029	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	460	e5
Di-n-butyl phthalate	UG/KG	69	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-028	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA					
1,2-Dichloroethene (total)	UG/KG			ND		25	h5
cis-1,2-Dichloroethene	UG/KG			ND		24	h5
Tetrachloroethylene (PCE)	UG/KG			150	h5,h9	530	h5,h9
Trichloroethylene (TCE)	UG/KG			4	h5	92	h5,h9
Semivolatile Organic Compounds							
All SVOCs	UG/KG			NA		ND	
Benzo(a)pyrene	UG/KG	63	e5				
Benzo(b)fluoranthene	UG/KG	52	e5				
Benzo(g,h,i)perylene	UG/KG	49	e5				
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	43	e5				
Chrysene	UG/KG	47	e5				
Pentachlorophenol	UG/KG	130	e5,h5,h9				
Phenanthrene	UG/KG	46	e5				
Explosives							
All Explosives	UG/KG	ND		NA		ND	

AUS-A11H-027	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA			
Trichloroethylene (TCE)	UG/KG			10	h5
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-A11H-026 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-025	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-024	Units	Result: 0 - 6 in	Reference Code
Explosives			
HMX	UG/KG	720	
Nitroglycerin	UG/KG	11000	
RDX	UG/KG	1300	

AUS-A11H-010 Sediment	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
Di-n-butyl phthalate	UG/KG	420	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-A11H-011 Sediment	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AREA 11H–
HIGH EXPLOSIVES AREA

100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15–3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

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AREA 11H–SECTION LOCATION MAP
1
2

Revision No.	Description	Date	By	App.

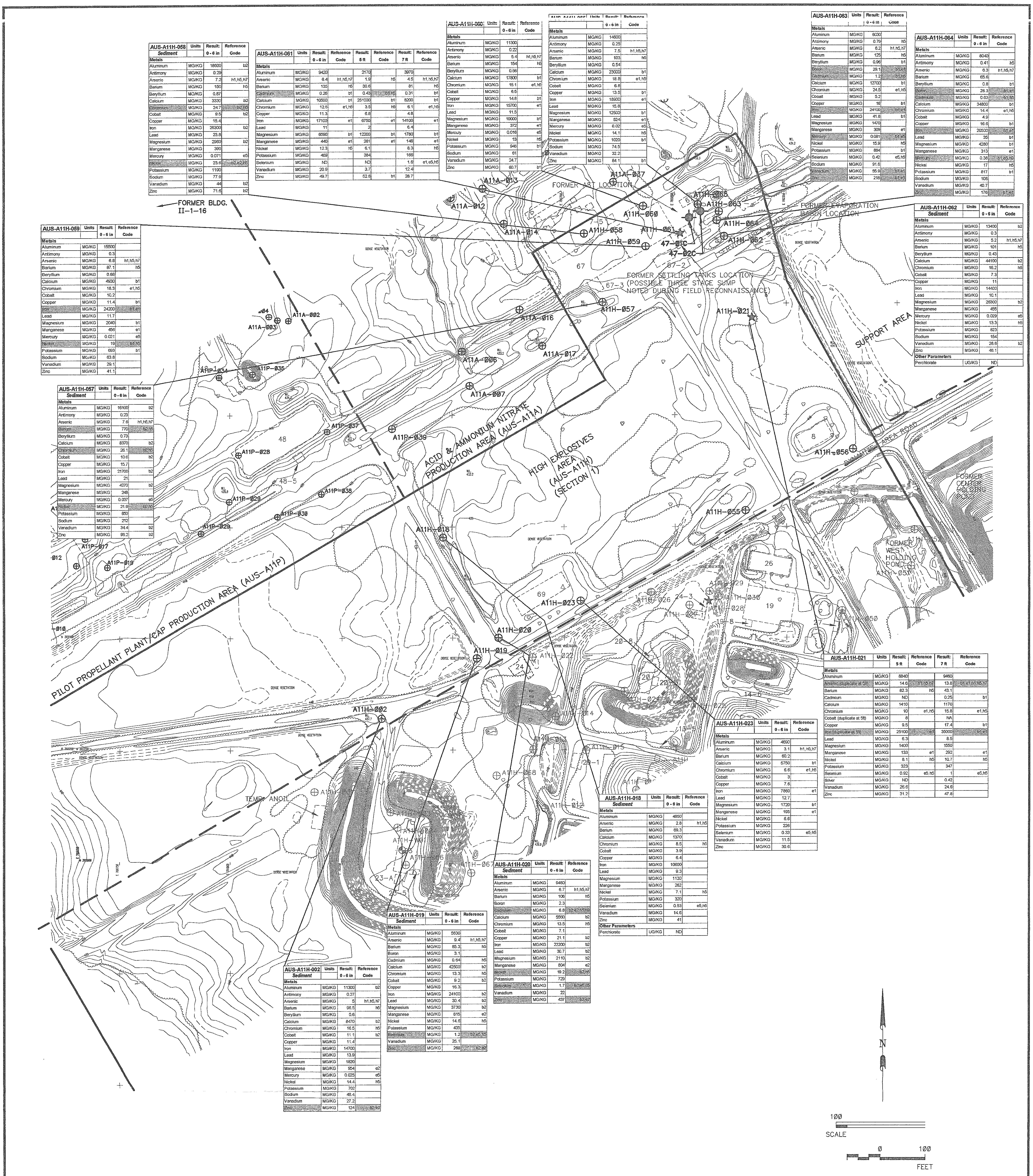
REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–A11H–Section 2–Sample Locations and Detections of Organic Compounds in Soils/Sediments

Date: 12/26/00	Project Number: 23200000026.00	Figure Number: 16–2
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS



AUS-A11H-058	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	18600	b2
Antimony	MG/KG	0.29	
Arsenic	MG/KG	7.2	h1,h5,h7
Barium	MG/KG	150	h5
Beryllium	MG/KG	0.87	
Calcium	MG/KG	3330	b2
Chromium	MG/KG	24.7	b2,h5
Cobalt	MG/KG	9.5	b2
Copper	MG/KG	15.4	
Iron	MG/KG	26300	b2
Lead	MG/KG	23.8	
Magnesium	MG/KG	2960	b2
Manganese	MG/KG	390	
Mercury	MG/KG	0.071	e5
Nickel	MG/KG	23.6	b2,e2,h5
Potassium	MG/KG	1190	
Sodium	MG/KG	77.9	
Vanadium	MG/KG	44	b2
Zinc	MG/KG	71.6	b2

AUS-A11H-061	Units	Result:	Reference	Result:	Reference	Result:	Reference
		0 - 6 in	Code	5 ft	Code	7 ft	Code
Metals							
Aluminum	MG/KG	9420		2170		3970	
Arsenic	MG/KG	6.4	h1,h5,h7	1.9	h5	4.5	h1,h5,h7
Barium	MG/KG	135	h5	30.6		81	h5
Cadmium	MG/KG	0.26	b1	0.43	b1,h5	0.31	b1
Calcium	MG/KG	10500	b1	251000	b1	8200	b1
Chromium	MG/KG	12.5	e1,h5	3.5	h5	6.1	e1,h5
Copper	MG/KG	11.3		6.8		4.8	
Iron	MG/KG	17100	e1	6750	e1	14100	e1
Lead	MG/KG	11		2		6.4	
Magnesium	MG/KG	6590	b1	12200	b1	1780	b1
Manganese	MG/KG	440	e1	261	e1	146	e1
Nickel	MG/KG	12.3	h5	6.1		8.3	h5
Potassium	MG/KG	469		384		166	
Selenium	MG/KG	ND		ND		1.6	e1,e5,h5
Vanadium	MG/KG	20.9		3.7		12.4	
Zinc	MG/KG	49.7		52.8	b1	28.7	

AUS-A11H-060	Units	Result:	Reference
		0 - 6 in	Code
Metals			
Aluminum	MG/KG	11300	
Antimony	MG/KG	0.22	
Arsenic	MG/KG	5.4	h1,h5,h7
Barium	MG/KG	154	h5
Beryllium	MG/KG	0.56	
Calcium	MG/KG	17800	b1
Chromium	MG/KG	15.1	e1,h5
Cobalt	MG/KG	6.5	
Copper	MG/KG	14.8	b1
Iron	MG/KG	15700	e1
Lead	MG/KG	11.5	
Magnesium	MG/KG	10000	b1
Manganese	MG/KG	372	e1
Mercury	MG/KG	0.016	e5
Nickel	MG/KG	13	h5
Potassium	MG/KG	946	b1
Sodium	MG/KG	61	
Vanadium	MG/KG	24.7	
Zinc	MG/KG	60.7	b1

AUS-A11H-065	Units	Result:	Reference
		0 - 6 in	Code
Metals			
Aluminum	MG/KG	14600	
Antimony	MG/KG	0.25	
Arsenic	MG/KG	7.5	h1,h5,h7
Barium	MG/KG	103	h5
Beryllium	MG/KG	0.54	
Calcium	MG/KG	23000	b1
Chromium	MG/KG	18.8	e1,h5
Cobalt	MG/KG	6.8	
Copper	MG/KG	13.5	b1
Iron	MG/KG	18900	e1
Lead	MG/KG	15.8	
Magnesium	MG/KG	12500	b1
Manganese	MG/KG	524	e1
Mercury	MG/KG	0.02	e5
Nickel	MG/KG	14.1	h5
Potassium	MG/KG	1020	b1
Sodium	MG/KG	74.5	
Vanadium	MG/KG	32.2	
Zinc	MG/KG	84.1	b1

AUS-A11H-063	Units	Result:	Reference
		0 - 6 in	Code
Metals			
Aluminum	MG/KG	8030	
Antimony	MG/KG	0.79	h5
Arsenic	MG/KG	6.2	h1,h5,h7
Barium	MG/KG	125	h5
Beryllium	MG/KG	0.96	b1
Boron	MG/KG	29.1	b1,e1
Cadmium	MG/KG	1.2	b1,h5
Calcium	MG/KG	12700	b1
Chromium	MG/KG	24.5	e1,h5
Cobalt	MG/KG	5.2	
Copper	MG/KG	16	b1
Iron	MG/KG	24100	b1,e1
Lead	MG/KG	41.8	b1
Magnesium	MG/KG	1470	
Manganese	MG/KG	309	e1
Mercury	MG/KG	0.081	b1,e5
Nickel	MG/KG	15.9	h5
Potassium	MG/KG	884	b1
Selenium	MG/KG	0.42	e5,h5
Sodium	MG/KG	91.6	
Vanadium	MG/KG	55.9	b1,e1
Zinc	MG/KG	218	b1,e1

AUS-A11H-064	Units	Result:	Reference
		0 - 6 in	Code
Metals			
Aluminum	MG/KG	8040	
Antimony	MG/KG	0.41	h5
Arsenic	MG/KG	6.3	h1,h5,h7
Barium	MG/KG	65.6	
Beryllium	MG/KG	0.8	b1
Boron	MG/KG	28.3	b1,e1
Cadmium	MG/KG	0.63	b1,h5
Calcium	MG/KG	34800	b1
Chromium	MG/KG	14.4	e1,h5
Cobalt	MG/KG	4.9	
Copper	MG/KG	16.6	b1
Iron	MG/KG	20500	b1,e1
Lead	MG/KG	35	b1
Magnesium	MG/KG	4280	b1
Manganese	MG/KG	313	e1
Mercury	MG/KG	0.38	b1,e5,h9
Nickel	MG/KG	17	h5
Potassium	MG/KG	817	b1
Sodium	MG/KG	106	
Vanadium	MG/KG	40.7	
Zinc	MG/KG	176	b1,e1

AUS-A11H-062	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	13400	b2
Antimony	MG/KG	0.3	
Arsenic	MG/KG	5.2	h1,h5,h7
Barium	MG/KG	101	h5
Beryllium	MG/KG	0.43	
Calcium	MG/KG	44100	b2
Chromium	MG/KG	16.2	h5
Cobalt	MG/KG	7.3	
Copper	MG/KG	11	
Iron	MG/KG	14400	
Lead	MG/KG	10.1	
Magnesium	MG/KG	26300	b2
Manganese	MG/KG	455	
Mercury	MG/KG	0.029	e5
Nickel	MG/KG	13.3	h5
Potassium	MG/KG	823	
Sodium	MG/KG	154	
Vanadium	MG/KG	28.6	b2
Zinc	MG/KG	46.1	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-A11H-059	Units	Result:	Reference
		0 - 6 in	Code
Metals			
Aluminum	MG/KG	15500	
Antimony	MG/KG	0.3	
Arsenic	MG/KG	6.8	h1,h5,h7
Barium	MG/KG	87.1	h5
Beryllium	MG/KG	0.68	
Calcium	MG/KG	4930	b1
Chromium	MG/KG	18.3	e1,h5
Cobalt	MG/KG	10.2	
Copper	MG/KG	11.4	b1
Iron	MG/KG	24200	b1,e1
Lead	MG/KG	11.7	
Magnesium	MG/KG	2040	b1
Manganese	MG/KG	456	e1
Mercury	MG/KG	0.021	e5
Nickel	MG/KG	19	b1,h5
Potassium	MG/KG	693	b1
Sodium	MG/KG	63.8	
Vanadium	MG/KG	29.1	
Zinc	MG/KG	41.1	

AUS-A11H-057	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	16100	b2
Antimony	MG/KG	0.23	
Arsenic	MG/KG	7.6	h1,h5,h7
Barium	MG/KG	770	b2,h5
Beryllium	MG/KG	0.73	
Calcium	MG/KG	8370	b2
Chromium	MG/KG	26.1	b2,h5
Cobalt	MG/KG	10.6	b2
Copper	MG/KG	15.7	
Iron	MG/KG	21700	b2
Lead	MG/KG	21	
Magnesium	MG/KG	4270	b2
Manganese	MG/KG	248	
Mercury	MG/KG	0.037	e5
Nickel	MG/KG	21.9	b2,h5
Potassium	MG/KG	850	
Sodium	MG/KG	212	
Vanadium	MG/KG	34.4	b2
Zinc	MG/KG	96.2	b2

AUS-A11H-021	Units	Result:	Reference	Result:	Reference
		5 ft	Code	7 ft	Code
Metals					
Aluminum	MG/KG	8840		9460	
Arsenic (duplicate at 5ft)	MG/KG	14.6	h1,h5,h7	13.8	b1,e1,h1,h5,h7
Barium	MG/KG	82.3	h5	43.1	
Cadmium	MG/KG	ND		0.25	b1
Calcium	MG/KG	1410		1170	
Chromium	MG/KG	10	e1,h5	15.8	e1,h5
Cobalt (duplicate at 5ft)	MG/KG	8		NA	
Copper	MG/KG	9.5		17.4	b1
Iron (duplicate at 5ft)	MG/KG	25100	e1	35000	b1,e1
Lead	MG/KG	6.3		8.5	
Magnesium	MG/KG	1400		1550	
Manganese	MG/KG	133	e1	292	e1
Nickel	MG/KG	8.1	h5	10.7	h5
Potassium	MG/KG	323		347	
Selenium	MG/KG	0.92	e5,h5	1	e5,h5
Silver	MG/KG	ND		0.42	
Vanadium	MG/KG	26.6		24.6	
Zinc	MG/KG	31.2		47.8	

AUS-A11H-023	Units	Result:	Reference
		0 - 6 in	Code
Metals			
Aluminum	MG/KG	4690	
Arsenic	MG/KG	3.1	h1,h5,h7
Barium	MG/KG	60.2	
Calcium	MG/KG	5750	b1
Chromium	MG/KG	6.6	e1,h5
Cobalt	MG/KG	3	
Copper	MG/KG	7.6	
Iron	MG/KG	7860	e1
Lead	MG/KG	12.7	
Magnesium	MG/KG	1720	b1
Manganese	MG/KG	195	e1
Nickel	MG/KG	6.6	
Potassium	MG/KG	226	
Selenium	MG/KG	0.33	e5,h5
Vanadium	MG/KG	11.5	
Zinc	MG/KG	30.6	

AUS-A11H-018	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	4850	
Arsenic	MG/KG	2.8	h1,h5
Barium	MG/KG	69.3	
Calcium	MG/KG	1370	
Chromium	MG/KG	8.5	h5
Cobalt	MG/KG	3.9	
Copper	MG/KG	6.4	
Iron	MG/KG	10600	
Lead	MG/KG	9.3	
Magnesium	MG/KG	1130	
Manganese	MG/KG	262	
Nickel	MG/KG	7.1	h5
Potassium	MG/KG	320	
Selenium	MG/KG	0.53	e5,h5
Vanadium	MG/KG	14.6	
Zinc	MG/KG	41	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-A11H-020	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	9480	
Arsenic	MG/KG	6.7	h1,h5,h7
Barium	MG/KG	106	h5
Boron	MG/KG	2.3	
Cadmium	MG/KG	6.8	b2,e2,h5,h9
Calcium	MG/KG	5560	b2
Chromium	MG/KG	13.5	h5
Cobalt	MG/KG	7.1	
Copper	MG/KG	21.1	b2
Iron	MG/KG	22200	b2
Lead	MG/KG	30.7	b2
Magnesium	MG/KG	2110	b2
Manganese	MG/KG	804	e2
Nickel	MG/KG	19.2	b2,h5
Potassium	MG/KG	729	
Selenium	MG/KG	1.7	b2,e5,h5
Vanadium	MG/KG	22	
Zinc	MG/KG	437	b2,e2

AUS-A11H-019	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	5630	
Arsenic	MG/KG	9.4	h1,h5,h7
Barium	MG/KG	85.3	h5
Boron	MG/KG	3.1	
Cadmium	MG/KG	0.64	h5
Calcium	MG/KG	42500	b2
Chromium	MG/KG	13.3	h5
Cobalt	MG/KG	9.2	b2
Copper	MG/KG	16.3	
Iron	MG/KG	24100	b2
Lead	MG/KG	30.4	b2
Magnesium	MG/KG	3730	b2
Manganese	MG/KG	815	e2
Nickel	MG/KG	14.6	h5
Potassium	MG/KG	435	
Selenium	MG/KG	1.2	b2,e5,h5
Vanadium	MG/KG	25.1	
Zinc	MG/KG	288	b2,e2

AUS-A11H-002	Units	Result:	Reference
Sediment		0 - 6 in	Code
Metals			
Aluminum	MG/KG	11300	b2
Antimony	MG/KG	0.27	
Arsenic	MG/KG	5	h1,h5,h7
Barium	MG/KG	96.5	h5
Beryllium	MG/KG	0.6	
Calcium	MG/KG	8470	b2
Chromium	MG/KG	16.5	h5
Cobalt	MG/KG	11.1	b2
Copper	MG/KG	11.4	
Iron	MG/KG	14700	
Lead	MG/KG	13.9	
Magnesium	MG/KG	1820	
Manganese	MG/KG	954	e2
Mercury	MG/KG	0.025	e5
Nickel	MG/KG	14.4	h5
Potassium	MG/KG	702	
Sodium	MG/KG	48.4	
Vanadium	MG/KG	27.2	
Zinc	MG/KG	124	b2,e2

100
SCALE

0 100
FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

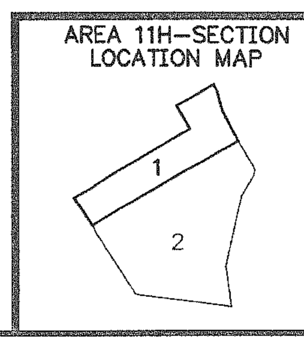
4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AREA 11H-SECTION LOCATION MAP



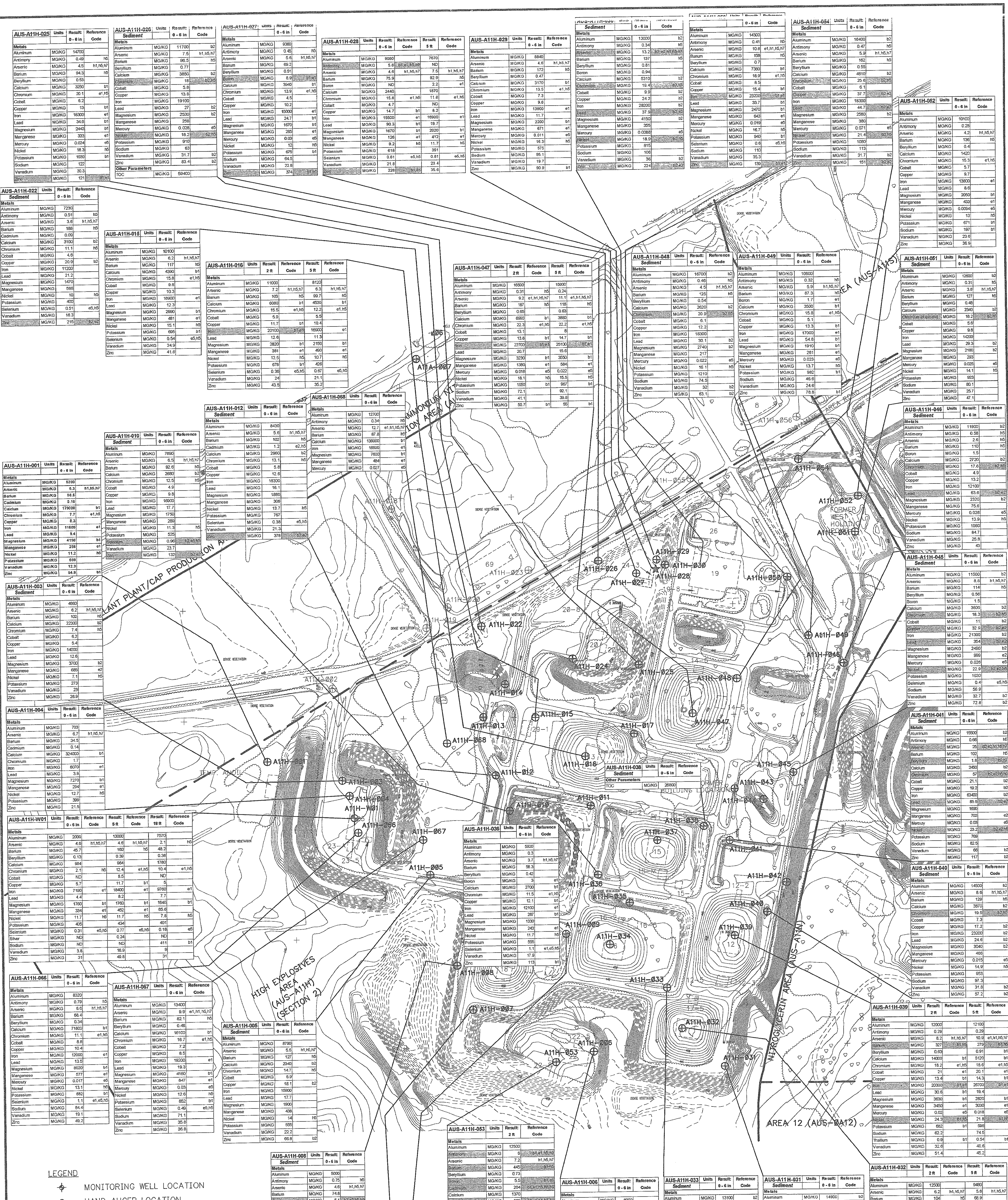
PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11H-Section 1-Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

Date:	Project Number:	Figure Number:
12/26/00	2320000026.00	16-3
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

AREA 11-HIGH EXPLOSIVES AREA



LEGEND

- ⌖ MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

AREA 11–HIGH EXPLOSIVES AREA

100 0 100

SCALE FEET

AREA 11H–SECTION LOCATION MAP

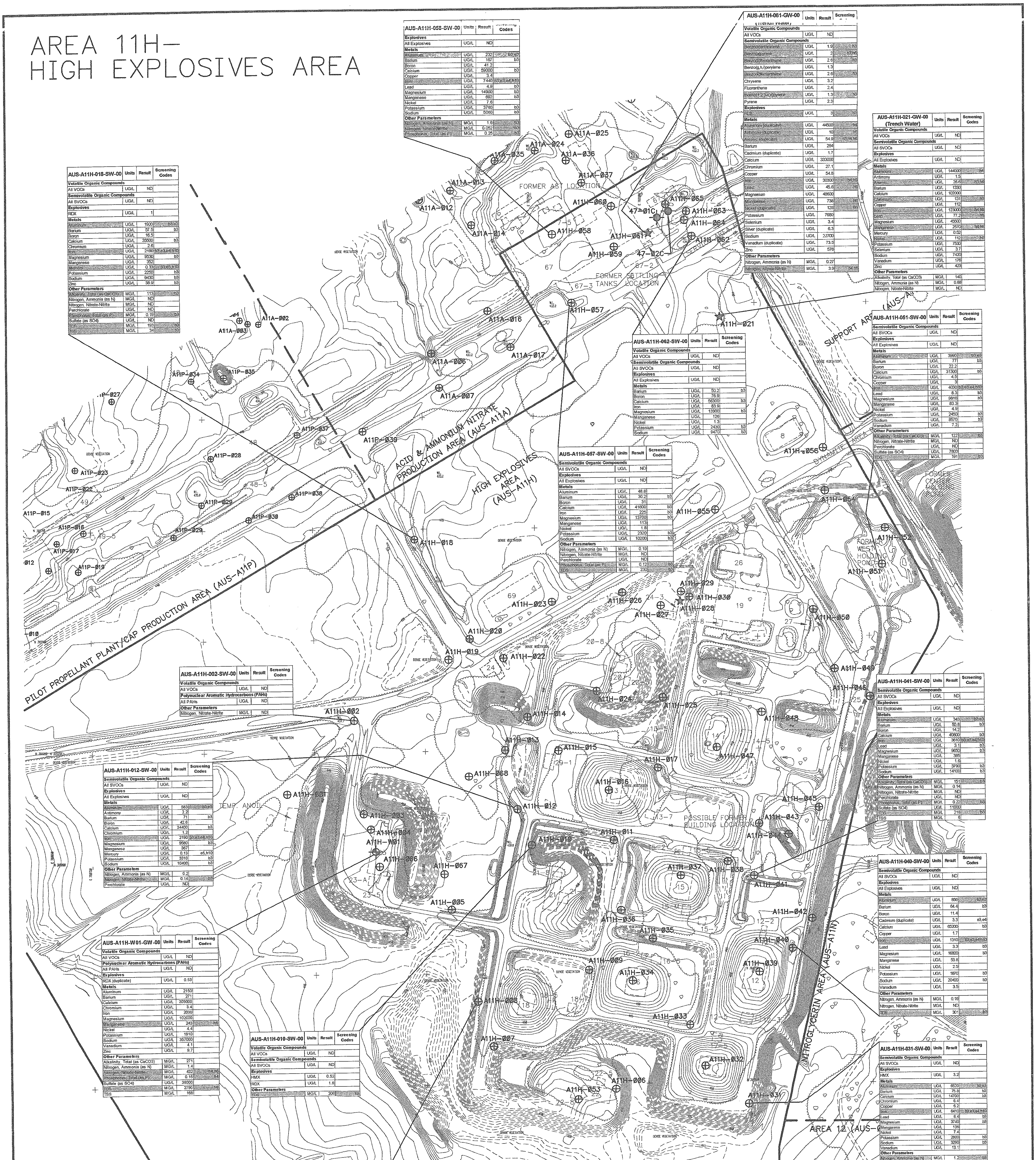
PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–A11H–Section 2–Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

Date: 12/26/00	Project Number: 2320000026.00	Figure Number: 16-4
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

AREA 11H– HIGH EXPLOSIVES AREA



AUS-A11H-058-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	232	b3,e3
Barium	UG/L	167	b3
Boron	UG/L	41.2	
Calcium	UG/L	59000	b3
Copper	UG/L	3.4	
Iron	UG/L	7440	b3,e3,e4,h10
Lead	UG/L	4.9	b3
Magnesium	UG/L	14900	b3
Manganese	UG/L	692	b3
Nickel	UG/L	7.6	
Potassium	UG/L	3780	b3
Sodium	UG/L	5060	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	1.6	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.052	b3
Phosphorus, Total (as P)	MG/L	0.25	b3

AUS-A11H-061-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
Benzo(a)anthracene	UG/L	1.9	h3
Benzo(a)pyrene	UG/L	2	h3,h6
Benzo(b)fluoranthene	UG/L	2.6	h3
Benzo(g,h,i)perylene	UG/L	1.3	
Benzo(k)fluoranthene	UG/L	2.6	h3
Chrysene	UG/L	3.2	
Fluoranthene	UG/L	2.4	
Indeno(1,2,3-c,d)pyrene	UG/L	1.3	h3
Pyrene	UG/L	2.3	
Explosives			
RDX	UG/L	3	h3
Metals			
Aluminum (duplicate)	UG/L	44500	h4
Antimony (duplicate)	UG/L	10	h6
Arsenic (duplicate)	UG/L	54.9	h3,h4,h6
Barium	UG/L	284	
Cadmium (duplicate)	UG/L	1.7	
Calcium	UG/L	333000	
Chromium	UG/L	27.1	
Copper	UG/L	54.8	
Iron	UG/L	30300	h4,h6
Lead	UG/L	45.6	h6
Magnesium	UG/L	48600	
Manganese	UG/L	738	h6
Nickel (duplicate)	UG/L	128	h6
Potassium	UG/L	7680	
Selenium	UG/L	3.4	
Silver (duplicate)	UG/L	6.3	
Sodium	UG/L	22700	
Vanadium (duplicate)	UG/L	73.5	
Zinc	UG/L	576	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.27	
Nitrogen, Nitrate-Nitrite	MG/L	3.9	h4,h6

AUS-A11H-021-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	144000	h4
Antimony	UG/L	1.5	
Arsenic	UG/L	26.6	h3,h4
Barium	UG/L	1330	
Calcium	UG/L	102000	
Chromium	UG/L	131	h6
Copper	UG/L	112	
Iron	UG/L	123000	h4,h6
Lead	UG/L	77.2	h6
Magnesium	UG/L	45500	
Manganese	UG/L	2570	h4,h6
Mercury	UG/L	0.52	
Nickel	UG/L	112	h6
Potassium	UG/L	7530	
Selenium	UG/L	3.7	
Sodium	UG/L	7420	
Vanadium	UG/L	176	
Zinc	UG/L	423	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	140	
Nitrogen, Ammonia (as N)	MG/L	0.88	
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-A11H-018-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
RDX	UG/L	1	
Metals			
Aluminum	UG/L	1900	b3,e3
Barium	UG/L	57.5	b3
Boron	UG/L	16.5	
Calcium	UG/L	35500	b3
Chromium	UG/L	2.6	
Iron	UG/L	2190	b3,e3,e4,h10
Magnesium	UG/L	9530	b3
Manganese	UG/L	352	
Mercury	UG/L	0.33	b3,e5,h10
Potassium	UG/L	2250	b3
Sodium	UG/L	9430	b3
Zinc	UG/L	38.9	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	113	b3
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.19	b3
Sulfate (as SO4)	UG/L	ND	
TDS	MG/L	193	b3
TSS	MG/L	34	b3

AUS-A11H-062-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Barium	UG/L	50.2	b3
Boron	UG/L	76.9	
Calcium	UG/L	56300	b3
Iron	UG/L	83.9	
Magnesium	UG/L	13300	b3
Manganese	UG/L	126	
Nickel	UG/L	1.3	
Potassium	UG/L	2430	b3
Sodium	UG/L	9470	b3

AUS-A11H-057-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	48.8	
Barium	UG/L	30.2	b3
Boron	UG/L	31	
Calcium	UG/L	41800	b3
Iron	UG/L	225	b3
Magnesium	UG/L	13700	b3
Manganese	UG/L	113	
Nickel	UG/L	1.8	
Potassium	UG/L	2320	b3
Sodium	UG/L	10200	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.19	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.12	b3
TDS	MG/L	230	b3

AUS-A11H-051-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	3990	b3,e3
Barium	UG/L	77	b3
Boron	UG/L	22.2	
Calcium	UG/L	31300	b3
Chromium	UG/L	4.5	
Copper	UG/L	3	
Iron	UG/L	4030	b3,e3,e4,h10
Lead	UG/L	8.3	b3
Magnesium	UG/L	9810	b3
Manganese	UG/L	83.3	
Nickel	UG/L	4.9	
Potassium	UG/L	2450	b3
Sodium	UG/L	8570	b3
Vanadium	UG/L	7.2	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	122	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	7800	
TDS	MG/L	191	b3

AUS-A11H-041-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	343	b3,e3
Barium	UG/L	50.8	b3
Boron	UG/L	14.2	
Calcium	UG/L	40800	b3
Iron	UG/L	3610	b3,e3,e4,h10
Lead	UG/L	3.1	b3
Magnesium	UG/L	9650	b3
Manganese	UG/L	385	
Nickel	UG/L	1.6	
Potassium	UG/L	3790	b3
Sodium	UG/L	14100	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	151	b3
Nitrogen, Ammonia (as N)	MG/L	0.14	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.22	b3
Sulfate (as SO4)	UG/L	11000	
TDS	MG/L	218	b3
TSS	MG/L	6	

AUS-A11H-040-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	856	b3,e3
Barium	UG/L	64.4	b3
Boron	UG/L	11.4	
Cadmium (duplicate)	UG/L	3.3	e3,e4
Calcium	UG/L	65200	b3
Copper	UG/L	1.7	
Iron	UG/L	1310	b3,e3,e4,h10
Lead	UG/L	3.3	b3
Magnesium	UG/L	16800	b3
Manganese	UG/L	53.8	
Nickel	UG/L	2.5	
Potassium	UG/L	1870	b3
Sodium	UG/L	20400	b3
Vanadium	UG/L	3.5	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.16	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
TDS	MG/L	301	b3

AUS-A11H-031-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	3.2	
Metals			
Aluminum	UG/L	6520	b3,e3
Barium	UG/L	75.8	b3
Calcium	UG/L	14700	b3
Chromium	UG/L	6.4	
Copper	UG/L	6.2	
Iron	UG/L	6410	b3,e3,e4,h10
Lead	UG/L	6.4	b3
Magnesium	UG/L	3740	b3
Manganese	UG/L	136	
Nickel	UG/L	7.4	
Potassium	UG/L	2800	b3
Sodium	UG/L	3290	b3
Vanadium	UG/L	13.1	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	1.2	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.082	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	8300	
TDS	MG/L	151	b3

AUS-A11H-002-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Other Parameters			
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-A11H-012-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	583	b3,e3
Antimony	UG/L	2.2	
Barium	UG/L	71	b3
Boron	UG/L	42.6	
Calcium	UG/L	34400	b3
Chromium	UG/L	1.2	
Iron	UG/L	2190	b3,e3,e4,h10
Magnesium	UG/L	9580	b3
Manganese	UG/L	367	
Mercury	UG/L	0.13	e5,h10
Potassium	UG/L	3310	b3
Sodium	UG/L	10400	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.2	
Nitrogen, Nitrate-Nitrite	MG/L	0.14	b3
Perchlorate	UG/L	ND	

AUS-A11H-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
RDX (duplicate)	UG/L	0.53	
Metals			
Aluminum	UG/L	2150	
Barium	UG/L	271	
Calcium	UG/L	205000	
Chromium	UG/L	3.4	
Iron	UG/L	2030	
Magnesium	UG/L	102000	
Manganese	UG/L	243	h6
Nickel	UG/L	4.4	
Potassium	UG/L	1910	
Sodium	UG/L	357000	
Vanadium	UG/L	4.1	
Zinc	UG/L	9.7	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	271	
Nitrogen, Ammonia (as N)	MG/L	1.4	
Nitrogen, Nitrate-Nitrite	MG/L	432	h4,h6
Phosphorus, Total (as P)	MG/L	0.15	h4
Sulfate (as SO4)	UG/L	38000	
TDS	MG/L	2790	h6
TSS	MG/L	168	

AUS-A11H-010-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	0.52	
RDX	UG/L	1.8	
Other Parameters			
TDS	MG/L	206	b3

AUS-A11H-008-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	430	b3,e3
Barium	UG/L	53.3	b3
Boron	UG/L	32.6	
Calcium	UG/L	34000	b3
Chromium	UG/L	0.96	
Iron	UG/L	2680	b3,e3,e4,h10
Lead	UG/L	1.7	
Magnesium	UG/L	9940	b3
Manganese	UG/L	510	
Mercury	UG/L	0.23	b3,e5,h10
Potassium	UG/L	3450	b3
Sodium	UG/L	9620	b3
Other Parameters			
Nitrogen, Nitrate-Nitrite	MG/L	ND	

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11H Sample Locations and Detections in Surface Water, Trench Water and Groundwater

Date: 12/27/00	Project Number: 23200000026.00	Figure Number: 16-5
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

Site AUS-A11N is located in Area 11 and was used by industrial tenants for manufacturing nitroglycerin from the 1950s to the late 1960s. It has been designated in this report as the Nitroglycerin Area. During World War II, a small portion of the northern section of Site AUS-A11N was within the Illinois Ordnance Plant (IOP) Group II Load Line. This portion of the Group II Load Line was a parking area with no buildings.

Refer to the introduction to Section 15 for a general discussion of Area 11 and its history. Area 11 sites, including AUS-A11N, are shown in Figure 15-1.

AUS Original Site Designations

AUS-0056, one of the original Additional and Uncharacterized Sites Operable Unit (AUS OU) sites designated in 1997-1999 by the United States Fish and Wildlife Service (USFWS), was located in AUS-A11N. This site has been incorporated into the current site AUS-A11N.

17.1 HISTORIC SEARCH INFORMATION

17.1.1 Site Description

There are no buildings remaining on this site. Since the early 1990s it has been allowed to return to a natural state.

17.1.2 Operational History and Waste Characteristics

17.1.2.1 Olin Operations

Olin began manufacturing nitroglycerin in late 1957[1], at the same time it began acid and ammonium nitrate production in the area designated in this report as AUS-A11A.

Biazzi Process

Olin used the Biazzi process for manufacturing nitroglycerin in Building 9, the Nitrator.[2] The following summary of the process is based on the Department of Army's technical manual on explosives.[3] A mixture of concentrated nitric and sulfuric acid, and pure glycerin or ethylene glycol is piped into a nitrator which passes the mixture through cooling coils, forming a mixture of nitroglycerin and spent acid. The spent acid is separated from the nitroglycerin by gravity. At this site, the acids required for nitroglycerin manufacturing were piped from the ammonium nitrate area to the nitroglycerin plant.

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[1] DPRA Document 00009410. U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1957, Page 31.
[2] Deposition of John Miller, April 9, 1998, Pages 28-29.
[3] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-12 and 8-13.

The nitroglycerin is then passed through a series of separators and washes with water and/or soda ash[4]. At this site, the Soda Ash Building was Building 9B, and the soda ash may have been stored in two horizontal aboveground storage tanks (ASTs) on the east side of this building that were observed in the 1960 aerial photograph[5]. In the process, the water reduces the sensitivity of the nitroglycerin and the soda ash helps neutralize the remaining acid. For a high purity product, several wash cycles are required.

If the mixture begins to overheat during the nitrating process, the nitrator and/or first separator may be emptied quickly into a drowning tank filled with either water or sulfuric acid. At this site, that tank may have been Building 10A, the Catch Tank.

The production process results in nitroglycerin, spent acid, and waste wash water.

The resulting nitroglycerin was stored in a tank at Building 10. The Spent Acid House was Building 9A, shown in Figure 15-3. Two vertical ASTs located just south of this building were observed in a 1960 aerial photograph.[6] These ASTs, which were possibly lead-lined,[7] may have been used to hold the spent acid. The spent acid may have been recycled.

The nitroglycerin was likely transported between buildings in aboveground pipes as a nitroglycerin-in-water emulsion.[8]

Nitroglycerin Area Holding Ponds

The wastewater from the nitroglycerin manufacturing was probably discharged to the East Holding Pond just north of the Nitroglycerin Area, shown in Figure 15-3. This wastewater probably contained soluble materials like ammonium nitrate, sodium nitrate, acid, and traces of nitroglycerin.[9] There did not appear to be liquid in the East Pond at the time of the 1960 photograph. However, it appeared to have recently received liquid inflows and contained lighter-toned sediments.[10]

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[4]Soda ash is sodium carbonate.

[5] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).

[6] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A). The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

[7] Dupont Environmental Remediation Services, 1993, Memorandum written by Matthew Champion from Larry Joh to other Dupont employees– Subject: Decontamination Blasting Former Nitroglycerin Plants, dated June 28, 1993.

[8] Dupont Environmental Remediation Services, 1993, Memorandum written by Matthew Champion from Larry Joh to other Dupont employees– Subject: Decontamination Blasting Former Nitroglycerin Plants, dated June 28, 1993.

[9] Dupont Environmental Remediation Services, 1993, Memorandum written by Matthew Champion from Larry Joh to other Dupont employees– Subject: Decontamination Blasting Former Nitroglycerin Plants, dated June 28, 1993.

[10] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).

The figure shows two other "holding ponds." The West Holding Pond is included in the High Explosives Area, AUS-A11H, because it appears to receive drainage from that area. The "Center Holding Pond" may never have existed. It is currently a mound, about 30 to 50 ft tall. It appeared as a mound in the 1960 aerial photograph, which was the first photograph available after Olin leased this area, and it has appeared as a mound in all photographs since.[11] This mound may be composed of excess soil from excavation/construction of this area's facilities.[12]

Miscellaneous Nitroglycerin Area Features

The following miscellaneous features are associated with Olin operations at Area 11:

- Two Buried Railroad Tank Cars.[13] The AUS OU site reconnaissance identified these railroad tank cars just southeast of Building 10.[14] Mr. Harvey Pitt, a former Olin manager, confirmed the presence of at least one tank car during Olin's operations.[15] Buried railroad tank cars have been used at other industrial facilities for liquid waste or fuel storage.
- There was a nitroglycerin loading dock in Site AUS-A11N, but the location was not determined.[16]
- Olin also used ethyl centralite (as a stabilizer for nitroglycerin) and dimethyl sebacate, premixed in shipping containers for nitroglycerin production.[17]
- As seen in the 1960 aerial photograph,[18] there was some light-toned material located in the 20-foot (ft) deep depression (drainage ditch) just north of the two horizontal ASTs mentioned above. This material appears to have been dumped from the adjacent access road.
- There were three other mounds present on site in 1960.[19] There is no evidence of disposal activities on these mounds and they may have been excess soil from excavation/construction activities in this area.[20]

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[11] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).
[12] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Page 2.
[13] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-55.
[14] According to the 1997 Parsons Engineering report, two tank cars were located just east of Building 17 and south of Building 12. A fill port for one of the tanks was accessible and observation indicated that water and solid material had accumulated in this tank. Reference: Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Figure 2.18 and Page 2-55.
[15] Deposition of Harvey Pitt, November 19, 1997, Pages 132-133.
[16] PRI-00495. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 2.
[17] PRI-00493. Minutes from a meeting between Olin Dynamite and U.S. Powder (Commercial Solvents Corporation), dated September 30, 1963, Page 3.
[18] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).
[19] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).
[20] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Page 2.

- There was a roughly circular bermed area just north of Building 9 in the 1960 aerial photograph. The area inside this berm appeared to contain refuse, but there did not appear to be a functioning facility in this area at the time.[21]

17.1.2.2 Commercial Solvents Corporation (CSC)/IMC Operations

CSC probably continued to operate the nitroglycerin manufacturing facility the same way as Olin had, after acquiring it from Olin in 1964. The only apparent changes were that CSC added a Water Softener Building (Building 9-3) near the Nitrator (Building 9) and the Olin Catch Tank (Building 10A) is not on the U.S. Powder Map. Also, CSC changed several building numbers slightly. Table 15-1 identifies both the new and old building numbers.

Explosions

In December 1966, an explosion involving an estimated 8,000 pounds of nitroglycerin occurred in an unspecified location, presumably in Area 11.[22] One man disappeared.

In June 1968, a buried concrete bunker containing raw "nitro" exploded.[23] This bunker may have been in the Nitroglycerin Area or in the High Explosives Area. The building number and use were not determined.

Nitroglycerin Area Holding Ponds

The 1965 aerial photograph shows some ponding and some lighter toned sediment in the East Holding Pond.[24]

Shut Down and Decontamination of Area 11 by CSC/IMC

According to an IMC[25] internal memorandum, the "dynamite line was shut down" in 1968, and the "chemical area was eliminated in 1969."[26] The memorandum did not specifically address the nitroglycerin plant, but it may have been considered part of the dynamite line. In any case, since it supplied the dynamite area and was supplied by the chemical area, it too was apparently shut down by 1969.

Ditches and Ponds: The same IMC memorandum stated, "Shooting of the ditches and ponds in the NG Drainage Area was done between February and May 1972."[27] Shooting involves

[21] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1 (Area 11A).
[22] U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1966, Page 42.
[23] U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1968, Page 54.
[24] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11A).
[25] IMC acquired CSC in 1975. See discussion in Section 15.
[26] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[27] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.

detonating explosive charges along the length of the ditches and in the ponds. The object is to cause a sympathetic detonation of any remaining nitroglycerin. The memorandum described a 1972 meeting at the site in which the employee responsible for the shooting felt that at "no time, during or after the shooting, did he see anything that would lead him to believe that the ditches, ponds, contained any Nitroglycerine." Mr. Bill Anderson of Trojan, who conducted the shots, noted that all of the pits and ditches in the area had been decontaminated by blowing explosive charges every three ft.[28] Based on this information, IMC apparently concluded that no further explosive decontamination of the Nitroglycerin Area ditches and ponds was needed, and these areas were not addressed in their variance applications for open burning.[29]

Buildings: In the Nitroglycerin Area, the only structure, Building 9 (the Nitrator), was decontaminated under an open burning variance issued to IMC. This was done in 1977.[30,31]

The following procedures were used for decontaminating the building[32]:

- The building was treated with a reducing agent such as sodium sulfide (a nitroglycerin killer).
- Combustible materials were removed from the building and burned.
- The building was lightly flashed with a mixture of fuel oil and straw.

Probable Burning Trenches: Two of the three open-burning variances issued to IMC during 1977 to 1979 allowed for destruction of 75,000 lbs of defective explosives and 3 million lbs of FNH.[33] At least some of these materials may have been burned in trenches in Area 11N. The 1980 aerial photograph identified eight probable burning trenches located in this area.[34] All eight trenches were oriented in a northwest-southeast direction. Two of the trenches were located inside the bermed area that formerly contained Building 10 (Nitroglycerin Storage).[35] The remaining six trenches were located just south of the other two probable trenches, across an un-named roadway. These trenches were no longer evident in the 1993 aerial photograph.[36] It is assumed that these trenches were used in association with decontamination activities in Areas 11 and 12, since they were present on site during the time decontamination of these areas was taking place.

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[28] DPRA Document No. 00021278. United States Government Memorandum from USFWS Safety Manager to Regional Director regarding explosive decontamination activities at Crab Orchard NWR, dated November 19, 1975, Page 2.

[29] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.

[30] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1.

[31] DPRA Document No. 00005681. Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), October 1976, Page 3.

[32] DPRA Document No. 00005688. USFWS, Memorandum to the USFWS Regional Safety Manager regarding the decontamination of Area 12, U.S. Powder, dated July 16, 1976.

[33] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 2. FNH was not defined in the memorandum but probably stands for flashless non-hydroscopic powder, which was stored in ponds in Area 12.

[34] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4 (Area 11A).

[35] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4 (Area 11A).

[36] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5 (Area 11A).

17.1.3 Area 11N Previous Sampling Results

There were two previous Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU) sites located in the Area 11 Nitroglycerin Area: COPGII and COP-2. O'Brien & Gere[37] investigated one site in AUS A11N that was designated as Site 4, the Area 11 North Field. This site was later renamed as COP-2 in the Woodward Clyde Confirmation Study.[38] COP-2 was further investigated in the Environmental Science & Engineering, Inc. (ESE) EMMA OU Remedial Investigation/Baseline Risk Assessment (RI/BRA) Report.[39] EMMA OU Site COPGII was not investigated until Parsons Engineering Science Inc. conducted their investigation in 1997. The Parsons Engineering Evaluation and Cost Analysis report[40] only addressed ordnance and explosive waste (OEW) concerns at this site.

O'Brien & Gere, 1988

Site 4, the Area 11 North Field, is the former East Holding Pond in the Nitroglycerin Area shown in Figure 15-3. One composite surface soil and one composite sediment sample were collected inside the boundaries of this former holding pond.[41] Sediment results are reported in wet weight. Some results reported by O'Brien and Gere are not included here because they were determined to be not useable. Results reported here are estimated.[42] The following semi-volatile organic compounds (SVOCs) exceeded USEPA Region IV levels and/or Canadian Sediment Quality Guidelines (CSEQGs) in the sediment sample: 2-methylnaphthalene (0.002 mg/kg), anthracene (0.004 mg/kg), chrysene (0.032 mg/kg), fluoranthene (0.044 mg/kg), phenanthrene (0.011 mg/kg), and pyrene (0.086 mg/kg). Aroclor 1254 (0.26 mg/kg) exceeded USEPA Region IV levels.

Woodward Clyde Consultants Confirmation Study, 1988

Under contract with the Department of the Army, Woodward Clyde Consultants (WCC) conducted a Confirmation Study in 1988 which included O'Brien & Gere Site 4, renamed as COP-2. A magnetometer survey was done at COP-2 and the survey revealed possible buried ferrous items at this site. Three soil borings were collected for analysis; and one monitoring well was installed and a groundwater sample collected for analysis. No metals were detected above preliminary screening levels in the groundwater sample. Beryllium (0.86 mg/kg) and nickel (21

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[37] O'Brien & Gere, 1988, Remedial Investigation Report, Crab Orchard National Wildlife Refuge, Volume I, Final Report, Pages 101- 10-3.

Woodward Clyde Consultants, 1988, Final Confirmation Study at Crab Orchard National Wildlife Refuge, Hampton Cemetery and Ammunition Plant Dera Site, Volume I, Figure 3.46.

[39] Environmental Science & Engineering, Inc., 1994, Draft Final Remedial Investigation/Baseline Risk Assessment Report, Explosives/Munitions Manufacturing Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I, Remedial Investigation (RI) Report, Page 4-77.

[40] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois.

[41] O'Brien & Gere, 1988, Remedial Investigation Report for Crab Orchard National Wildlife Refuge, Figure 10-1.

[42] DPRA Document No. 00018887. Letter from Richard Boice to Dick Ruelle of USFWS regarding Crab Orchard Lake RI/FS, dated February 18, 1987. The letter reports that the data for the following constituents are not useable: 2-butanone, vinyl acetate, 4-methyl-2-pentanone, aniline, bis(2-chloro-isopropyl)ether, 4-chloroaniline, 2-nitrosodiphenylamine, benzidine, di-n-octyl-phthalate, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, cyanide, Ag, As, Be, Cd, Cu, Ni, Pb, Se, Zn, and Hg.

mg/kg) both exceeded USEPA SSLs. The results from this site showed some evidence of chemical contamination, and it was included in the ESE RI, discussed below.

ESE RI/BRA, 1994

Results from the 1994 ESE investigation for COP-2, are shown in Figure 17-1. A second monitoring well was installed at this site during this investigation. Soil and groundwater samples were analyzed for explosives, total recoverable petroleum hydrocarbons (TRPH), and metals. One soil sample was also analyzed for SVOCs; and the groundwater sample from MW-COP2-1 was also analyzed for SVOCs and VOCs. Nitroglycerin was not included in the explosives analyte list. As shown in Figure 17-1, there were minor exceedances in soil samples of background values for a few metals. Cobalt (22.1 mg/kg) exceeded New Dutchlist Soil Optimum Levels (DSOLs) and Refuge background levels in the soil samples. In the groundwater samples, nitrate (32.4 milligrams per Liter (mg/L)) and thallium (3 micrograms per Liter (ug/L)) exceeded Canadian Water Quality Guidelines (CWQGs) and/or federal Maximum Contaminant Levels (MCLs). Based on the results, the report concluded that there were no unacceptable human health risks or ecological risks associated with COP-2.

Parsons Engineering, 1997

Parsons Engineering conducted an OEW investigation at former EMMA OU Site COPGII in 1997. COPGII covers all of Area 11, including the AUS-A11A, AUS-A11H, AUS-A11N, AUS-A11P and AUS-A11S. This area is approximately 11,440,000 square ft in size. There was no chemical investigation done in this area at this time. The area was divided into 572 grids (100ft by 200ft grids). Eleven 100-ft square grids were investigated at this site and a total of 629 magnetic anomalies were identified.[43] Two hundred and fifty five of these were intrusively investigated and all were non-ordnance scrap.[44]

Parsons also sampled the suspected buried railroad tank cars for SVOCs, metals, explosives, nitrate and cyanide. Some low-level explosives and SVOCs were detected in the material found inside the railroad tank cars (RRTCs); however, Parsons states that this area does not pose an OE concern and recommended no further action regarding these two RRTCs.

17.1.4 Observations During Site Visit

There were numerous mounded areas observed throughout the Site AUS-A11N during the site reconnaissance, in the spring of 1999. Figure 17-2 shows the mounded areas. One of the mounded areas appears to coincide with the location of former Building 9. The remaining mounded areas are of unknown origin. There was a large (40-50 ft high) mounded area in the northern portion of the site in the area reported to be the former Center Holding Pond. There were also numerous berms present that were originally built as a part of the explosives (and nitroglycerin) manufacturing areas.

[43] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-36 through 2-44.
[44] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-36 through 2-44.

There were also numerous ponded areas identified throughout the site. The former East Holding Pond appears to have received drainage from the former Nitroglycerin Production Area located in the southern portion of AUS-A11N. This pond was mostly dry, with only a few smaller ponded areas located within its berms. One of these ponded areas had a sheen on it during the site reconnaissance. There was a concrete spillway identified during the site reconnaissance on the north side of this former pond, which appeared to have allowed liquids from this pond to spill into a northeast-flowing drainageway located on the north side of this pond. There was a barren area located in the southern corner of the pond, where the ditch from the nitroglycerin production area discharged into the pond.

Many of the drainage ditches constructed and used by former industrial tenants were still present. In general, most of the surface water in this area drained to the north and east via drainage ditches and/or creeks. Most of the site (all of AUS-A11N north of former Building 9) appeared to drain to the north, into the northeast-flowing drainageway mentioned above. The rest of the area (all of AUS-A11N south of former Building 9), appeared to drain into another east-flowing drainageway just south of former Building 9.

In general, most of this area was tree-covered and contains dense vegetation. There was also some construction-related debris scattered throughout the area.

At one location there were several cut pipes observed during the site reconnaissance that were located under a former roadway. It is possible that these pipes drained onto the ground surface at this location. Another long section of piping was observed protruding from a hillside. It appeared to be generally aligned with the RRTCs.

There was a previously unidentified (un-numbered) concrete bunker observed during the site reconnaissance. This was the only concrete bunker found to be intact in Area 11. The concrete bunker first appeared on the 1960 aerial photographs.[45] The former use of this building was not determined. It is located on the east side of the roadway, across from former Building 9.

17.1.5 Recommendations Based on Preliminary Assessment

Based on the historic search, all potential releases from Area A11H have not been previously addressed. Based on the lack of previous investigation that covered all areas, AUS-A11H was included in the Site Investigation (SI).

17.2 SITE INVESTIGATION INFORMATION

URS conducted an SI at AUS-A11N from April 11 through June 26, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[46] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 17.1) has been updated to include that information.

[45] 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[46] U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 17-2, 17-3 and 17-4. Survey coordinates for all sample locations in Area 11N are listed in Table 17-1. Table 17-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples unless otherwise noted.

17.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. There were several areas of concern investigated during the SI. They are as follows:

Nitroglycerin Manufacturing Area

Soil sample locations A11N-018 through A11N-023, A11N-026 and A11N-027 were all located within the Nitroglycerin Manufacturing Area. Sample location A11N-026 was on top of a mound that appeared to be at the former location of Building 9, the Nitrator. Sample location A11N-020 was collected from the top of a mound that was assumed to cover former Building 10, the Nitroglycerin Storage Building. However, after reviewing the topographic map for the site, it is believed that this mound is actually located to the northeast of the former building location and it may either be a part of the berm that surrounded Building 10 or it may contain buried materials from Building 10.

Sample A11N-018 is located below an area of several cut pipes under a former roadway. It is possible that these pipes drained onto the ground surface at this location. Sample A11N-021 was located near an open end of a long section of piping that leads into the hillside and appears to head towards the railroad tank cars (discussed below). It is not known what the contents of the piping were at either of these two sample locations.

Sample location A11N-019 (soil and surface water) was in a ponded area just north-northeast of former Building 10 (which now appears to be a mounded area at the site). It is possible that this ponded area received drainage from the areas surrounding this building. Sample A11N-022 is located in an approximately 20-ft deep drainage ditch that is located between former Building 10 and former Building 9 (on the west side of the berm that is just west of former Building 9). It is possible that this drainage ditch received drainage from the areas surrounding these two buildings.

Sample location A11N-023 is located in the same 20-ft deep drainage ditch as sample A11N-022. It is located in a portion of the drainage ditch near four former ASTs (2 horizontal and 2 vertical). The 1960 aerial photograph interpretation[47] indicated that there was possible dumping in this drainage ditch.

Sample location A11N-027 was located next to the unnumbered concrete bunker identified during the site reconnaissance.

[47] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.

East and Center Holding Ponds

According to the Olin and U.S. Powder Maps, there were two holding ponds located in the Nitroglycerin Area: the East Holding Pond and the Center Holding Pond. There is no evidence to indicate that the Center Holding Pond was actually a holding pond. There is currently a 40- to 50-ft tall mound in this location. Two soil samples (A11N-007 and A11N-011) were collected from this soil mound from a depth of approximately 7 to 8 ft.

The aerial photographs show that drainage from the Nitroglycerin Manufacturing Area flowed into the East Holding Pond via drainage ditches. This holding pond was bermed and it appeared to have a small dam on the north side of the pond, and a spillway which allowed water to flow out of the pond into a generally northeast-flowing ditch. Three samples were located in the East Holding Pond. Sample location A11N-012 (soil and surface water) was in a ponded area that appeared to have a sheen on it. Sample A11N-008 (soil) was located in an area of the pond that previously showed scarring in aerial photographs. Sample A11N-013 (soil) was located in the southern corner of the holding pond, in a barren area where the drainage ditch from the Nitroglycerin Manufacturing Area entered the East Holding Pond. Sample location A11N-015 (soil and surface water) was located upstream of A11N-013, in the same drainage ditch on the east side of the roadway. The surface water sample was collected from Location A11N-015 instead of from Location A11N-014 (discussed in Miscellaneous Drainage in AUS-A11N section below) as planned in the Field Sampling Plan (FSP). There was a monitoring well (MW-COP2-1) located in the East Holding Pond that had been installed during a previous investigation, but it had been decommissioned, so no sample could be collected from this monitoring well as was originally planned.

Soil sample A11N-016 was located just east of the above-mentioned drainage ditch, on a mound of soil and debris. The origin of this mound is not known.

All samples were collected in accordance with the tables in the FSP, except as noted above, and with the following additional exceptions:

- AUS-A11N-012-SW-00 This sample was not analyzed for phosphorus, although it was called for in the FSP.
- AUS-A11N-019-SW-00 This sample was not analyzed for phosphorus, although it was called for in the FSP.

Railroad Tank Cars (RRTCs)

As noted above, there are two partially buried railroad tank cars located to the southwest of former Building 9 as seen in Figure 15-3. Sample location A11N-024 (seen in Figure 17-2) consisted of a surface soil sample and a tank contents sample (water). The surface soil sample was planned to be collected from the surface soil located between the two tanks. The tank sample was collected from the tank, which had no obvious access port, since the tank with the access port was sampled in previous investigations. This tank was drilled into using remote drilling methods and its contents were sampled.

There was an east-flowing drainage ditch that began just to the east of these two RRTCs, and this ditch appears to have received drainage from the area surrounding the RRTCs. Sample A11N-025 (soil) was collected from this east-flowing drainage ditch.

Possible Burning Trenches

Eight former trenches that may have been used for burning were identified in the 1980 aerial photograph. These trenches are labeled T-01 through T-08 on Figure 17-2. They were located southwest of the RRTCs. Two test pits were located in this area. Since there are no present-day features to indicate the location of the former trenches, the site was located by survey coordinates determined from the aerial photograph, by Entech.[48] The coordinates of these possible burning trenches are summarized in Table 17-1A. Sample location A11N-030 (soil) was at former Trench T-01, and location A11N-031 (soil) was at former Trench T-06.

Just to the northwest of the eight former trenches and across the former roadway, there was a presumed debris/dumping area based on the irregular topography in this area. Sample A11N-028 (soil) was collected from this area.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-A11N-030-GW-00 No groundwater was encountered during excavation, therefore this groundwater sample was not taken.
- AUS-A11N-031-GW-00 No groundwater was encountered during excavation, therefore this groundwater sample was not taken.

Semi-Circular Bermed Area

Two samples were collected from inside this semi-circular bermed area: A11N-017 (soil) and A11N-029 (soil) . The berm was probably related to the explosives manufacturing in this area. Sample A11N-029 was located near the base of a former large mound located inside of this bermed area. This mound may have housed a bunker-type building according to aerial photographs. This sample was located in an area judged likely to have received spillage of explosive materials. Coordinates for the sample were obtained from an aerial photograph.

Miscellaneous Drainage in AUS-A11N

Soil samples A11N-004, A11N-005 and A11N-006 were all collected from a generally northeast-flowing ditch that appeared to receive drainage from both the High Explosives Area (AUS-A11H) and from the Nitroglycerin Area (AUS-A11N). This ditch is located on the northwest side of the East and Center Holding Ponds. Sample A11A-004 was collected on the east side of the roadway, where drainage from the High Explosives Area entered into the

[48] At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few ft.

Nitroglycerin Area. Sample A11N-005 (soil and surface water) was collected at the intersection of this generally east-flowing ditch and another ditch which served as a discharge point for the former East Holding Pond. Sample A11N-006 was collected from near a drain pipe, approximately 370 ft downstream of sample A11N-005. This drain pipe drains the area just to the north of the Nitroglycerin Area. A monitoring well (MW-COP2-4), located near sample location A11N-006, was installed during a previous investigation at this site, but this well has been decommissioned, so no sample could be collected from it as was originally planned.

There is a ditch on the west side of the roadway that generally runs northwest-southeast through the Nitroglycerin Area. In the 1960 historical aerial photograph,[49] it appeared that this ditch originally flowed into the former West Holding Pond (located in the High Explosives Area as discussed in Section 16.0). In later aerial photographs (starting in 1980),[50] it appeared as if this ditch bypassed the West Holding Pond and flowed straight into the generally northeast-flowing ditch located northwest of the former holding ponds. The former West Holding Pond also drained into this generally northeast-flowing ditch. Sample locations A11N-009 (soil) and A11N-014 (soil) are located in the generally northwest-flowing ditch. There was no surface water sample collected from A11N-014 as planned in the Field Sampling Plan because there was no water present at the time of sampling. Sample A11N-001 (soil and surface water) is also located in this ditch, however it is located on the north side of the east-flowing creek and the ditch appears to flow southward at this point. It appears that all of the drainage at sample location A11N-001 is received from the High Explosives Area (AUS-A11H).

There were three other samples in the Nitroglycerin Area located in drainage ditches that appear to contain water only during precipitation events. These samples were A11N-002 (soil) located on the south side of the Dynamite Area Road, A11N-003 (soil) located on the north side of Dynamite Area Road and A11N-010 (soil) located on the east side of the generally northwest-southeast trending road that runs through the Nitroglycerin Area (next to the 40 to 50 ft tall mound that is referred to as the Center Holding Pond).

17.2.2 Field Results

17.2.2.1 Site Conditions

17.2.2.1.1 Geologic Conditions

ESE boring data from COP-2 (former East Holding Pond on Figure 17-2) indicate that sandstone bedrock was encountered at a depth of about 25 ft.

No monitoring wells were installed at AUS-A11N as part of this investigation. Therefore the only other geologic information was obtained during the excavation of two test pits A11N-030 and A11N-031. Test pit logs are included in Appendix A. These test pits were located in the southwestern portion AUS-A11N, as shown on Figure 17-2. A11N-030 has approximately 9 inches of fill (topsoil) material over three inches of rock and black ash material. Below the ash

[49] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.
[50] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.

material is a 9-ft layer of loess, then a 1.5-ft thick layer of low plastic clay. A few inches above the bottom of the pit depth of 12 ft below ground surface (bgs) the excavation encountered white weathered sandstone. Similarly, A11S-031 had a 3-ft layer of fill overlaying 5 ft of loess (clayey silt). The loess overlays approximately 1.5 ft of sandy low plastic clay. White weathered sandstone was also encountered a few inches from the bottom of A11N-31, which was at 10 ft bgs.

17.2.2.1.2 Hydrogeologic Conditions

No hydrogeologic information is available for AUS-A11N because groundwater was not encountered in either of the two test pits located at this site and because there were no monitoring wells installed in this area due to potential explosive hazards. The maximum test pit depth was 12 ft bgs. A groundwater contour map (Figure 15-12) was made for Area 11 using groundwater elevations obtained from October 2000. As seen in the groundwater contour map, the overall flow direction of the groundwater appears to be toward the north-northeast. Groundwater elevations were collected several different times during this investigation as seen in Table 15-4, and the flow direction was generally the same each time.

17.2.2.1.3 Hydrologic Conditions

The surface drainage in this area, which is generally toward Wolf Creek to the northeast, has been greatly modified by the construction of the explosives manufacturing facilities. Most of the drainage from the former plant area is directed toward the north, to the former East Holding Pond. The former East Holding Pond is still present as a ponded area, but the dam has been breached and drainage goes directly to the east-flowing drainageway downstream of the former East Holding Pond (Figure 17-4).

17.2.2.2 Chemical Results

The sample analytical results are summarized as follows:

- Table 17-3 – soil samples results, and
- Table 17-4 – surface water samples results.

These tables list all the chemicals detected in Area 11N during this investigation, along with the frequency and range of detections.

Tetrachlorodibenzo-p-Dioxin (TCDD) equivalent results for Area 11N are not shown in the screening tables. They are instead included in Table 17-9, and are discussed in the following human health and ecological risk sections.

Sample results are presented on figures as follows:

- Figure 17-2 – organic results for soil samples,
- Figure 17-3 – inorganic results for soil samples, and
- Figure 17-4 – all results for surface water samples at this site.

17.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 17-5 through 17-8 as follows:

- Table 17-5--human health risk screening for soils,
- Table 17-6--human health risk screening for surface water,
- Table 17-7--ecological risk screening for soils, and
- Table 17-8--ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 11N. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs for human health risk and COPECs for ecological risk). The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 17-2 through 17-4, the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 17-10 (human health risk) and 17-11 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 17-10) and COPECs (Table 17-11) are shaded in the tables.

17.3.1 Human Health Risk

17.3.1.1 Soil

Human health screening results for soil samples are presented in Table 17-5. For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil PRGs as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1 x 10^{-6}. In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (DAF=1), the Illinois TACO Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

Dioxin/furan congener concentrations were converted to 2,3,7,8-TCDD equivalents, for comparison against a 2,3,7,8-TCDD screening value. A toxic equivalency (TEQ) was calculated for each dioxin/furan congener by multiplying a congener-specific toxic equivalency factor (TEF) value by the congener's observed concentration. The TEQs for all congeners in a sample were summed. The summed TEQ values were then compared to the 2,3,7,8-TCDD screening value of 1 ppb. Refer to Table 17-9.

There were two soil samples analyzed for dioxin/furan congeners with detections noted in both samples. However, none of the TEQ values calculated for the congeners exceeded the 2,3,7,8-TCDD screening level. Therefore, none of the dioxin/furan congeners detected within Area 11N are assumed to pose potential risk to human health.

17.3.1.2 Surface Water

Human health risk screening results for chemicals in surface water from Area 11N are presented in Table 17-6. The maximum concentrations from Area 11A were screened against the Illinois EPA General Use Surface Water Quality Criteria – Human Health.

17.3.2 Ecological Risk

17.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 17-7. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[51]
- Environment Canada (1995)[52]
- Talmage *et al.* (1999)[53]
- Efroymson *et al.* (1997a, 1997b)[54]

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[51] USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

[52] Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

[53] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. Rev Environ. Contam. Toxicol 161:1-156.

[54] Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

- CCME (1999)[55]
- MHSPE (1994)[56]
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)[57] used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

Direct exposure screening concentrations in soils were available for 2,3,7,8-TCDD, but not for other dioxin/furan congeners. Therefore, the potential for direct exposure effects were only screened in conjunction with 2,3,7,8-TCDD (Table 17-7). Based on the screening results in Table 17-7, 2,3,7,8-TCDD is not a concern relative to direct exposures (it was not detected). Other congeners, if detected, were retained as potentially bioaccumulative COPECs. Results of the dioxin/furan analyses are presented in Table 17-9. Congeners detected are summarized below:

Dioxins/Furans Detected in Soils (AUS-A11N)	
1,2,3,4,6,7,8-HpCDD	2,3,7,8—TCDF
OCDD	1,2,3,4,7,8-HxCDF
	1,2,3,4,6,7,8-HpCDF
	OCDF

Each of these congeners is retained as a COPEC (note the individual congeners are not included in the COPEC summary of Table 17-11).

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

[55] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

[56] Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

[57] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

17.3.2.2 Surface Water

Ecological screening results for surface water samples are presented in Table 17-8. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)[58]
- EcoTox (USEPA 1996)[59]
- USEPA Region IV Freshwater Screening Values (1999b)[60]
- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)[61]
- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ecological screening value (ESV) from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 17.3.2.1.

17.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-A11N, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 17-10; and on the COPEC list, Table 17-11. COPCs in this category include antimony, chromium, and selenium in soil. COPECs coded with "D" on Table 17-11 include cobalt in surface water; and boron, chromium manganese, and selenium in soil. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be evaluated in the

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[58] USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.

[59] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

[60] USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at http://www.epa.gov/region4/waste/oftecser/ecolbul.htm.

[61] ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 17-12.

Note that a number of the human health COPCs exceed migration to groundwater screening criteria. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site and media and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

TABLE 17-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11N

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11N-001	365888.2	782513.4	436.82	NA	
A11N-002	366006.5	782633.5	437.05	NA	
A11N-003	366133.0	782774.2	437.11	NA	
A11N-004	365854.8	782569.6	432.82	NA	
A11N-005	365991.0	782822.3	433.58	NA	
A11N-006	366148.8	783104.3	431.46	NA	
A11N-007	365786.8	782710.5	463.94	NA	
A11N-008	365906.8	782889.7	436.22	NA	
A11N-009	365697.1	782617.6	435.21	NA	
A11N-010	365611.1	782706.7	439.33	NA	
A11N-011	365650.0	782772.5	466.87	NA	
A11N-012	365825.8	782841.3	437.31	NA	
A11N-013	365706.0	782907.9	438.13	NA	
A11N-014	365452.2	782756.3	437.81	NA	
A11N-015	365339.7	782869.9	439.71	NA	
A11N-016	365435.6	782943.2	455.12	NA	
A11N-017	365119.5	782793.9	452.40	NA	
A11N-018	364982.8	782628.6	456.24	NA	
A11N-019	364961.3	782628.6	453.34	NA	
A11N-020	364905.7	782616.1	468.57	NA	
A11N-021	364870.7	782630.0	453.01	NA	
A11N-022	364922.8	782693.9	449.31	NA	
A11N-023	365010.8	782906.3	444.39	NA	
A11N-024	364729.0	782600.8	457.81	NA	
A11N-025	364685.7	782640.7	452.33	NA	
A11N-026	364822.1	782807.5	470.21	NA	
A11N-027	364839.6	782957.1	452.70	NA	
A11N-028	364600.8	782471.7	462.75	NA	
A11N-029	365195.6	782734.8	445.11	NA	
A11N-030	364430.9	782542.8	458.75	NA	
A11N-031	364548.3	782631.6	459.24	NA	

Sheet 1 of 1

NA = Not Applicable

TABLE 17-1A
SURVEY COORDINATES FOR POSSIBLE FORMER TRENCH LOCATIONS IN AUS-A11N

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11N-T01	364430.9	782542.8	458.75	NA	Coordinates for previous trench location
A11N-T02	364478.1	782535.5	459.14	NA	Coordinates for previous trench location
A11N-T03	364496.7	782555.2	459.27	NA	Coordinates for previous trench location
A11N-T04	364512.2	782569.5	459.46	NA	Coordinates for previous trench location
A11N-T05	364534.7	782592.7	460.42	NA	Coordinates for previous trench location
A11N-T06	364548.3	782631.6	459.24	NA	Coordinates for previous trench location
A11N-T07	364812.8	782482.1	461.17	NA	Coordinates for previous trench location
A11N-T08	364875.5	782519.1	460.35	NA	Coordinates for previous trench location

Sheet 1 of 1

NA = Not Applicable

TABLE 17-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-A11N

Soil		Surface Water
AUS-A11N-001*	AUS-A11N-017	AUS-A11N-001
AUS-A11N-002*	AUS-A11N-018	AUS-A11N-005
AUS-A11N-003*	AUS-A11N-019*	AUS-A11N-012
AUS-A11N-004*	AUS-A11N-020	AUS-A11N-015
AUS-A11N-005*	AUS-A11N-021	AUS-A11N-019
AUS-A11N-006*	AUS-A11N-022	AUS-A11N-024
AUS-A11N-007	AUS-A11N-023	
AUS-A11N-008	AUS-A11N-024*	
AUS-A11N-009*	AUS-A11N-025*	
AUS-A11N-010*	AUS-A11N-026	
AUS-A11N-011	AUS-A11N-027	
AUS-A11N-012*	AUS-A11N-028	
AUS-A11N-013	AUS-A11N-029	
AUS-A11N-014*	AUS-A11N-030	
AUS-A11N-015*	AUS-A11N-031	
AUS-A11N-016		

Sheet 1 of 1

* Note that the samples at this location were originally designated as sediment, but are actually soil samples.

TABLE 17-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Acetone	1/10	23 ug/kg
Semivolatile Organic Compounds		
2-Methylnaphthalene	1/16	300 ug/kg
Benzo(a)Anthracene	2/16	120 ug/kg to 180 ug/kg
Benzo(a)Pyrene	2/16	140 ug/kg to 160 ug/kg
Benzo(b)Fluoranthene	2/16	130 ug/kg to 190 ug/kg
Benzo(g,h,i)Perylene	2/16	70 ug/kg to 140 ug/kg
Benzo(k)Fluoranthene	2/16	70 ug/kg to 170 ug/kg
Bis(2-Ethylhexyl) Phthalate	7/12	45 ug/kg to 270 ug/kg
Chrysene	2/16	120 ug/kg to 180 ug/kg
Dibenzofuran	1/12	360 ug/kg
Fluoranthene	2/16	190 ug/kg to 240 ug/kg
Indeno(1,2,3-c,d)Pyrene	1/16	75 ug/kg
Naphthalene	1/16	140 ug/kg
Phenanthrene	3/16	9.1 ug/kg to 240 ug/kg
Pyrene	2/16	180 ug/kg to 250 ug/kg
Metals		
Aluminum	35/35	3,130 mg/kg to 14,300 mg/kg
Antimony	3/35	0.26 mg/kg to 0.5 mg/kg
Arsenic	35/35	2.4 mg/kg to 23.9 mg/kg
Barium	35/35	65.4 mg/kg to 474 mg/kg
Beryllium	2/35	0.74 mg/kg to 1.1 mg/kg
Boron	10/35	2 mg/kg to 3.7 mg/kg
Cadmium	28/35	0.29 mg/kg to 1.4 mg/kg
Calcium	35/35	547 mg/kg to 17,500 mg/kg
Chromium, Total	35/35	7.1 mg/kg to 21.5 mg/kg
Cobalt	18/35	4 mg/kg to 35.3 mg/kg
Copper	35/35	3.5 mg/kg to 41.5 mg/kg
Iron	35/35	8,230 mg/kg to 34,500 mg/kg
Lead	35/35	7.9 mg/kg to 568 mg/kg
Magnesium	35/35	1,080 mg/kg to 10,400 mg/kg
Manganese	35/35	121 mg/kg to 2,250 mg/kg
Mercury	8/35	0.05 mg/kg to 0.14 mg/kg
Nickel	35/35	6.9 mg/kg to 24.4 mg/kg
Potassium	35/35	301 mg/kg to 1,050 mg/kg
Selenium	19/35	0.18 mg/kg to 2.1 mg/kg
Silver	13/35	0.18 mg/kg to 1 mg/kg
Sodium	14/35	119 mg/kg to 3,330 mg/kg
Thallium	1/35	0.24 mg/kg
Vanadium	35/35	11.3 mg/kg to 55.8 mg/kg
Zinc	35/35	14.7 mg/kg to 82.2 mg/kg

Sheet 1 of 2

TABLE 17-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Other Parameters		
Total Organic Carbon	3/3	5,540 mg/kg to 74,300 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 17-4
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Toluene	1/4	3 ug/L
Semivolatile Organic Compounds		
Bis(2-Ethylhexyl) phthalate (DEHP)	1/3	1.1 ug/L
Explosives		
1,3,5-Trinitrobenzene	1/6	0.69 ug/L
Metals		
Aluminum	6/6	1,110 ug/L to 6,220 ug/L
Antimony	1/6	1.5 ug/L
Barium	6/6	46.8 ug/L to 165 ug/L
Beryllium	2/6	0.1 ug/L to 0.13 ug/L
Boron	2/6	15 ug/L to 35.6 ug/L
Calcium	6/6	8,110 ug/L to 64,000 ug/L
Chromium, Total	3/6	1.5 ug/L to 7.5 ug/L
Cobalt	4/6	2.5 ug/L to 6.3 ug/L
Copper	4/6	6.5 ug/L to 20.7 ug/L
Iron	6/6	1,720 ug/L to 14,100 ug/L
Lead	4/6	4.7 ug/L to 93 ug/L
Magnesium	6/6	4,650 ug/L to 15,800 ug/L
Manganese	6/6	44.6 ug/L to 1,260 ug/L
Nickel	3/6	9.2 ug/L to 18.4 ug/L
Potassium	6/6	452 ug/L to 7,660 ug/L
Selenium	1/6	3.7 ug/L
Sodium	4/6	3,590 ug/L to 19,100 ug/L
Zinc	4/6	21.8 ug/L to 97.7 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	6/6	58.2 mg/L to 210 mg/L
Nitrogen, Ammonia (as N)	2/2	0.53 mg/L to 0.55 mg/L
Nitrogen, Nitrate-Nitrite	4/6	0.057 mg/L to 0.28 mg/L
Sulfate (as SO4)	6/6	550 ug/L to 12,000 ug/L
Suspended Solids (Residue, Non-Filterable)	2/2	35.5 mg/L to 38.5 mg/L
Total Dissolved Solids (Residue, Filterable)	4/4	182 mg/L to 301 mg/L

Sheet 1 of 1

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			2.10E-06	7.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG		7.79E-09	1.79E-06	3.50E+01
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG		3.68E-09	4.60E-05	7.78E+00
75-34-3	1,1-Dichloroethane	7	U	UG/KG			3.40E-06	7.00E-03
75-35-4	1,1-Dichloroethene	7	U	UG/KG		5.90E-08	1.04E-04	2.33E+00
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG		9.15E-09	1.99E-04	7.00E+00
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG			4.75E-05	3.50E-01
78-87-5	1,2-Dichloropropane	7	U	UG/KG		9.12E-09	3.29E-04	7.00E+00
78-93-3	2-Butanone (MEK)	13	U	UG/KG			4.69E-07	
591-78-6	2-Hexanone	13	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	13	U	UG/KG			4.50E-06	
67-64-1	Acetone	23	J	UG/KG			3.70E-06	2.88E-02
71-43-2	Benzene	7	U	UG/KG		4.78E-09	2.89E-04	3.50E+00
75-27-4	Bromodichloromethane	7	U	UG/KG		2.97E-09	6.71E-06	2.33E-01
75-25-2	Bromoform	7	U	UG/KG		2.24E-11	3.97E-07	1.75E-01
74-83-9	Bromomethane	7	U	UG/KG			5.33E-04	7.00E-01
75-15-0	Carbon disulfide	7	U	UG/KG			5.79E-06	3.50E-03
56-23-5	Carbon tetrachloride	7	U	UG/KG		1.32E-08	1.00E-03	2.33E+00
108-90-7	Chlorobenzene	7	U	UG/KG			1.29E-05	1.00E-01
75-00-3	Chloroethane	7	U	UG/KG		1.08E-09	3.71E-07	
67-66-3	Chloroform	7	U	UG/KG		1.34E-08	5.43E-03	2.33E-01
74-87-3	Chloromethane	7	U	UG/KG		2.63E-09		
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG			4.75E-05	3.50E-01
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	7	U	UG/KG		2.64E-09	4.40E-06	3.50E-01
100-41-4	Ethylbenzene	7	U	UG/KG			1.17E-06	1.00E-02
75-09-2	Methylene chloride	8	U	UG/KG		3.90E-10	8.18E-07	8.00E+00
110-54-3	N-Hexane	7	U	UG/KG			1.73E-05	
100-42-5	Styrene	7	U	UG/KG			3.42E-07	3.50E-02
127-18-4	Tetrachloroethylene (PCE)	7	U	UG/KG		3.75E-10	4.11E-06	2.33E+00
108-88-3	Toluene	7	U	UG/KG			3.52E-06	1.17E-02
1330-20-7	total Xylenes	7	U	UG/KG			1.57E-06	7.00E-04
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG			3.27E-05	2.33E-01
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG		1.14E-09	8.85E-05	2.33E+00
75-01-4	Vinyl chloride	7	U	UG/KG		1.44E-07		1.00E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	520	U	UG/KG			6.83E-05	1.73E+00
95-50-1	1,2-Dichlorobenzene	520	U	UG/KG			1.57E-04	5.78E-01
541-73-1	1,3-Dichlorobenzene	520	U	UG/KG			1.00E-02	
106-46-7	1,4-Dichlorobenzene	520	U	UG/KG		6.40E-08	2.71E-04	5.20E+00
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG			2.95E-05	2.60E-01
88-06-2	2,4,6-Trichlorophenol	520	U	UG/KG		2.32E-09		6.50E+01
120-83-2	2,4-Dichlorophenol	520	U	UG/KG			1.97E-04	1.04E+01
105-67-9	2,4-Dimethylphenol	520	U	UG/KG			2.95E-05	1.30E+00
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG			1.48E-03	2.60E+02
91-58-7	2-Chloronaphthalene	520	U	UG/KG			1.91E-05	
95-57-8	2-Chlorophenol	520	U	UG/KG			2.15E-03	2.60E+00
90-12-0	1-Methylnaphthalene	41	U	UG/KG			2.17E-04	1.03E-02

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J = Estimated U = Nondetect

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
91-57-6	2-Methylnaphthalene	300	J	UG/KG			5.53E-06	1.50E-03
95-48-7	2-Methylphenol	520	U	UG/KG			1.18E-05	6.50E-01
88-74-4	2-Nitroaniline	2600	U	UG/KG			5.17E-02	
88-75-5	2-Nitrophenol	520	U	UG/KG			7.38E-05	
91-94-1	3,3'-Dichlorobenzidine	520	U	UG/KG		9.49E-08		1.73E+03
99-09-2	3-Nitroaniline	2600	U	UG/KG			5.17E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	520	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	520	U	UG/KG			1.18E-05	
106-47-8	4-Chloroaniline	1000	U	UG/KG			2.84E-04	3.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	520	U	UG/KG				
106-44-5	4-Methylphenol	520	U	UG/KG			1.18E-04	
100-01-6	4-Nitroaniline	2600	U	UG/KG			5.17E-02	
100-02-7	4-Nitrophenol	2600	U	UG/KG			3.69E-04	
83-32-9	Acenaphthene	520	U	UG/KG			1.36E-05	1.73E-02
208-96-8	Acenaphthylene	520	U	UG/KG			9.59E-06	2.60E-03
120-12-7	Anthracene	520	U	UG/KG			1.33E-06	8.67E-04
56-55-3	Benzo(a)anthracene	180	J	UG/KG		6.24E-08		2.25E+00
50-32-8	Benzo(a)pyrene	160	J	UG/KG		5.54E-07		4.00E-01
205-99-2	Benzo(b)fluoranthene	190	J	UG/KG		6.58E-08		9.50E-01
191-24-2	Benzo(g,h,i)perylene	140	J	UG/KG			2.58E-06	7.00E-04
207-08-9	Benzo(k)fluoranthene	170	J	UG/KG		5.89E-09		8.50E-02
111-91-1	bis(2-Chloroethoxy)methane	520	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	520	U	UG/KG		8.39E-07		2.60E+04
108-60-1	bis(2-Chloroisopropyl) ether	520	U	UG/KG		6.44E-08	1.22E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	270	J	UG/KG		1.53E-09	1.53E-05	
85-68-7	Butyl benzyl phthalate	520	U	UG/KG			2.95E-06	6.50E-04
86-74-8	Carbazole	520	U	UG/KG		4.22E-09		1.73E+01
218-01-9	Chrysene	180	J	UG/KG		6.24E-10		2.25E-02
84-74-2	Di-n-butyl phthalate	520	U	UG/KG			5.90E-06	1.73E-03
117-84-0	Di-n-octyl phthalate	520	U	UG/KG			2.95E-05	5.20E-05
53-70-3	Dibenz(a,h)anthracene	520	U	UG/KG		1.80E-06		6.50E+00
132-64-9	Dibenzofuran	360	J	UG/KG			7.11E-05	
84-66-2	Diethyl phthalate	520	U	UG/KG			7.38E-07	
131-11-3	Dimethyl phthalate	520	U	UG/KG			5.90E-08	
206-44-0	Fluoranthene	240	J	UG/KG			7.97E-06	1.20E-03
86-73-7	Fluorene	520	U	UG/KG			1.57E-05	1.73E-02
118-74-1	Hexachlorobenzene	520	U	UG/KG		3.37E-07	7.38E-04	5.20E+00
87-68-3	Hexachlorobutadiene	520	U	UG/KG		1.64E-08	2.95E-03	5.20E+00
77-47-4	Hexachlorocyclopentadiene	520	U	UG/KG			8.82E-05	2.60E-02
67-72-1	Hexachloroethane	520	U	UG/KG		2.95E-09	5.90E-04	2.60E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	75	J	UG/KG		2.60E-08		1.07E-01
78-59-1	Isophorone	520	U	UG/KG		2.00E-10	2.95E-06	1.73E+01
621-64-7	N-Nitroso-di-n-propylamine	520	U	UG/KG		1.48E-06		2.60E+05
86-30-6	N-Nitrosodiphenylamine	520	U	UG/KG		1.03E-09		8.67E+00
91-20-3	Naphthalene	140	J	UG/KG			7.42E-04	3.50E-02
87-86-5	Pentachlorophenol	2600	U	UG/KG		2.34E-07	1.82E-04	2.60E+03
85-01-8	Phenanthrene	240	J	UG/KG			4.43E-06	1.20E-03
108-95-2	Phenol	520	U	UG/KG			9.84E-07	1.04E-01
88-89-1	Picric Acid	1100	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
129-00-0	Pyrene	250	J	UG/KG			4.61E-06	1.25E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	490	UJ	UG/KG			1.85E-05	
99-65-0	1,3-Dinitrobenzene	490	UJ	UG/KG			5.56E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	990	UJ	UG/KG		1.20E-08	2.25E-03	
121-14-2	2,4-Dinitrotoluene	490	UJ	UG/KG			2.78E-04	1.23E+04
606-20-2	2,6-Dinitrotoluene	990	UJ	UG/KG			1.12E-03	3.30E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	990	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	990	UJ	UG/KG				
99-08-1	3-Nitrotoluene	990	UJ	UG/KG			4.87E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	990	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	990	UJ	UG/KG			4.87E-04	
2691-41-0	HMX	990	UJ	UG/KG			2.25E-05	
98-95-3	Nitrobenzene	490	UJ	UG/KG			4.28E-03	
55-63-0	Nitroglycerin	2000	UJ	UG/KG		1.14E-08		
78-11-5	Pentaerythritol tetranitrate (PETN)	3200	U	UG/KG				
121-82-4	RDX	990	UJ	UG/KG		4.42E-08	3.75E-04	
479-45-8	Tetryl	1500	UJ	UG/KG			1.70E-04	
Metals								
7429-90-5	Aluminum	14300		MG/KG	4.97E-01		8.53E-03	
7440-36-0	Antimony	0.5	J	MG/KG	6.02E-01		6.12E-04	1.67E+00
7440-38-2	Arsenic	23.9		MG/KG	1.77E+00	8.76E-06	5.44E-02	2.39E+01
7440-39-3	Barium	474	J	MG/KG	2.43E+00		3.81E-03	5.93E+00
7440-41-7	Beryllium	1.1		MG/KG	1.45E+00	4.91E-10	2.98E-04	3.67E-01
7440-42-8	Boron	3.7	J	MG/KG	6.98E-01		4.68E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-43-9	Cadmium	1.4		MG/KG	7.37E+00	4.68E-10	1.73E-03	3.50E+00
7440-70-2	Calcium	17500	J	MG/KG	7.01E+00			
7440-47-3	Chromium	21.5		MG/KG	8.53E-01	4.80E-08		1.08E+01
7440-48-4	Cobalt	35.3		MG/KG	1.63E+00		2.88E-04	
7440-50-8	Copper	41.5		MG/KG	3.67E+00		5.47E-04	
7439-89-6	Iron	34500		MG/KG	1.79E+00		5.63E-02	
7439-92-1	Lead	568		MG/KG	2.43E+01			
7439-95-4	Magnesium	10400		MG/KG	6.70E+00			
7439-96-5	Manganese	2250		MG/KG	6.18E-01		6.98E-02	
7439-97-6	Mercury	0.14		MG/KG	2.33E+00			
7440-02-0	Nickel	24.4		MG/KG	1.29E+00		5.97E-04	3.49E+00
2023695	Potassium	1050		MG/KG	1.68E+00			
7782-49-2	Selenium	2.1		MG/KG	8.97E-01		2.05E-04	7.00E+00
7440-22-4	Silver	1	J	MG/KG	1.72E+00		9.78E-05	5.00E-01
7440-23-5	Sodium	3330		MG/KG	1.96E+01			
7440-28-0	Thallium	0.24	J	MG/KG	5.85E-01		1.68E-06	
7440-62-2	Vanadium	55.8		MG/KG	1.18E+00		3.90E-03	1.86E-01
7440-66-6	Zinc	82.2		MG/KG	1.60E+00		1.34E-04	1.37E-01
Dioxins								
1746-01-6	2,3,7,8-TCDD	0.000727	U	UG/KG				
Other Parameters								
7601-90-3	Perchlorate	9800	U	UG/KG			9.59E-03	
TOC	TOC	74300		MG/KG	2.37E+00			

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TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			3.50E-03
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG	8.54E-07	8.54E-07	3.50E-01
75-34-3	1,1-Dichloroethane	7	U	UG/KG	3.50E-08	3.50E-08	3.04E-04
75-35-4	1,1-Dichloroethene	7	U	UG/KG	3.89E-07	3.89E-06	1.17E-01
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG	1.11E-04	5.00E-06	3.50E-01
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
78-87-5	1,2-Dichloropropane	7	U	UG/KG	8.33E-05	3.89E-06	2.33E-01
78-93-3	2-Butanone (MEK)	13	U	UG/KG			
591-78-6	2-Hexanone	13	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	13	U	UG/KG			
67-64-1	Acetone	23	J	UG/KG	1.15E-07	1.15E-07	1.44E-03
71-43-2	Benzene	7	U	UG/KG	3.50E-05	1.63E-06	2.33E-01
75-27-4	Bromodichloromethane	7	U	UG/KG	7.61E-05	3.50E-06	1.17E-02
75-25-2	Bromoform	7	U	UG/KG	9.72E-06	4.38E-07	8.75E-03
74-83-9	Bromomethane	7	U	UG/KG	2.41E-06	7.00E-06	3.50E-02
75-15-0	Carbon disulfide	7	U	UG/KG	3.50E-08	3.50E-07	2.19E-04
56-23-5	Carbon tetrachloride	7	U	UG/KG	1.59E-04	1.71E-05	1.00E-01
108-90-7	Chlorobenzene	7	U	UG/KG	1.71E-07	1.71E-06	7.00E-03
75-00-3	Chloroethane	7	U	UG/KG			
67-66-3	Chloroform	7	U	UG/KG	7.45E-06	3.50E-06	1.17E-02
74-87-3	Chloromethane	7	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG			

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ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	7	U	UG/KG	1.71E-07	1.71E-07	1.75E-02
100-41-4	Ethylbenzene	7	U	UG/KG	3.50E-08	3.50E-07	5.38E-04
75-09-2	Methylene chloride	8	U	UG/KG	1.05E-05	6.67E-07	4.00E-01
110-54-3	N-Hexane	7	U	UG/KG			
100-42-5	Styrene	7	U	UG/KG	1.71E-08	1.71E-07	1.75E-03
127-18-4	Tetrachloroethylene (PCE)	7	U	UG/KG	6.36E-05	2.92E-06	1.17E-01
108-88-3	Toluene	7	U	UG/KG	1.71E-08	1.71E-08	5.83E-04
1330-20-7	total Xylenes	7	U	UG/KG	7.00E-09	1.71E-08	4.67E-05
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG	1.71E-07	1.71E-07	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG	1.35E-05	5.83E-06	1.17E-01
75-01-4	Vinyl chloride	7	U	UG/KG	2.33E-03	1.08E-04	7.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	520	U	UG/KG	2.60E-05	2.60E-04	1.04E-01
95-50-1	1,2-Dichlorobenzene	520	U	UG/KG	2.89E-06	2.89E-05	3.06E-02
541-73-1	1,3-Dichlorobenzene	520	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	520	U	UG/KG			2.60E-01
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG	1.30E-05	1.30E-05	9.63E-03
88-06-2	2,4,6-Trichlorophenol	520	U	UG/KG	1.00E-03	4.73E-05	2.60E+00
120-83-2	2,4-Dichlorophenol	520	U	UG/KG	8.52E-05	8.52E-04	5.20E-01
105-67-9	2,4-Dimethylphenol	520	U	UG/KG	1.27E-05	1.27E-05	5.78E-02
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG	6.34E-04	6.34E-03	1.30E+01
91-58-7	2-Chloronaphthalene	520	U	UG/KG			
95-57-8	2-Chlorophenol	520	U	UG/KG	5.20E-05	5.20E-05	1.30E-01
90-12-0	1-Methylnaphthalene	41	U	UG/KG	5.00E-07	5.00E-06	4.88E-04

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TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
91-57-6	2-Methylnaphthalene	300	J	UG/KG	4.92E-06	4.92E-06	7.14E-05
95-48-7	2-Methylphenol	520	U	UG/KG	5.20E-06	5.20E-06	3.47E-02
88-74-4	2-Nitroaniline	2600	U	UG/KG			
88-75-5	2-Nitrophenol	520	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	520	U	UG/KG	4.00E-02	1.86E-03	7.43E+01
99-09-2	3-Nitroaniline	2600	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	520	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	520	U	UG/KG			
106-47-8	4-Chloroaniline	1000	U	UG/KG	1.22E-04	1.22E-03	1.43E+00
7005-72-3	4-Chlorophenyl phenyl ether	520	U	UG/KG			
106-44-5	4-Methylphenol	520	U	UG/KG			
100-01-6	4-Nitroaniline	2600	U	UG/KG			
100-02-7	4-Nitrophenol	2600	U	UG/KG			
83-32-9	Acenaphthene	520	U	UG/KG	4.33E-06	4.33E-06	9.12E-04
208-96-8	Acenaphthylene	520	U	UG/KG	8.52E-06	8.52E-06	1.24E-04
120-12-7	Anthracene	520	U	UG/KG	8.52E-07	8.52E-07	4.33E-05
56-55-3	Benzo(a)anthracene	180	J	UG/KG	2.25E-02	1.06E-03	9.00E-02
50-32-8	Benzo(a)pyrene	160	J	UG/KG	2.00E-01	9.41E-03	2.00E-02
205-99-2	Benzo(b)fluoranthene	190	J	UG/KG	2.38E-02	1.12E-03	3.80E-02
191-24-2	Benzo(g,h,i)perylene	140	J	UG/KG	2.30E-06	2.30E-06	3.33E-05
207-08-9	Benzo(k)fluoranthene	170	J	UG/KG	2.18E-03	1.00E-04	3.47E-03
111-91-1	bis(2-Chloroethoxy)methane	520	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	520	U	UG/KG	1.04E-01	6.93E-03	1.30E+03
108-60-1	bis(2-Chloroisopropyl) ether	520	U	UG/KG			

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TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	270	J	UG/KG	6.59E-04	6.59E-05	7.50E-05
85-68-7	Butyl benzyl phthalate	520	U	UG/KG	1.27E-06	1.27E-06	5.59E-04
86-74-8	Carbazole	520	U	UG/KG	1.79E-03	8.39E-05	8.67E-01
218-01-9	Chrysene	180	J	UG/KG	2.31E-04	1.06E-05	1.13E-03
84-74-2	Di-n-butyl phthalate	520	U	UG/KG	2.60E-06	2.60E-06	2.26E-04
117-84-0	Di-n-octyl phthalate	520	U	UG/KG	1.27E-05	1.27E-04	5.20E-05
53-70-3	Dibenz(a,h)anthracene	520	U	UG/KG	6.50E-01	3.06E-02	2.60E-01
132-64-9	Dibenzofuran	360	J	UG/KG			
84-66-2	Diethyl phthalate	520	U	UG/KG	5.20E-07	5.20E-07	1.11E-03
131-11-3	Dimethyl phthalate	520	U	UG/KG			
206-44-0	Fluoranthene	240	J	UG/KG	2.93E-06	2.93E-06	5.58E-05
86-73-7	Fluorene	520	U	UG/KG	6.34E-06	6.34E-06	9.29E-04
118-74-1	Hexachlorobenzene	520	U	UG/KG	1.30E-01	6.67E-03	2.60E-01
87-68-3	Hexachlorobutadiene	520	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	520	U	UG/KG	3.71E-05	3.71E-05	1.30E-03
67-72-1	Hexachloroethane	520	U	UG/KG	2.60E-04	2.60E-04	1.04E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	75	J	UG/KG	9.38E-03	4.41E-04	5.36E-03
78-59-1	Isophorone	520	U	UG/KG	1.27E-06	1.27E-06	6.50E-02
621-64-7	N-Nitroso-di-n-propylamine	520	U	UG/KG	6.50E-01	2.89E-02	1.04E+04
86-30-6	N-Nitrosodiphenylamine	520	U	UG/KG	4.33E-04	2.08E-05	5.20E-01
91-20-3	Naphthalene	140	J	UG/KG	1.71E-06	1.71E-05	1.67E-03
87-86-5	Pentachlorophenol	2600	U	UG/KG	1.08E-01	5.00E-03	8.67E+01
85-01-8	Phenanthrene	240	J	UG/KG	3.93E-06	3.93E-06	5.71E-05
108-95-2	Phenol	520	U	UG/KG	5.20E-07	4.33E-06	5.20E-03
88-89-1	Picric Acid	1100	U	UG/KG			

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TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
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CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
129-00-0	Pyrene	250	J	UG/KG	4.10E-06	4.10E-06	5.95E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	490	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	490	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	990	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	490	UJ	UG/KG	5.83E-02	2.72E-03	6.13E+02
606-20-2	2,6-Dinitrotoluene	990	UJ	UG/KG	1.18E-01	5.50E-03	1.41E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	990	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	990	UJ	UG/KG			
99-08-1	3-Nitrotoluene	990	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	990	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	990	UJ	UG/KG			
2691-41-0	HMX	990	UJ	UG/KG			
98-95-3	Nitrobenzene	490	UJ	UG/KG	4.90E-04	4.90E-04	4.90E+00
55-63-0	Nitroglycerin	2000	UJ	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	3200	U	UG/KG			
121-82-4	RDX	990	UJ	UG/KG			
479-45-8	Tetryl	1500	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	14300		MG/KG			
7440-36-0	Antimony	0.5	J	MG/KG	6.10E-04	6.10E-03	1.00E-01
7440-38-2	Arsenic	23.9		MG/KG	7.97E+00	3.92E-01	8.54E-01
7440-39-3	Barium	474	J	MG/KG	3.39E-03	3.39E-02	3.95E-01
7440-41-7	Beryllium	1.1		MG/KG	1.10E+00	3.79E-02	1.67E-01
7440-42-8	Boron	3.7	J	MG/KG	2.06E-05	2.06E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-43-9	Cadmium	1.4		MG/KG	7.00E-04	7.00E-03	3.78E-01
7440-70-2	Calcium	17500	J	MG/KG			
7440-47-3	Chromium	21.5		MG/KG	2.15E-03	5.24E-03	7.68E-01
7440-48-4	Cobalt	35.3		MG/KG	2.94E-04	2.94E-03	
7440-50-8	Copper	41.5		MG/KG	5.06E-04	5.06E-03	3.77E-03
7439-89-6	Iron	34500		MG/KG			
7439-92-1	Lead	568		MG/KG	1.42E+00	1.42E+00	
7439-95-4	Magnesium	10400		MG/KG			
7439-96-5	Manganese	2250		MG/KG	2.34E-02	2.34E-01	
7439-97-6	Mercury	0.14		MG/KG	2.30E-04	2.30E-03	9.33E-01
7440-02-0	Nickel	24.4		MG/KG	5.95E-04	5.95E-03	3.21E-01
2023695	Potassium	1050		MG/KG			
7782-49-2	Selenium	2.1		MG/KG	2.10E-04	2.10E-03	8.75E-01
7440-22-4	Silver	1	J	MG/KG	1.00E-04	1.00E-03	6.67E-01
7440-23-5	Sodium	3330		MG/KG			
7440-28-0	Thallium	0.24	J	MG/KG	1.50E-03	1.50E-03	1.00E-01
7440-62-2	Vanadium	55.8		MG/KG	3.99E-03	3.99E-02	5.69E-02
7440-66-6	Zinc	82.2		MG/KG	1.35E-04	1.35E-03	2.28E-02
Dioxins							
1746-01-6	2,3,7,8-TCDD	0.000727	U	UG/KG			
Other Parameters							
7601-90-3	Perchlorate	9800	U	UG/KG			
TOC	TOC	74300		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-6
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	5	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		
67-64-1	Acetone	5	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	3		UG/L		4.84E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1	U	UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 17-6
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1.1	J	UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-6
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	10	U	UG/L	1.00E+00	1.00E-01
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.69	J	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L		
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L		
99-08-1	3-Nitrotoluene	0.5	U	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	UJ	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		
2691-41-0	HMX	0.5	UJ	UG/L		
98-95-3	Nitrobenzene	10	U	UG/L		
55-63-0	Nitroglycerin	1	UJ	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	0.5	UJ	UG/L		
121-82-4	RDX	0.5	UJ	UG/L		
479-45-8	Tetryl	0.75	UJ	UG/L		
Metals						
7429-90-5	Aluminum	6220	J	UG/L	3.11E+01	
7440-36-0	Antimony	1.5	J	UG/L	2.50E-01	
7440-38-2	Arsenic	10	U	UG/L	1.00E+00	
7440-39-3	Barium	165	J	UG/L	7.27E+00	3.30E-02

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 17-6
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7440-41-7	Beryllium	0.13		UG/L	2.60E-02	
7440-42-8	Boron	35.6	J	UG/L		3.56E-02
7440-43-9	Cadmium	5	U	UG/L	1.00E+00	
7440-70-2	Calcium	64000		UG/L	8.89E+00	
7440-47-3	Chromium	7.5	J	UG/L	7.50E-01	
7440-48-4	Cobalt	6.3	J	UG/L	1.26E-01	
7440-50-8	Copper	20.7		UG/L	2.07E+00	
7439-89-6	Iron	14100		UG/L	1.41E+02	1.41E+01
7439-92-1	Lead	93		UG/L	4.65E+01	
7439-95-4	Magnesium	15900		UG/L	6.27E+00	
7439-96-5	Manganese	1260		UG/L	2.16E+00	1.26E+00
7439-97-6	Mercury	0.2	U	UG/L	1.00E+00	1.67E+01
7440-02-0	Nickel	18.4		UG/L	1.84E+00	1.84E-02
2023695	Potassium	7660		UG/L	4.75E+00	
7782-49-2	Selenium	3.7	J	UG/L	1.37E+00	3.70E-03
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	19100		UG/L	6.03E+00	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	50	U	UG/L	1.00E+00	
7440-66-6	Zinc	97.7		UG/L	4.89E+00	9.77E-02
Other Parameters						
ALK	Alkalinity, Total (as CaCO3)	210		MG/L	6.84E+00	
7664-41-7	Nitrogen, Ammonia (as N)	0.55	J	MG/L	2.12E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.29		MG/L	5.80E+00	
7601-90-3	Perchlorate	500	U	UG/L		
14808-79-8	Sulfate (as SO4)	12000		UG/L		2.40E-02
TDS	TDS	307		MG/L	4.28E+00	3.07E-01
TSS	TSS	38.5		MG/L	4.81E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		7	U	UG/KG	2.35E-04	
79-34-5	1,1,2,2-Tetrachloroethane		7	U	UG/KG	5.50E-02	
79-00-5	1,1,2-Trichloroethane		7	U	UG/KG	2.45E-04	
75-34-3	1,1-Dichloroethane		7	U	UG/KG	3.48E-04	
75-35-4	1,1-Dichloroethene		7	U	UG/KG	8.45E-04	
107-06-2	1,2-Dichloroethane (EDC)		7	U	UG/KG	3.30E-04	
540-59-0	1,2-Dichloroethene (total)		7	U	UG/KG	8.89E-03	
78-87-5	1,2-Dichloropropane		7	U	UG/KG	1.00E-05	
78-93-3	2-Butanone (MEK)		13	U	UG/KG	1.45E-04	
591-78-6	2-Hexanone		13	U	UG/KG	1.03E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		13	U	UG/KG	2.93E-05	
67-64-1	Acetone		23	J	UG/KG	9.20E-03	
71-43-2	Benzene		7	U	UG/KG	4.38E-04	
75-27-4	Bromodichloromethane		7	U	UG/KG	1.30E-02	
75-25-2	Bromoform		7	U	UG/KG	4.40E-04	
74-83-9	Bromomethane		7	U	UG/KG	2.98E-02	
75-15-0	Carbon disulfide		7	U	UG/KG	7.44E-02	
56-23-5	Carbon tetrachloride		7	U	UG/KG	7.00E-06	
108-90-7	Chlorobenzene		7	U	UG/KG	1.75E-04	
75-00-3	Chloroethane		7	U	UG/KG		
67-66-3	Chloroform		7	U	UG/KG	5.88E-03	
74-87-3	Chloromethane		7	U	UG/KG	6.73E-04	
156-59-2	cis-1,2-Dichloroethene		7	U	UG/KG	8.89E-03	
10061-01-5	cis-1,3-Dichloropropene		7	U	UG/KG	1.76E-02	
124-48-1	Dibromochloromethane		7	U	UG/KG	3.41E-03	
100-41-4	Ethylbenzene		7	U	UG/KG	1.40E-03	
75-09-2	Methylene chloride		8	U	UG/KG	1.98E-03	
110-54-3	N-Hexane		7	U	UG/KG		
100-42-5	Styrene		7	U	UG/KG	2.33E-05	
127-18-4	Tetrachloroethylene (PCE)		7	U	UG/KG	5.38E-04	
108-88-3	Toluene		7	U	UG/KG	2.33E-03	
1330-20-7	total Xylenes		7	U	UG/KG	1.17E-02	
156-60-5	trans-1,2-Dichloroethene		7	U	UG/KG	8.89E-03	
10061-02-6	trans-1,3-Dichloropropene		7	U	UG/KG	1.76E-02	
79-01-6	Trichloroethylene (TCE)		7	U	UG/KG	7.78E-04	
75-01-4	Vinyl chloride		7	U	UG/KG	1.08E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		520	U	UG/KG	2.60E-02	
95-50-1	1,2-Dichlorobenzene		520	U	UG/KG	1.76E-01	
541-73-1	1,3-Dichlorobenzene		520	U	UG/KG	1.38E-02	
106-46-7	1,4-Dichlorobenzene		520	U	UG/KG	2.60E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2600	U	UG/KG	6.50E-01	
88-06-2	2,4,6-Trichlorophenol		520	U	UG/KG	5.20E-02	
120-83-2	2,4-Dichlorophenol		520	U	UG/KG	5.94E-03	
105-67-9	2,4-Dimethylphenol		520	U	UG/KG	5.20E+01	
51-28-5	2,4-Dinitrophenol		2600	U	UG/KG	1.30E-01	
91-58-7	2-Chloronaphthalene		520	U	UG/KG	4.27E+01	
95-57-8	2-Chlorophenol		520	U	UG/KG	2.14E+00	
90-12-0	1-Methylnaphthalene		41	U	UG/KG		
91-57-6	2-Methylnaphthalene		300	J	UG/KG	9.26E-02	YES
95-48-7	2-Methylphenol		520	U	UG/KG	1.29E-02	
88-74-4	2-Nitroaniline		2600	U	UG/KG	3.51E-02	
88-75-5	2-Nitrophenol		520	U	UG/KG	3.25E-01	
91-94-1	3,3'-Dichlorobenzidine		520	U	UG/KG	8.05E-01	
99-09-2	3-Nitroaniline		2600	U	UG/KG	8.23E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2600	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		520	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		520	U	UG/KG	6.54E-02	
106-47-8	4-Chloroaniline		1000	U	UG/KG	9.09E-01	
7005-72-3	4-Chlorophenyl phenyl ether		520	U	UG/KG		
106-44-5	4-Methylphenol		520	U	UG/KG	3.19E-03	
100-01-6	4-Nitroaniline		2600	U	UG/KG	1.19E-01	
100-02-7	4-Nitrophenol		2600	U	UG/KG	3.71E-01	
83-32-9	Acenaphthene		520	U	UG/KG	7.62E-04	
208-96-8	Acenaphthylene		520	U	UG/KG	7.62E-04	
120-12-7	Anthracene		520	U	UG/KG	3.51E-04	
56-55-3	Benzo(a)anthracene		180	J	UG/KG	3.45E-02	YES
50-32-8	Benzo(a)pyrene		160	J	UG/KG	3.64E-05	YES
205-99-2	Benzo(b)fluoranthene		190	J	UG/KG	3.18E-03	YES
191-24-2	Benzo(g,h,i)perylene		140	J	UG/KG	1.18E-03	YES
207-08-9	Benzo(k)fluoranthene		170	J	UG/KG	2.84E-03	YES
111-91-1	bis(2-Chloroethoxy)methane		520	U	UG/KG	1.72E+00	
111-44-4	bis(2-Chloroethyl) ether		520	U	UG/KG	2.19E-02	
108-60-1	bis(2-Chloroisopropyl) ether		520	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		270	J	UG/KG	2.92E-01	YES
85-68-7	Butyl benzyl phthalate		520	U	UG/KG	2.18E+00	
86-74-8	Carbazole		520	U	UG/KG		
218-01-9	Chrysene		180	J	UG/KG	3.81E-02	YES
84-74-2	Di-n-butyl phthalate		520	U	UG/KG	2.60E-03	
117-84-0	Di-n-octyl phthalate		520	U	UG/KG	7.33E-04	
53-70-3	Dibenz(a,h)anthracene		520	U	UG/KG	2.83E-02	
132-64-9	Dibenzofuran		360	J	UG/KG		YES
84-66-2	Diethyl phthalate		520	U	UG/KG	5.20E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		520	U	UG/KG	2.60E-03	
206-44-0	Fluoranthene		240	J	UG/KG	1.97E-03	YES
86-73-7	Fluorene		520	U	UG/KG	1.73E-02	
118-74-1	Hexachlorobenzene		520	U	UG/KG	5.20E-04	
87-68-3	Hexachlorobutadiene		520	U	UG/KG	1.31E+01	
77-47-4	Hexachlorocyclopentadiene		520	U	UG/KG	5.20E-02	
67-72-1	Hexachloroethane		520	U	UG/KG	8.72E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		75	J	UG/KG	6.88E-04	YES
78-59-1	Isophorone		520	U	UG/KG	3.74E-03	
621-64-7	N-Nitroso-di-n-propylamine		520	U	UG/KG	9.56E-01	
86-30-6	N-Nitrosodiphenylamine		520	U	UG/KG	2.60E-02	
91-20-3	Naphthalene		140	J	UG/KG	5.62E-04	
87-86-5	Pentachlorophenol		2600	U	UG/KG	4.33E-01	
85-01-8	Phenanthrene		240	J	UG/KG	5.25E-03	YES
108-95-2	Phenol		520	U	UG/KG	1.30E-02	
88-89-1	Picric Acid		1100	U	UG/KG		
129-00-0	Pyrene		250	J	UG/KG	3.18E-03	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		490	UJ	UG/KG	1.30E+00	
99-65-0	1,3-Dinitrobenzene		490	UJ	UG/KG	7.48E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		990	UJ	UG/KG	3.30E-02	
121-14-2	2,4-Dinitrotoluene		490	UJ	UG/KG	3.83E-01	
606-20-2	2,6-Dinitrotoluene		990	UJ	UG/KG	3.02E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		990	UJ	UG/KG	1.24E-02	
88-72-2	2-Nitrotoluene (ONT)		990	UJ	UG/KG		
99-08-1	3-Nitrotoluene		990	UJ	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		990	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		990	UJ	UG/KG		
2691-41-0	HMX		990	UJ	UG/KG	3.96E-02	
98-95-3	Nitrobenzene		490	UJ	UG/KG	1.23E-02	
55-63-0	Nitroglycerin		2000	UJ	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		3200	U	UG/KG		
121-82-4	RDX		990	UJ	UG/KG	9.90E-03	
479-45-8	Tetryl		1500	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	14300		MG/KG		
7440-36-0	Antimony	0.83	0.5	J	MG/KG	1.00E-01	
7440-38-2	Arsenic	13.5	23.9		MG/KG	2.66E+00	
7440-39-3	Barium	195	474	J	MG/KG	9.48E-01	
7440-41-7	Beryllium	0.76	1.1		MG/KG	1.10E-01	
7440-42-8	Boron	5.3	3.7	J	MG/KG	7.40E+00	
7440-43-9	Cadmium	0.19	1.4		MG/KG	4.83E-02	

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 17-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-70-2	Calcium	2497	17500	J	MG/KG		
7440-47-3	Chromium	25.2	21.5		MG/KG	4.30E+00	
7440-48-4	Cobalt	21.7	35.3		MG/KG	1.77E+00	
7440-50-8	Copper	11.3	41.5		MG/KG	1.34E+00	
7439-89-6	Iron	19306	34500		MG/KG	1.73E+02	
7439-92-1	Lead	23.4	568		MG/KG	1.31E+00	
7439-95-4	Magnesium	1552	10400		MG/KG		
7439-96-5	Manganese	3640	2250		MG/KG	2.25E+01	
7439-97-6	Mercury	0.06	0.14		MG/KG	2.00E-02	YES
7440-02-0	Nickel	18.9	24.4		MG/KG	8.13E-01	
2023695	Potassium	625	1050		MG/KG		
7782-49-2	Selenium	2.34	2.1		MG/KG	2.10E+00	YES
7440-22-4	Silver	0.58	1	J	MG/KG	5.00E-01	
7440-23-5	Sodium	170	3330		MG/KG		
7440-28-0	Thallium	0.41	0.24	J	MG/KG	2.40E-01	
7440-62-2	Vanadium	47.2	55.8		MG/KG	1.21E+00	
7440-66-6	Zinc	51.4	82.2		MG/KG	6.85E-01	
Dioxins							
1746-01-6	2,3,7,8-TCDD		0.000727	U	UG/KG	1.45E-07	
Other Parameters							
7601-90-3	Perchlorate		9800	U	UG/KG		
TOC	TOC	31393	74300		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-8
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		5	U	UG/L	3.57E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		5	U	UG/L	2.94E-02	
67-64-1	Acetone		5	U	UG/L	9.86E-03	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		3		UG/L	3.06E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1	U	UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-8
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1.1	J	UG/L	3.67E-01	YES
85-68-7	Butyl benzyl phthalate		10	U	UG/L	5.26E-01	
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-8
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	10	U	UG/L	1.00E-01	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.69	J	UG/L	2.30E-02	
99-65-0	1,3-Dinitrobenzene		0.25	UJ	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	UJ	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	UJ	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	UJ	UG/L	1.19E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	UJ	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		0.5	UJ	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	U	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	UJ	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	UJ	UG/L	7.14E-05	
2691-41-0	HMX		0.5	UJ	UG/L	1.52E-03	
98-95-3	Nitrobenzene		10	U	UG/L	3.70E-02	
55-63-0	Nitroglycerin		1	UJ	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		0.5	UJ	UG/L	5.88E-06	
121-82-4	RDX		0.5	UJ	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	UJ	UG/L		
Metals							
7429-90-5	Aluminum	200	6220	J	UG/L	7.15E+01	
7440-36-0	Antimony	6	1.5	J	UG/L	5.00E-02	
7440-38-2	Arsenic	10	10	U	UG/L	5.26E-02	
7440-39-3	Barium	22.7	165	J	UG/L	3.30E-02	
7440-41-7	Beryllium	5	0.13		UG/L	2.45E-01	
7440-42-8	Boron		35.6	J	UG/L	3.56E-02	
7440-43-9	Cadmium	5	5	U	UG/L	4.55E+00	
7440-70-2	Calcium	7197	64000		UG/L	5.52E-01	
7440-47-3	Chromium	10	7.5	J	UG/L	3.62E-02	
7440-48-4	Cobalt	50	6.3	J	UG/L	2.74E+00	

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J = Estimated U = Nondetect

TABLE 17-8
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7440-50-8	Copper	10	20.7		UG/L	1.75E+00	
7439-89-6	Iron	100	14100		UG/L	1.41E+01	
7439-92-1	Lead	2	93		UG/L	4.63E+00	
7439-95-4	Magnesium	2534	15900		UG/L	1.94E-01	
7439-96-5	Manganese	582	1260		UG/L	1.26E+00	
7439-97-6	Mercury	0.2	0.2	U	UG/L	1.54E-01	
7440-02-0	Nickel	10	18.4		UG/L	1.84E-02	
2023695	Potassium	1613	7660		UG/L	1.45E-01	
7782-49-2	Selenium	2.7	3.7	J	UG/L	3.70E-03	YES
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	19100		UG/L	2.81E-02	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	50	U	UG/L	2.63E+00	
7440-66-6	Zinc	20	97.7		UG/L	9.77E-02	
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	30.7	210		MG/L		
7664-41-7	Nitrogen, Ammonia (as N)	0.26	0.55	J	MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	0.29		MG/L		
7601-90-3	Perchlorate		500	U	UG/L		
14808-79-8	Sulfate (as SO4)		12000		UG/L		
TDS	TDS	71.7	307		MG/L		
TSS	TSS	8	38.5		MG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 17-9

DIOXIN/FURAN TOXICITY EQUIVALENTS
FOR SOIL SAMPLES FROM AREA 11N (AUS-A11N)

ADDITIONAL AND UNCHARACTERIZED SITES OU

FIELD ID	TEF	AUS-A11N-030-SS-05			AUS-A11N-031-SS-03		
		Result	Qual	*TEQ*	Result	Qual	*TEQ*
DIOXINS / FURANS (ng/kg)							
2,3,7,8-TCDD	1.000	<	U		<	U	
1,2,3,7,8-PeCDD	1.000	<	U		<	U	
1,2,3,4,7,8-HxCDD	0.100	<	U		<	U	
1,2,3,6,7,8-HxCDD	0.100	<	U		<	U	
1,2,3,7,8,9-HxCDD	0.100	<	U		<	U	
1,2,3,4,6,7,8-HpCDD	0.010	<	U		9.03		*0.09030*
OCDD	0.0001	54.90		*0.00549*	598.00		*0.05980*
2,3,7,8--TCDF	0.100	<	U		0.18	X	*0.01810*
1,2,3,7,8-PeCDF	0.050	<	U		<	U	
2,3,4,7,8-PeCDF	0.500	<	U		<	U	
1,2,3,4,7,8-HxCDF	0.100	<	U		0.36	J	*0.03590*
1,2,3,6,7,8-HxCDF	0.100	<	U		<	U	
2,3,4,6,7,8-HxCDF	0.100	<	U		<	U	
1,2,3,7,8,9-HxCDF	0.100	<	U		<	U	
1,2,3,4,6,7,8-HpCDF	0.010	<	U		1.26	J	*0.01260*
1,2,3,4,7,8,9-HpCDF	0.010	<	U		<	U	
OCDF	0.0001	<	U		4.76	J	*0.00048*
Total TCDDs		<	U		<	U	
Total PeCDDs		<	U		<	U	
Total HxCDDs		<	U		1.51	J	
Total HpCDDs		0.74	J		17.60		
Total TCDFs		<	U		0.30	J	
Total PeCDFs		<	U		<	U	
Total HxCDFs		<	U		<	U	
Total HpCDFs		<	U		<	U	

TOTAL TEQ		***0.00549***	***0.217176***

Diluted sample results were used, if available.
E = Value exceeds linear range
EDL = Estimated Detection Limit
J = Estimated
ND = Not Detected
Qual = Qualifier
TEF = Toxic Equivalency Factor
TEQ = Toxicity Equivalent
U = Nondetect
UJ = Estimated Nondetect
X = Estimated Maximum Possible Concentration (EMPC)

TABLE 17-10, AUS-A11N
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
1,1-Dichloroethane	No	C	NA	NA	NA	NA	No	A
1,1-Dichloroethene	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	C	NA	NA	NA	NA	Uncertainty	B
2-Butanone (MEK)	No	C	NA	NA	NA	NA	No	A
2-Hexanone	No	C	NA	NA	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	No	C	NA	NA	NA	NA	No	A
Acetone	No	C	NA	NA	NA	NA	No	F
Benzene	No	A	NA	NA	NA	NA	Uncertainty	B
Bromodichloromethane	No	C	NA	NA	NA	NA	No	A
Bromoform	No	C	NA	NA	NA	NA	No	A
Bromomethane	No	C	NA	NA	NA	NA	No	A
Carbon disulfide	No	C	NA	NA	NA	NA	No	A
Carbon tetrachloride	No	C	NA	NA	NA	NA	Uncertainty	B
Chlorobenzene	No	C	NA	NA	NA	NA	No	A
Chloroethane	No	C	NA	NA	NA	NA	No	A
Chloroform	No	C	NA	NA	NA	NA	No	A
Chloromethane	No	C	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	No	C	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	No	C	NA	NA	NA	NA	No	A
Dibromochloromethane	No	C	NA	NA	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	NA	NA	No	A
Methylene chloride	No	A	NA	NA	NA	NA	Uncertainty	B
N-Hexane	No	C	NA	NA	NA	NA	No	A
Styrene	No	C	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	No	C	NA	NA	NA	NA	Uncertainty	B
Toluene	No	F	NA	NA	NA	NA	No	A
total Xylenes	No	A	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	No	C	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	No	C	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	No	C	NA	NA	NA	NA	Uncertainty	B
Vinyl chloride	No	C	NA	NA	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichlorobenzene	No	C	NA	NA	NA	NA	No	A
1,3-Dichlorobenzene	No	C	NA	NA	NA	NA	No	A
1,4-Dichlorobenzene	No	C	NA	NA	NA	NA	Uncertainty	B
2,4,5-Trichlorophenol	No	C	NA	NA	NA	NA	No	A

TABLE 17-10, AUS-A11N
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	NA	NA	NA	NA	Uncertainty	B
2,4-Dichlorophenol	No	C	NA	NA	NA	NA	Uncertainty	B
2,4-Dimethylphenol	No	C	NA	NA	NA	NA	Uncertainty	B
2,4-Dinitrophenol	No	C	NA	NA	NA	NA	Uncertainty	B
2-Chloronaphthalene	No	C	NA	NA	NA	NA	No	A
2-Chlorophenol	No	C	NA	NA	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	No	A
2-Methylnaphthalene	No	A	NA	NA	NA	NA	No	F
2-Methylphenol	No	C	NA	NA	NA	NA	No	A
2-Nitroaniline	No	C	NA	NA	NA	NA	No	A
2-Nitrophenol	No	C	NA	NA	NA	NA	No	A
3,3'-Dichlorobenzidine	No	C	NA	NA	NA	NA	Uncertainty	B
3-Nitroaniline	No	C	NA	NA	NA	NA	No	A
4,6-Dinitro-2-methylphenol	No	C	NA	NA	NA	NA	No	C
4-Bromophenyl phenyl ether	No	C	NA	NA	NA	NA	No	C
4-Chloro-3-methylphenol	No	C	NA	NA	NA	NA	No	A
4-Chloroaniline	No	C	NA	NA	NA	NA	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	NA	NA	NA	NA	No	C
4-Methylphenol	No	C	NA	NA	NA	NA	No	A
4-Nitroaniline	No	C	NA	NA	NA	NA	No	A
4-Nitrophenol	No	C	NA	NA	NA	NA	No	A
Acenaphthene	No	C	NA	NA	NA	NA	No	A
Acenaphthylene	No	A	NA	NA	NA	NA	No	A
Anthracene	No	A	NA	NA	NA	NA	No	A
Benzo(a)anthracene	Uncertainty	B	NA	NA	NA	NA	Yes	E
Benzo(a)pyrene	Uncertainty	B	NA	NA	NA	NA	No	F
Benzo(b)fluoranthene	Uncertainty	B	NA	NA	NA	NA	No	F
Benzo(g,h,i)perylene	No	A	NA	NA	NA	NA	No	F
Benzo(k)fluoranthene	No	C	NA	NA	NA	NA	No	F
bis(2-Chloroethoxy)methane	No	C	NA	NA	NA	NA	No	C
bis(2-Chloroethyl) ether	No	C	NA	NA	NA	NA	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	NA	NA	NA	NA	No	A
bis(2-Ethylhexyl) phthalate	Uncertainty	G	NA	NA	NA	NA	No	F
Butyl benzyl phthalate	No	C	NA	NA	NA	NA	No	A
Carbazole	No	C	NA	NA	NA	NA	Uncertainty	B
Chrysene	Uncertainty	B	NA	NA	NA	NA	No	F
Di-n-butyl phthalate	No	C	NA	NA	NA	NA	No	A
Di-n-octyl phthalate	No	C	NA	NA	NA	NA	No	A
Dibenz(a,h)anthracene	No	C	NA	NA	NA	NA	Uncertainty	B
Dibenzofuran	No	C	NA	NA	NA	NA	No	F
Diethyl phthalate	No	C	NA	NA	NA	NA	No	A
Dimethyl phthalate	No	C	NA	NA	NA	NA	No	A
Fluoranthene	No	A	NA	NA	NA	NA	No	F

TABLE 17-10, AUS-A11N
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	NA	NA	NA	NA	No	A
Hexachlorobenzene	No	C	NA	NA	NA	NA	Uncertainty	B
Hexachlorobutadiene	No	C	NA	NA	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	No	C	NA	NA	NA	NA	No	A
Hexachloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	NA	NA	NA	NA	No	F
Isophorone	No	C	NA	NA	NA	NA	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	NA	NA	NA	NA	Uncertainty	B
N-Nitrosodiphenylamine	No	C	NA	NA	NA	NA	Uncertainty	B
Naphthalene	No	C	NA	NA	NA	NA	No	F
Pentachlorophenol	No	C	NA	NA	NA	NA	Uncertainty	B
Phenanthrene	No	A	NA	NA	NA	NA	No	F
Phenol	No	A	NA	NA	NA	NA	No	A
Pyrene	No	A	NA	NA	NA	NA	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	NA	NA	NA	NA	No	F
Antimony	Uncertainty	G	NA	NA	NA	NA	Yes	D
Arsenic	No	C	NA	NA	NA	NA	Yes	E
Barium	No	F	NA	NA	NA	NA	Yes	E
Beryllium	Uncertainty	G	NA	NA	NA	NA	Yes	E
Boron	No	F	NA	NA	NA	NA	No	F
Cadmium	No	C	NA	NA	NA	NA	Yes	E
Calcium	No	H	NA	NA	NA	NA	No	H
Chromium	Uncertainty	G	NA	NA	NA	NA	Yes	D
Cobalt	Uncertainty	G	NA	NA	NA	NA	No	F
Copper	Uncertainty	G	NA	NA	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	NA	NA	NA	NA	No	F
Lead	Uncertainty	G	NA	NA	NA	NA	Yes	E
Magnesium	No	H	NA	NA	NA	NA	No	H
Manganese	Yes	E	NA	NA	NA	NA	No	F
Mercury	Uncertainty	B	NA	NA	NA	NA	No	F
Nickel	No	F	NA	NA	NA	NA	Yes	E
Potassium	No	H	NA	NA	NA	NA	No	H
Selenium	No	F	NA	NA	NA	NA	Yes	D
Silver	Uncertainty	B	NA	NA	NA	NA	No	F
Sodium	No	H	NA	NA	NA	NA	No	H
Thallium	No	C	NA	NA	NA	NA	No	F
Vanadium	No	C	NA	NA	NA	NA	No	F
Zinc	No	F	NA	NA	NA	NA	No	F
Explosives								
1,3,5-Trinitrobenzene	Uncertainty	G	NA	NA	NA	NA	No	A
1,3-Dinitrobenzene	No	C	NA	NA	NA	NA	No	A

TABLE 17-10, AUS-A11N
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	No	C	NA	NA	NA	NA	Uncertainty	B
2,6-Dinitrotoluene	No	C	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	C	NA	NA	NA	NA	No	C
2-Nitrotoluene (ONT)	No	C	NA	NA	NA	NA	No	C
3-Nitrotoluene	No	C	NA	NA	NA	NA	No	A
4-Amino-2,6-Dinitrotoluene	No	C	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	No	C	NA	NA	NA	NA	No	A
HMX	No	C	NA	NA	NA	NA	No	A
Nitrobenzene	No	C	NA	NA	NA	NA	Uncertainty	B
Nitroglycerin	No	C	NA	NA	NA	NA	No	A
Pentaerythritol tetranitrate (PETN)	No	C	NA	NA	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	NA	NA	NA	NA	No	A
Tetryl	No	C	NA	NA	NA	NA	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	Uncertainty	G	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins								
2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA	No	C

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceceded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 17-11, AUS-A11N
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	A	NA	NA	No	A
1,1,2-Trichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethene	No	A	NA	NA	No	A
1,2-Dichloroethane (EDC)	No	A	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	A	NA	NA	No	A
2-Butanone (MEK)	No	A	NA	NA	No	A
2-Hexanone	No	A	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	No	A	NA	NA	No	A
Acetone	No	A	NA	NA	No	F
Benzene	No	A	NA	NA	No	A
Bromodichloromethane	No	A	NA	NA	No	A
Bromoform	No	A	NA	NA	No	A
Bromomethane	No	A	NA	NA	No	A
Carbon disulfide	Uncertainty	B	NA	NA	No	A
Carbon tetrachloride	No	A	NA	NA	No	A
Chlorobenzene	No	A	NA	NA	No	A
Chloroethane	No	A	NA	NA	No	C
Chloroform	No	A	NA	NA	No	A
Chloromethane	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	No	A	NA	NA	No	A
cis-1,3-Dichloropropene	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	A	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	No	A
Methylene chloride	No	A	NA	NA	No	A
N-Hexane	No	C	NA	NA	No	C
Styrene	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	No	A	NA	NA	No	A
Toluene	No	F	NA	NA	No	A
total Xylenes	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	No	A	NA	NA	No	A
Trichloroethylene (TCE)	No	A	NA	NA	No	A
Vinyl chloride	No	A	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	NA	NA	No	A
1,2-Dichlorobenzene	No	A	NA	NA	No	A
1,3-Dichlorobenzene	No	A	NA	NA	No	A
1,4-Dichlorobenzene	No	A	NA	NA	No	A
2,4,5-Trichlorophenol	No	A	NA	NA	No	A

TABLE 17-11, AUS-A11N
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	NA	NA	No	A
2,4-Dichlorophenol	No	A	NA	NA	No	A
2,4-Dimethylphenol	No	A	NA	NA	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	NA	NA	No	A
2-Chloronaphthalene	No	A	NA	NA	Uncertainty	B
2-Chlorophenol	No	A	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	No	C
2-Methylnaphthalene	No	A	NA	NA	Yes	E
2-Methylphenol	No	A	NA	NA	No	A
2-Nitroaniline	No	A	NA	NA	No	A
2-Nitrophenol	No	A	NA	NA	No	A
3,3'-Dichlorobenzidine	No	A	NA	NA	No	A
3-Nitroaniline	No	A	NA	NA	No	A
4,6-Dinitro-2-methylphenol	Uncertainty	B	NA	NA	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	NA	NA	No	C
4-Chloro-3-methylphenol	Uncertainty	B	NA	NA	No	A
4-Chloroaniline	No	A	NA	NA	No	A
4-Chlorophenyl phenyl ether	No	A	NA	NA	No	C
4-Methylphenol	No	A	NA	NA	No	A
4-Nitroaniline	No	A	NA	NA	No	A
4-Nitrophenol	No	A	NA	NA	No	A
Acenaphthene	No	A	NA	NA	No	A
Acenaphthylene	No	A	NA	NA	No	A
Anthracene	Uncertainty	B	NA	NA	No	A
Benzo(a)anthracene	Uncertainty	B	NA	NA	Yes	E
Benzo(a)pyrene	Uncertainty	B	NA	NA	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	NA	NA	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	NA	NA	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	NA	NA	Yes	E
bis(2-Chloroethoxy)methane	No	A	NA	NA	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	NA	NA	No	A
bis(2-Chloroisopropyl) ether	No	C	NA	NA	No	C
bis(2-Ethylhexyl) phthalate	Yes	E	NA	NA	Yes	E
Butyl benzyl phthalate	No	A	NA	NA	Uncertainty	B
Carbazole	No	A	NA	NA	No	C
Chrysene	No	A	NA	NA	Yes	E
Di-n-butyl phthalate	Uncertainty	B	NA	NA	No	A
Di-n-octyl phthalate	No	A	NA	NA	No	A
Dibenz(a,h)anthracene	Uncertainty	B	NA	NA	No	A
Dibenzofuran	Uncertainty	B	NA	NA	Yes	E
Diethyl phthalate	No	A	NA	NA	No	A
Dimethyl phthalate	No	A	NA	NA	No	A
Fluoranthene	Uncertainty	B	NA	NA	Yes	E

TABLE 17-11, AUS-A11N
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	NA	NA	No	A
Hexachlorobenzene	Uncertainty	B	NA	NA	No	A
Hexachlorobutadiene	Uncertainty	B	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	NA	NA	No	A
Hexachloroethane	Uncertainty	B	NA	NA	No	A
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	NA	NA	Yes	E
Isophorone	No	A	NA	NA	No	A
N-Nitroso-di-n-propylamine	No	C	NA	NA	No	A
N-Nitrosodiphenylamine	No	A	NA	NA	No	A
Naphthalene	No	A	NA	NA	No	F
Pentachlorophenol	Uncertainty	B	NA	NA	No	A
Phenanthrene	Uncertainty	B	NA	NA	Yes	E
Phenol	No	A	NA	NA	No	A
Pyrene	No	A	NA	NA	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	NA	NA	Uncertainty	I
Antimony	No	F	NA	NA	No	F
Arsenic	No	A	NA	NA	Yes	E
Barium	No	F	NA	NA	No	F
Beryllium	No	F	NA	NA	No	F
Boron	No	F	NA	NA	Yes	D
Cadmium	Uncertainty	B	NA	NA	No	F
Calcium	No	F,H	NA	NA	Uncertainty	G,H
Chromium	No	F	NA	NA	Yes	D
Cobalt	Yes	D	NA	NA	Yes	E
Copper	Yes	E	NA	NA	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	NA	NA	Yes	E
Lead	Yes	E	NA	NA	Yes	E
Magnesium	No	F,H	NA	NA	Uncertainty	G,H
Manganese	Yes	E	NA	NA	Yes	D
Mercury	No	A	NA	NA	Yes	E
Nickel	No	F	NA	NA	No	F
Potassium	No	F,H	NA	NA	Uncertainty	G,H
Selenium	Yes	E	NA	NA	Yes	D
Silver	Uncertainty	B	NA	NA	No	F
Sodium	No	F,H	NA	NA	Uncertainty	G,H
Thallium	Uncertainty	B	NA	NA	No	F
Vanadium	Uncertainty	B	NA	NA	Yes	E
Zinc	No	F	NA	NA	No	F
Explosives						
1,3,5-Trinitrobenzene	No	F	NA	NA	Uncertainty	B
1,3-Dinitrobenzene	No	A	NA	NA	No	A

TABLE 17-11, AUS-A11N
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	NA	NA	No	A
2,4-Dinitrotoluene	No	A	NA	NA	No	A
2,6-Dinitrotoluene	No	A	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	A	NA	NA	No	A
2-Nitrotoluene (ONT)	No	A	NA	NA	No	C
3-Nitrotoluene	No	A	NA	NA	No	C
4-Amino-2,6-Dinitrotoluene	No	A	NA	NA	No	C
4-Nitrotoluene (PNT)	No	A	NA	NA	No	C
HMX	No	A	NA	NA	No	A
Nitrobenzene	No	A	NA	NA	No	A
Nitroglycerin	No	A	NA	NA	No	C
Pentaerythritol tetranitrate (PETN)	No	A	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	NA	NA	No	A
Tetryl	No	C	NA	NA	No	C
Dioxins						
2,3,7,8-TCDD	NA	NA	NA	NA	No	A

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 17-12
AUS-A11N - IOP GROUP II MELT LOADING LINE (NITROGLYCERIN AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND (WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
SVOCs					
2-Methylnaphthalene		**E**	NA	NA	
Benzo(a)anthracene		**H,E**	NA	NA	
Benzo(a)pyrene		**E**	NA	NA	
Benzo(b)fluoranthene		**E**	NA	NA	
Benzo(g,h,i)perylene		**E**	NA	NA	
Benzo(k)fluoranthene		**E**	NA	NA	
bis(2-Ethylheyl)phthalate (DEHP)		**E**	NA	NA	**E**
Chrysene		**E**	NA	NA	
Dibenzofuran		**E**	NA	NA	
Fluoranthene		**E**	NA	NA	
Indeno(1,2,3-c,d)pyrene		**E**	NA	NA	
Phenanthrene		**E**	NA	NA	
Pyrene		**E**	NA	NA	
Metals					
Aluminum			NA	NA	**E**
Arsenic		**H,E**	NA	NA	
Barium		**H**	NA	NA	
Beryllium		**H**	NA	NA	
Cadmium		**H**	NA	NA	
Cobalt		**E**	NA	NA	
Copper		**E**	NA	NA	**E**
Iron		**E**	NA	NA	**H,E**
Lead		**H,E**	NA	NA	**E**
Manganese			NA	NA	**H,E**
Mercury		**E**	NA	NA	
Nickel		**H**	NA	NA	
Selenium			NA	NA	**E**
Vanadium		**E**	NA	NA	

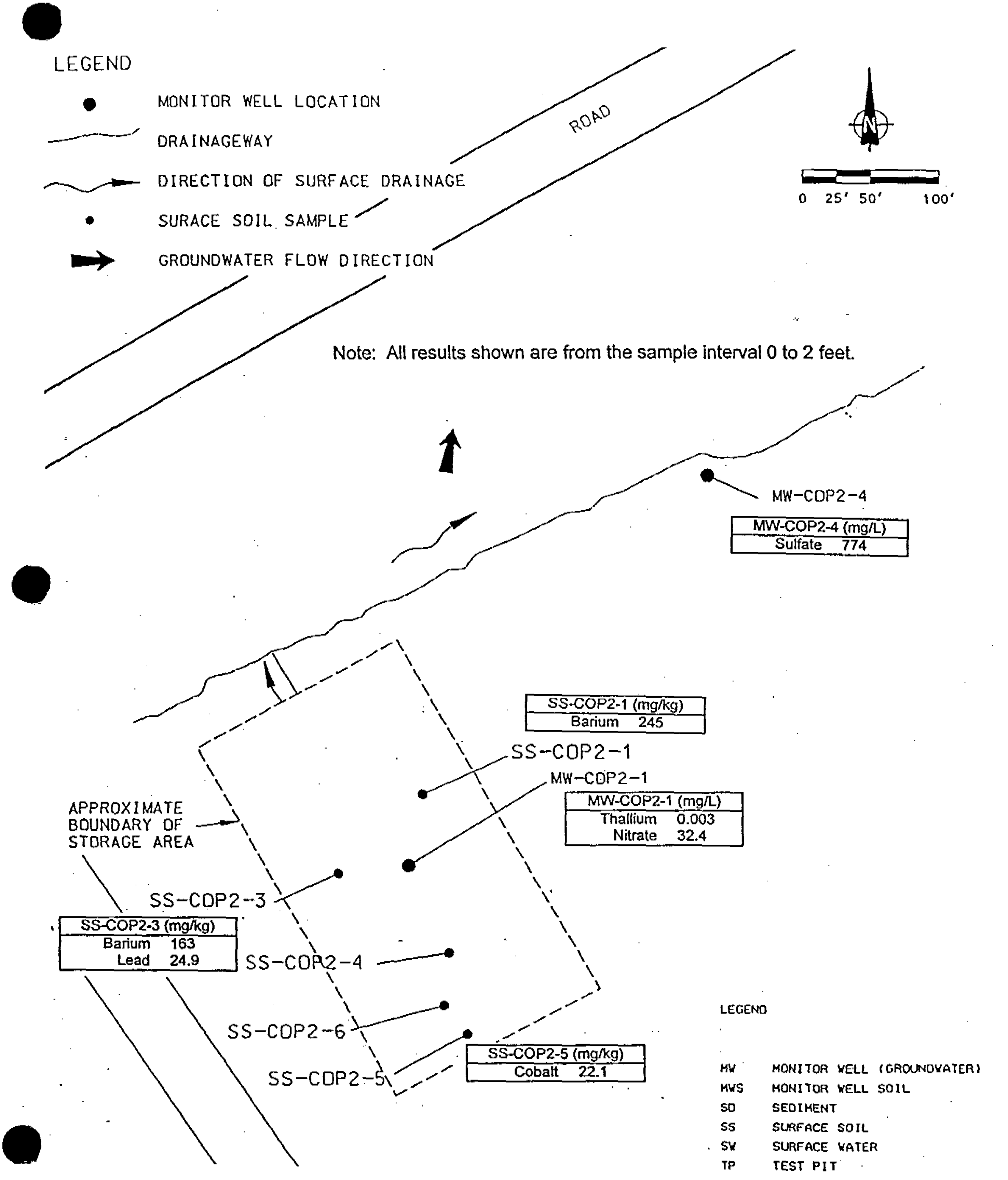
Key:

[1] Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded



Note: The base map used for this figure is taken from Figure 4-13 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-42 and 4-43 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 17-1
Site COP-2

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- POSSIBLE FORMER TRENCH LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-A11N NITROGLYCERIN AREA

Revision No.	Description	Date	By	App.

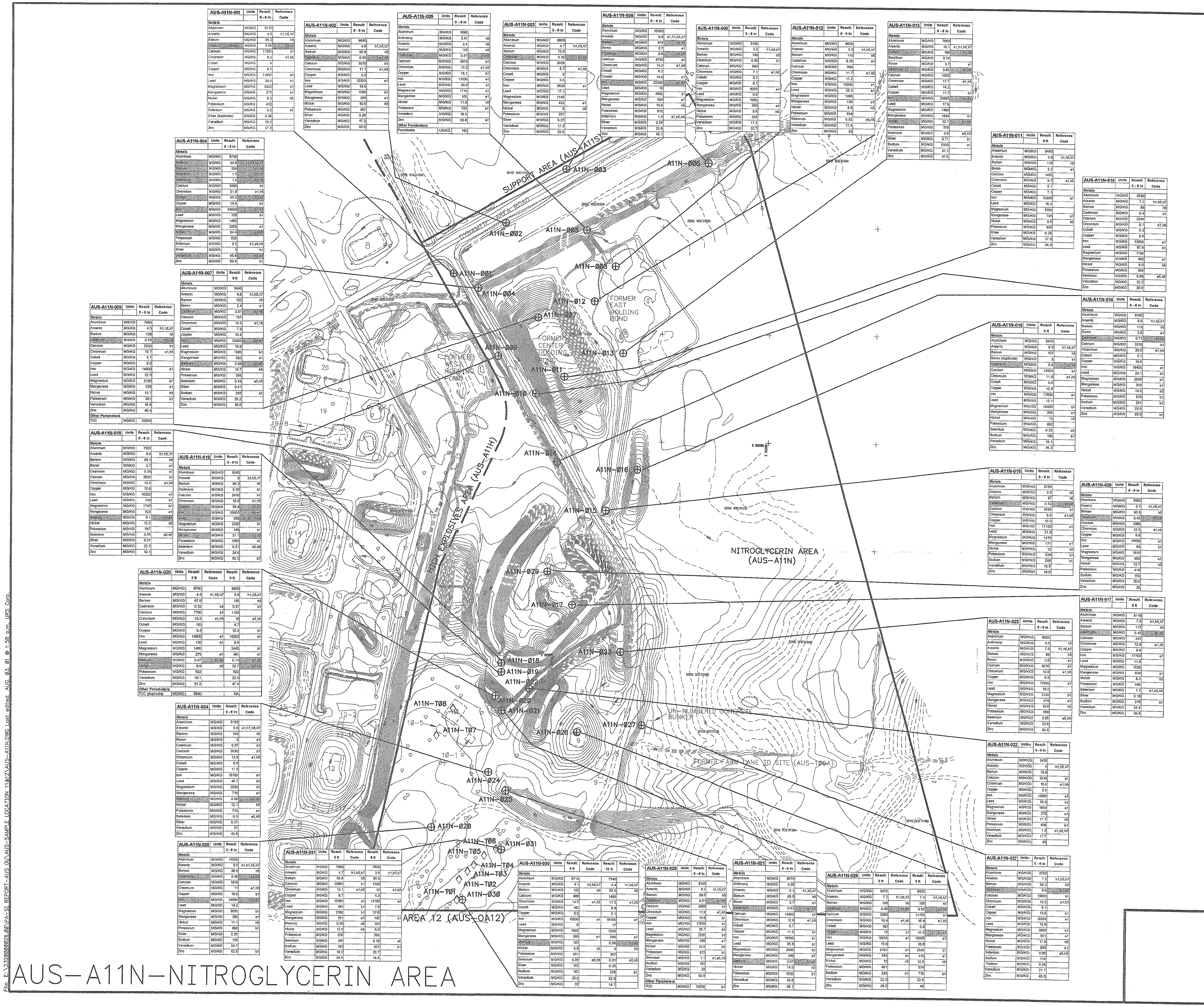
REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11N Sample Locations and Detections of Organic Compounds in Soils

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 17-2
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- POSSIBLE FORMER TRENCH LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11N Sample Locations and Detections of Inorganic Compounds in Soils

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 17-3
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

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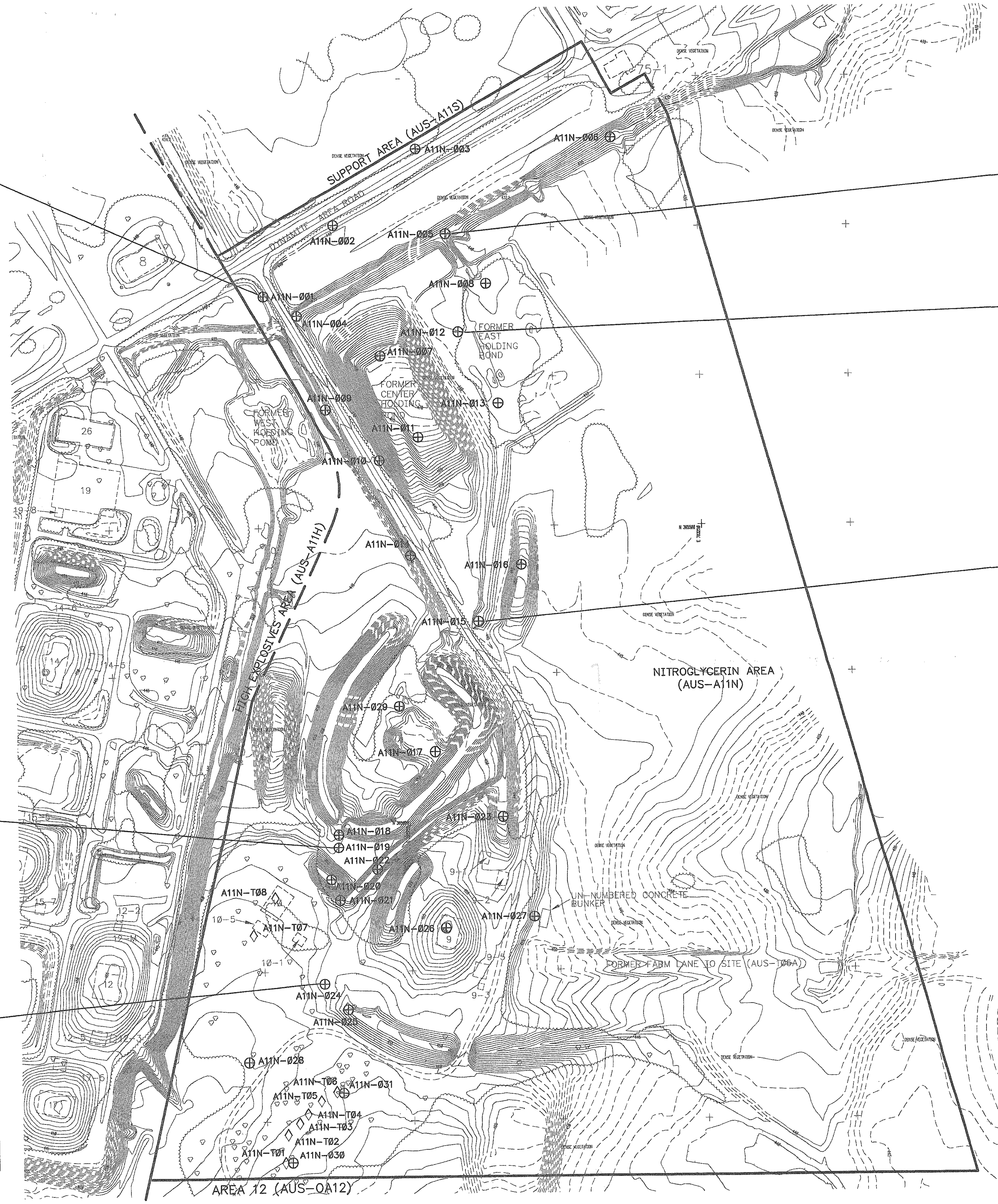

AUS-A11N-001-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1690	b3,e3
Barium	UG/L	58.2	b3
Boron	UG/L	15	
Calcium	UG/L	34900	b3
Chromium	UG/L	1.5	
Iron	UG/L	1720	b3,e3,e4,h10
Lead	UG/L	4.7	b3
Magnesium	UG/L	5290	b3
Manganese	UG/L	44.6	
Potassium	UG/L	3230	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	100	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Sulfate (as SO4)	UG/L	12000	

AUS-A11N-005-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2940	b3,e3
Antimony	UG/L	1.5	
Barium	UG/L	68.1	b3
Boron	UG/L	35.6	
Calcium	UG/L	21100	b3
Chromium	UG/L	3.8	
Iron	UG/L	3120	b3,e3,e4,h10
Lead	UG/L	5.9	b3
Magnesium	UG/L	5670	b3
Manganese	UG/L	102	
Potassium	UG/L	452	
Sodium	UG/L	7980	b3
Zinc	UG/L	21.8	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	72.8	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.11	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	10000	
TDS	MG/L	182	b3

AUS-A11N-012-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Toluene	UG/L	3	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1110	b3,e3
Barium	UG/L	46.8	b3
Beryllium	UG/L	0.1	
Calcium	UG/L	8110	b3
Cobalt	UG/L	5.7	e3
Copper	UG/L	20.7	b3,e3,e4
Iron	UG/L	2910	b3,e3,e4,h10
Magnesium	UG/L	4650	b3
Manganese	UG/L	1260	b3,e3,e4,h10
Nickel	UG/L	18.4	b3
Potassium	UG/L	6620	b3
Sodium	UG/L	19100	b3
Zinc	UG/L	61.9	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	58.2	b3
Nitrogen, Ammonia (as N)	MG/L	0.53	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Sulfate (as SO4)	UG/L	650	
TDS	MG/L	184	b3
TSS	MG/L	38.5	b3

AUS-A11N-015-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP) (duplicate)	UG/L	1.1	e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2900	b3,e3
Barium	UG/L	133	b3
Beryllium (duplicate)	UG/L	0.13	
Calcium	UG/L	64000	b3
Cobalt	UG/L	3.6	e3
Copper	UG/L	6.5	
Iron	UG/L	4480	b3,e3,e4,h10
Magnesium	UG/L	15800	b3
Manganese	UG/L	373	
Nickel	UG/L	9.2	
Potassium	UG/L	6390	b3
Sodium	UG/L	11800	b3
Zinc	UG/L	28.6	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	210	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.16	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	5800	
TDS	MG/L	301	b3

AUS-A11N-019-SW-00	Units	Result	Screening Codes
Explosives			
1,3,5-Trinitrobenzene	UG/L	0.69	
Metals			
Aluminum	UG/L	6220	b3,e3
Barium	UG/L	165	b3
Calcium	UG/L	39300	b3
Chromium	UG/L	7.5	
Cobalt	UG/L	6.3	e3
Copper	UG/L	17.7	b3,e3,e4
Iron	UG/L	14100	b3,e3,e4,h10
Lead	UG/L	93	b3,e3,e4
Magnesium	UG/L	8510	b3
Manganese	UG/L	779	b3
Nickel	UG/L	14.1	b3
Potassium	UG/L	7660	b3
Selenium	UG/L	3.7	b3,e5
Sodium	UG/L	3590	b3
Zinc	UG/L	97.7	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	110	b3
Nitrogen, Ammonia (as N)	MG/L	0.55	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.057	b3
Sulfate (as SO4)	UG/L	920	
TDS	MG/L	194	b3
TSS	MG/L	35.5	b3

AUS-A11N-024-TK-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2290	b3,e3
Barium	UG/L	64.8	b3
Calcium	UG/L	25900	b3
Cobalt	UG/L	2.5	e3
Copper	UG/L	7.7	
Iron	UG/L	3010	b3,e3,e4,h10
Lead	UG/L	12	b3
Magnesium	UG/L	6350	b3
Manganese	UG/L	137	
Potassium	UG/L	3420	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	64.5	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.28	b3
Sulfate (as SO4)	UG/L	6900	

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- POSSIBLE FORMER TRENCH LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

100 0 100

SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

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Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11N Sample Locations and Detections in Surface Water

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 17-4
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

AUS-A11N-NITROGLYCERIN AREA

Site AUS-A11P, the former Area 11 Pilot Propellant Plant/CAP Production Area, was used by industrial tenants for ordnance/explosives manufacturing from the 1950s to the 1970s. During World War II, the area occupied by Site AUS-A11P was part of the Illinois Ordnance Plant (IOP) Group II Load Line.

See the introduction to Section 15 for a general discussion of Area 11 and its history. Area 11 sites, including AUS-A11P, are shown in Figure 15-1.

AUS Original Site Designations

None of the original Additional and Uncharacterized Sites Operable Unit (AUS OU) sites designated in 1997-1999 by the United States Fish and Wildlife Service (USFWS) were located within the boundaries of the former Area 11 Pilot Propellant Plant/CAP Production Area.

18.1 HISTORIC SEARCH INFORMATION

18.1.1 Site Description

There are no buildings remaining on this site. Since the early 1990s it has been allowed to return to a natural state.

18.1.2 Operational History And Waste Characteristics

18.1.2.1 IOP Load Line II Operations

Twelve IOP buildings (II-1-12, II-1-15 through II-1-22, II-1-30, II-1-34 and II-1-35) were within what has now been designated as AUS OU Site AUS-A11P. See Figure 15-2.

Delivery and Screening

Building II-1-16 was a TNT Service Building. The TNT Screening Building (II-1-15) contained one screening machine.[1]

Cooling Building (II-1-12)

This building was used for cooling filled shells; they may also have been topped off with melted TNT/amatol in this building which contained five scales and three presses.[2] The building was connected by ramp to the Drilling and Boostering Building.[3]

[1] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.
[2] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 7.
[3] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.

Drilling and Boostering, Building II-1-17

This building contained office space and 12 concrete bays, seven of which were shell drilling bays located mostly in the center of the building.[4] Based on the building name and the equipment, it is assumed that the building was used to drill out the shells or bombs and insert the boosters. The building had five drilling machines, eight thread cleaning machines, and two tensioning machines.[5,6] After the shells were drilled and cleaned they were painted (possibly touched up) in a spray booth which vented out through a stack on the roof. At the end of the line, these shells were loaded on trucks.

Booster Service Magazines, II-1-22 and II-1-35

Boosters were probably delivered and temporarily stored at these magazines. According to the War Department Facilities Inventory, Booster Service Magazine Building (II-1-35), not shown on Figure 15-2 was located northeast of Building II-1-17.[7] It was constructed after the completion of general construction of Load Line II.[8] This building was removed sometime between 1980 and 1993.[9]

Pump Houses and Guard House

There were five IOP pump houses located in AUS-A11P. One was a Condensate Pump House (II-1-34) located between Buildings II-1-12 and II-1-15. The other four were Vacuum Pump Houses (II-1-18 through II-1-21) that were associated with Building II-1-17.

Building II-1-30 was one of two Guard Houses on Load Line II.

18.1.2.2 Olin Operations

Olin initially used this area as a Pilot Propellant Plant for research and development of propellants, and also used this area for the development of gas generators used for starting jet engines.

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[4] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 26.
[5] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 8.
[6] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 24.
[7] DPRA Document No. CO01128. Corps of Engineers files, Location Layout – Group II- Melt Loading Line – Area II, Supersedes drawing dated November 8, 1941, this drawing dated February 14, 1942.
[8] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part II, Section 4, Sheet 12 of 23.
[9] 1980 and 1993 aerial photographs from the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

Pilot Propellant Plant

According to Mr. Richard Altekruse, a former Olin engineer and manager, Building II-1-17 was the Pilot Propellant Plant when he started working at Olin in 1957. He reported that Olin developed gas generators and solid propellants in this building.[10] Mr. Paul Moore, a former Olin employee who worked in the "Old Pilot Plant" (Area 11) for about six months in 1960, said that jet starter cartridges were being manufactured in the area at that time[11]. Mr. Maynard Arnett, a former Olin foreman who worked in the Pilot Propellant Plant in Area 11 from about 1957 to 1959, said that he worked on building an 8,000-lb propellant charge for the Nike Zeus, using a continuous mixing process.

The following chemicals were reported to be constituents of the solid propellant and/or gas generators produced at this plant, according to various former Olin employees:

- Ammonium nitrate, synthetic rubber, carbon black, and ammonium oxalate (Altekruse).[12]
- Ammonium perchlorate, magnesium, aluminum, and a plastic binder, for propellant; and ammonium nitrate, nitrocellulose and a plasticizer – dioctyl phthalate – for gas generators. (John Miller, a former Olin chemist and manager).[13]
- Perchlorates, ammonium nitrate, hexane and various plasticizers (Harvey Pitt, manager).[14]
- Nitroglycerin (Arnett).[15]
- Nitroglycerin and ball powder (Moore).[16]

According to Mr. Altekruse, Olin tested experimental explosive devices in a building in this area.[17] One of Mr. Altekruse's co-workers was killed in an explosion during one of these tests that failed.[18] This is probably the same explosion that was reported in the 1959 Refuge Annual Report,[19] which completely destroyed IOP Building II-1-16.

The solid propellant and gas generator research and development was later moved to the 2P area according to Mr. John Miller.[20]

Area 11P Support Buildings

According to Mr. Altekruse, Olin Building 48 was used for storage of jet starter cartridges[21]. An Olin Plant Building Directory and Insurance Report identified this building as a Starter Cartridge

[10] Mr. Richard Altekruse, personal interview, July 14, 1999.
[11] Mr. Paul Moore, personal interview, July 14, 1999.
[12] Mr. Richard Altekruse, personal interview, July 14, 1999.
[13] Deposition of John Miller, April 9, 1998, Page 7, 8 and 74.
[14] Deposition of Harvey Pitt, November 19, 1997, Page 89.
[15] Mr. Maynard Arnett, personal interview, June 29, 1999.
[16] Mr. Paul Moore, personal interview, July 14, 1999.
[17] Mr. Richard Altekruse, personal interview, July 14, 1999. Altekruse identified this building as Building 86 on the U.S. Powder Map; however, this was incorrect. Building 86 was still visible on the 1960 aerial photograph, but Building II-1-16 was not.
[18] Mr. Richard Altekruse, personal interview, July 14, 1999.
[19] CRO 000839. U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1959, Page 33.
[20] Deposition of John Miller, April 9, 1998, Pages 41-42.
[21] Mr. Richard Altekruse, personal interview, July 14, 1999.

Assembly Building.[22] This building was also used to store raw materials, and was designated as Ammonium Nitrate Warehouse – Ammonium Nitrate Grained.[23]

Buildings II-1-18, II-1-19, and II-1-20 were used for grain curing. Building II-1-21 was used for Nitroglycerin Storage. Building II-1-15 was a TNT Screening Building during IOP operations, and was used by Olin for this same purpose in 1963. Olin did not occupy Building II-1-22 in 1963. Olin used Building II-1-35 in 1963 as a Maintenance Shop and for storage.[24]

18.1.2.3 Commercial Solvents Corporation (CSC) Operations

CSC produced Big Inch Caps in this area. The Olin registered trademark "Big Inch Caps" was part of the 1964 Olin/CSC sales agreement. They were listed under "Blasting Caps" and described as "for detonators" in the agreement. They were probably part of the Olin cap production line in East Alton, Illinois which was included in the sale.[25] The caps were ½-inch in diameter and 1-inch long. They were used with a cord fuse and contained a combination of lead azide and lead styphnate.[26,27;28]

Handling and Storage of the Components

Based on industry information, the lead azide for the caps was shipped wet, in metal drums that contained a water alcohol solution (to prevent freezing), sawdust, and packaged lead azide (in powder form).[29] These drums may have been stored in Building 86 (Ingredient Storage for the Big Inch Cap Line). The Dryer Building, 85-1, was used for drying lead azide and lead styphnate, which was wet when it was removed from the packaging.[30,31] It was placed in a pan in the Dryer House for one to two weeks to dry the material; during drying, the lead azide would form a crust on the surface.[32] The crust was broken down during the screening phase[33] (done in

[22] PRI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.
[23] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[24] PRI-00505. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Pages 1 and 4.
[25] DOI 004850, 004852, and 004877. Agreement between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated August 28, 1963, Pages 5 and 7, Exhibit B, Page 9.
[26] Charlie Kershaw, Ralph Sloat, and Mark Vetter, DuPont employees, personal interview, August 24, 1999.
[27] Mr. Charles Kovach, a former Trojan/CSC employee, reported that mercury fulminate was used in the production of detonator caps produced in this area. This is not supported by any other information about the Big Inch Caps. Reference: Interview with Mr. Charles Kovach as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations and Ownership History, Crab Orchard National Wildlife Refuge, Page B-4.
[28] According to Mr. Wayne Adams, a former Refuge Manager, U.S. Powder/CSC manufactured lead azide, but this is not supported by other information about the site. Lead azide production would have involved the use of precipitation facilities and holding tanks, neither of which were identified in this area. References: Wayne Adams, personal interview, March 23, 2000; and Charlie Kershaw, Ralph Sloat, and Mark Vetter, DuPont employees, personal interview, August 24, 1999.
[29] Charlie Kershaw, Ralph Sloat, and Mark Vetter, personal interview, August 24, 1999.
[30] CRO 001699. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated June 30, 1978, Page 1.
[31] Charlie Kershaw, Ralph Sloat, and Mark Vetter, personal interview, August 24, 1999.
[32] Charlie Kershaw, Ralph Sloat, and Mark Vetter, personal interview, August 24, 1999.
[33] Charlie Kershaw, Ralph Sloat, and Mark Vetter, personal interview, August 24, 1999.

Building 49-1, the Big Inch Cap Screening House[34]) After screening, the lead azide could be loaded and pressed[35] into caps in Building 49, the Big Inch Cap Assembly Line. According to CSC/IMC records, Building 49 was used for punching and casing of Big Inch Caps.[36]

Building 49-5 was a new Electric Control House that was associated with this production. Building 87 was reportedly used both for Testing Big Inch Blasting Caps[37] and for storage (according to the U.S. Powder map). IMC identified nitroglycerin as a potential contaminant in Building 87 but they did not identify lead azide or lead styphnate as potential contaminants in this building, as would be expected if Big Inch Caps were tested here.[38] If Big Inch Caps were tested here, then lead contamination could possibly be found as far as 100 ft down wind of the testing site.[39]

Miscellaneous Big Inch Cap Production Buildings

There were several other buildings identified in this area which may or may not have been associated with Big Inch Cap production. These buildings are listed below with the U.S. Powder Map descriptions. The Olin and U.S. Powder Maps are discussed in the introductory part of Section 15.

- Building 85 – Storage
- Building 85-2 – Compressor Building
- Building 85-3 – Storage Building
- Building 85-4 – Storage Building
- Building 85-5 – Electric Control House
- Building 88 – Storage Building
- Building 48 – Storage Building
- Building 48-1 – Storage Building
- Building 48-5 – Electric Control Building

Decontamination of Area 11P by CSC/IMC

The cap line was probably shut down by 1971, by which time most, if not all, of CSC's production in Area 11 had ended.[40] Trojan, the CSC division which was operating the plant, reportedly decontaminated the Big Inch Cap line for explosives, but the activities were not documented.[41] After re-evaluating the site in 1976 and concluding that the buildings on site

[34] CRO 001699. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated June 30, 1978, Page 1.
[35] Charlie Kershaw, Ralph Sloat, and Mark Vetter, personal interview, August 24, 1999.
[36] CRO 001701. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated July 31, 1978, Page 1.
[37] DPRA Document No. 00005624. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated June 1, 1978, Page 1.
[38] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1.
[39] Charlie Kershaw, Ralph Sloat, and Mark Vetter, personal (telephone) interview, August 24, 1999.
[40] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[41] ACC 000283. Decontamination History for Trojan Powder Company.

needed to be decontaminated for explosives, IMC (which acquired CSC in 1975) applied for a variance from the Illinois regulations prohibiting open burning.[42]

In 1977, IMC was issued a 6-month variance by the Illinois Pollution Control Board (IPCB) to destroy buildings.[43] Under two subsequent variances, IMC destroyed more buildings, and unusable explosives.[44] Usable explosive materials stored on site were sent to Trojan's Wolf Lake facility, or were moved to storage in Area 13.[45]

The following buildings were decontaminated under the variance in 1978: Building 49, Building 49-1, Building 85-1, Building 86, and Building 87.[46,47,48,49]

According to CSC/IMC records, RDX (Royal Demolition Explosive), lead azide and lead styphnate were the explosive contaminants of concern in all these buildings except Building 87, for which nitroglycerin only was identified.[50]

The following procedures were used for decontaminating these buildings:[51]

- The buildings were treated with a reducing agent such as sodium sulfide (a nitroglycerin killer) and possibly with a caustic solution (for TNT).
- Combustible materials was removed from the buildings and burned.
- The buildings were lightly flashed with a mixture of fuel oil and straw.

18.1.2.4 U.S. Fish and Wildlife Service Demolition

The following buildings, with U.S. Powder Map Building numbers, were demolished under USFWS contracts in 1990:

- Building 85 (referred to in contract as "II-1-17")
- Building 88 (referred to in contract as "II-1-22")
- Building 87 (referred to in contract as "II-1-22 (NW)")
- Building 86 (referred to in contract as "II-1-22 (NE)")
- Building 49 (referred to in contract as "II-1-35;" however, this is not likely building II-1-35)

[42]ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[43] ACC 000283. Decontamination History for Trojan Powder Company.
[44] ACC 000283. Decontamination History for Trojan Powder Company.
[45] Charles Kovach, personal interview, as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations and Ownership History, Crab Orchard National Wildlife Refuge, Page B-3.
[46] CRO 001701. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated July 31, 1978, Page 1.
[47] CRO 001699. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated June 30, 1978, Page 1.
[48] DPRA Document No. 00005617. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated May 2, 1978, Page 1.
[49] DPRA Document No. 00005624. IMC, Letter to Mr. Walter Franke of IEPA submitting a monthly progress report, dated June 1, 1978, Page 1.
[50] DOI 006721. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 2.
[51] DPRA Document No. 00005688. USFWS, Memorandum to the USFWS Regional Safety Manager regarding the decontamination of Area 12, U.S. Powder, dated July 16, 1976.

- Building 85-1 (referred to in contract as "II-1-18")
- Building 85-5 (referred to in contract as "II-1-19")
- Building 85-4 (referred to in contract as "II-1-20")
- Building not listed on U.S. Powder map (referred to in contract as "II-1-21")
- Building 48-1 (referred to in contract as "II-1-15")
- Building not listed on U.S. Powder map (referred to in contract as "II-1-34")
- Building 48 (referred to in contract as "II-1-12").

Table 15-1 shows the relation between IOP building numbers and numbers used on the Olin and U.S. Powder maps. Based on site observations and discussions with Refuge personnel, the buildings, their foundations, and the demolition debris were buried in place. The contract required that all debris be covered with at least 36 inches of fill material. This demolition information was obtained from USFWS files.[52]

18.1.3 Area 11P Previous Sampling Results

USEPA Sampling, 1998

United States Environmental Protection Agency (USEPA) sample locations are shown in Figures 18-1, 18-2, and 18-3. The results for all detected constituents are listed in Table 18-1A.

Three samples (49-01 through 49-03) were collected from the original AUS OU Site AUS-0049 (Load Line II Drainage Ditch Sediments). AUS-0049 was incorporated into AUS-A11A; however, sample 49-03 was actually located in AUS-A11P and therefore, its discussion is included in this section. Sample 49-03 was located slightly north of former Building II-1-16 and was analyzed for semi-volatile organic compounds and metals. This sample did not exceed any screening criteria.

One sample and a duplicate (50-01 and 50-01 DUP) were collected from the original AUS OU Site AUS-0050 (Load Line II – Areas Around Buildings). AUS-0050 included all of the areas around the former Load Line II buildings and was incorporated into AUS-A11A; however, according to USEPA field notes, this sample location was next to the TNT Screening Building which is likely Building 48-1 (coordinates position this location slightly south of Building 48-1) which is located in the Pilot Propellant Plant/CAP Production area. This sample was analyzed for SVOCs and metals. No SVOC target compounds were detected above preliminary screening levels. Mercury (0.08 mg/kg) exceeded Refuge background levels.

18.1.4 Observations During Site Visit

There were numerous mounded and ponded areas observed during the site reconnaissance in the spring of 1999, throughout the Pilot Propellant Plant/CAP Production Area. Most of the mounded areas appear to coincide with the location of former buildings. As noted above, all the buildings in this area have been razed and most were buried in-place after they were razed.

[52] USFWS file for Contract No. 14-16-0003-89-0033, White Equipment – Building Demolition.

Many of the drainage ditches that were used by former industrial tenants are still on site. In general, most of the surface water in this area drains either to the north or to the west via drainage ditches and/or creeks. One drainage ditch/creek identified during the site reconnaissance appears to originate in a depressed area to the northeast of former Building 49-1. There was a concrete spillway that led from this depression into this drainage ditch/creek, which flows off to the northeast and then heads northward. The purpose of this area was not determined. There was also a broad low-lying area located to the northwest of this drainage ditch.

Most of the area north of the former load line buildings appears to drain to the north and most of the area south of the former load line buildings appears to flow to the west. The only obvious exception to this is the area surrounding the former Building 87. The area southwest of this building (Building 87) appears to drain to the southeast into the southwest-flowing ditch that drains the southern part of the former load line buildings. The area to the north of this building appears to flow to the east into the north-flowing ditch that drains the portion of AUS-A11P located on the north side of the former load line buildings.

Much of this area is tree-covered and contains dense vegetation. There was also some construction-related debris scattered throughout this area.

18.1.5 Recommendations Based on Preliminary Assessment

AUS-A11P was included in the SI because it is a former industrial facility that has not been investigated.

18.2 SITE INVESTIGATION INFORMATION

URS conducted an SI at AUS-A11P from March 22 through May 19, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[53] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 18.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 18-1, 18-2 and 18-3. Survey coordinates for all sample locations in Area 11P are listed in Table 18-1. Table 18-3 lists the sample locations and the matrix sampled at that location. All samples are soil samples unless otherwise noted.

18.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. There were several areas of concern investigated during the SI. They are discussed below.

[53] U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

Pilot Propellant Plant

Building 85 (former IOP Building II-1-17, Drilling and Boostering Building) was the former Olin Pilot Propellant Plant, which was used for research and development of solid propellants and gas generators. Olin may have later used this building for production of jet starter cartridges. Sample location A11P-W01 (groundwater and soil) was placed outside a former doorway in a location that may have been a loading dock. This location would have likely received spillage from wash waters used inside the building. Paint was also used in this building during the IOP, likely for touching up the bombs or shells prior to shipping them. Therefore solvents and paints may also be potential contaminants in this area. Sample location A11P-018 was planned to be located on the northeast side of this building between Building 85 and the likely location of former Building II-1-35 (IOP Booster Service Magazine and Olin/CSC Maintenance Shop and Stores). However, it was actually located within the footprint of former Building 85 as shown in Figure 18-1. Sample locations A11P-011 and A11P-012 were also located within the footprint of former Building 85, instead of next to former Building 85-1 as was planned.

Samples A11P-010 (sediment) and A11P-020 (sediment) were located in the drainage ditch south-southeast of Building 85, on the north side of the Service Area Road. Sample location A11P-019 (sediment and surface water) was located in a ponded area to the east of this building. These three locations could have received contamination from the operations in this building.

All samples were collected in accordance with the tables in the Field Sampling Plan (FSP) except as noted above, and with the following additional exception:

- AUS-A11P-010-SW-00 No surface water was present at this location at time of sampling, therefore no sample was taken.

CAP Production Area

Big Inch Caps were manufactured in the area just north of Building 85. Sample A11P-014 is located in the loading area for former Building 86 (CSC Ingredient Storage for Big Inch Caps), where lead azide and lead styphnate would have been stored prior to their use in the manufacture of Big Inch Caps. Sample A11P-013 is located in the drainage ditch that would have received drainage from the areas surrounding former Building 86.

Building 85-1 was a Dryer Building, likely used to dry the lead azide and lead styphnate prior to its use. Sample locations A11P-011 and A11P-012 were planned to be located on either end of the building; however, both samples were actually located within the footprint of Building 85. Samples A11P-011 and A11P-009 was located near Building 85-1.

Building 49-1 was the Big Inch Screening House. Sample A11P-015 was located near the entrance to this building, in the area of likely spillage or dumping.

Building 49 was used for the production of Big Inch Caps. Samples A11P-016 and A11P-017 were planned to be located next to this building near what were believed to be doorways for the building. Historically in Area 11, wash waters were allowed to flow out of doorways and through floor drains, thus the areas surrounding the buildings could potentially be contaminated.

Samples A11P-016 and A11P-017 were actually collected from the opposite side of the rampway, away from Building 49 and therefore it is unlikely that wash waters from Building 49 would have contaminated the area that the samples were collected from. Sample A11P-017 was collected near Building 85 and sample A11P-016 was collected from next to Building 49-5 (Electric Control House).

Sample A11P-022 was collected from a depressed area west of Building 49, in an area that could possibly have received drainage from the area surrounding this building. This depressed area had a concrete spillway and an associated drainage ditch that flowed northeastward from the depressed area. Samples A11P-023 (sediment), A11P-025 (sediment), and A11P-026 (sediment) were collected from this drainage ditch. It was not known at the time of the field investigation that this depressed area was located just north of Building 49. Sample A11P-023 was located just on the other side of this concrete spillway, in the drainage ditch. This ditch turns to the northwest approximately 300 ft downstream and samples A11P-025 and A11P-026 were located in this northwest-flowing portion of the ditch. A11P-026 was collected from a location of the ditch that had a film on the surface of the water. A11P-025 was collected at the intersection of three ditches, on the south side of the Chemical Area Road.

Sample A11P-007 was supposed to be located east of former Building 85-3. It was actually collected west of former Building 85-3. Sample A11P-008 was actually collected from next to Building 85-3, not next to Building 85-2 as was originally planned. Sample A11P-009 was supposed to be located next to former Building II-1-19, however it was collected from next to Building 85-1 as discussed above. Olin used both Buildings 85-2 and II-1-19 for Propellant Grain Curing.

All of the sample locations in the CAP Production Area (except for A11P-008, A11P-009 and A1P-013) were identified using Global Positioning System (GPS) coordinates obtained from the aerial photographs.

Possible CAP Testing Area

Sample locations A11P-002 through A11P-006, A11P-040 and A11P-041 were located in a possible CAP testing area (former Building 87) reported by IMC. Sample A11P-002 was located on a soil mound that likely covers former Building 87. Sample A11P-003 is located next to the building, near the former access road to this building. Sample A11P-004 (surface water) was located in a ponded area to the east of former Building 87 and sample A11P-005 (sediment) was located in a ditch downstream of this ponded area. Sample A11P-006 was located in another drainage ditch that runs to the southeast, away from former Building 87. There is potential for lead azide and lead styphnate contamination at all of these locations.

Sample location A11P-041 was located just downwind of this facility since, according to Dupont, significant lead contamination could exist as far as 100 ft downwind of the CAP testing area. Sample location A11P-040 is located in a former scarred area identified in historical aerial photographs. It is possible that this scarred area was a former drainage ditch.

Building 48

Samples A11P-028 and A11P-037 were supposed to be located next to doorways of former Building 48 (IOP Cooling Building and Olin/CSC Possible Manufacture of Jet Starter Cartridges/Storage). These locations would have likely received spillage from wash waters that would have been used to wash out the building. Sample A11P-028 was actually collected from within the footprint of Building 48, not next to the doorway as planned.

Sample locations A11P-030 (sediment), A11P-038 (sediment and surface water) and A11P-039 (sediment and surface water) were all located in drainage ditches along the Service Area Road that would have received drainage from the area surrounding former Building 48. A11P-030 and A11P-039 were located on the north side of the road and A11P-038 was located on the south side of the road. Sample A11P-030 was actually located approximately 100 ft closer to the building and sample A11P-039 was moved approximately 80 ft further from the building than originally planned. Sample A11P-039 was actually collected from inside AUS-A11A instead of AUS-A11P.

There was a ponded area located to the southwest of former Building 48 and sample A11P-029 (sediment and surface water) was collected from this ponded area.

All samples were collected in accordance to the tables in the FSP with the following exception:

- AUS-A11P-030-SW-00 No surface water was present at this location at time of sampling, therefore no sample was taken.

Building 48-1

Sample A11P-034 was planned to be located to the south of former Building 48-1 (IOP TNT Screening Building and Olin/CSC Storage Building); however it was actually located within the footprint of this building. It is possible that this building was used for storage of explosive materials, since a berm was built around this building by Olin. Sample location A11P-035 was located on a 12-ft high soil mound that was identified during the site reconnaissance, to the northeast of former Building 48-1. Sample A11P-036 (sediment and surface water) was located in a ponded area to the east of the 12-ft high mound, which had a sheen on the water.

Sample A11P-033 was located to the northwest of former Building 48-1, underneath a pile of power poles, to determine if chemicals used to treat these power poles, leached into the soil.

Building II-1-16

Olin may have tested experimental explosive devices in former Building II-1-16. This building was also a former IOP TNT Service Magazine. Sample A11P-031 was located just southwest of an existing mounded area that is believed to be the former location of Building II-1-16, in an area that would have likely received spillage since it appears to be the former loading dock for this building. Sample location A11P-032 (sediment) is located in a drainage ditch that may have received drainage from the area surrounding this building.

All samples were collected in accordance to the tables in the FSP with the following exception:

- AUS-A11P-032-SW-00 No surface water was present at this location at time of sampling, therefore no sample was taken.

Miscellaneous Drainage in AUS-A11P

Sample A11P-021 was located in a dry ditch along the north side of the Chemical Area Road, to the north of former Building 86. This drainage ditch likely received drainage from former Building 87.

Sample A11P-024 was in a low-lying area located to the north of the depressed area with the concrete spillway.

Sample A11P-027 was collected from an IOP sewer manhole. It was not determined from which buildings this manhole received drainage.

Sample A11P-001 was located in a dry drainage ditch that appears to have received drainage from former Building 87. It is located on the northwest corner of the intersection of the Service Area Road and the Chemical Area Road.

All samples were collected in accordance with the tables in the FSP with the following exceptions:

- AUS-A11P-023-SW-00 No surface water was present at this location at time of sampling, therefore no sample was taken.
- AUS-A11P-026-SW-00 No surface water was present at this location at time of sampling, therefore no sample was taken.

18.2.2 Field Results

18.2.2.1 Site Conditions

18.2.2.1.1 Geologic Conditions

There were a total of eight wells installed in Area 11. This includes one well in AUS-A11P. A geologic cross-section (Figure 15-11) was made for the site using the soil boring information obtained from the monitoring well. Boring logs and monitoring well construction diagrams are included in Appendices A and B, respectively.

As shown on the geologic cross-section Figure 15-11, the boring log for A11P-W01 indicates that the site is overlain with 3 ft of fill material (topsoil, possible cast TNT flakes, etc.). A 6-inch layer of concrete rubble was encountered at 3 ft below ground surface (bgs). Beneath the till is an 8.5-ft thick layer of loess (low to medium plastic silty clay). The loess layer lies on top of a 1-ft thick layer of tan/black, wet, loose silty sand. From the sand layer to the bottom of the boring at 19 ft bgs is another layer of silty clay.

18.2.2.1.2 Hydrogeologic Conditions

Groundwater was encountered during drilling a 12 ft bgs as shown on Figure 15-11. A groundwater contour map (Figure 15-2) was made for Area 11 using groundwater elevations obtained from October 2000. The groundwater elevations taken at Area 11P are presented on Table 15-4. As shown in this groundwater contour map, the overall flow direction of the groundwater appears to be toward the northwest. Groundwater elevations were collected several different times during this investigation as seen in Table 15-4, and the flow direction was generally the same each time. Slug tests were performed on the well installed in Area A11P during the AUS OU investigation, resulting in a hydraulic conductivity value of 3.18E-05 centimeters per second (cm/sec). Slug tests results are summarized in Table 18-2. Slug tests are included in Appendix C.

Hydraulic conductivity values from slug tests are less than the trigger values for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)). Based on the borings at the site, the aquifer does not appear to meet any of the other criteria for Class I Groundwater (35 IAC 620), although one of the trigger criterion has not been measured. That criterion is "sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less" (35 IAC 620.210(a)(4)(A)). Based on the slow recovery of wells at this site, yields that would indicate Class I groundwater by that criterion would definitely not be expected. In accordance with 35 IAC 620.220, groundwater that does not meet the criteria for Class I, III, or IV is classified as Class II. Based on the available data, the groundwater at this site appears to be Class II as defined by the State of Illinois. This classification could change based on additional data.

18.2.2.1.3 Hydrologic Conditions

There are both ditches/creeks and pond surface water features in A11P, see Figure 18-1. Ditches run north-northeast parallel to the Chemical Area Road. Another ditch begins in the center of this site within a depressed, sometimes ponded area and flows east then north under the Chemical area road. Several ponded areas are present at this site near the Service Area Road (both north and south of the road), which is located in the southern portion of the site.

18.2.2.2 Chemical Results

The sample analytical results are summarized as follows:

- Table 18-4 – soil samples results,
- Table 18-5 – sediment samples results,
- Table 18-6 – groundwater samples results, and
- Table 18-7 – surface water samples results.

These tables list all the chemicals detected in Area 11P during this investigation, along with the frequency and range of detections.

Tetrachlorodibenzo-p-Dioxin (TCDD) equivalent results for Area 11P are not shown in the screening tables. They are instead included in Table 18-15, and are discussed in the following human health and ecological risk sections.

Sample results are presented on figures as follows:

- Figure 18-1 – organic results for soil and sediment samples,
- Figure 18-2 – inorganic results for soil and sediment samples, and
- Figure 18-3 – all results for surface water and groundwater samples at this site.

18.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 18-8 through 18-14 as follows:

- Table 18-8--human health risk screening for soils,
- Table 18-9--human health risk screening for sediment,
- Table 18-10--human health risk screening for groundwater,
- Table 18-11--human health risk screening for surface water,
- Table 18-12--ecological risk screening for soils,
- Table 18-13--ecological risk screening for sediment, and
- Table 18-14--ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 11P. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk). The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 18-1 through 18-3, the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 18-16 (human health risk) and 18-17 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 18-16) and COPECs (Table 18-17) are shaded in the tables.

18.3.1 Human Health Risk

18.3.1.1 Soil/Sediment

Human health screening results for soil and sediment samples are presented in Tables 18-8 and 18-9, respectively. Soil screening values were conservatively used to screen the sediment samples. For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1 x 10^{-6}. In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

Dioxin/furan congener concentrations were converted to 2,3,7,8-TCDD equivalents, for comparison against a 2,3,7,8-TCDD screening value. A toxic equivalency (TEQ) was calculated for each dioxin/furan congener by multiplying a congener-specific toxic equivalency factor (TEF) value by the congener's observed concentration. The TEQs for all congeners in a sample were summed. The summed TEQ values were then compared to the 2,3,7,8-TCDD screening value of 1 ppb. Refer to Table 18-15.

One soil sample from Area 11P was analyzed for dioxin/furan congeners. The sample did have detections for some dioxin/furan congeners. However, none of the TEQ values calculated for the congeners exceeded the 2,3,7,8-TCDD screening level. Therefore, none of the dioxin/furan congeners detected within Area 11P are assumed to pose potential risk to human health.

18.3.1.2 Groundwater

Human health screening results for groundwater are presented in Table 18-10. The maximum groundwater concentrations from Area 11A were screened against maximum contaminant levels (MCLs) and Illinois Class I groundwater standards.

18.3.1.3 Surface Water

Human health risk screening results for chemicals in surface water from Area 11P are presented in Table 18-11. The maximum concentrations from Area 11P were screened against the IEPA General Use Surface Water Quality Criteria – Human Health.

18.3.2 Ecological Risk

18.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 18-12. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[54]
- Environment Canada (1995)[55]
- Talmage *et al.* (1999)[56]
- Efroymson *et al.* (1997a, 1997b)[57]
- CCME (1999)[58]
- MHSPE (1994)[59]
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)[60] used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

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[54] USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.
[55] Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.
[56] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. Rev Environ. Contam. Toxicol 161:1-156.
[57] Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3.
Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2.
[58] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.
[59] Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards.* Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.
[60] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

Direct exposure screening concentrations in soils were available for 2,3,7,8-TCDD, but not for other dioxin/furan congeners. Therefore, the potential for direct exposure effects were only screened in conjunction with 2,3,7,8-TCDD (Table 18-12). Based on the screening results in Table 18-12, 2,3,7,8-TCDD is not a concern relative to direct exposures (it was not detected). Other congeners, if detected, were retained as potentially bioaccumulative COPECs. Results of the dioxin/furan analyses are presented in Table 18-15. Congeners detected are summarized below:

Dioxins/Furans Detected in Soils (AUS-A11P)	
1,2,3,7,8-PeCDD	2,3,7,8—TCDF
1,2,3,6,7,8-HxCDD	1,2,3,7,8-PeCDF
1,2,3,7,8,9-HxCDD	2,3,4,7,8-PeCDF
1,2,3,4,6,7,8-HpCDD	1,2,3,4,7,8-HxCDF
OCDD	1,2,3,6,7,8-HxCDF
	1,2,3,4,6,7,8-HpCDF
	OCDF

Each of these congeners is retained as a COPEC (note the individual congeners are not included in the COPEC summary of Table 18-17).

18.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 18-13. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)[61]
- USEPA (1996 – summarized by Ingersoll *et al.* 1996)[62]
- Ontario Ministry of the Environment and Energy (1995)[63]
- NOAA (1999)[64]
- Ecotox (USEPA 1996)[65]
- Long *et al.* (1995)[66]
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

[61] MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. MacDonald Environmental Services Ltd., British Columbia, Canada.

[62] Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfirld, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22(3):602-623.

[63] Ontario Ministry of Environment and Energy. 1995. Ontario's Approach to Sediment Assessment and Remediation. Second SETAC World Congress (16[TH] Annual Meeting). Vancouver, British Columbia, Canada.

[64] NOAA. 1999. Screening quick Reference Tables. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

[65] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

[66] Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management. 19(1): 81-97.

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15^{th} percentile and 50^{th} percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50^{th} percentile in the effects data set and the 85^{th} percentile in the no-effects data set, and the effects range medium is the 50^{th} percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed "consensus-based" freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the "equilibrium-partitioning" (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 18.3.2.1.

18.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 18-14. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)[67]
- EcoTox (USEPA 1996[68])
- USEPA Region IV Freshwater Screening Values (1999b)[69]

[67] USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.
[68] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.
[69] USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at http://www.epa.gov/region4/waste/oftecser/ecolbul.htm.

- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)[70]
- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 18.3.2.1.

18.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-A11P, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 11-16; and on the COPEC list, Table 11-17. The only COPC in this category is antimony in sediment. There are no COPECs coded with "D" on Table 11-17. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be evaluated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 18-18.

Other areas of the site and media and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

[70] ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

TABLE 18-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11P

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11P-001	365377.7	780284.4	432.43	NA	
A11P-002	365817.2	780112.0	435.25	NA	
A11P-003	365815.4	780116.0	436.90	NA	
A11P-004	365846.3	780191.9	438.14	NA	
A11P-005	365824.8	780230.4	429.56	NA	
A11P-006	365702.1	780275.3	435.72	NA	
A11P-007	365662.1	780392.5	437.36	NA	
A11P-008	365679.6	780470.1	437.64	NA	
A11P-009	365699.4	780511.5	437.50	NA	
A11P-010	365516.8	780561.5	430.88	NA	
A11P-011	365659.3	780519.6	438.98	NA	
A11P-012	365669.9	780566.4	438.93	NA	
A11P-013	365926.7	780457.2	434.64	NA	
A11P-014	365859.9	780500.4	440.00	NA	
A11P-015	365791.1	780588.8	434.49	NA	
A11P-016	365748.6	780734.5	435.52	NA	
A11P-017	365726.1	780672.4	438.88	NA	
A11P-018	365666.4	780652.7	437.96	NA	
A11P-019	365662.2	780722.3	431.62	NA	
A11P-020	365619.7	780729.0	431.61	NA	
A11P-021	366054.4	780488.3	433.59	NA	
A11P-022	365838.8	780688.3	433.72	NA	
A11P-023	365889.6	780716.4	431.82	NA	
A11P-024	366191.6	780674.0	427.15	NA	
A11P-025	366291.9	780692.6	424.62	NA	
A11P-026	366204.2	780708.2	426.62	NA	
A11P-027	366042.8	780799.9	434.90	NA	
A11P-028	365912.2	781019.3	439.63	NA	
A11P-029	365808.1	780998.7	435.28	NA	
A11P-030	365736.9	780935.3	433.67	NA	
A11P-031	366422.8	780777.7	431.89	NA	
A11P-032	366522.6	780868.4	430.16	NA	
A11P-033	366165.3	780891.8	435.88	NA	
A11P-034	366070.5	781004.9	438.93	NA	
A11P-035	366093.1	781049.5	446.66	NA	
A11P-036	366043.1	781096.7	435.56	NA	
A11P-037	365963.8	781216.9	437.74	NA	
A11P-038	365824.6	781204.1	433.71	NA	
A11P-039	365970.1	781364.5	433.53	NA	
A11P-040	365811.0	780171.4	434.95	NA	
A11P-041	365839.6	780131.6	431.95	NA	
A11P-W01	365522.1	780500.1	435.04	437.33	New monitoring well

Sheet 1 of 1

NA = Not Applicable

TABLE 18-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
49-03	Benzoic Acid	1.6
	Bis(2-Ethylhexyl)phthalate	0.13JB
	Aluminum	14,000
	Barium	96
	Beryllium	0.8
	Calcium	4,000
	Chromium	17
	Cobalt	9.1
	Copper	11
	Iron	18,000
	Lead	18
	Magnesium	3,400
	Manganese	650
	Mercury	0.06
	Nickel	12
	Potassium	950
	Vanadium	32
	Zinc	44
50-01	Bis(2-Ethylhexyl)phthalate	0.4JB
	Aluminum	13,000
	Barium	110
	Beryllium	0.8
	Calcium	3,700
	Chromium	19
	Cobalt	12
	Copper	9
	Iron	22,000
	Magnesium	3,500
	Manganese	1,400
	Mercury	0.08
	Nickel	12
	Potassium	900
	Vanadium	41
	Zinc	40
50-01 DUP	Bis(2-Ethylhexyl)phthalate	0.38
	Aluminum	13,000
	Barium	100
	Beryllium	0.7
	Calcium	3,900
	Chromium	17
	Cobalt	10
	Copper	9.6
	Iron	19,000
	Lead	14
	Magnesium	3,700
	Manganese	1,100

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TABLE 18-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
50-01 DUP	Mercury	0.05
	Nickel	12
	Potassium	920
	Vanadium	34
	Zinc	47

mg/kg = milligrams per kilogram
J = Estimated
B = No explanation of "B" qualifier in report

TABLE 18-2
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
A11P-W01	3.18E-05

Sheet 1 of 1

cm/sec = centimeters per second

TABLE 18-3
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-A11P

Soil	Sediment	Groundwater	Surface Water
AUS-A11P-001*	AUS-A11P-005	AUS-A11P-W01	AUS-A11P-004
AUS-A11P-002	AUS-A11P-010		AUS-A11P-019
AUS-A11P-003	AUS-A11P-019		AUS-A11P-029
AUS-A11P-006*	AUS-A11P-020		AUS-A11P-036
AUS-A11P-007	AUS-A11P-023		AUS-A11P-038
AUS-A11P-008	AUS-A11P-025		AUS-A11P-039
AUS-A11P-009	AUS-A11P-026		
AUS-A11P-011	AUS-A11P-029		
AUS-A11P-012	AUS-A11P-030		
AUS-A11P-013*	AUS-A11P-032		
AUS-A11P-014	AUS-A11P-036		
AUS-A11P-015	AUS-A11P-038		
AUS-A11P-016	AUS-A11P-039		
AUS-A11P-017			
AUS-A11P-018			
AUS-A11P-021*			
AUS-A11P-022			
AUS-A11P-024			
AUS-A11P-027			
AUS-A11P-028			
AUS-A11P-031			
AUS-A11P-033			
AUS-A11P-034			
AUS-A11P-035			
AUS-A11P-037			
AUS-A11P-040*			
AUS-A11P-041*			
AUS-A11P-W01			

Sheet 1 of 1

* Note that the samples at this location were originally designated as sediment, but are actually soil samples.

TABLE 18-4
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Styrene	1/9	38 ug/kg
Tetrachloroethylene(PCE)	1/9	2 ug/kg
Semivolatile Organic Compounds		
2-Methylnaphthalene	2/12	100 ug/kg to 170 ug/kg
Acenaphthylene	1/12	70 ug/kg
Anthracene	3/12	54 ug/kg to 190 ug/kg
Benzo(a)Anthracene	3/12	120 ug/kg to 690 ug/kg
Benzo(a)Pyrene	3/12	150 ug/kg to 760 ug/kg
Benzo(b)Fluoranthene	4/12	44 ug/kg to 1,600 ug/kg
Benzo(g,h,i)Perylene	4/12	47 ug/kg to 480 ug/kg
Benzo(k)Fluoranthene	3/12	100 ug/kg to 1,500 ug/kg
Bis(2-Ethylhexyl) Phthalate	6/12	54 ug/kg to 57,000 ug/kg
Carbazole	1/12	160 ug/kg
Chrysene	4/12	43 ug/kg to 1,200 ug/kg
Dibenz(a,h)Anthracene	1/12	230 ug/kg
Dibenzofuran	2/12	65 ug/kg to 180 ug/kg
Diethyl Phthalate	1/12	310 ug/kg
Dimethyl Phthalate	1/12	72 ug/kg
Di-N-Butyl Phthalate	3/12	44 ug/kg to 5,900 ug/kg
Fluoranthene	3/12	120 ug/kg to 1,900 ug/kg
Indeno(1,2,3-c,d)Pyrene	3/12	110 ug/kg to 480 ug/kg
Naphthalene	2/12	44 ug/kg to 84 ug/kg
N-Nitrosodiphenylamine	1/12	300 ug/kg
Phenanthrene	4/12	130 ug/kg to 910 ug/kg
Pyrene	3/12	190 ug/kg to 2,000 ug/kg
PCBs		
PCB (Total)	1/1	18 ug/kg
PCB-1260 (Arochlor 1260)	1/1	18 ug/kg
Explosives		
2,4-Dinitrotoluene	1/43	530 ug/kg
Metals		
Aluminum	29/29	4,930 mg/kg to 28,400 mg/kg
Antimony	20/29	0.21 mg/kg to 1.8 mg/kg
Arsenic	29/29	1.7 mg/kg to 30.8 mg/kg
Barium	29/29	72.8 mg/kg to 386 mg/kg
Beryllium	26/29	0.43 mg/kg to 0.9 mg/kg
Boron	14/29	0.58 mg/kg to 32 mg/kg
Cadmium	1/29	3.1 mg/kg
Calcium	28/29	882 mg/kg to 75,600 mg/kg

Sheet 1 of 2

TABLE 18-4
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Chromium, Total	29/29	7.8 mg/kg to 61.2 mg/kg
Cobalt	27/29	5.3 mg/kg to 70.8 mg/kg
Copper	29/29	4.4 mg/kg to 187 mg/kg
Cyanide	1/2	0.26 mg/kg
Iron	29/29	6,050 mg/kg to 42,600 mg/kg
Lead	29/29	4.4 mg/kg to 146 mg/kg
Magnesium	29/29	1,210 mg/kg to 20,000 mg/kg
Manganese	29/29	170 mg/kg to 15,200 mg/kg
Mercury	26/29	0.01 mg/kg to 1.3 mg/kg
Nickel	29/29	6.8 mg/kg to 74.6 mg/kg
Potassium	29/29	186 mg/kg to 1,250 mg/kg
Selenium	14/29	0.38 mg/kg to 22.5 mg/kg
Silver	1/29	0.6 mg/kg
Sodium	26/29	35.4 mg/kg to 174 mg/kg
Thallium	7/29	0.16 mg/kg to 0.71 mg/kg
Vanadium	29/29	9.5 mg/kg to 47.4 mg/kg
Zinc	29/29	15.6 mg/kg to 1,100 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 18-5
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
4-Methylphenol (P-Cresol)	1/9	160 ug/kg
Benzo(a)Anthracene	1/9	63 ug/kg
Benzo(b)Fluoranthene	1/9	94 ug/kg
Benzo(g,h,i)Perylene	1/9	130 ug/kg
Bis(2-ethylhexyl) Phthalate	5/9	54 ug/kg to 910 ug/kg
Chrysene	2/9	64 ug/kg to 100 ug/kg
Fluoranthene	1/9	64 ug/kg
Pyrene	1/9	92 ug/kg
Metals		
Aluminum	13/13	11,500 mg/kg to 22,400 mg/kg
Antimony	6/13	0.31 mg/kg to 1 mg/kg
Arsenic	13/13	4 mg/kg to 16.7 mg/kg
Barium	13/13	48.5 mg/kg to 239 mg/kg
Beryllium	13/13	0.36 mg/kg to 2.1 mg/kg
Boron	6/13	0.85 mg/kg to 4 mg/kg
Calcium	13/13	1,670 mg/kg to 12,300 mg/kg
Chromium, Total	13/13	14.8 mg/kg to 27.4 mg/kg
Cobalt	13/13	5 mg/kg to 50.4 mg/kg
Copper	13/13	10.7 mg/kg to 66.8 mg/kg
Iron	13/13	13,400 mg/kg to 33,200 mg/kg
Lead	13/13	13.2 mg/kg to 48.1 mg/kg
Magnesium	13/13	1,900 mg/kg to 8,630 mg/kg
Manganese	13/13	123 mg/kg to 8,560 mg/kg
Mercury	13/13	0.021 mg/kg to 1.6 mg/kg
Nickel	13/13	8.2 mg/kg to 64.5 mg/kg
Potassium	13/13	621 mg/kg to 1,540 mg/kg
Selenium	5/13	0.42 mg/kg to 3.2 mg/kg
Sodium	13/13	57.6 mg/kg to 274 mg/kg
Thallium	2/13	0.83 mg/kg to 3.2 mg/kg
Vanadium	13/13	23.1 mg/kg to 57.5 mg/kg
Zinc	13/13	42.2 mg/kg to 236 mg/kg

Sheet 1 of 2

TABLE 18-5 SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY		
Constituents	**Number of Detections**	**Range of Detections**
Other Inorganics		
Total Organic Carbon	2/2	7,990 mg/kg to 15,300 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

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TABLE 18-6
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Cis-1,2-Dichloroethene	1/1	36 ug/L
Tetrachloroethylene(PCE)	1/1	4 ug/L
Trichloroethylene (TCE)	1/1	4 ug/L
Semivolatile Organic Compounds		
Bis(2-Ethylhexyl) Phthalate	1/1	1.2 ug/L
Metals		
Aluminum	1/1	5,730 ug/L
Barium	1/1	125 ug/L
Boron	1/1	12.3 ug/L
Calcium	1/1	91,300 ug/L
Chromium, Total	1/1	5.6 ug/L
Copper	1/1	2.8 ug/L
Iron	1/1	5,490 ug/L
Lead	1/1	2.9 ug/L
Magnesium	1/1	40,200 ug/L
Manganese	1/1	157 ug/L
Nickel	1/1	7.1 ug/L
Potassium	1/1	933 ug/L
Sodium	1/1	30,600 ug/L
Vanadium	1/1	8.7 ug/L
Zinc	1/1	14.8 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	1/1	337 mg/L
Nitrogen, Nitrate-Nitrite	1/1	0.27 mg/L
Phosphorus, Total (as P)	1/1	0.19 mg/L
Sulfate (as SO4)	1/1	80,000 ug/L
Suspended Solids (Residue, Non-Filterable)	1/1	160 mg/L
Total Dissolved Solids (Residue, Filterable)	1/1	497 mg/L

Sheet 1 of 1

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

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TABLE 18-7
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Bis(2-Ethylhexyl) Phthalate	1/5	1.3 ug/L
Metals		
Aluminum	6/6	662 ug/L to 6,570 ug/L
Arsenic	4/6	5.4 ug/L to 14.6 ug/L
Barium	6/6	61.9 ug/L to 79.7 ug/L
Boron	6/6	12.4 ug/L to 33.6 ug/L
Calcium	6/6	3,900 ug/L to 56,200 ug/L
Chromium, Total	3/6	3.8 ug/L to 7.2 ug/L
Copper	2/6	1.3 ug/L to 31.9 ug/L
Iron	6/6	1,790 ug/L to 11,200 ug/L
Lead	2/6	3.6 ug/L to 8.8 ug/L
Magnesium	6/6	3,200 ug/L to 22,200 ug/L
Manganese	6/6	121 ug/L to 2,410 ug/L
Nickel	5/6	2 ug/L to 4.9 ug/L
Potassium	6/6	1,040 ug/L to 3,210 ug/L
Selenium	2/6	3.2 ug/L to 4.2 ug/L
Sodium	6/6	2,920 ug/L to 5,480 ug/L
Vanadium	6/6	3.3 ug/L to 18.4 ug/L
Zinc	3/6	4.6 ug/L to 13.7 ug/L
Other Inorganics		
Nitrogen, Ammonia (as N)	5/5	0.16 mg/L to 0.32 mg/L
Phosphorus, Total (as P)	2/2	0.14 mg/L to 0.38 mg/L
Total Dissolved Solids (Residue, Filterable)	3/3	59.5 mg/L to 155 mg/L

Sheet 1 of 1

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/27/01

TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			2.10E-06	7.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG		7.79E-09	1.79E-06	3.50E+01
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG		3.68E-09	4.60E-05	7.78E+00
75-34-3	1,1-Dichloroethane	7	U	UG/KG			3.40E-06	7.00E-03
75-35-4	1,1-Dichloroethene	7	U	UG/KG		5.90E-08	1.04E-04	2.33E+00
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG		9.15E-09	1.99E-04	7.00E+00
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG			4.75E-05	3.50E-01
78-87-5	1,2-Dichloropropane	7	U	UG/KG		9.12E-09	3.29E-04	7.00E+00
78-93-3	2-Butanone (MEK)	14	U	UG/KG			5.05E-07	
591-78-6	2-Hexanone	14	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	14	U	UG/KG			4.85E-06	
67-64-1	Acetone	14	U	UG/KG			2.25E-06	1.75E-02
71-43-2	Benzene	7	U	UG/KG		4.78E-09	2.89E-04	3.50E+00
75-27-4	Bromodichloromethane	7	U	UG/KG		2.97E-09	6.71E-06	2.33E-01
75-25-2	Bromoform	7	U	UG/KG		2.24E-11	3.97E-07	1.75E-01
74-83-9	Bromomethane	7	U	UG/KG			5.33E-04	7.00E-01
75-15-0	Carbon disulfide	7	U	UG/KG			5.79E-06	3.50E-03
56-23-5	Carbon tetrachloride	7	U	UG/KG		1.32E-08	1.00E-03	2.33E+00
108-90-7	Chlorobenzene	7	U	UG/KG			1.29E-05	1.00E-01
75-00-3	Chloroethane	7	U	UG/KG		1.08E-09	3.71E-07	
67-66-3	Chloroform	7	U	UG/KG		1.34E-08	5.43E-03	2.33E-01
74-87-3	Chloromethane	7	U	UG/KG		2.63E-09		
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG			4.75E-05	3.50E-01
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-8
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ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

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124-48-1	Dibromochloromethane	7	U	UG/KG		2.64E-09	4.40E-06	3.50E-01
100-41-4	Ethylbenzene	7	U	UG/KG			1.17E-06	1.00E-02
75-09-2	Methylene chloride	7	U	UG/KG		3.41E-10	7.16E-07	7.00E+00
110-54-3	N-Hexane	7	U	UG/KG			1.73E-05	
100-42-5	Styrene	38		UG/KG			1.86E-06	1.90E-01
127-18-4	Tetrachloroethylene (PCE)	2	J	UG/KG		1.07E-10	1.17E-06	6.67E-01
108-88-3	Toluene	7	U	UG/KG			3.52E-06	1.17E-02
1330-20-7	total Xylenes	7	U	UG/KG			1.57E-06	7.00E-04
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG			3.27E-05	2.33E-01
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG		1.14E-09	8.85E-05	2.33E+00
75-01-4	Vinyl chloride	7	U	UG/KG		1.44E-07		1.00E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	560	U	UG/KG			7.35E-05	1.87E+00
95-50-1	1,2-Dichlorobenzene	560	U	UG/KG			1.69E-04	6.22E-01
541-73-1	1,3-Dichlorobenzene	560	U	UG/KG			1.08E-02	
106-46-7	1,4-Dichlorobenzene	560	U	UG/KG		6.89E-08	2.91E-04	5.60E+00
95-95-4	2,4,5-Trichlorophenol	2800	U	UG/KG			3.18E-05	2.80E-01
88-06-2	2,4,6-Trichlorophenol	560	U	UG/KG		2.50E-09		7.00E+01
120-83-2	2,4-Dichlorophenol	560	U	UG/KG			2.12E-04	1.12E+01
105-67-9	2,4-Dimethylphenol	560	U	UG/KG			3.18E-05	1.40E+00
51-28-5	2,4-Dinitrophenol	2800	U	UG/KG			1.59E-03	2.80E+02
91-58-7	2-Chloronaphthalene	560	U	UG/KG			2.05E-05	
95-57-8	2-Chlorophenol	560	U	UG/KG			2.32E-03	2.80E+00
91-57-6	2-Methylnaphthalene	170	J	UG/KG			3.14E-06	8.50E-04

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-48-7	2-Methylphenol	560	U	UG/KG			1.27E-05	7.00E-01
88-74-4	2-Nitroaniline	2800	U	UG/KG			5.56E-02	
88-75-5	2-Nitrophenol	560	U	UG/KG			7.95E-05	
91-94-1	3,3'-Dichlorobenzidine	560	U	UG/KG		1.02E-07		1.87E+03
99-09-2	3-Nitroaniline	2800	U	UG/KG			5.56E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2800	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	560	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	560	U	UG/KG			1.27E-05	
106-47-8	4-Chloroaniline	1100	U	UG/KG			3.12E-04	3.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	560	U	UG/KG				
106-44-5	4-Methylphenol	560	U	UG/KG			1.27E-04	
100-01-6	4-Nitroaniline	2800	U	UG/KG			5.56E-02	
100-02-7	4-Nitrophenol	2800	U	UG/KG			3.97E-04	
83-32-9	Acenaphthene	560	U	UG/KG			1.46E-05	1.87E-02
208-96-8	Acenaphthylene	70	J	UG/KG			1.29E-06	3.50E-04
120-12-7	Anthracene	190	J	UG/KG			4.88E-07	3.17E-04
56-55-3	Benzo(a)anthracene	690		UG/KG		2.39E-07		8.63E+00
50-32-8	Benzo(a)pyrene	760		UG/KG		2.63E-06		1.90E+00
205-99-2	Benzo(b)fluoranthene	1600		UG/KG		5.54E-07		8.00E+00
191-24-2	Benzo(g,h,i)perylene	480	J	UG/KG			8.85E-06	2.40E-03
207-08-9	Benzo(k)fluoranthene	1500		UG/KG		5.20E-08		7.50E-01
111-91-1	bis(2-Chloroethoxy)methane	560	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	560	U	UG/KG		9.03E-07		2.80E+04
108-60-1	bis(2-Chloroisopropyl) ether	560	U	UG/KG		6.93E-08	1.32E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	57000	J	UG/KG		3.24E-07	3.24E-03	

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-68-7	Butyl benzyl phthalate	560	U	UG/KG			3.18E-06	7.00E-04
86-74-8	Carbazole	160	J	UG/KG		1.30E-09		5.33E+00
218-01-9	Chrysene	1200		UG/KG		4.16E-09		1.50E-01
84-74-2	Di-n-butyl phthalate	5900		UG/KG			6.70E-05	1.97E-02
117-84-0	Di-n-octyl phthalate	560	U	UG/KG			3.18E-05	5.60E-05
53-70-3	Dibenz(a,h)anthracene	230	J	UG/KG		7.97E-07		2.88E+00
132-64-9	Dibenzofuran	180	J	UG/KG			3.56E-05	
84-66-2	Diethyl phthalate	310	J	UG/KG			4.40E-07	
131-11-3	Dimethyl phthalate	72	J	UG/KG			8.17E-09	
206-44-0	Fluoranthene	1900		UG/KG			6.31E-05	9.50E-03
86-73-7	Fluorene	560	U	UG/KG			1.69E-05	1.87E-02
118-74-1	Hexachlorobenzene	560	U	UG/KG		3.63E-07	7.95E-04	5.60E+00
87-68-3	Hexachlorobutadiene	560	U	UG/KG		1.77E-08	3.18E-03	5.60E+00
77-47-4	Hexachlorocyclopentadiene	560	U	UG/KG			9.50E-05	2.80E-02
67-72-1	Hexachloroethane	560	U	UG/KG		3.18E-09	6.36E-04	2.80E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	480		UG/KG		1.66E-07		6.86E-01
78-59-1	Isophorone	560	U	UG/KG		2.16E-10	3.18E-06	1.87E+01
621-64-7	N-Nitroso-di-n-propylamine	560	U	UG/KG		1.59E-06		2.80E+05
86-30-6	N-Nitrosodiphenylamine	300	J	UG/KG		5.96E-10		5.00E+00
91-20-3	Naphthalene	84	J	UG/KG			4.45E-04	2.10E-02
87-86-5	Pentachlorophenol	2800	U	UG/KG		2.52E-07	1.96E-04	2.80E+03
85-01-8	Phenanthrene	910		UG/KG			1.68E-05	4.55E-03
108-95-2	Phenol	560	U	UG/KG			1.06E-06	1.12E-01
129-00-0	Pyrene	2000		UG/KG			3.69E-05	1.00E-02

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

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Explosives								
99-35-4	1,3,5-Trinitrobenzene	420	U	UG/KG			1.59E-05	
99-65-0	1,3-Dinitrobenzene	420	U	UG/KG			4.77E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	830	U	UG/KG		1.01E-08	1.88E-03	
121-14-2	2,4-Dinitrotoluene	530	J	UG/KG			3.01E-04	1.33E+04
606-20-2	2,6-Dinitrotoluene	680	U	UG/KG			7.72E-04	2.27E+04
	Dinitrotoluene Mixture	530	J	UG/KG		1.47E-07		1.33E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	830	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	830	U	UG/KG				
99-08-1	3-Nitrotoluene	830	U	UG/KG			4.09E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	830	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	830	U	UG/KG			4.09E-04	
2691-41-0	HMX	830	U	UG/KG			1.88E-05	
98-95-3	Nitrobenzene	480	U	UG/KG			4.19E-03	
55-63-0	Nitroglycerin	1500	U	UG/KG		8.51E-09		
78-11-5	Pentaerythritol tetranitrate (PETN)	3000	U	UG/KG				
121-82-4	RDX	830	U	UG/KG		3.70E-08	3.14E-04	
479-45-8	Tetryl	1200	U	UG/KG			1.36E-04	
Metals								
7429-90-5	Aluminum	28400		MG/KG	9.86E-01		1.69E-02	
7440-36-0	Antimony	1.8	J	MG/KG	2.17E+00		2.20E-03	6.00E+00
7440-38-2	Arsenic	30.8		MG/KG	2.28E+00	1.13E-05	7.01E-02	3.08E+01
7440-39-3	Barium	386		MG/KG	1.98E+00		3.10E-03	4.83E+00
7440-41-7	Beryllium	0.9		MG/KG	1.18E+00	4.02E-10	2.44E-04	3.00E-01
7440-42-8	Boron	32		MG/KG	6.04E+00		4.04E-04	

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-43-9	Cadmium	3.1		MG/KG	1.63E+01	1.04E-09	3.83E-03	7.75E+00
7440-70-2	Calcium	75600		MG/KG	3.03E+01			
7440-47-3	Chromium	61.2		MG/KG	2.43E+00	1.37E-07		3.06E+01
7440-48-4	Cobalt	70.8		MG/KG	3.26E+00		5.77E-04	
7440-50-8	Copper	187		MG/KG	1.65E+01		2.46E-03	
57-12-5	Cyanide, Total	0.26		MG/KG	6.34E-01		1.48E-05	1.30E-01
7439-89-6	Iron	42600		MG/KG	2.21E+00		6.96E-02	
7439-92-1	Lead	146		MG/KG	6.24E+00			
7439-95-4	Magnesium	20000		MG/KG	1.29E+01			
7439-96-5	Manganese	15200		MG/KG	4.18E+00		4.71E-01	
7439-97-6	Mercury	1.3		MG/KG	2.17E+01			
7440-02-0	Nickel	74.6		MG/KG	3.95E+00		1.83E-03	1.07E+01
2023695	Potassium	1250		MG/KG	2.00E+00			
7782-49-2	Selenium	22.5		MG/KG	9.62E+00		2.20E-03	7.50E+01
7440-22-4	Silver	0.6	J	MG/KG	1.03E+00		5.87E-05	3.00E-01
7440-23-5	Sodium	174		MG/KG	1.02E+00			
7440-28-0	Thallium	0.71	J	MG/KG	1.73E+00		4.96E-06	
7440-62-2	Vanadium	47.4		MG/KG	1.00E+00		3.31E-03	1.58E-01
7440-66-6	Zinc	1100		MG/KG	2.14E+01		1.80E-03	1.83E+00
Polychlorinated Biphenyls (PCB)								
12674-11-2	PCB-1016	9.5	U	UG/KG		3.31E-10	1.89E-04	
11104-28-2	PCB-1221	19	U	UG/KG		1.89E-08		
11141-16-5	PCB-1232	9.5	U	UG/KG		9.46E-09		
53469-21-9	PCB-1242	9.5	U	UG/KG		9.46E-09		
12672-29-6	PCB-1248	9.5	U	UG/KG		9.46E-09		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
11097-69-1	PCB-1254	9.5	U	UG/KG		9.46E-09	6.62E-04	
11096-82-5	PCB-1260	18		UG/KG		1.79E-08		
Dioxins								
1746-01-6	2,3,7,8-TCDD	0.000306	U	UG/KG				
Other Parameters								
7601-90-3	Perchlorate	7600	U	UG/KG			7.44E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			3.50E-03
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG	8.54E-07	8.54E-07	3.50E-01
75-34-3	1,1-Dichloroethane	7	U	UG/KG	3.50E-08	3.50E-08	3.04E-04
75-35-4	1,1-Dichloroethene	7	U	UG/KG	3.89E-07	3.89E-06	1.17E-01
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG	1.11E-04	5.00E-06	3.50E-01
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
78-87-5	1,2-Dichloropropane	7	U	UG/KG	8.33E-05	3.89E-06	2.33E-01
78-93-3	2-Butanone (MEK)	14	U	UG/KG			
591-78-6	2-Hexanone	14	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	14	U	UG/KG			
67-64-1	Acetone	14	U	UG/KG	7.00E-08	7.00E-08	8.75E-04
71-43-2	Benzene	7	U	UG/KG	3.50E-05	1.63E-06	2.33E-01
75-27-4	Bromodichloromethane	7	U	UG/KG	7.61E-05	3.50E-06	1.17E-02
75-25-2	Bromoform	7	U	UG/KG	9.72E-06	4.38E-07	8.75E-03
74-83-9	Bromomethane	7	U	UG/KG	2.41E-06	7.00E-06	3.50E-02
75-15-0	Carbon disulfide	7	U	UG/KG	3.50E-08	3.50E-07	2.19E-04
56-23-5	Carbon tetrachloride	7	U	UG/KG	1.59E-04	1.71E-05	1.00E-01
108-90-7	Chlorobenzene	7	U	UG/KG	1.71E-07	1.71E-06	7.00E-03
75-00-3	Chloroethane	7	U	UG/KG			
67-66-3	Chloroform	7	U	UG/KG	7.45E-06	3.50E-06	1.17E-02
74-87-3	Chloromethane	7	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG			

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	7	U	UG/KG	1.71E-07	1.71E-07	1.75E-02
100-41-4	Ethylbenzene	7	U	UG/KG	3.50E-08	3.50E-07	5.38E-04
75-09-2	Methylene chloride	7	U	UG/KG	9.21E-06	5.83E-07	3.50E-01
110-54-3	N-Hexane	7	U	UG/KG			
100-42-5	Styrene	38		UG/KG	9.27E-08	9.27E-07	9.50E-03
127-18-4	Tetrachloroethylene (PCE)	2	J	UG/KG	1.82E-05	8.33E-07	3.33E-02
108-88-3	Toluene	7	U	UG/KG	1.71E-08	1.71E-08	5.83E-04
1330-20-7	total Xylenes	7	U	UG/KG	7.00E-09	1.71E-08	4.67E-05
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG	1.71E-07	1.71E-07	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG	1.35E-05	5.83E-06	1.17E-01
75-01-4	Vinyl chloride	7	U	UG/KG	2.33E-03	1.08E-04	7.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	560	U	UG/KG	2.80E-05	2.80E-04	1.12E-01
95-50-1	1,2-Dichlorobenzene	560	U	UG/KG	3.11E-06	3.11E-05	3.29E-02
541-73-1	1,3-Dichlorobenzene	560	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	560	U	UG/KG			2.80E-01
95-95-4	2,4,5-Trichlorophenol	2800	U	UG/KG	1.40E-05	1.40E-05	1.04E-02
88-06-2	2,4,6-Trichlorophenol	560	U	UG/KG	1.08E-03	5.09E-05	2.80E+00
120-83-2	2,4-Dichlorophenol	560	U	UG/KG	9.18E-05	9.18E-04	5.60E-01
105-67-9	2,4-Dimethylphenol	560	U	UG/KG	1.37E-05	1.37E-05	6.22E-02
51-28-5	2,4-Dinitrophenol	2800	U	UG/KG	6.83E-04	6.83E-03	1.40E+01
91-58-7	2-Chloronaphthalene	560	U	UG/KG			
95-57-8	2-Chlorophenol	560	U	UG/KG	5.60E-05	5.60E-05	1.40E-01
91-57-6	2-Methylnaphthalene	170	J	UG/KG	2.79E-06	2.79E-06	4.05E-05

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-48-7	2-Methylphenol	560	U	UG/KG	5.60E-06	5.60E-06	3.73E-02
88-74-4	2-Nitroaniline	2800	U	UG/KG			
88-75-5	2-Nitrophenol	560	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	560	U	UG/KG	4.31E-02	2.00E-03	8.00E+01
99-09-2	3-Nitroaniline	2800	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2800	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	560	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	560	U	UG/KG			
106-47-8	4-Chloroaniline	1100	U	UG/KG	1.34E-04	1.34E-03	1.57E+00
7005-72-3	4-Chlorophenyl phenyl ether	560	U	UG/KG			
106-44-5	4-Methylphenol	560	U	UG/KG			
100-01-6	4-Nitroaniline	2800	U	UG/KG			
100-02-7	4-Nitrophenol	2800	U	UG/KG			
83-32-9	Acenaphthene	560	U	UG/KG	4.67E-06	4.67E-06	9.82E-04
208-96-8	Acenaphthylene	70	J	UG/KG	1.15E-06	1.15E-06	1.67E-05
120-12-7	Anthracene	190	J	UG/KG	3.11E-07	3.11E-07	1.58E-05
56-55-3	Benzo(a)anthracene	690		UG/KG	8.63E-02	4.06E-03	3.45E-01
50-32-8	Benzo(a)pyrene	760		UG/KG	9.50E-01	4.47E-02	9.50E-02
205-99-2	Benzo(b)fluoranthene	1600		UG/KG	2.00E-01	9.41E-03	3.20E-01
191-24-2	Benzo(g,h,i)perylene	480	J	UG/KG	7.87E-06	7.87E-06	1.14E-04
207-08-9	Benzo(k)fluoranthene	1500		UG/KG	1.92E-02	8.82E-04	3.06E-02
111-91-1	bis(2-Chloroethoxy)methane	560	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	560	U	UG/KG	1.12E-01	7.47E-03	1.40E+03
108-60-1	bis(2-Chloroisopropyl) ether	560	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	57000	J	UG/KG	1.39E-01	1.39E-02	1.58E-02

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-68-7	Butyl benzyl phthalate	560	U	UG/KG	1.37E-06	1.37E-06	6.02E-04
86-74-8	Carbazole	160	J	UG/KG	5.52E-04	2.58E-05	2.67E-01
218-01-9	Chrysene	1200		UG/KG	1.54E-03	7.06E-05	7.50E-03
84-74-2	Di-n-butyl phthalate	5900		UG/KG	2.95E-05	2.95E-05	2.57E-03
117-84-0	Di-n-octyl phthalate	560	U	UG/KG	1.37E-05	1.37E-04	5.60E-05
53-70-3	Dibenz(a,h)anthracene	230	J	UG/KG	2.88E-01	1.35E-02	1.15E-01
132-64-9	Dibenzofuran	180	J	UG/KG			
84-66-2	Diethyl phthalate	310	J	UG/KG	3.10E-07	3.10E-07	6.60E-04
131-11-3	Dimethyl phthalate	72	J	UG/KG			
206-44-0	Fluoranthene	1900		UG/KG	2.32E-05	2.32E-05	4.42E-04
86-73-7	Fluorene	560	U	UG/KG	6.83E-06	6.83E-06	1.00E-03
118-74-1	Hexachlorobenzene	560	U	UG/KG	1.40E-01	7.18E-03	2.80E-01
87-68-3	Hexachlorobutadiene	560	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	560	U	UG/KG	4.00E-05	4.00E-05	1.40E-03
67-72-1	Hexachloroethane	560	U	UG/KG	2.80E-04	2.80E-04	1.12E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	480		UG/KG	6.00E-02	2.82E-03	3.43E-02
78-59-1	Isophorone	560	U	UG/KG	1.37E-06	1.37E-06	7.00E-02
621-64-7	N-Nitroso-di-n-propylamine	560	U	UG/KG	7.00E-01	3.11E-02	1.12E+04
86-30-6	N-Nitrosodiphenylamine	300	J	UG/KG	2.50E-04	1.20E-05	3.00E-01
91-20-3	Naphthalene	84	J	UG/KG	1.02E-06	1.02E-05	1.00E-03
87-86-5	Pentachlorophenol	2800	U	UG/KG	1.17E-01	5.38E-03	9.33E+01
85-01-8	Phenanthrene	910		UG/KG	1.49E-05	1.49E-05	2.17E-04
108-95-2	Phenol	560	U	UG/KG	5.60E-07	4.67E-06	5.60E-03
129-00-0	Pyrene	2000		UG/KG	3.28E-05	3.28E-05	4.76E-04

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	420	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	420	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	830	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	530	J	UG/KG	6.31E-02	2.94E-03	6.63E+02
606-20-2	2,6-Dinitrotoluene	680	U	UG/KG	8.10E-02	3.78E-03	9.71E+02
	Dinitrotoluene Mixture	530	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	830	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	830	U	UG/KG			
99-08-1	3-Nitrotoluene	830	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	830	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	830	U	UG/KG			
2691-41-0	HMX	830	U	UG/KG			
98-95-3	Nitrobenzene	480	U	UG/KG	4.80E-04	4.80E-04	4.80E+00
55-63-0	Nitroglycerin	1500	U	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	3000	U	UG/KG			
121-82-4	RDX	830	U	UG/KG			
479-45-8	Tetryl	1200	U	UG/KG			
Metals							
7429-90-5	Aluminum	28400		MG/KG			
7440-36-0	Antimony	1.8	J	MG/KG	2.20E-03	2.20E-02	3.60E-01
7440-38-2	Arsenic	30.8		MG/KG	1.03E+01	5.05E-01	1.10E+00
7440-39-3	Barium	386		MG/KG	2.76E-03	2.76E-02	3.22E-01
7440-41-7	Beryllium	0.9		MG/KG	9.00E-01	3.10E-02	1.36E-01
7440-42-8	Boron	32		MG/KG	1.78E-04	1.78E-03	

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TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-43-9	Cadmium	3.1		MG/KG	1.55E-03	1.55E-02	8.38E-01
7440-70-2	Calcium	75600		MG/KG			
7440-47-3	Chromium	61.2		MG/KG	6.12E-03	1.49E-02	2.19E+00
7440-48-4	Cobalt	70.8		MG/KG	5.90E-04	5.90E-03	
7440-50-8	Copper	187		MG/KG	2.28E-03	2.28E-02	1.70E-02
57-12-5	Cyanide, Total	0.26		MG/KG	6.34E-06	6.34E-05	6.50E-03
7439-89-6	Iron	42600		MG/KG			
7439-92-1	Lead	146		MG/KG	3.65E-01	3.65E-01	
7439-95-4	Magnesium	20000		MG/KG			
7439-96-5	Manganese	15200		MG/KG	1.58E-01	1.58E+00	
7439-97-6	Mercury	1.3		MG/KG	2.13E-03	2.13E-02	8.67E+00
7440-02-0	Nickel	74.6		MG/KG	1.82E-03	1.82E-02	9.82E-01
2023695	Potassium	1250		MG/KG			
7782-49-2	Selenium	22.5		MG/KG	2.25E-03	2.25E-02	9.38E+00
7440-22-4	Silver	0.6	J	MG/KG	6.00E-05	6.00E-04	4.00E-01
7440-23-5	Sodium	174		MG/KG			
7440-28-0	Thallium	0.71	J	MG/KG	4.44E-03	4.44E-03	2.96E-01
7440-62-2	Vanadium	47.4		MG/KG	3.39E-03	3.39E-02	4.84E-02
7440-66-6	Zinc	1100		MG/KG	1.80E-03	1.80E-02	3.06E-01
Polychlorinated Biphenyls (PCB)							
12674-11-2	PCB-1016	9.5	U	UG/KG			
11104-28-2	PCB-1221	19	U	UG/KG			
11141-16-5	PCB-1232	9.5	U	UG/KG			
53469-21-9	PCB-1242	9.5	U	UG/KG			
12672-29-6	PCB-1248	9.5	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
11097-69-1	PCB-1254	9.5	U	UG/KG			
11096-82-5	PCB-1260	18		UG/KG			
Dioxins							
1746-01-6	2,3,7,8-TCDD	0.000306	U	UG/KG			
Other Parameters							
7601-90-3	Perchlorate	7600	U	UG/KG			

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J = Estimated U = Nondetect

TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	570	U	UG/KG			7.48E-05	1.90E+00
95-50-1	1,2-Dichlorobenzene	570	U	UG/KG			1.72E-04	6.33E-01
541-73-1	1,3-Dichlorobenzene	570	U	UG/KG			1.10E-02	
106-46-7	1,4-Dichlorobenzene	570	U	UG/KG		7.01E-08	2.97E-04	5.70E+00
95-95-4	2,4,5-Trichlorophenol	2900	U	UG/KG			3.29E-05	2.90E-01
88-06-2	2,4,6-Trichlorophenol	570	U	UG/KG		2.54E-09		7.13E+01
120-83-2	2,4-Dichlorophenol	570	U	UG/KG			2.16E-04	1.14E+01
105-67-9	2,4-Dimethylphenol	570	U	UG/KG			3.24E-05	1.43E+00
51-28-5	2,4-Dinitrophenol	2900	U	UG/KG			1.65E-03	2.90E+02
91-58-7	2-Chloronaphthalene	570	U	UG/KG			2.09E-05	
95-57-8	2-Chlorophenol	570	U	UG/KG			2.36E-03	2.85E+00
91-57-6	2-Methylnaphthalene	570	U	UG/KG			1.05E-05	2.85E-03
95-48-7	2-Methylphenol	570	U	UG/KG			1.29E-05	7.13E-01
88-74-4	2-Nitroaniline	2900	U	UG/KG			5.76E-02	
88-75-5	2-Nitrophenol	570	U	UG/KG			8.09E-05	
91-94-1	3,3'-Dichlorobenzidine	570	U	UG/KG		1.04E-07		1.90E+03
99-09-2	3-Nitroaniline	2900	U	UG/KG			5.76E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2900	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	570	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	570	U	UG/KG			1.29E-05	
106-47-8	4-Chloroaniline	1100	U	UG/KG			3.12E-04	3.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	570	U	UG/KG				
106-44-5	4-Methylphenol	160	J	UG/KG			3.63E-05	
100-01-6	4-Nitroaniline	2900	U	UG/KG			5.76E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
100-02-7	4-Nitrophenol	2900	U	UG/KG			4.12E-04	
83-32-9	Acenaphthene	570	U	UG/KG			1.49E-05	1.90E-02
208-96-8	Acenaphthylene	570	U	UG/KG			1.05E-05	2.85E-03
120-12-7	Anthracene	570	U	UG/KG			1.46E-06	9.50E-04
56-55-3	Benzo(a)anthracene	63	J	UG/KG		2.18E-08		7.88E-01
50-32-8	Benzo(a)pyrene	570	U	UG/KG		1.97E-06		1.43E+00
205-99-2	Benzo(b)fluoranthene	94	J	UG/KG		3.26E-08		4.70E-01
191-24-2	Benzo(g,h,i)perylene	130	J	UG/KG			2.40E-06	6.50E-04
207-08-9	Benzo(k)fluoranthene	570	U	UG/KG		1.97E-08		2.85E-01
111-91-1	bis(2-Chloroethoxy)methane	570	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	570	U	UG/KG		9.20E-07		2.85E+04
108-60-1	bis(2-Chloroisopropyl) ether	570	U	UG/KG		7.06E-08	1.34E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	910		UG/KG		5.17E-09	5.16E-05	
85-68-7	Butyl benzyl phthalate	570	U	UG/KG			3.24E-06	7.13E-04
86-74-8	Carbazole	570	U	UG/KG		4.62E-09		1.90E+01
218-01-9	Chrysene	100	J	UG/KG		3.46E-10		1.25E-02
84-74-2	Di-n-butyl phthalate	570	U	UG/KG			6.47E-06	1.90E-03
117-84-0	Di-n-octyl phthalate	570	U	UG/KG			3.24E-05	5.70E-05
53-70-3	Dibenz(a,h)anthracene	570	U	UG/KG		1.97E-06		7.13E+00
132-64-9	Dibenzofuran	570	U	UG/KG			1.13E-04	
84-66-2	Diethyl phthalate	570	U	UG/KG			8.09E-07	
131-11-3	Dimethyl phthalate	570	U	UG/KG			6.47E-08	
206-44-0	Fluoranthene	64	J	UG/KG			2.13E-06	3.20E-04
86-73-7	Fluorene	570	U	UG/KG			1.72E-05	1.90E-02
118-74-1	Hexachlorobenzene	570	U	UG/KG		3.70E-07	8.09E-04	5.70E+00

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J = Estimated U = Nondetect

TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
87-68-3	Hexachlorobutadiene	570	U	UG/KG		1.80E-08	3.24E-03	5.70E+00
77-47-4	Hexachlorocyclopentadiene	570	U	UG/KG			9.67E-05	2.85E-02
67-72-1	Hexachloroethane	570	U	UG/KG		3.24E-09	6.47E-04	2.85E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	570	U	UG/KG		1.97E-07		8.14E-01
78-59-1	Isophorone	570	U	UG/KG		2.20E-10	3.24E-06	1.90E+01
621-64-7	N-Nitroso-di-n-propylamine	570	U	UG/KG		1.62E-06		2.85E+05
86-30-6	N-Nitrosodiphenylamine	570	U	UG/KG		1.13E-09		9.50E+00
91-20-3	Naphthalene	570	U	UG/KG			3.02E-03	1.43E-01
87-86-5	Pentachlorophenol	2900	U	UG/KG		2.61E-07	2.03E-04	2.90E+03
85-01-8	Phenanthrene	570	U	UG/KG			1.05E-05	2.85E-03
108-95-2	Phenol	570	U	UG/KG			1.08E-06	1.14E-01
129-00-0	Pyrene	92	J	UG/KG			1.70E-06	4.60E-04
Explosives								
99-35-4	1,3,5-Trinitrobenzene	460	U	UG/KG			1.74E-05	
99-65-0	1,3-Dinitrobenzene	460	U	UG/KG			5.22E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	930	U	UG/KG		1.13E-08	2.11E-03	
121-14-2	2,4-Dinitrotoluene	460	U	UG/KG			2.61E-04	1.15E+04
606-20-2	2,6-Dinitrotoluene	930	U	UG/KG			1.06E-03	3.10E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	930	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	930	U	UG/KG				
99-08-1	3-Nitrotoluene	930	U	UG/KG			4.58E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	930	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	930	U	UG/KG			4.58E-04	
2691-41-0	HMX	930	U	UG/KG			2.11E-05	
98-95-3	Nitrobenzene	460	U	UG/KG			4.02E-03	

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TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
55-63-0	Nitroglycerin	1600	U	UG/KG		9.08E-09		
78-11-5	Pentaerythritol tetranitrate (PETN)	3100	U	UG/KG				
121-82-4	RDX	930	U	UG/KG		4.15E-08	3.52E-04	
479-45-8	Tetryl	1400	U	UG/KG			1.59E-04	
Metals								
7429-90-5	Aluminum	22400		MG/KG	1.99E+00		1.34E-02	
7440-36-0	Antimony	1	J	MG/KG	5.26E-01		1.22E-03	3.33E+00
7440-38-2	Arsenic	27.2		MG/KG	2.64E+00	9.97E-06	6.19E-02	2.72E+01
7440-39-3	Barium	239		MG/KG	1.22E+00		1.92E-03	2.99E+00
7440-41-7	Beryllium	2.1		MG/KG	1.31E+00	9.37E-10	5.68E-04	7.00E-01
7440-42-8	Boron	4	J	MG/KG			5.05E-05	
7440-43-9	Cadmium	0.93	U	MG/KG	5.81E-01	3.11E-10	1.15E-03	2.33E+00
7440-70-2	Calcium	12300		MG/KG	8.49E+00			
7440-47-3	Chromium	29.5	J	MG/KG	1.72E+00	6.58E-08		1.48E+01
7440-48-4	Cobalt	50.4		MG/KG	5.54E+00		4.11E-04	
7440-50-8	Copper	66.8		MG/KG	3.98E+00		8.80E-04	
57-12-5	Cyanide, Total	0.29	U	MG/KG			1.65E-05	1.45E-01
7439-89-6	Iron	33200		MG/KG	1.60E+00		5.42E-02	
7439-92-1	Lead	48.1		MG/KG	2.00E+00			
7439-95-4	Magnesium	8630		MG/KG	4.52E+00			
7439-96-5	Manganese	8560		MG/KG	8.21E+00		2.65E-01	
7439-97-6	Mercury	1.6		MG/KG	1.07E+01			
7440-02-0	Nickel	64.5		MG/KG	3.82E+00		1.58E-03	9.21E+00
2023695	Potassium	1540		MG/KG	1.08E+00			
7782-49-2	Selenium	3.2		MG/KG	5.00E+00		3.13E-04	1.07E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-22-4	Silver	1.9	U	MG/KG	6.33E-01		1.86E-04	9.50E-01
7440-23-5	Sodium	274		MG/KG	1.89E-01			
7440-28-0	Thallium	3.2	J	MG/KG	1.03E+01		2.24E-05	
7440-62-2	Vanadium	57.5		MG/KG	2.05E+00		4.02E-03	1.92E-01
7440-66-6	Zinc	779		MG/KG	1.36E+01		1.27E-03	1.30E+00
Other Parameters								
7601-90-3	Perchlorate	8600	U	UG/KG			8.41E-03	
TOC	TOC	15300		MG/KG	2.44E-01			

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TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	570	U	UG/KG	2.85E-05	2.85E-04	1.14E-01
95-50-1	1,2-Dichlorobenzene	570	U	UG/KG	3.17E-06	3.17E-05	3.35E-02
541-73-1	1,3-Dichlorobenzene	570	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	570	U	UG/KG			2.85E-01
95-95-4	2,4,5-Trichlorophenol	2900	U	UG/KG	1.45E-05	1.45E-05	1.07E-02
88-06-2	2,4,6-Trichlorophenol	570	U	UG/KG	1.10E-03	5.18E-05	2.85E+00
120-83-2	2,4-Dichlorophenol	570	U	UG/KG	9.34E-05	9.34E-04	5.70E-01
105-67-9	2,4-Dimethylphenol	570	U	UG/KG	1.39E-05	1.39E-05	6.33E-02
51-28-5	2,4-Dinitrophenol	2900	U	UG/KG	7.07E-04	7.07E-03	1.45E+01
91-58-7	2-Chloronaphthalene	570	U	UG/KG			
95-57-8	2-Chlorophenol	570	U	UG/KG	5.70E-05	5.70E-05	1.43E-01
91-57-6	2-Methylnaphthalene	570	U	UG/KG	9.34E-06	9.34E-06	1.36E-04
95-48-7	2-Methylphenol	570	U	UG/KG	5.70E-06	5.70E-06	3.80E-02
88-74-4	2-Nitroaniline	2900	U	UG/KG			
88-75-5	2-Nitrophenol	570	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	570	U	UG/KG	4.38E-02	2.04E-03	8.14E+01
99-09-2	3-Nitroaniline	2900	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2900	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	570	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	570	U	UG/KG			
106-47-8	4-Chloroaniline	1100	U	UG/KG	1.34E-04	1.34E-03	1.57E+00
7005-72-3	4-Chlorophenyl phenyl ether	570	U	UG/KG			
106-44-5	4-Methylphenol	160	J	UG/KG			
100-01-6	4-Nitroaniline	2900	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
100-02-7	4-Nitrophenol	2900	U	UG/KG			
83-32-9	Acenaphthene	570	U	UG/KG	4.75E-06	4.75E-06	1.00E-03
208-96-8	Acenaphthylene	570	U	UG/KG	9.34E-06	9.34E-06	1.36E-04
120-12-7	Anthracene	570	U	UG/KG	9.34E-07	9.34E-07	4.75E-05
56-55-3	Benzo(a)anthracene	63	J	UG/KG	7.88E-03	3.71E-04	3.15E-02
50-32-8	Benzo(a)pyrene	570	U	UG/KG	7.13E-01	3.35E-02	7.13E-02
205-99-2	Benzo(b)fluoranthene	94	J	UG/KG	1.18E-02	5.53E-04	1.88E-02
191-24-2	Benzo(g,h,i)perylene	130	J	UG/KG	2.13E-06	2.13E-06	3.10E-05
207-08-9	Benzo(k)fluoranthene	570	U	UG/KG	7.31E-03	3.35E-04	1.16E-02
111-91-1	bis(2-Chloroethoxy)methane	570	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	570	U	UG/KG	1.14E-01	7.60E-03	1.43E+03
108-60-1	bis(2-Chloroisopropyl) ether	570	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	910		UG/KG	2.22E-03	2.22E-04	2.53E-04
85-68-7	Butyl benzyl phthalate	570	U	UG/KG	1.39E-06	1.39E-06	6.13E-04
86-74-8	Carbazole	570	U	UG/KG	1.97E-03	9.19E-05	9.50E-01
218-01-9	Chrysene	100	J	UG/KG	1.28E-04	5.88E-06	6.25E-04
84-74-2	Di-n-butyl phthalate	570	U	UG/KG	2.85E-06	2.85E-06	2.48E-04
117-84-0	Di-n-octyl phthalate	570	U	UG/KG	1.39E-05	1.39E-04	5.70E-05
53-70-3	Dibenz(a,h)anthracene	570	U	UG/KG	7.13E-01	3.35E-02	2.85E-01
132-64-9	Dibenzofuran	570	U	UG/KG			
84-66-2	Diethyl phthalate	570	U	UG/KG	5.70E-07	5.70E-07	1.21E-03
131-11-3	Dimethyl phthalate	570	U	UG/KG			
206-44-0	Fluoranthene	64	J	UG/KG	7.80E-07	7.80E-07	1.49E-05
86-73-7	Fluorene	570	U	UG/KG	6.95E-06	6.95E-06	1.02E-03
118-74-1	Hexachlorobenzene	570	U	UG/KG	1.43E-01	7.31E-03	2.85E-01

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TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

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87-68-3	Hexachlorobutadiene	570	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	570	U	UG/KG	4.07E-05	4.07E-05	1.43E-03
67-72-1	Hexachloroethane	570	U	UG/KG	2.85E-04	2.85E-04	1.14E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	570	U	UG/KG	7.13E-02	3.35E-03	4.07E-02
78-59-1	Isophorone	570	U	UG/KG	1.39E-06	1.39E-06	7.13E-02
621-64-7	N-Nitroso-di-n-propylamine	570	U	UG/KG	7.13E-01	3.17E-02	1.14E+04
86-30-6	N-Nitrosodiphenylamine	570	U	UG/KG	4.75E-04	2.28E-05	5.70E-01
91-20-3	Naphthalene	570	U	UG/KG	6.95E-06	6.95E-05	6.79E-03
87-86-5	Pentachlorophenol	2900	U	UG/KG	1.21E-01	5.58E-03	9.67E+01
85-01-8	Phenanthrene	570	U	UG/KG	9.34E-06	9.34E-06	1.36E-04
108-95-2	Phenol	570	U	UG/KG	5.70E-07	4.75E-06	5.70E-03
129-00-0	Pyrene	92	J	UG/KG	1.51E-06	1.51E-06	2.19E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	460	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	460	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	930	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	460	U	UG/KG	5.48E-02	2.56E-03	5.75E+02
606-20-2	2,6-Dinitrotoluene	930	U	UG/KG	1.11E-01	5.17E-03	1.33E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	930	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	930	U	UG/KG			
99-08-1	3-Nitrotoluene	930	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	930	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	930	U	UG/KG			
2691-41-0	HMX	930	U	UG/KG			
98-95-3	Nitrobenzene	460	U	UG/KG	4.60E-04	4.60E-04	4.60E+00

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J = Estimated U = Nondetect

TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
55-63-0	Nitroglycerin	1600	U	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	3100	U	UG/KG			
121-82-4	RDX	930	U	UG/KG			
479-45-8	Tetryl	1400	U	UG/KG			
Metals							
7429-90-5	Aluminum	22400		MG/KG			
7440-36-0	Antimony	1	J	MG/KG	1.22E-03	1.22E-02	2.00E-01
7440-38-2	Arsenic	27.2		MG/KG	9.07E+00	4.46E-01	9.71E-01
7440-39-3	Barium	239		MG/KG	1.71E-03	1.71E-02	1.99E-01
7440-41-7	Beryllium	2.1		MG/KG	2.10E+00	7.24E-02	3.18E-01
7440-42-8	Boron	4	J	MG/KG	2.22E-05	2.22E-04	
7440-43-9	Cadmium	0.93	U	MG/KG	4.65E-04	4.65E-03	2.51E-01
7440-70-2	Calcium	12300		MG/KG			
7440-47-3	Chromium	29.5	J	MG/KG	2.95E-03	7.20E-03	1.05E+00
7440-48-4	Cobalt	50.4		MG/KG	4.20E-04	4.20E-03	
7440-50-8	Copper	66.8		MG/KG	8.15E-04	8.15E-03	6.07E-03
57-12-5	Cyanide, Total	0.29	U	MG/KG	7.07E-06	7.07E-05	7.25E-03
7439-89-6	Iron	33200		MG/KG			
7439-92-1	Lead	48.1		MG/KG	1.20E-01	1.20E-01	
7439-95-4	Magnesium	8630		MG/KG			
7439-96-5	Manganese	8560		MG/KG	8.92E-02	8.92E-01	
7439-97-6	Mercury	1.6		MG/KG	2.62E-03	2.62E-02	1.07E+01
7440-02-0	Nickel	64.5		MG/KG	1.57E-03	1.57E-02	8.49E-01
2023695	Potassium	1540		MG/KG			
7782-49-2	Selenium	3.2		MG/KG	3.20E-04	3.20E-03	1.33E+00

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 18-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-22-4	Silver	1.9	U	MG/KG	1.90E-04	1.90E-03	1.27E+00
7440-23-5	Sodium	274		MG/KG			
7440-28-0	Thallium	3.2	J	MG/KG	2.00E-02	2.00E-02	1.33E+00
7440-62-2	Vanadium	57.5		MG/KG	4.11E-03	4.11E-02	5.87E-02
7440-66-6	Zinc	779		MG/KG	1.28E-03	1.28E-02	2.16E-01
Other Parameters							
7601-90-3	Perchlorate	8600	U	UG/KG			
TOC	TOC	15300		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		1.26E-03	5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L	1.81E-05	2.74E-03	
79-00-5	1,1,2-Trichloroethane	1	U	UG/L	5.01E-06	4.11E-02	2.00E-01
75-34-3	1,1-Dichloroethane	1	U	UG/L		1.23E-03	
75-35-4	1,1-Dichloroethene	1	U	UG/L	2.19E-05	1.83E-02	1.43E-01
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L	8.12E-06	9.88E-02	2.00E-01
78-87-5	1,2-Dichloropropane	1	U	UG/L	6.07E-06	1.45E-01	2.00E-01
78-93-3	2-Butanone (MEK)	5	U	UG/L		2.63E-03	
591-78-6	2-Hexanone	5	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		3.17E-02	
67-64-1	Acetone	5	U	UG/L		8.22E-03	
71-43-2	Benzene	1	U	UG/L	2.44E-06	8.92E-02	2.00E-01
75-27-4	Bromodichloromethane	1	U	UG/L	5.53E-06	8.22E-03	
75-25-2	Bromoform	1	U	UG/L	1.18E-07	1.37E-03	
74-83-9	Bromomethane	1	U	UG/L		1.15E-01	
75-15-0	Carbon disulfide	1	U	UG/L		9.59E-04	
56-23-5	Carbon tetrachloride	1	U	UG/L	5.84E-06	2.35E-01	2.00E-01
108-90-7	Chlorobenzene	1	U	UG/L		9.43E-03	1.00E-02
75-00-3	Chloroethane	1	U	UG/L	2.16E-07	1.16E-04	
67-66-3	Chloroform	1	U	UG/L	6.08E-06	1.60E+00	
74-87-3	Chloromethane	1	U	UG/L	6.62E-07		
156-59-2	cis-1,2-Dichloroethene	36		UG/L		5.92E-01	5.14E-01
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
124-48-1	Dibromochloromethane	1	U	UG/L	7.50E-06	8.22E-03	
100-41-4	Ethylbenzene	1	U	UG/L		7.46E-04	1.43E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
75-09-2	Methylene chloride	1	U	UG/L	2.34E-07	6.16E-04	2.00E-01
110-54-3	N-Hexane	1	U	UG/L		2.85E-03	
100-42-5	Styrene	1	U	UG/L		6.09E-04	1.00E-02
127-18-4	Tetrachloroethylene (PCE)	4		UG/L	3.70E-06	1.58E-02	8.00E-01
108-88-3	Toluene	1	U	UG/L		1.38E-03	1.00E-03
1330-20-7	total Xylenes	1	U	UG/L		6.99E-04	1.00E-04
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		8.22E-03	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
79-01-6	Trichloroethylene (TCE)	4		UG/L	2.44E-06	1.10E-01	8.00E-01
75-01-4	Vinyl chloride	1	U	UG/L	5.06E-05		5.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		1.37E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	50	U	UG/L		6.85E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
91-57-6	2-Methylnaphthalene	10	U	UG/L		5.48E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	
88-74-4	2-Nitroaniline	50	U	UG/L		2.40E+01	
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L	1.34E-04		
99-09-2	3-Nitroaniline	50	U	UG/L		2.40E+01	
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	20	U	UG/L		1.37E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	50	U	UG/L		2.40E+01	
100-02-7	4-Nitrophenol	50	U	UG/L		1.71E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	10	U	UG/L		5.48E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	10	U	UG/L	1.09E-04		
50-32-8	Benzo(a)pyrene	10	U	UG/L	1.09E-03		5.00E+01
205-99-2	Benzo(b)fluoranthene	10	U	UG/L	1.09E-04		
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		5.48E-02	
207-08-9	Benzo(k)fluoranthene	10	U	UG/L	1.09E-05		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1.2	J	UG/L	2.50E-07	1.64E-03	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	10	U	UG/L	1.09E-06		
84-74-2	Di-n-butyl phthalate	10	U	UG/L		2.74E-03	

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 18-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	10	U	UG/L		3.42E-04	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	10	U	UG/L		6.85E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L	1.09E-04		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	UJ	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	10	U	UG/L		1.61E+00	
87-86-5	Pentachlorophenol	50	U	UG/L	8.92E-05	4.57E-02	5.00E+01
85-01-8	Phenanthrene	10	U	UG/L		5.48E-02	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	10	U	UG/L		5.48E-02	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		2.28E-04	
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L	2.23E-07	2.74E-02	
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		3.42E-03	
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		1.37E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	UJ	UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		8.22E-03	
2691-41-0	HMX	0.5	UJ	UG/L		2.74E-04	
98-95-3	Nitrobenzene	0.25	UJ	UG/L		7.36E-02	
55-63-0	Nitroglycerin	1	UJ	UG/L	2.08E-07		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	UJ	UG/L			
121-82-4	RDX	0.5	UJ	UG/L	8.18E-07	4.57E-03	
479-45-8	Tetryl	0.75	UJ	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	5730		UG/L		1.57E-01	
7440-36-0	Antimony	6	U	UG/L		4.11E-01	1.00E+00
7440-38-2	Arsenic	10	U	UG/L	2.23E-04	9.13E-01	2.00E-01
7440-39-3	Barium	125	J	UG/L		4.89E-02	6.25E-02
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	12.3	J	UG/L		3.74E-03	6.15E-03
7440-43-9	Cadmium	5	U	UG/L		2.74E-01	1.00E+00
7440-70-2	Calcium	91300		UG/L			
7440-47-3	Chromium	5.6	J	UG/L			5.60E-02
7440-48-4	Cobalt	50	U	UG/L		2.28E-02	5.00E-02
7440-50-8	Copper	2.8	J	UG/L		2.07E-03	4.31E-03
7439-89-6	Iron	5490		UG/L		5.01E-01	1.10E+00
7439-92-1	Lead	2.9	J	UG/L			3.87E-01
7439-95-4	Magnesium	40200		UG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7439-96-5	Manganese	157		UG/L		1.79E-01	1.05E+00
7439-97-6	Mercury	0.2	U	UG/L			1.00E-01
7440-02-0	Nickel	7.1	J	UG/L		9.73E-03	7.10E-02
2023695	Potassium	933	J	UG/L			
7782-49-2	Selenium	5	U	UG/L		2.74E-02	1.00E-01
7440-22-4	Silver	10	U	UG/L		5.48E-02	2.00E-01
7440-23-5	Sodium	30600		UG/L			
7440-28-0	Thallium	10	U	UG/L		3.91E+00	5.00E+00
7440-62-2	Vanadium	8.7	J	UG/L		3.41E-02	
7440-66-6	Zinc	14.8	J	UG/L		1.35E-03	2.96E-03
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	337		MG/L			
7664-41-7	Nitrogen, Ammonia (as N)	0.1	U	MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.27	J	MG/L		2.70E-01	2.70E-01
7601-90-3	Perchlorate	500	U	UG/L		2.74E+01	
7723-14-0	Phosphorus, Total (as P)	0.19		MG/L		2.60E+02	
14808-79-8	Sulfate (as SO4)	80000		UG/L			2.00E-01
TDS	TDS	497	J	MG/L			4.14E-01
TSS	TSS	160		MG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	5	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		
67-64-1	Acetone	7	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	1	U	UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1	U	UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1.3	J	UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 18-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	10	U	UG/L	1.00E+00	1.00E-01
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L		
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L		
99-08-1	3-Nitrotoluene	0.5	U	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	UJ	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		
2691-41-0	HMX	0.5	UJ	UG/L		
98-95-3	Nitrobenzene	0.25	UJ	UG/L		
55-63-0	Nitroglycerin	1	U	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L		
121-82-4	RDX	0.5	UJ	UG/L		
479-45-8	Tetryl	0.75	UJ	UG/L		
Metals						
7429-90-5	Aluminum	6570		UG/L	3.29E+01	
7440-36-0	Antimony	6	U	UG/L	1.00E+00	
7440-38-2	Arsenic	14.6		UG/L	1.46E+00	
7440-39-3	Barium	79.7	J	UG/L	3.51E+00	1.59E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7440-41-7	Beryllium	5	U	UG/L	1.00E+00	
7440-42-8	Boron	33.6	J	UG/L		3.36E-02
7440-43-9	Cadmium	5	U	UG/L	1.00E+00	
7440-70-2	Calcium	56200		UG/L	7.81E+00	
7440-47-3	Chromium	7.2	J	UG/L	7.20E-01	
7440-48-4	Cobalt	50	U	UG/L	1.00E+00	
7440-50-8	Copper	31.9		UG/L	3.19E+00	
7439-89-6	Iron	11200		UG/L	1.12E+02	1.12E+01
7439-92-1	Lead	8.8		UG/L	4.40E+00	
7439-95-4	Magnesium	22200		UG/L	8.76E+00	
7439-96-5	Manganese	2410		UG/L	4.14E+00	2.41E+00
7439-97-6	Mercury	0.2	U	UG/L	1.00E+00	1.67E+01
7440-02-0	Nickel	4.9	J	UG/L	4.90E-01	4.90E-03
2023695	Potassium	3210		UG/L	1.99E+00	
7782-49-2	Selenium	4.2	J	UG/L	1.56E+00	4.20E-03
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	5480		UG/L	1.73E+00	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	18.4	J	UG/L	3.68E-01	
7440-66-6	Zinc	13.7	J	UG/L	6.85E-01	1.37E-02
Other Parameters						
7664-41-7	Nitrogen, Ammonia (as N)	0.32		MG/L	1.23E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	U	MG/L	1.00E+00	
7601-90-3	Perchlorate	500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.38		MG/L	7.60E+00	
TDS	TDS	155		MG/L	2.16E+00	1.55E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 18-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		7	U	UG/KG	2.35E-04	
79-34-5	1,1,2,2-Tetrachloroethane		7	U	UG/KG	5.50E-02	
79-00-5	1,1,2-Trichloroethane		7	U	UG/KG	2.45E-04	
75-34-3	1,1-Dichloroethane		7	U	UG/KG	3.48E-04	
75-35-4	1,1-Dichloroethene		7	U	UG/KG	8.45E-04	
107-06-2	1,2-Dichloroethane (EDC)		7	U	UG/KG	3.30E-04	
540-59-0	1,2-Dichloroethene (total)		7	U	UG/KG	8.89E-03	
78-87-5	1,2-Dichloropropane		7	U	UG/KG	1.00E-05	
78-93-3	2-Butanone (MEK)		14	U	UG/KG	1.56E-04	
591-78-6	2-Hexanone		14	U	UG/KG	1.11E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		14	U	UG/KG	3.16E-05	
67-64-1	Acetone		14	U	UG/KG	5.60E-03	
71-43-2	Benzene		7	U	UG/KG	4.38E-04	
75-27-4	Bromodichloromethane		7	U	UG/KG	1.30E-02	
75-25-2	Bromoform		7	U	UG/KG	4.40E-04	
74-83-9	Bromomethane		7	U	UG/KG	2.98E-02	
75-15-0	Carbon disulfide		7	U	UG/KG	7.44E-02	
56-23-5	Carbon tetrachloride		7	U	UG/KG	7.00E-06	
108-90-7	Chlorobenzene		7	U	UG/KG	1.75E-04	
75-00-3	Chloroethane		7	U	UG/KG		
67-66-3	Chloroform		7	U	UG/KG	5.88E-03	
74-87-3	Chloromethane		7	U	UG/KG	6.73E-04	
156-59-2	cis-1,2-Dichloroethene		7	U	UG/KG	8.89E-03	
10061-01-5	cis-1,3-Dichloropropene		7	U	UG/KG	1.76E-02	
124-48-1	Dibromochloromethane		7	U	UG/KG	3.41E-03	
100-41-4	Ethylbenzene		7	U	UG/KG	1.40E-03	
75-09-2	Methylene chloride		7	U	UG/KG	1.73E-03	
110-54-3	N-Hexane		7	U	UG/KG		
100-42-5	Styrene		38		UG/KG	1.27E-04	
127-18-4	Tetrachloroethylene (PCE)		2	J	UG/KG	1.54E-04	
108-88-3	Toluene		7	U	UG/KG	2.33E-03	
1330-20-7	total Xylenes		7	U	UG/KG	1.17E-02	
156-60-5	trans-1,2-Dichloroethene		7	U	UG/KG	8.89E-03	
10061-02-6	trans-1,3-Dichloropropene		7	U	UG/KG	1.76E-02	
79-01-6	Trichloroethylene (TCE)		7	U	UG/KG	7.78E-04	
75-01-4	Vinyl chloride		7	U	UG/KG	1.08E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		560	U	UG/KG	2.80E-02	
95-50-1	1,2-Dichlorobenzene		560	U	UG/KG	1.89E-01	
541-73-1	1,3-Dichlorobenzene		560	U	UG/KG	1.49E-02	
106-46-7	1,4-Dichlorobenzene		560	U	UG/KG	2.80E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2800	U	UG/KG	7.00E-01	
88-06-2	2,4,6-Trichlorophenol		560	U	UG/KG	5.60E-02	
120-83-2	2,4-Dichlorophenol		560	U	UG/KG	6.40E-03	
105-67-9	2,4-Dimethylphenol		560	U	UG/KG	5.60E+01	
51-28-5	2,4-Dinitrophenol		2800	U	UG/KG	1.40E-01	
91-58-7	2-Chloronaphthalene		560	U	UG/KG	4.60E+01	
95-57-8	2-Chlorophenol		560	U	UG/KG	2.31E+00	
91-57-6	2-Methylnaphthalene		170	J	UG/KG	5.25E-02	YES
95-48-7	2-Methylphenol		560	U	UG/KG	1.39E-02	
88-74-4	2-Nitroaniline		2800	U	UG/KG	3.78E-02	
88-75-5	2-Nitrophenol		560	U	UG/KG	3.50E-01	
91-94-1	3,3'-Dichlorobenzidine		560	U	UG/KG	8.66E-01	
99-09-2	3-Nitroaniline		2800	U	UG/KG	8.86E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2800	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		560	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		560	U	UG/KG	7.04E-02	
106-47-8	4-Chloroaniline		1100	U	UG/KG	1.00E+00	
7005-72-3	4-Chlorophenyl phenyl ether		560	U	UG/KG		
106-44-5	4-Methylphenol		560	U	UG/KG	3.44E-03	
100-01-6	4-Nitroaniline		2800	U	UG/KG	1.28E-01	
100-02-7	4-Nitrophenol		2800	U	UG/KG	4.00E-01	
83-32-9	Acenaphthene		560	U	UG/KG	8.21E-04	
208-96-8	Acenaphthylene		70	J	UG/KG	1.03E-04	
120-12-7	Anthracene		190	J	UG/KG	1.28E-04	YES
56-55-3	Benzo(a)anthracene		690		UG/KG	1.32E-01	YES
50-32-8	Benzo(a)pyrene		760		UG/KG	1.73E-04	YES
205-99-2	Benzo(b)fluoranthene		1600		UG/KG	2.68E-02	YES
191-24-2	Benzo(g,h,i)perylene		480	J	UG/KG	4.03E-03	YES
207-08-9	Benzo(k)fluoranthene		1500		UG/KG	2.51E-02	YES
111-91-1	bis(2-Chloroethoxy)methane		560	U	UG/KG	1.85E+00	
111-44-4	bis(2-Chloroethyl) ether		560	U	UG/KG	2.36E-02	
108-60-1	bis(2-Chloroisopropyl) ether		560	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		57000	J	UG/KG	6.16E+01	YES
85-68-7	Butyl benzyl phthalate		560	U	UG/KG	2.34E+00	
86-74-8	Carbazole		160	J	UG/KG		YES
218-01-9	Chrysene		1200		UG/KG	2.54E-01	YES
84-74-2	Di-n-butyl phthalate		5900		UG/KG	2.95E-02	YES
117-84-0	Di-n-octyl phthalate		560	U	UG/KG	7.90E-04	
53-70-3	Dibenz(a,h)anthracene		230	J	UG/KG	1.25E-02	YES
132-64-9	Dibenzofuran		180	J	UG/KG		YES
84-66-2	Diethyl phthalate		310	J	UG/KG	3.10E-03	
131-11-3	Dimethyl phthalate		72	J	UG/KG	3.60E-04	

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 18-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		1900		UG/KG	1.56E-02	YES
86-73-7	Fluorene		560	U	UG/KG	1.87E-02	
118-74-1	Hexachlorobenzene		560	U	UG/KG	5.60E-04	
87-68-3	Hexachlorobutadiene		560	U	UG/KG	1.41E+01	
77-47-4	Hexachlorocyclopentadiene		560	U	UG/KG	5.60E-02	
67-72-1	Hexachloroethane		560	U	UG/KG	9.39E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		480		UG/KG	4.40E-03	YES
78-59-1	Isophorone		560	U	UG/KG	4.03E-03	
621-64-7	N-Nitroso-di-n-propylamine		560	U	UG/KG	1.03E+00	
86-30-6	N-Nitrosodiphenylamine		300	J	UG/KG	1.50E-02	
91-20-3	Naphthalene		84	J	UG/KG	3.37E-04	
87-86-5	Pentachlorophenol		2800	U	UG/KG	4.67E-01	
85-01-8	Phenanthrene		910		UG/KG	1.99E-02	YES
108-95-2	Phenol		560	U	UG/KG	1.40E-02	
129-00-0	Pyrene		2000		UG/KG	2.55E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		420	U	UG/KG	1.12E+00	
99-65-0	1,3-Dinitrobenzene		420	U	UG/KG	6.42E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		830	U	UG/KG	2.77E-02	
121-14-2	2,4-Dinitrotoluene		530	J	UG/KG	4.14E-01	
606-20-2	2,6-Dinitrotoluene		680	U	UG/KG	2.07E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		830	U	UG/KG	1.04E-02	
88-72-2	2-Nitrotoluene (ONT)		830	U	UG/KG		
99-08-1	3-Nitrotoluene		830	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		830	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		830	U	UG/KG		
2691-41-0	HMX		830	U	UG/KG	3.32E-02	
98-95-3	Nitrobenzene		480	U	UG/KG	1.20E-02	
55-63-0	Nitroglycerin		1500	U	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		3000	U	UG/KG		
121-82-4	RDX		830	U	UG/KG	8.30E-03	
479-45-8	Tetryl		1200	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	28400		MG/KG		
7440-36-0	Antimony	0.83	1.8	J	MG/KG	3.60E-01	
7440-38-2	Arsenic	13.5	30.8		MG/KG	3.42E+00	
7440-39-3	Barium	195	386		MG/KG	7.72E-01	
7440-41-7	Beryllium	0.76	0.9		MG/KG	9.00E-02	
7440-42-8	Boron	5.3	32		MG/KG	6.40E+01	
7440-43-9	Cadmium	0.19	3.1		MG/KG	1.07E-01	
7440-70-2	Calcium	2497	75600		MG/KG		
7440-47-3	Chromium	25.2	61.2		MG/KG	1.22E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-48-4	Cobalt	21.7	70.8		MG/KG	3.54E+00	
7440-50-8	Copper	11.3	187		MG/KG	6.03E+00	
57-12-5	Cyanide, Total	0.41	0.26		MG/KG	2.89E-01	
7439-89-6	Iron	19306	42600		MG/KG	2.13E+02	
7439-92-1	Lead	23.4	146		MG/KG	3.37E-01	
7439-95-4	Magnesium	1552	20000		MG/KG		
7439-96-5	Manganese	3640	15200		MG/KG	1.52E+02	
7439-97-6	Mercury	0.06	1.3		MG/KG	1.86E-01	YES
7440-02-0	Nickel	18.9	74.6		MG/KG	2.49E+00	
2023695	Potassium	625	1250		MG/KG		
7782-49-2	Selenium	2.34	22.5		MG/KG	2.25E+01	YES
7440-22-4	Silver	0.58	0.6	J	MG/KG	3.00E-01	
7440-23-5	Sodium	170	174		MG/KG		
7440-28-0	Thallium	0.41	0.71	J	MG/KG	7.10E-01	
7440-62-2	Vanadium	47.2	47.4		MG/KG	1.03E+00	
7440-66-6	Zinc	51.4	1100		MG/KG	9.17E+00	
Polychlorinated Biphenyls (PCB)							
12674-11-2	PCB-1016		9.5	U	UG/KG		
11104-28-2	PCB-1221		19	U	UG/KG		
11141-16-5	PCB-1232		9.5	U	UG/KG		
53469-21-9	PCB-1242		9.5	U	UG/KG		
12672-29-6	PCB-1248		9.5	U	UG/KG		
11097-69-1	PCB-1254		9.5	U	UG/KG		
11096-82-5	PCB-1260		18		UG/KG		YES
Dioxins							
1746-01-6	2,3,7,8-TCDD		0.000306	U	UG/KG	6.12E-08	
Other Parameters							
7601-90-3	Perchlorate		7600	U	UG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		570	U	UG/KG	6.20E-02	
95-50-1	1,2-Dichlorobenzene		570	U	UG/KG	1.68E+00	
541-73-1	1,3-Dichlorobenzene		570	U	UG/KG	3.35E-01	
106-46-7	1,4-Dichlorobenzene		570	U	UG/KG	1.63E+00	
95-95-4	2,4,5-Trichlorophenol		2900	U	UG/KG	2.00E+00	
88-06-2	2,4,6-Trichlorophenol		570	U	UG/KG	3.10E+01	
120-83-2	2,4-Dichlorophenol		570	U	UG/KG	1.56E+00	
105-67-9	2,4-Dimethylphenol		570	U	UG/KG	1.27E+01	
51-28-5	2,4-Dinitrophenol		2900	U	UG/KG	2.34E+02	
91-58-7	2-Chloronaphthalene		570	U	UG/KG	1.63E-01	
95-57-8	2-Chlorophenol		570	U	UG/KG	2.57E+00	
91-57-6	2-Methylnaphthalene		570	U	UG/KG	8.14E+00	
95-48-7	2-Methylphenol		570	U	UG/KG	1.25E+02	
88-74-4	2-Nitroaniline		2900	U	UG/KG	6.00E-02	
88-75-5	2-Nitrophenol		570	U	UG/KG	1.79E-01	
91-94-1	3,3'-Dichlorobenzidine		570	U	UG/KG	2.85E-01	
99-09-2	3-Nitroaniline		2900	U	UG/KG	4.87E-02	
534-52-1	4,6-Dinitro-2-methylphenol		2900	U	UG/KG	3.46E+02	
101-55-3	4-Bromophenyl phenyl ether		570	U	UG/KG	4.38E-01	
59-50-7	4-Chloro-3-methylphenol		570	U	UG/KG	3.80E+03	
106-47-8	4-Chloroaniline		1100	U	UG/KG	6.71E-02	
7005-72-3	4-Chlorophenyl phenyl ether		570	U	UG/KG	4.15E-01	
106-44-5	4-Methylphenol		160	J	UG/KG	4.00E-02	
100-01-6	4-Nitroaniline		2900	U	UG/KG	8.01E-02	
100-02-7	4-Nitrophenol		2900	U	UG/KG	6.99E+01	
83-32-9	Acenaphthene		570	U	UG/KG	3.56E+01	
208-96-8	Acenaphthylene		570	U	UG/KG	1.30E+01	
120-12-7	Anthracene		570	U	UG/KG	1.00E+01	
56-55-3	Benzo(a)anthracene		63	J	UG/KG	5.83E-01	YES
50-32-8	Benzo(a)pyrene		570	U	UG/KG	3.80E+00	
205-99-2	Benzo(b)fluoranthene		94	J	UG/KG	3.48E+00	YES
191-24-2	Benzo(g,h,i)perylene		130	J	UG/KG	8.13E+00	YES
207-08-9	Benzo(k)fluoranthene		570	U	UG/KG	2.11E+01	
111-91-1	bis(2-Chloroethoxy)methane		570	U	UG/KG	4.38E-01	
111-44-4	bis(2-Chloroethyl) ether		570	U	UG/KG	2.00E-01	
108-60-1	bis(2-Chloroisopropyl) ether		570	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		910		UG/KG	1.21E+00	YES
85-68-7	Butyl benzyl phthalate		570	U	UG/KG	5.18E-02	
86-74-8	Carbazole		570	U	UG/KG	1.73E-01	
218-01-9	Chrysene		100	J	UG/KG	6.02E-01	YES
84-74-2	Di-n-butyl phthalate		570	U	UG/KG	5.18E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
117-84-0	Di-n-octyl phthalate		570	U	UG/KG	8.05E-04	
53-70-3	Dibenz(a,h)anthracene		570	U	UG/KG	1.73E+01	
132-64-9	Dibenzofuran		570	U	UG/KG	2.85E-01	
84-66-2	Diethyl phthalate		570	U	UG/KG	9.05E-01	
131-11-3	Dimethyl phthalate		570	U	UG/KG	1.09E-03	
206-44-0	Fluoranthene		64	J	UG/KG	1.51E-01	YES
86-73-7	Fluorene		570	U	UG/KG	7.36E+00	
118-74-1	Hexachlorobenzene		570	U	UG/KG	5.70E+00	
87-68-3	Hexachlorobutadiene		570	U	UG/KG	1.19E+01	
77-47-4	Hexachlorocyclopentadiene		570	U	UG/KG	1.91E+02	
67-72-1	Hexachloroethane		570	U	UG/KG	8.38E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		570	U	UG/KG	3.35E+01	
78-59-1	Isophorone		570	U	UG/KG	4.97E-01	
621-64-7	N-Nitroso-di-n-propylamine		570	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		570	U	UG/KG	8.14E-01	
91-20-3	Naphthalene		570	U	UG/KG	3.24E+00	
87-86-5	Pentachlorophenol		2900	U	UG/KG	3.92E+01	
85-01-8	Phenanthrene		570	U	UG/KG	2.79E+00	
108-95-2	Phenol		570	U	UG/KG	1.19E+01	
129-00-0	Pyrene		92	J	UG/KG	4.72E-01	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		460	U	UG/KG	1.12E+01	
99-65-0	1,3-Dinitrobenzene		460	U	UG/KG	9.20E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		930	U	UG/KG	1.60E+00	
121-14-2	2,4-Dinitrotoluene		460	U	UG/KG	7.09E-01	
606-20-2	2,6-Dinitrotoluene		930	U	UG/KG	1.09E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		930	U	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		930	U	UG/KG	5.54E-02	
99-08-1	3-Nitrotoluene		930	U	UG/KG	7.82E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		930	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		930	U	UG/KG	4.97E-02	
2691-41-0	HMX		930	U	UG/KG	9.30E+01	
98-95-3	Nitrobenzene		460	U	UG/KG	7.86E-01	
55-63-0	Nitroglycerin		1600	U	UG/KG	4.85E+00	
78-11-5	Pentaerythritol tetranitrate (PETN)		3100	U	UG/KG	6.57E-03	
121-82-4	RDX		930	U	UG/KG	4.65E+00	
479-45-8	Tetryl		1400	U	UG/KG		
Metals							
7429-90-5	Aluminum	11241	22400		MG/KG	8.62E-01	
7440-36-0	Antimony	1.9	1	J	MG/KG	3.33E-01	
7440-38-2	Arsenic	10.3	27.2		MG/KG	2.78E+00	
7440-39-3	Barium	196	239		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 18-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-41-7	Beryllium	1.6	2.1		MG/KG		
7440-42-8	Boron		4	J	MG/KG		
7440-43-9	Cadmium	1.6	0.93	U	MG/KG	9.39E-01	
7440-70-2	Calcium	1448	12300		MG/KG		
7440-47-3	Chromium	17.2	29.5	J	MG/KG	6.80E-01	
7440-48-4	Cobalt	9.1	50.4		MG/KG	1.01E+00	
7440-50-8	Copper	16.8	66.8		MG/KG	2.11E+00	
57-12-5	Cyanide, Total		0.29	U	MG/KG	2.90E+03	
7439-89-6	Iron	20750	33200		MG/KG	1.75E-01	
7439-92-1	Lead	24	48.1		MG/KG	1.34E+00	
7439-95-4	Magnesium	1909	8630		MG/KG		
7439-96-5	Manganese	1043	8560		MG/KG	1.36E+01	
7439-97-6	Mercury	0.15	1.6		MG/KG	8.89E+00	YES
7440-02-0	Nickel	16.9	64.5		MG/KG	2.84E+00	
2023695	Potassium	1421	1540		MG/KG		
7782-49-2	Selenium	0.64	3.2		MG/KG		YES
7440-22-4	Silver	3	1.9	U	MG/KG	1.90E+00	
7440-23-5	Sodium	1450	274		MG/KG		
7440-28-0	Thallium	0.31	3.2	J	MG/KG		
7440-62-2	Vanadium	28	57.5		MG/KG		
7440-66-6	Zinc	57.1	779		MG/KG	6.44E+00	
Other Parameters							
7601-90-3	Perchlorate		8600	U	UG/KG		
TOC	TOC	62778	15300		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		5	U	UG/L	3.57E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		5	U	UG/L	2.94E-02	
67-64-1	Acetone		7	U	UG/L	1.38E-02	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		1	U	UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1	U	UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1.3	J	UG/L	4.33E-01	YES
85-68-7	Butyl benzyl phthalate		10	U	UG/L	5.26E-01	
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	10	U	UG/L	1.00E-01	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	UJ	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	UJ	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	UJ	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	UJ	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	UJ	UG/L	1.19E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	UJ	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		0.5	UJ	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	U	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	UJ	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	U	UG/L	7.14E-05	
2691-41-0	HMX		0.5	UJ	UG/L	1.52E-03	
98-95-3	Nitrobenzene		0.25	UJ	UG/L	9.26E-04	
55-63-0	Nitroglycerin		1	U	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		2	U	UG/L	2.35E-05	
121-82-4	RDX		0.5	UJ	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	UJ	UG/L		
Metals							
7429-90-5	Aluminum	200	6570		UG/L	7.55E+01	
7440-36-0	Antimony	6	6	U	UG/L	2.00E-01	
7440-38-2	Arsenic	10	14.6		UG/L	7.68E-02	
7440-39-3	Barium	22.7	79.7	J	UG/L	1.59E-02	
7440-41-7	Beryllium	5	5	U	UG/L	9.43E+00	
7440-42-8	Boron		33.6	J	UG/L	3.36E-02	
7440-43-9	Cadmium	5	5	U	UG/L	4.55E+00	
7440-70-2	Calcium	7197	56200		UG/L	4.84E-01	
7440-47-3	Chromium	10	7.2	J	UG/L	3.48E-02	
7440-48-4	Cobalt	50	50	U	UG/L	2.17E+01	

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 18-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7440-50-8	Copper	10	31.9		UG/L	2.70E+00	
7439-89-6	Iron	100	11200		UG/L	1.12E+01	
7439-92-1	Lead	2	8.8		UG/L	4.38E-01	
7439-95-4	Magnesium	2534	22200		UG/L	2.71E-01	
7439-96-5	Manganese	582	2410		UG/L	2.41E+00	
7439-97-6	Mercury	0.2	0.2	U	UG/L	1.54E-01	
7440-02-0	Nickel	10	4.9	J	UG/L	4.90E-03	
2023695	Potassium	1613	3210		UG/L	6.06E-02	
7782-49-2	Selenium	2.7	4.2	J	UG/L	4.20E-03	YES
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	5480		UG/L	8.06E-03	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	18.4	J	UG/L	9.68E-01	
7440-66-6	Zinc	20	13.7	J	UG/L	1.37E-02	
Other Parameters							
7664-41-7	Nitrogen, Ammonia (as N)	0.26	0.32		MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	0.05	U	MG/L		
7601-90-3	Perchlorate		500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.05	0.38		MG/L		
TDS	TDS	71.7	155		MG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 18-15

DIOXIN/FURAN TOXICITY EQUIVALENTS FOR A SOIL SAMPLE FROM AREA 11P (AUS-A11P)

ADDITIONAL AND UNCHARACTERIZED SITES OU

FIELD ID	TEF	AUS-A11P-033-SS-0X		
		Result	Qual	*TEQ*
DIOXINS / FURANS (ng/kg)				
2,3,7,8-TCDD	**1.000**	<	U	
1,2,3,7,8-PeCDD	**1.000**	0.26	J	*0.2580*
1,2,3,4,7,8-HxCDD	**0.100**	<	U	
1,2,3,6,7,8-HxCDD	**0.100**	0.87	J	*0.0865*
1,2,3,7,8,9-HxCDD	**0.100**	0.68	J	*0.0677*
1,2,3,4,6,7,8-HpCDD	**0.010**	20.80	X	*0.2080*
OCDD	**0.0001**	791.00		*0.0791*
2,3,7,8--TCDF	**0.100**	0.48	XJ	*0.0483*
1,2,3,7,8-PeCDF	**0.050**	0.20	XJ	*0.0101*
2,3,4,7,8-PeCDF	**0.500**	0.28	J	*0.1380*
1,2,3,4,7,8-HxCDF	**0.100**	0.26	J	*0.0258*
1,2,3,6,7,8-HxCDF	**0.100**	0.23	XJ	*0.0232*
2,3,4,6,7,8-HxCDF	**0.100**	<	U	
1,2,3,7,8,9-HxCDF	**0.100**	<	U	
1,2,3,4,6,7,8-HpCDF	**0.010**	1.68	J	*0.0168*
1,2,3,4,7,8,9-HpCDF	**0.010**	<	U	
OCDF	**0.0001**	2.24	J	*0.0002*
Total TCDDs		0.40	J	
Total PeCDDs		1.19	J	
Total HxCDDs		6.17	J	
Total HpCDDs		44.70		
Total TCDFs		0.32	J	
Total PeCDFs		1.75	J	
Total HxCDFs		2.95	J	
Total HpCDFs		3.21	J	

TOTAL TEQ ***0.961674***

Diluted sample results were used, if available.
E = Value exceeds linear range
EDL = Estimated Detection Limit
J = Estimated
ND = Not Detected
Qual = Qualifier
TEF = Toxic Equivalency Factor
TEQ = Toxicity Equivalent
U = Nondetect
UJ = Estimated Nondetect
X = Estimated Maximum Possible Concentration (EMPC)

TABLE 18-16, AUS-A11P
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,1-Dichloroethane	No	C	No	A	NA	NA	No	A
1,1-Dichloroethene	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
2-Butanone (MEK)	No	C	No	A	NA	NA	No	A
2-Hexanone	No	C	No	C	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	No	C	No	A	NA	NA	No	A
Acetone	No	C	No	A	NA	NA	No	A
Benzene	No	A	Uncertainty	B	NA	NA	Uncertainty	B
Bromodichloromethane	No	C	Uncertainty	B	NA	NA	No	A
Bromoform	No	C	No	A	NA	NA	No	A
Bromomethane	No	C	No	A	NA	NA	No	A
Carbon disulfide	No	C	No	A	NA	NA	No	A
Carbon tetrachloride	No	C	Uncertainty	B	NA	NA	Uncertainty	B
Chlorobenzene	No	C	No	A	NA	NA	No	A
Chloroethane	No	C	No	A	NA	NA	No	A
Chloroform	No	C	Uncertainty	B	NA	NA	No	A
Chloromethane	No	C	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	No	C	No	F	NA	NA	No	A
cis-1,3-Dichloropropene	No	C	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	C	Uncertainty	B	NA	NA	No	A
Ethylbenzene	No	A	No	A	NA	NA	No	A
Methylene chloride	No	A	No	A	NA	NA	Uncertainty	B
N-Hexane	No	C	No	A	NA	NA	No	A
Styrene	No	C	No	A	NA	NA	No	F
Tetrachloroethylene (PCE)	No	C	Yes	E	NA	NA	No	F
Toluene	No	A	No	A	NA	NA	No	A
total Xylenes	No	A	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	C	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	No	C	Uncertainty	B	NA	NA	No	A
Trichloroethylene (TCE)	No	C	Yes	E	NA	NA	Uncertainty	B
Vinyl chloride	No	C	Uncertainty	B	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	No	A	No	A	No	A
1,3-Dichlorobenzene	No	C	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	No	A	No	A	No	A

TABLE 18-16, AUS-A11P
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	No	A	No	A	No	A
2-Chlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	No	A	No	A	No	A	No	F
2-Methylphenol	No	C	No	A	No	A	No	A
2-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
2-Nitrophenol	No	C	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	No	C	No	C	No	C
4-Bromophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Chloro-3-methylphenol	No	C	No	A	No	A	No	A
4-Chloroaniline	No	C	No	A	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Methylphenol	No	C	No	A	No	F	No	A
4-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4-Nitrophenol	No	C	No	A	No	A	No	A
Acenaphthene	No	C	No	A	No	A	No	A
Acenaphthylene	No	A	No	A	No	A	No	F
Anthracene	No	A	No	A	No	A	No	F
Benzo(a)anthracene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Benzo(a)pyrene	Uncertainty	B	Uncertainty	B	Uncertainty	B	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Benzo(g,h,i)perylene	No	A	No	A	No	F	No	F
Benzo(k)fluoranthene	No	C	Uncertainty	B	No	A	No	F
bis(2-Chloroethoxy)methane	No	C	No	C	No	C	No	C
bis(2-Chloroethyl) ether	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	Uncertainty	G	No	F	No	F	No	F
Butyl benzyl phthalate	No	C	No	A	No	A	No	A
Carbazole	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Chrysene	Uncertainty	B	Uncertainty	B	No	F	No	F
Di-n-butyl phthalate	No	C	No	A	No	A	No	F
Di-n-octyl phthalate	No	C	No	A	No	A	No	A
Dibenz(a,h)anthracene	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	No	C	No	A	No	A	No	F
Diethyl phthalate	No	C	No	A	No	A	No	F
Dimethyl phthalate	No	C	No	A	No	A	No	F
Fluoranthene	No	A	No	A	No	F	No	F

TABLE 18-16, AUS-A11P
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	No	A	No	A	No	A
Hexachlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	No	A	No	A	No	A
Hexachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	No	A	No	F
Isophorone	No	C	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	No	A	Uncertainty	B	Yes	E
Naphthalene	No	C	Uncertainty	B	No	A	No	F
Pentachlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Phenanthrene	No	A	No	A	No	A	No	F
Phenol	No	A	No	A	No	A	No	A
Pyrene	No	A	No	A	No	F	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	No	F	No	F	No	F
Antimony	No	C	Uncertainty	B	Yes	D	Yes	E
Arsenic	Uncertainty	G	Uncertainty	B	Yes	E	Yes	E
Barium	No	F	No	F	Yes	E	Yes	E
Beryllium	No	C	Uncertainty	B	Yes	E	No	F
Boron	No	F	No	F	No	F	No	F
Cadmium	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Calcium	No	H	No	H	No	H	No	H
Chromium	Uncertainty	G	No	F	Yes	E	Yes	E
Cobalt	No	C	No	A	No	F	No	F
Copper	Uncertainty	G	No	F	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	No	A	No	F
Iron	Yes	E	Yes	E	No	F	No	F
Lead	Uncertainty	G	No	F	No	F	No	F
Magnesium	No	H	No	H	No	H	No	H
Manganese	Yes	E	Yes	E	No	F	Yes	E
Mercury	Uncertainty	B	No	A	Yes	E	Yes	E
Nickel	No	F	No	F	Yes	E	Yes	E
Potassium	No	H	No	H	No	H	No	H
Selenium	No	F	No	A	Yes	E	Yes	E
Silver	Uncertainty	B	No	A	Uncertainty	B	No	F
Sodium	No	H	No	H	No	H	No	H
Thallium	No	C	Uncertainty	B	Yes	E	No	F
Vanadium	Uncertainty	G	No	F	No	F	No	F
Zinc	No	F	No	F	Yes	E	Yes	E
Explosives								
1,3,5-Trinitrobenzene	No	C	No	A	No	A	No	A
1,3-Dinitrobenzene	No	C	No	A	No	A	No	A

TABLE 18-16, AUS-A11P
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	No	A	No	A	No	A
2,4-Dinitrotoluene	No	C	No	A	Uncertainty	B	Yes	E
2,6-Dinitrotoluene	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	C	No	C	No	C	No	C
2-Nitrotoluene (ONT)	No	C	No	C	No	C	No	C
3-Nitrotoluene	No	C	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	No	C	No	C	No	C
4-Nitrotoluene (PNT)	No	C	No	A	No	A	No	A
HMX	No	C	No	A	No	A	No	A
Nitrobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
Nitroglycerin	No	C	No	A	No	A	No	A
Pentaerythritol tetranitrate (PETN)	No	C	No	C	No	C	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	No	A	No	A	No	A
Tetryl	No	C	No	A	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	No	C	No	F	NA	NA	NA	NA
Phosphorus, Total (as P)	Uncertainty	G	Yes	E	NA	NA	NA	NA
Polychlorinated Biphenyls (PCB)								
PCB-1016	NA	NA	NA	NA	NA	NA	No	A
PCB-1221	NA	NA	NA	NA	NA	NA	No	A
PCB-1232	NA	NA	NA	NA	NA	NA	No	A
PCB-1242	NA	NA	NA	NA	NA	NA	No	A
PCB-1248	NA	NA	NA	NA	NA	NA	No	A
PCB-1254	NA	NA	NA	NA	NA	NA	No	A
PCB-1260	NA	NA	NA	NA	NA	NA	No	F
Dioxins								
2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA	No	C

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 18-17, AUS-A11P
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	A	NA	NA	No	A
1,1,2-Trichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethene	No	A	NA	NA	No	A
1,2-Dichloroethane (EDC)	No	A	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	A	NA	NA	No	A
2-Butanone (MEK)	No	A	NA	NA	No	A
2-Hexanone	No	A	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	No	A	NA	NA	No	A
Acetone	No	A	NA	NA	No	A
Benzene	No	A	NA	NA	No	A
Bromodichloromethane	No	A	NA	NA	No	A
Bromoform	No	A	NA	NA	No	A
Bromomethane	No	A	NA	NA	No	A
Carbon disulfide	Uncertainty	B	NA	NA	No	A
Carbon tetrachloride	No	A	NA	NA	No	A
Chlorobenzene	No	A	NA	NA	No	A
Chloroethane	No	A	NA	NA	No	C
Chloroform	No	A	NA	NA	No	A
Chloromethane	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	No	A	NA	NA	No	A
cis-1,3-Dichloropropene	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	A	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	No	A
Methylene chloride	No	A	NA	NA	No	A
N-Hexane	No	C	NA	NA	No	C
Styrene	No	A	NA	NA	No	F
Tetrachloroethylene (PCE)	No	A	NA	NA	No	F
Toluene	No	A	NA	NA	No	A
total Xylenes	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	No	A	NA	NA	No	A
Trichloroethylene (TCE)	No	A	NA	NA	No	A
Vinyl chloride	No	A	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	No	A	No	A
1,2-Dichlorobenzene	No	A	Uncertainty	B	No	A
1,3-Dichlorobenzene	No	A	No	A	No	A
1,4-Dichlorobenzene	No	A	Uncertainty	B	No	A
2,4,5-Trichlorophenol	No	A	Uncertainty	B	No	A

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	Uncertainty	B	No	A
2,4-Dichlorophenol	No	A	Uncertainty	B	No	A
2,4-Dimethylphenol	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	Uncertainty	B	No	A
2-Chloronaphthalene	No	A	No	A	Uncertainty	B
2-Chlorophenol	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	No	A	Uncertainty	B	Yes	E
2-Methylphenol	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	A	No	A	No	A
2-Nitrophenol	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	A	No	A	No	A
3-Nitroaniline	No	A	No	A	No	A
4,6-Dinitro-2-methylphenol	Uncertainty	B	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	No	A	No	C
4-Chloro-3-methylphenol	Uncertainty	B	Uncertainty	B	No	A
4-Chloroaniline	No	A	No	A	Uncertainty	B
4-Chlorophenyl phenyl ether	No	A	No	A	No	C
4-Methylphenol	No	A	No	F	No	A
4-Nitroaniline	No	A	No	A	No	A
4-Nitrophenol	No	A	Uncertainty	B	No	A
Acenaphthene	No	A	Uncertainty	B	No	A
Acenaphthylene	No	A	Uncertainty	B	No	F
Anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Benzo(a)anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Uncertainty	B	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	Uncertainty	B	Yes	E
bis(2-Chloroethoxy)methane	No	A	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	No	A	No	A
bis(2-Chloroisopropyl) ether	No	C	No	C	No	C
bis(2-Ethylhexyl) phthalate	Yes	E	Yes	E	Yes	E
Butyl benzyl phthalate	No	A	No	A	Uncertainty	B
Carbazole	No	A	No	A	Yes	E
Chrysene	No	A	Yes	E	Yes	E
Di-n-butyl phthalate	Uncertainty	B	No	A	Yes	E
Di-n-octyl phthalate	No	A	No	A	No	A
Dibenz(a,h)anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	Uncertainty	B	No	A	Yes	E
Diethyl phthalate	No	A	No	A	No	F
Dimethyl phthalate	No	A	No	A	No	F
Fluoranthene	Uncertainty	B	Yes	E	Yes	E

TABLE 18-17, AUS-A11P
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobenzene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobutadiene	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	Uncertainty	B	No	A
Hexachloroethane	Uncertainty	B	Uncertainty	B	No	A
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	Yes	E
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	Uncertainty	B
N-Nitrosodiphenylamine	No	A	No	A	No	F
Naphthalene	No	A	Uncertainty	B	No	F
Pentachlorophenol	Uncertainty	B	Uncertainty	B	No	A
Phenanthrene	Uncertainty	B	Uncertainty	B	Yes	E
Phenol	No	A	Uncertainty	B	No	A
Pyrene	No	A	Yes	E	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	A	No	F	No	F
Arsenic	No	F	Yes	E	Yes	E
Barium	No	F	Uncertainty	G	No	F
Beryllium	Uncertainty	B	Uncertainty	G	No	F
Boron	No	F	Uncertainty	G	Yes	E
Cadmium	Uncertainty	B	No	A	No	F
Calcium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	No	F	Yes	E
Cobalt	Uncertainty	B	Yes	E	Yes	E
Copper	Yes	E	Yes	E	Yes	E
Cyanide, Total	NA	NA	Uncertainty	B	No	F
Iron	Yes	E	No	F	Yes	E
Lead	No	F	Yes	E	No	F
Magnesium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	Yes	E	Yes	E	Yes	E
Mercury	No	A	Yes	E	Yes	E
Nickel	No	F	Yes	E	Yes	E
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	Yes	E	Yes	E	Yes	E
Silver	Uncertainty	B	Uncertainty	B	No	F
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Uncertainty	B	Uncertainty	G	No	F
Vanadium	No	F	Uncertainty	G	Yes	E
Zinc	No	F	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	Uncertainty	B
1,3-Dinitrobenzene	No	A	Uncertainty	B	No	A

TABLE 18-17, AUS-A11P
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Uncertainty	B	No	A
2,4-Dinitrotoluene	No	A	No	A	No	F
2,6-Dinitrotoluene	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	A	No	C	No	A
2-Nitrotoluene (ONT)	No	A	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	A	No	C	No	C
4-Nitrotoluene (PNT)	No	A	No	A	No	C
HMX	No	A	Uncertainty	B	No	A
Nitrobenzene	No	A	No	A	No	A
Nitroglycerin	No	A	Uncertainty	B	No	C
Pentaerythritol tetranitrate (PETN)	No	A	No	A	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	Uncertainty	B	No	A
Tetryl	No	C	No	C	No	C
Polychlorinated Biphenyls (PCB)						
PCB-1016	NA	NA	NA	NA	No	C
PCB-1221	NA	NA	NA	NA	No	C
PCB-1232	NA	NA	NA	NA	No	C
PCB-1242	NA	NA	NA	NA	No	C
PCB-1248	NA	NA	NA	NA	No	C
PCB-1254	NA	NA	NA	NA	No	C
PCB-1260	NA	NA	NA	NA	Yes	E
Dioxins						
2,3,7,8-TCDD	NA	NA	NA	NA	No	A

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 18-18
AUS-A11P - IOP GROUP II MELT LOADING LINE
(PILOT PROPELLANT PLANT/CAP PRODUCTION AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
VOCs					
Tetrachloroethylene (PCE)			NA	H	
Trichloroethylene (TCE)			NA	H	
SVOCs					
2-Methylnaphthalene		E			
Anthracene		E			
Benzo(a)anthracene		H,E	E		
Benzo(a)pyrene		H,E			
Benzo(b)fluoranthene		H,E	E		
Benzo(g,h,i)perylene		E	E		
Benzo(k)fluoranthene		E			
bis(2-Ethylhexyl)phthalate (DEHP)		E	E		E
Carbazole		H,E			
Chrysene		E	E		
Di-n-butyl phthalate		E			
Dibenz(a,h)anthracene		H,E			
Dibenzofuran		E			
Fluoranthene		E	E		
Indeno(1,2,3-c,d)pyrene		E			
N-Nitrosodiphenylamine		H			
Phenanthrene		E			
Pyrene		E	E		
Metals					
Aluminum					E
Antimony		H			
Arsenic		H,E	H,E		
Barium		H	H		
Beryllium			H		
Boron		E			
Cadmium		H			
Chromium		H,E	H		
Cobalt		E	E		
Copper		E	E		E
Iron		E		H	H,E
Lead			E		
Manganese		H,E	E	H	H,E
Mercury		H,E	H,E		
Nickel		H,E	H,E		
Selenium		H,E	H,E		E
Thallium			H		
Vanadium		E			
Zinc		H,E	H,E		

TABLE 18-18
AUS-A11P - IOP GROUP II MELT LOADING LINE
(PILOT PROPELLANT PLANT/CAP PRODUCTION AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
Explosives					
2,4-Dinitrotoluene		**H**			
Other Parameters					
Phosphorus, Total (as P)		NA	NA	**H**	
PCBs					
PCB-1260		**E**	NA	NA	NA

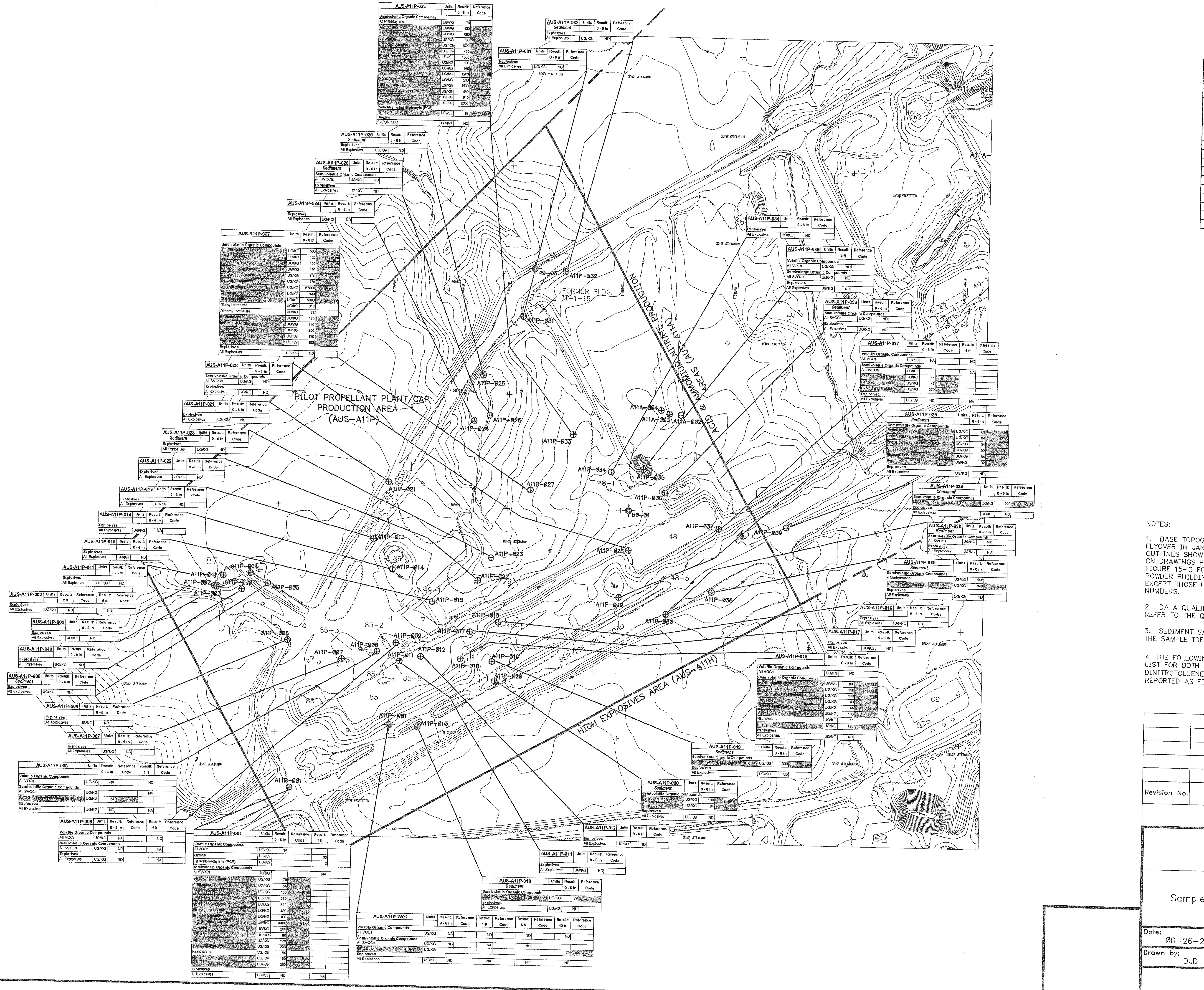
Key:

[1] Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

Revision No.	Description	Date	By	App.

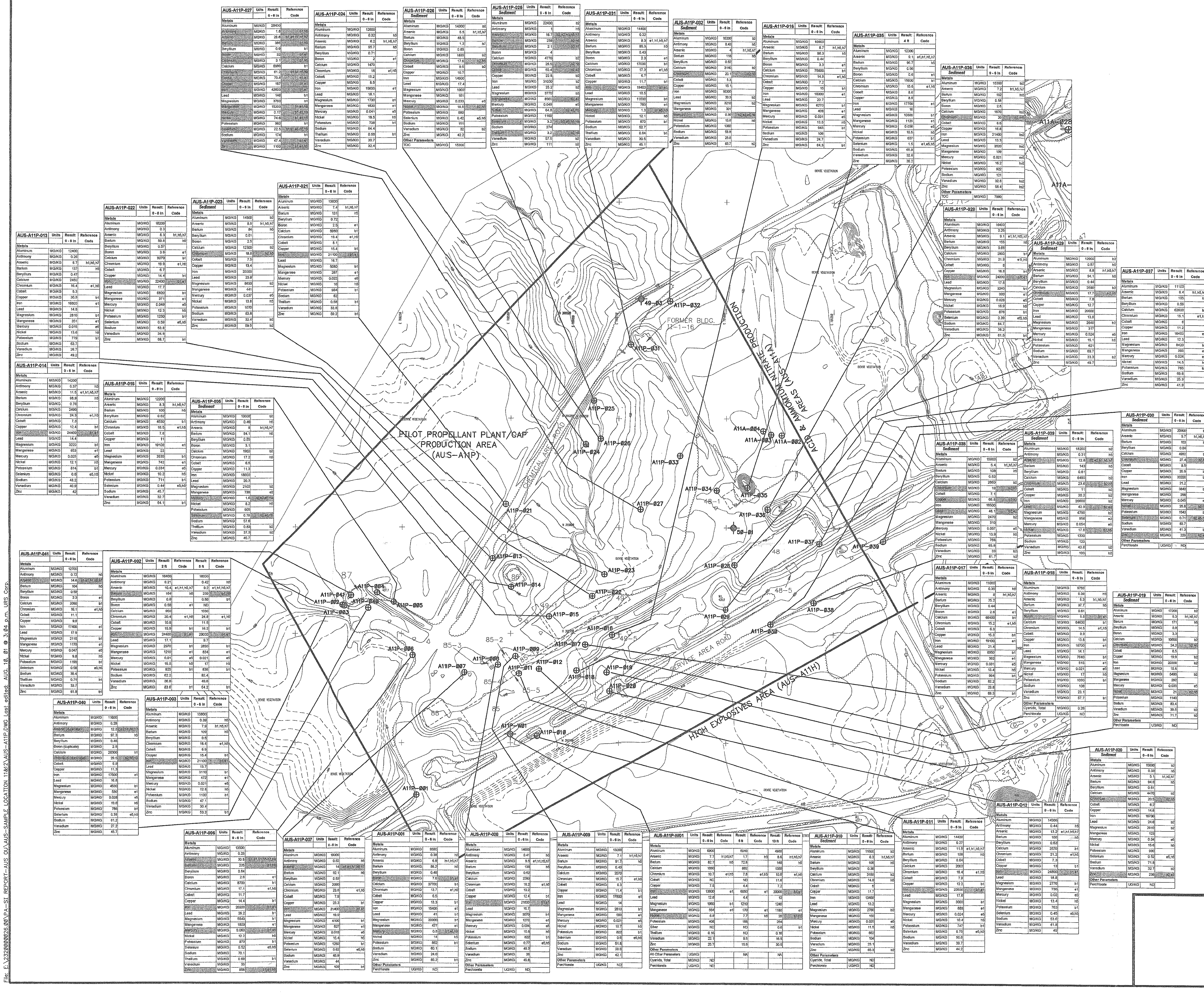
REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11P
Sample Locations and Detections of Organic Compounds in Soils/Sediments

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 18-1
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11P
Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

Date: 06-26-2000	Project Number: 23200000026.00	Figure Number: 18-2
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

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LEGEND

MONITORING WELL LOCATION

HAND AUGER LOCATION

USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-A11P-004-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	6570	b3,e3
Arsenic	UG/L	12.2	b3
Barium	UG/L	79.7	b3
Boron	UG/L	29.8	
Calcium	UG/L	3900	
Chromium	UG/L	7.2	
Iron	UG/L	11200	b3,e3,e4,h10
Lead	UG/L	8.8	b3
Magnesium	UG/L	3340	b3
Manganese	UG/L	2410	b3,e3,e4,h10
Potassium	UG/L	2600	b3
Selenium	UG/L	4.2	b3,e5
Sodium	UG/L	2970	
Vanadium	UG/L	18.4	

AUS-A11P-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	36	
Tetrachloroethylene (PCE)	UG/L	4	h3
Trichloroethylene (TCE)	UG/L	4	h3
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	1.2	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	5730	
Barium	UG/L	125	
Boron	UG/L	12.3	
Calcium	UG/L	91300	
Chromium	UG/L	5.6	
Copper	UG/L	2.8	
Iron	UG/L	5490	h6
Lead	UG/L	2.9	
Magnesium	UG/L	40200	
Manganese	UG/L	157	h6
Nickel	UG/L	7.1	
Potassium	UG/L	933	
Sodium	UG/L	30600	
Vanadium	UG/L	8.7	
Zinc	UG/L	14.8	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	337	
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	0.27	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.19	h4
Sulfate (as SO4)	UG/L	80000	
TDS	MG/L	497	
TSS	MG/L	160	

AUS-A11P-036-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	1.3	e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2870	b3,e3
Arsenic	UG/L	5.4	
Barium	UG/L	68	b3
Boron	UG/L	12.4	
Calcium	UG/L	10400	b3
Chromium	UG/L	5.5	
Copper	UG/L	1.3	
Iron	UG/L	4120	b3,e3,e4,h10
Magnesium	UG/L	8580	b3
Manganese	UG/L	121	
Nickel	UG/L	3.9	
Potassium	UG/L	2220	b3
Sodium	UG/L	4180	b3
Vanadium	UG/L	8.5	
Zinc	UG/L	10.7	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.32	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-A11P-039-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	669	b3,e3
Arsenic	UG/L	14.6	b3
Barium	UG/L	69.1	b3
Boron	UG/L	33.6	
Calcium	UG/L	56200	b3
Iron	UG/L	2650	b3,e3,e4,h10
Magnesium	UG/L	22200	b3
Manganese	UG/L	2250	b3,e3,e4,h10
Nickel	UG/L	3.5	
Potassium	UG/L	3210	b3
Sodium	UG/L	5480	b3
Vanadium	UG/L	4	
Zinc	UG/L	4.6	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.3	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-A11P-038-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2030	b3,e3
Barium	UG/L	61.9	b3
Boron	UG/L	25.1	
Calcium	UG/L	26600	b3
Chromium	UG/L	3.8	
Copper	UG/L	31.9	b3,e3,e4
Iron	UG/L	6490	b3,e3,e4,h10
Lead	UG/L	3.6	b3
Magnesium	UG/L	9060	b3
Manganese	UG/L	941	b3
Nickel	UG/L	4.9	
Potassium	UG/L	1910	b3
Selenium	UG/L	3.2	b3,e5
Sodium	UG/L	3750	b3
Vanadium	UG/L	6.1	
Zinc	UG/L	13.7	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.16	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Phosphorus, Total (as P)	MG/L	0.38	b3
TDS	MG/L	155	b3

AUS-A11P-019-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	695	b3,e3
Barium	UG/L	70.6	b3
Boron	UG/L	21.9	
Calcium	UG/L	33300	b3
Iron	UG/L	1790	b3,e3,e4,h10
Magnesium	UG/L	8270	b3
Manganese	UG/L	142	
Nickel	UG/L	2	
Potassium	UG/L	2400	b3
Sodium	UG/L	3230	b3
Vanadium	UG/L	4.7	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.3	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
TDS	MG/L	147	b3

AUS-A11P-029-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	662	b3,e3
Arsenic	UG/L	9.4	
Barium	UG/L	77.8	b3
Boron	UG/L	23.4	
Calcium	UG/L	5270	
Iron	UG/L	3760	b3,e3,e4,h10
Magnesium	UG/L	3200	b3
Manganese	UG/L	273	
Nickel	UG/L	3.7	
Potassium	UG/L	1040	
Sodium	UG/L	2920	
Vanadium	UG/L	3.3	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.31	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.14	b3
TDS	MG/L	59.5	

N

0 100

SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11P
Sample Locations and Detections in Surface Water and Groundwater

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 18-3
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11x17\AUS-A11P.DWG Last edited: SEP. 21, 01 @ 2:31 p.m. URS Corp.

Site AUS-A11S was used by industrial tenants from 1946 to the 1980s. It has been designated in this report as the Area 11 Support Area because its longest-term use was as a support area for the high explosives manufacturing done in Area 11 by industrial tenants. During World War II, the area was part of the Illinois Ordnance Plant (IOP) Group II Load Line.

See the introduction to Section 15 for a general discussion of Area 11 and its history. Area 11 sites, including AUS-A11S, are shown in Figure 15-1.

AUS Original Site Designations

Three of the original Additional and Uncharacterized Sites Operable Unit (AUS OU) sites designated in 1997-1999 by the United States Fish and Wildlife Service (USFWS) were located within the boundaries of Site AUS-A11S: AUS-0044, AUS-0045, and AUS-0046. These original AUS OU sites have all been incorporated into the current AUS-A11S.

19.1 HISTORIC SEARCH INFORMATION

19.1.1 Site Description

This area has not been used for industrial purposes since the late 1970s. There are no buildings on site and the area is being allowed to return to its natural state.

19.1.2 Operational History and Waste Characteristics

19.1.2.1 IOP Load Line II Operations

There were eleven IOP buildings (II-1-1 through II-1-5, II-1-23, II-1-24, II-1-28, II-1-29, II-1-31 and II-1-32) within the boundaries of Site AUS-A11S. See Figure 15-2 for locations.

The area occupied by Site AUS-A11S was on the front (northeast) end of the load line. In this area, shells were delivered, cleaned and painted.

Storage Buildings

According to Mr. Kermit Troutman, a former SWDC employee,[1] the empty shells were delivered by rail and stored in the Inert Storage Building (II-1-1) and the Receiving and Storage Building (II-1-2). Rail lines paralleled Load Line II.[2]

Cleaning and Painting Buildings

The Cleaning and Painting Building (II-1-3) was connected by a ramp to the Receiving and Storage Building.[3] The Cleaning and Painting Building contained 12 thread cleaning machines,

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[1] Interview with Mr. Kermit Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin Williams Company, Illinois Ordnance Plant, Page B-1. Note that Mr. Troutman worked in Load Line III. This report assumes that processes in the other lines were similar.

[2] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.

13 scales, a pressure-feed tank, a paint spray booth and a drying oven.[4] The eastern half of the building was used to clean the shells or casings and they were painted in the western half of the building.[5]

Paint Spray Booths and Drains

The paint spray booth had a pump drain the east side, and a drain and overflow for a tank on the west side. These drains appear to have been located above the sewer line.. There were also paint circulating lines that came in and exited the building on the north side. These paint-circulating lines led to the Paint Service Building, II-1-5.[6]

According to Mr. Kermit Troutman, the paint used in the spray booth was oil-based and olive-colored, and thinner was added when necessary. The paint spray booth was hooded and contained two stationary paint spray guns. The shells/casings were carried through the booth on a moving hoist. A constant stream of water created an air current that carried the fumes outside via a ventilator. After passing through the paint booth, the shells/casings were hoisted to the drying oven. Maintenance workers cleaned the paint spray booth on the weekends.[7]

It was not determined how the cleaning waste was disposed of. Some of this cleaning may have been done in the Paint Shield Cleaning Building, II-1-4.

Other Cleaning and Painting Areas

There was a tool room in the north corner of Building II-1-3.[8] There were two support buildings associated with the Cleaning and Painting Building: the Paint Service Building (II-1-5) and the Paint Shield Cleaning Building (II-1-4).[9] Paint storage and inspection, packing and shipping was done from the Paint Service building.

Boiler House

South of the Receiving and Storage Building was the Boiler House (II-1-23).[10] On the southwest side of the boiler house were four associated underground storage tanks (USTs).[11] According to

[3] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.
[4] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 7.
[5] Interview with Kermit C. Troutman as found in TechLaw Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company Illinois Ordnance Plant, Page B-1.
[6] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 19.
[7] Interview with Mr. Kermit Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin Williams Company, Illinois Ordnance Plant, Page B-2.
[8] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 19.
[9] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.
[10] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 11.
[11] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 30.

an Environmental Science & Engineering, Inc. (ESE) report, these USTs were no longer on site in 1991.[12] In the 1943 aerial photograph, there was a circular pad for a yet-to-be constructed fuel tank that had a low partial berm surrounding it (which appeared to be only partially finished).[13] This fuel tank was in place by 1951[14] and it is likely that it was constructed shortly after the 1943 aerial photograph was taken. The Boiler House also contained two boilers, a sump pit, a fuel oil pump, a compressor, a feedwater heater tank, and a condensate storage tank.[15]

Change Houses and Timekeepers Buildings

South of the main loading line were three Change Houses and two Timekeepers Buildings. One of the Change Houses (II-1-24) and one of the Timekeepers Buildings (II-1-28) were located in the Support Area. The Change House (II-1-24) contained locker rooms and a lunchroom.[16] The Timekeepers Building (II-1-28) held office space, utility rooms, and time clock rooms.[17]

Pump Houses

Two IOP Condensate Pump Houses (II-1-31 and II-1-32) were located in Site AUS-A11S. One (II-1-31) was located north of the Receiving and Storage Building (II-1-2) and the other (II-1-32) was located north of the Cleaning and Painting Building (II-1-3).

Guard Houses

One of the two Load Line II guard houses was located within Site AUS-A11S: Building II-1-29 at the eastern gate.

19.1.2.2 Silas Mason Operations

Silas Mason Company, a War Department contractor which operated the former IOP Ammonium Nitrate Plant in Area 12 from 1946 to 1950,[18] also occupied Buildings II-1-1 and II-1-2 (which were outside the AN plant area) as warehouses from 1946[19] to 1948.

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[12] ACO 5006. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Page 24.

[13] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11). The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

[14] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11).

[15] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 30.

[16] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 28.

[17] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 31.

[18] DPRA Document No. 00025484/CRO 001579B. Newspaper article from the Carbondale, Illinois area regarding Silas-Mason ending there fertilizer work at the Refuge, dated January 5, 1950.

[19] ACL 000637 through ACL 000643. Agreement RE Transfer of Illinois Ordnance Plant from the War Department to the War Assets Administration, dated July 24, 1946; and, U.S. Army Corps of Engineers, 1947, War Department

19.1.2.3 Hoosier Cardinal Corporation Operations

Hoosier leased property in Area 11 from August 1948[20] through August 1956.[21] In October of 1955, they reduced their rental space to one building that was used for storage of machinery.[22] Hoosier manufactured and finished decorative equipment for stoves, refrigerators and automobiles.[23] According to a former Hoosier Cardinal employee,[24] they manufactured automobile emblems for Ford from 1950-1952.

Hoosier occupied several buildings in the Support Area – AUS-A11S: II-1-1, II-1-2, II-1-3, II-1-4, II-1-5, II-1-24 and II-1-28.[25] Based on the review of historical aerial photographs, it also appears that they occupied Building II-1-23 and several other new structures in the areas surrounding their leased buildings.[26] Hoosier occupied almost 74,000 square ft in September of 1955, by October of 1955 they had reduced the leased footage to approximately 10,000 square ft.[27] The 10,000 square ft was used for storage of machinery only. [28]

The following bulleted information was obtained from historic aerial photographs:[29]

- Drainage next to Building II-1-3 – The 1951 aerial photograph showed evidence of a liquid release into two drainage ditches on the north side of Building II-1-3.
- Possible impoundment southwest of Boiler House (II-1-23) – This possible impoundment measures approximately 100-ft long by 50-ft wide. It appeared to be dry in 1951; however, there was some scarring in this area which may indicate past releases. There was a small ponded area just south of the impoundment, which does not appear to be associated with the impoundment.
- Roadways in Support Area – On the 1951 photograph, the roads in the Support Area appeared to be "oiled," probably for dust suppression.

Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part II, Section 1, Page 1.

[20] DOI 001112. Hoosier Cardinal Corporation response to 104e request, dated June 13, 1989.

[21] DPRA Document No. 00009401. U.S. Department of the Interior, Bureau of Fish and Wildlife, Fish and Wildlife Service, Narrative Report, May through August, 1956, Table IV; and DPRA Document No. 00009401. U.S. Department of the Interior, Bureau of Fish and Wildlife, Fish and Wildlife Service, Narrative Report, September through December 1956, Table VI.

[22] DPRA Document No. 00009389. U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1955, Page 17 and Table VIII.

[23] CRO-001575A – Article from Herrin Daily Journal, dated March 30, 1949.

[24] Ray Almaroad, personal interview, September 8, 1999.

[25] DPRA Document No. 00009059. Lease Data and Income Pertaining to Industrial Unit, Crab Orchard National Wildlife Refuge, April 12, 1949, Page 7.

[26] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 2 and 3 (Area 11).

[27] DPRA Document No. 00009389. U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1955, Table VIII.

[28] DPRA Document No. 00009389. U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1955, Page 17 and Table VIII.

[29] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Pages 3-5 and Figure 2 (Area 11).

19.1.2.4 Olin Operations 1956 - 1964

Most of the buildings in the Support Area during Olin's tenure were former IOP buildings. The Boiler House (Olin Map, Building 60) was rebuilt in the same location as the former IOP Boiler House, II-1-23.[30] The boilers used No. 6 Burner Fuel (also known as bunker fuel).[31] According to Mr. Harry Stiles, a former Refuge manager, this fuel was brought in on railroad tank cars.[32] Olin added a small boiler house shop building (Olin Map, Building 60A) adjacent to the rebuilt boiler house. Olin rebuilt the boiler house in late 1957 after the original boiler house burned down in October 1957.[33] As seen in the 1960 aerial photograph, there was also coal stored near the Boiler House,[34] which may have been used as a supplemental fuel source. The coal was stored in the location of the possible surface impoundment southwest of the Boiler House.

Olin Built Support Buildings

Additional buildings that Olin built in this area are as follows (see Figure 15-3 and Table 15-1):

- Building 75-A – Guard House – former location of IOP Building II-1-28 (Timekeepers Building) which was razed prior to 1951[35] - According to an Olin Plant Building Directory and Insurance Report,[36] the former Timekeepers Building was used as a laboratory;[37] however, this building was removed prior to Olin taking possession of the property.
- Building 80 – Laboratory
- Building 80-A – Laboratory Storage
- Unnumbered Building – Component Magazine – The location of this building is uncertain; it was probably Building 82 on Figure 15-3, which is located just north of the vehicle parking lot and just west of Building 80.[38] Building 82 was identified on the U.S. Powder Map as a Component Magazine, but was not identified on the Olin Map.

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[30] PRI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.
[31] Deposition of Harry Stiles, November 18, 1997, Page 61.
[32] Deposition of Harry Stiles, November 18, 1997, Pages 61and 62.
[33] DPRA Document No. 00009410. U.S. Department of the Interior, Bureau of Sport Fisheries & Wildlife, Fish and Wildlife Service, Narrative Report, September through December, 1957, Page 31.
[34] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3 (Area 11).
[35] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2 (Area 11).
[36] PRI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.
RI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.
[37] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[38] PRI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.
RI-00494. Olin Mathieson Chemical Corporation, Plant Building Directory and Insurance Report, dated June 30, 1963, Page 1.

- This area in the northern part of Site AUS-A11S (designated by Number 58 on the Olin Map) was labeled as a scrap or salvage yard. It was developed during Olin's tenure.[39]

Olin Use of Original IOP Buildings in Support Area

The remaining buildings in this area were former IOP buildings. The building numbers and descriptions from the Olin Map are followed by the IOP building numbers in parentheses:

- Building 55 - Carpenter and Machine Shop[40] (IOP Building II-1-2)
- Building 55-A - Steam Regulator for Bldg. 55[41] (IOP Building II-1-31)
- Building 56 - Garage-Wash Room-Office/Inert Stores[42] (part of IOP Building II-1-3). According to Mr. Paul Moore, a former Olin employee, in 1960 Olin cast MC1 generators in one of the buildings in the area of Building 56. He worked there for approximately 6 months making ammonium nitrate mixtures for gas generators and solid propellant mixtures.
- Building 57 - Welding Shop[43] (IOP Building II-1-5)
- Building 65 – General Stores[44] (IOP Building II-1-1)
- Building 66 - Inert Stores #1[45] (part of IOP Building II-1-3)
- Building 68 - Oil Stores[46] (IOP Building II-1-4)
- Building 75 - Administration Building[47] (IOP Building II-1-24).

There were also three IOP rail spurs running through the center of this area. One spur was slightly relocated to service the rebuilt boiler house and the other two ran parallel to the former load line, just south of the buildings.

19.1.2.5 Olin Operations 1980 to 1986

Olin leased Buildings II-1-1 and II-1-2 in 1980, for cold storage.[48] The Building II-1-2 lease was terminated in November of 1984;[49] the Building II-1-1 lease was terminated in December of 1986.[50]

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[39] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3 (Area 11).
[40] Olin Mathieson Chemical Corporation, Plant Map, Buildings – Roads – Trucks – Fences, Drawing D999, dated March 24, 1961.
[41] Olin Mathieson Chemical Corporation, Plant Map, Buildings – Roads – Trucks – Fences, Drawing D999, dated March 24, 1961.
[42] Olin Mathieson Chemical Corporation, Plant Map, Buildings – Roads – Trucks – Fences, Drawing D999, dated March 24, 1961; and PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[43] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[44] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[45] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[46] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[47] PRI-00502. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 1.
[48] CRO 000453 – CRO 000454. Building Lease Contract No. 14-16-0003-81-527 by and between U. S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980, Page1 and Page 1 of 1A.

19.1.2.6 Commercial Solvents Corporation Operations

Based on the U.S. Powder Map, CSC apparently used most of the buildings in Site AUS-A11S for the same purposes as Olin. There were some minor changes in building number designations, shown on Figure 15-3. Only the uses known to have changed are discussed here.

A new loading dock was added to the north side of Building 66, Inert Stores #1, sometime between 1965 and 1971.[51]

CSC apparently added building 65-1, designated as a Track Scale on the U.S. Powder Map. It does not appear on the Olin Map.

There was no documentation found to indicate that any of the buildings in the Support Area were included in the explosives decontamination done by CSC/IMC before leaving the site.

19.1.2.7 U.S. Fish and Wildlife Service Demolition

November 1983 Demolition

USFWS hired a contractor in November 1983 to demolish the following buildings in the Support Area:

- Building 75 (IOP Building II-1-24)
- Building 75-1 (IOP Building II-1-28)
- Building 80 (Laboratory)

The demolition was completed by February 28, 1984. The structure of Building 80 was buried just east of the foundation of the building, which was buried in place. The structures of Buildings 75 and 75-1 were also buried and their foundations were also buried in place, probably at or close to the building locations. All debris was covered with at least 24 inches of fill material.[52]

September 1989 Demolition

USFWS hired a contractor in September 1989, to demolish the following nine buildings in the Support Area:

- Portion of Buildings 56 and 66 (IOP Building II-1-3)
- Portion of Building 66 (referred to in Bid as "ANNEX #2")
- Building 68 (IOP Building II-1-4)
- Building 57 (IOP Building II-1-5)

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[49] DOI 001669. Amendment No. 2 to Building Lease Contract No. 14-16-0003-81-527, Olin Corporation, dated November 1, 1984.
[50] CRO 000468. Amendment No. 3 to Building Lease Contract No. 14-16-0003-81-527, Olin Corporation, dated December 1, 1986.
[51] Entech, Inc., 1999, Site Specific Reports on Areas 11 and 11A at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 4 and 5 (Area 11).
[52] USFWS file for Contract No. 14-16-0003-83-096, Excavating Services -- Building Demolition.

- Portion of Building 56 (IOP Building II-1-32, which had apparently been connected to the larger Building 56)
- Building 55 (IOP Building II-1-2)
- Building 55-1 (IOP Building II-1-31)
- Portion of Building 65 (IOP Building II-1-1)
- Portion of Building 65 (referred to in Bid as "ANNEX #1").

The demolition was completed by June 26, 1990. The structures and the foundations were buried in place, probably buried at or close to the original building locations. The contract required that all debris be covered with at least 36 inches of fill material.[53]

Drum Storage Area

A drum storage area was identified on an undated low-angle aerial photograph[54] on the eastern part of a former parking area in the southeast part of AUS-A11S. Based on the drainage evident in the photograph, it appears to have been taken around 1993. However, the Entech aerial photographic review of this area using high-angle aerial photographs did not identify this drum storage area. This area contained approximately 50 unmarked and rusted drums of unknown origin, which were observed by ESE in 1992 during their field survey.[55] ESE indicated that some of the drums appeared to contain soils and others appeared to be empty; that a number of the drums were split near the bottom and they appeared to be anywhere from 3 to 5 years old.

According to USFWS,[56] these drums have been disposed of as Investigation Derived Waste (IDW) from the Explosives and Munitions Operable Unit (EMMA OU). According to the *Sampling and Analysis Plan* for the IDW, approximately 90 drums containing soil and water[57] from disposal activities for the Phase II EMMA OU RI and the 1988 Confirmation Study were staged at this location, known as COP-5.[58] There drums were noted in poor condition with significant rust and corrosion.[59] Subsequently, the drums and contents were placed in a roll off box and disposed of off-site by the Army's contractor, ESE.[60]

[53] USFWS file for Contract No. 14-16-0003-89-0033, White Equipment – Building Demolition.
[54] Aerial photograph of the Support Area in Area 11, provided to URS by USFWS, date unknown.
[55] ACO 4999. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Page 24.
[56] Elaine L. Moore, e-mail correspondence, dated September 13, 2001.
[57] Some of the drums also contained personal protective equipment and plastic sheeting. QST Environmental, Inc., Investigation Derived Waste Disposal, Explosives/Munitions Manufacturing Area Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Sampling and Analysis Plan, Volume I: Field Sampling Plan, dated August 5, 1997, Page 7.
[58] QST Environmental, Inc., Investigation Derived Waste Disposal, Explosives/Munitions Manufacturing Area Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Sampling and Analysis Plan, Volume I: Field Sampling Plan, dated August 5, 1997, Pages 5-7.
[59] QST Environmental, Inc., Investigation Derived Waste Disposal, Explosives/Munitions Manufacturing Area Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Sampling and Analysis Plan, Volume I: Field Sampling Plan, dated August 5, 1997, Page 11.
[60] Elaine L. Moore, e-mail correspondence, dated September 13, 2001.

19.1.3 Area 11S Previous Sampling Results

Parsons Engineering, 1997

Parsons Engineering conducted an ordnance and explosive waste (OEW) investigation at former EMMA OU Site COPGII in 1997. COPGII covers an area of approximately 11,440,000 square ft and includes all of Area 11. There was no chemical investigation done in this area at this time. The area was divided into 572 grids (100ft by 200ft grids). Eleven -100ft square grids were investigated at this site and a total of 629 magnetic anomalies were identified.[61] Two hundred and fifty five of these were intrusively investigated and all were non-ordnance scrap.[62]

USEPA Sampling, 1998

United States Environmental Protection Agency (USEPA) sample locations are shown in Figures 19-1, 19-2, and 19-3. The results for all detected constituents are listed in Table 19-1A.

In 1998, USEPA collected three samples (44-01 through 44-03) from AUS OU Site AUS-0044. These samples were analyzed for semi-volatile organic compounds and metals. The following semi-volatile organic compounds (SVOCs) were detected above either USEPA Soil Screening Levels (SSLs) and/or Canadian Soil Quality Guidelines (CSOQGs): naphthalene (4.5 milligrams per kilogram (mg/kg)), benzo[a]anthracene (0.83 mg/kg), benzo[b]fluoranthene (0.62 mg/kg), and benzo[a]pyrene (0.37 mg/kg). Mercury (0.36 mg/kg) exceeded USEPA SSL and Refuge background level.[63]

The USEPA collected four samples (46-01C, 46-02, 46-03, and 46-04C) from AUS OU Site AUS-0046 (Load Line II Cleaning and Painting Building – Building II-1-3). These samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and metals. Dibenz[a,h]anthracene (3.0 mg/kg) exceeded USEPA SSLs. Mercury (0.12 mg/kg) and nickel (72 mg/kg) exceeded USEPA SSLs and Refuge background levels. Zinc (530 mg/kg) and lead (290 mg/kg) exceeded New Dutchlist Soil Optimum Levels (DSOLs) and Refuge background levels.

Three samples (49-01 through 49-03) were collected from the original AUS OU Site AUS-0049 (Load Line II Drainage Ditch Sediments). AUS-0049 was incorporated into AUS-A11A; however, sample 49-01 was actually located in AUS-A11S and therefore, its discussion is included in this section.

Sample 49-01 was located slightly northwest of Building 66 and was analyzed for semi-volatile organic compounds and metals. This sample did not exceed any screening criteria.

[61] Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis – Final Report. Former Illinois Ordnance Plant - Marion, Illinois, Pages 2-36 through 2-44.
[62] Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis – Final Report. Former Illinois Ordnance Plant - Marion, Illinois, Pages 2-36 through 2-44.
[63] See Table 1-11 of this report for Refuge background soil values used for the PA.

19.1.4 Observations During Site Visit

There were numerous mounded areas observed throughout Site AUS-A11S during the Spring 1999 site reconnaissance. Most of the mounded areas appear to coincide with the location of former buildings, which is likely since all the buildings in this area have been razed and most were buried in-place after they were razed.

There were also numerous ponded areas identified throughout the site. There was an un-named pond located to the north of the Support Area that was identified during the historical aerial photograph interpretation. This pond was not observed during the site reconnaissance. It appears to have disappeared sometime between 1965 and 1971 according to aerial photographs. It appears that this pond previously received drainage from the Support Area.

Many of the drainage ditches that were used by former industrial tenants are still present on site. In general, most of the surface water in this area drains either to the north or to the east via drainage ditches and/or creeks. Most of the area north of the former load line buildings appears to flow to the north of the Support Area, toward the above-mentioned former pond. There is currently a drainage ditch in the location of this former pond that now receives the drainage from this part of the Support Area. This ditch appears to be an extension of the north-flowing "Main Drainage Ditch," which is located along the entire west side of the Support Area.

Much of this area is tree-covered and contains dense vegetation. There is also construction debris scattered across the site. Construction debris which was apparently previously covered with soil was observed in the former buildings areas.

During the site reconnaissance, an L-shaped concrete structure, which may have been the former blow-off basin, was identified just north of the former Boiler. A 45-foot by 95-foot concrete pad was also identified during the site reconnaissance. This pad is located in the area that was previously identified as a possible former impoundment in historical aerial photographs. It is likely that this pad was later used for coal storage for the boiler house. During the site reconnaissance the pad was partially covered with cinders.

There was no visual evidence of former USTs on site (likely located to the west of former Building 60); however, a magnetometer survey indicated that they might still be present on site.

During the site reconnaissance, a former building or sump was identified to the east of the former Scrap Yard. There was a drain on the east side of the structure, which may lead into a drainage ditch located along the east side of the sump.

To the north of former Building 65, an area of brownish-orange colored vegetation was observed during the site reconnaissance.

19.1.5 Recommendations Based on Preliminary Assessment

Site AUS-A11S was retained for the SI because it is an area of past industrial use that has not been characterized, and because the USEPA sample results showed exceedances of PA screening criteria.

19.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-A11S from March 27 through May 19, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[64] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 19.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 19-1, 19-2, and 19-3. Survey coordinates for all sample locations in Area 11S are listed in Table 19-1. Table 19-3 lists the sample locations and the matrix sampled at that location.

19.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. There were several areas of concern investigated during the SI. All building numbers referenced are to the Olin/U.S. Powder Map unless otherwise indicated.

Buildings 56, 66 and 68

Cleaning and Painting Operations: IOP Building II-1-4, Paint Shield Cleaning Building (Olin/U.S. Powder Map Building 68), may have been used for cleaning the paint spray booths. A monitoring well (A11S-W02) was placed in the former drainageway for this building. This drainageway may have received spillage of paint wastes and solvents. Both a soil and a groundwater sample were taken from this location.

Building 56 and eastern part of Building 66 was the IOP Cleaning and Painting Building. In addition to monitoring well A11S-W02 which is located on the north side of this building, monitoring well A11S-W04 was placed on the south side of this building in what appeared to be a former doorway in the building which may have received wash waters from paint spillage. Coordinates for this location were obtained from the aerial photographs.[65] Both a soil and a groundwater sample were taken from this location.

Sample A11S-018 (soil) was collected from a depression located in the area of former Olin/U.S. Powder Map Building 56. A clay pipe entered this depression and the sample was collected from below the opening of this pipe.

[64] U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

[65] At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few feet.

Hoosier Cardinal Operations: Monitoring Well A11S-W02 (also discussed above) was placed in a drainage ditch that originated from IOP Building II-1-3. It appears that Hoosier Cardinal used this drainage ditch since the aerial photograph showed evidence of liquid releases from the building into this ditch. Sample A11S-040 (soil) was located in a similar drainage that was west of the above-mentioned drainage ditch. This drainage ditch also originated at former Building II-1-3 and also showed evidence of liquid releases to the ditch from this building.

Both of these drainage ditches eventually drained to a former ponded area on the north side of the fence line for Area 11, which was also investigated. Sample locations A11S-001 (sediment and surface water), A11S-034 (soil), A11S-041 (sediment), and A11S-042 (sediment and surface water) were all located along the drainage ditches that carried liquid to the pond. Locations A11S-041 and A11S-042 were both north of the Chemical Area Road and the other two were in the drainage ditches south of Chemical Area Road (Figure 19-1). Sample locations A11S-043 (sediment and surface water) and A11S-044 (sediment) were located within the boundaries of the former pond, which are no longer evident on site.

Olin and CSC Operations: Building 56 was a Garage/Wash Room and Office during the Olin and CSC tenures. Building 66 was a Storage Building during Olin/CSC's tenure. Sample location A11S-032 (soil) was collected from the soil mound located in the area of former Building 66, in the vicinity of the portion of this building added by Olin.

Sample location A11S-009 (sediment and surface water) is located in a ponded area, near the western end of former Building 66, that may contain contamination resulting from activities in Building 66. Sample location A11S-011 (sediment and surface water) was supposed to be located in a ponded area north of former Building 66 that appears to have been a truck loading dock according to the 1971 aerial photograph taken during CSC's tenure at the site. This sample was actually collected almost 200 ft from the building, during the field investigation. Sample A11S-011 was supposed to be collected from a ponded area with an oily sheen that was observed during the site reconnaissance. The soil in this area also appeared to be stained reddish brown. Approximately halfway between sample location A11S-011 and former Building 66, there was an additional sample collected – A11S-048 (soil). This sample appeared to be closer to the possible former loading dock than A11S-011.

Sample A11S-018 (previously discussed) was located in a depression (beneath an opening in a clay pipe) in the footprint of former Building 55, a former Garage/Wash Room/Office. Sample A11S-017 (soil) was also located within the footprint of Building 55. Hoosier Cardinal originally built this portion of the building. The sample is located beneath the opening of a 2-inch metal pipe that appeared to be in its original location.

Monitoring Well A11S-W02 (also discussed above) was placed in a drainage ditch next to the former location of Building 68 (IOP Building II-1-4), which was used by Olin and CSC as Oil Stores. Spillage of oil from this building would be likely.

All samples were collected in accordance with tables in the Field Sampling Plan (FSP) with the following exception:

- AUS-A11S-032-SS-05 This sample was not collected because refusal was encountered at the 2 ft depth.

- AUS-A11S-048-SS-0X This sample was added during the field investigation.
- AUS-A11S-048-SS-02 This sample was added during the field investigation.

Building 57

Building 57 (IOP Building II-1-5) was an IOP Paint Service Building and later a welding shop for Olin and CSC. Paint was delivered to this building and piped from this building to Building II-1-3 during IOP operations. There may have been spillage from these operations. Sample A11S-014 (soil) was collected from the likely loading area for this building. Sample A11S-034 (previously discussed) was collected from the drainage ditch just west of this building that likely received wash waters from this building. Sample A11S-016 (sediment) was located in the drainage ditch to the northeast of this building. This drainage ditch may have also received wash waters from this building. Sample location A11S-015 (soil) is located to the east of former Building 57 and was collected from a mound of buried construction debris (possibly from former Building 57).

Building 55

Building 55 is the former Maintenance, Carpenter and Machine Shop; possible contaminants include solvents and oils. Sample A11S-020 (soil) is located in a former driveway on the north side of the building, where there is the possibility of spillage. Sample A11S-021 (soil) is located on the south side of the building, along the former railroad tracks. There is the possibility of spillage in this area also. Finally, sample A11S-033 (soil) was collected from the soil mound at the former Building 57 location.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-A11S-033-SS-05 Sample was not collected because refusal was encountered at 2 ft.

Former Railroad Lines

Railroad lines previously ran along the south side of the Load Line II Buildings. These lines were originally used by the IOP, and later by industrial tenants. They appear to have been removed sometime between 1965 and 1971, according to the aerial photograph interpretation. There is currently ponding along the former railroad lines. Samples were collected from several of these ponded areas. Samples A11S-010 (sediment and surface water) and A11S-012 (sediment and surface water)were located in ponded areas south and southwest of Building 66. Sample A11S-012 was located south of the former Cleaning and Painting Building, but A11S-010 was not. Sample A11S-019 (sediment and surface water) was located southeast of former Building 57 (former IOP Cleaning and Painting Building and Olin/U.S. Powder Garage). Sample A11S-022 (sediment and surface water) was located southeast of former Olin/U.S. Powder Building 65 (former General Storage Building), in a ponded area just northeast of the ponded area that was originally planned to be sampled. This sample was collected from along the former railroad lines.

Areas Associated with Former Boiler House (Olin/U.S. Powder Building 60)

Building 60 was the former Boiler House for all the previous tenants at this site. There were four USTs on the west side of this building that were used to fuel the boilers. Monitoring well A11S-W03 was supposed to be placed in the assumed area of the boiler house USTs, which according to a magnetometer survey, may still be on site. Monitoring well A11S-W03 was installed west of the former UST location (in an approximate side gradient direction). Both a soil and a groundwater sample were taken from this location.

Previously a blow-off basin was located on the north side of the Boiler House. During the site reconnaissance, an L-shaped concrete structure was identified near the former boiler house and it was assumed that this was the former blow-off basin. Sample A11S-026 (soil) was supposed to be collected from this location, but was actually collected from approximately 70 ft southwest of the assumed location of the blow-off basin. Therefore, either the concrete structure was not the blow-off basin or the boiler house location was mis-identified.

Sample A11S-027 (soil) was collected next to the former Boiler House Shop (Olin/CSC Building 60-1). There is the potential for solvent and oils contamination associated with this shop.

A fuel oil AST was built in the area south of the former Boiler House during the IOP. Sample location A11S-037 (soil) was located using Global Positioning System (GPS) coordinates obtained from the aerial photographs, since the exact location of the AST was not discernible. As a result, it is not known for certain if sample A11S-037 was located within the boundaries of the former bermed area of the AST. The AST location on Figure 19-1 is approximate.

Sample location A11S-035 (soil) was supposed to be placed in a possible former impoundment identified in historical aerial photographs. This area was later used as storage for coal stocks. This area is located to the southwest of former Building 60. The sample was actually collected from along the northernmost edge of the possible former impoundment, because there is currently a concrete pad in the area of the former impoundment.

Sample location A11S-036 (soil) was located just south of this former impoundment, in an area of possible liquid pooling according.

All samples were collected in accordance with the tables in the Field Sampling Plan with exceptions noted above, and the following exceptions:

- AUS-A11S-026-SW-00 This sample was not taken because no surface water was present during the field investigation.
- AUS-A11S-036-SS-02 Sample was not collected because refusal was encountered on railroad ballast.
- AUS-A11S-W03-SS-24 Sample not collected.
- AUS-A11S-W03-GW-00 This sample was not analyzed for TDS, although the FSP did call for it this analysis.

Former Laboratories

Building 80 was a former Q.C. Laboratory and Building 81 was a storage building for the laboratory. Sample A11S-025 (sediment) was located in a ponded area of the ditch located just to the southwest of former Building 80, to determine if laboratory chemicals may have been dumped into the drainage ditch.

Olin Building 75A (U.S. Powder Building 75-1) may have also been a laboratory at one time, according to an Olin inventory. Sample A11S-047 (soil) was collected from near the west side of the building.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-A11S-047-SD-02 Sample was not collected because of refusal on asphalt/concrete.

Former Drum Storage Area

A low angle aerial photograph identified a former drum storage area on the eastern edge of the former employee parking lot, located to the northeast of former Building 75. Based on the drainage at the site, the photo appears to have been taken sometime around 1993. Sample A11S-045 (soil) was located in the actual drum storage area and sample A11S-046 (sediment) was located in a nearby drainage ditch.

Former Change House

Sample A11S-029 (sediment) was located in a drainage ditch to the southeast of the former IOP Change House, Building II-1-24 (Olin/U.S. Powder Building 75). This drainage ditch would have likely received any drainage from the former change house. A 4-inch drain empties into the drainage ditch at this location.

Scrap Yard/Debris Areas

In the area north of Chemical Area Road and south of the fence line, an Olin/CSC Scrap Yard and another area of debris were identified. Sample locations A11S-004 (soil) and A11S-005 (soil) were located in the Scrap Yard; sample location A11S-006 (sediment) was located in a drainage ditch just south of the Scrap Yard that likely received drainage from this area. Sample location A11S-003 (sediment) was located in a drainage ditch to the west of the Scrap Yard in a debris area.

Monitoring Well A11S-W01 was located on the east side of a former building or sump identified during the site reconnaissance, to the east of the former Scrap Yard. There was a drainage ditch running along the east side of this former building or sump. The purpose of this building or sump was not identified. A drain comes out of the east side of this structure. Both a soil and a groundwater sample were taken from this location.

Oiling of Roadways

Two samples were collected from the former roadways in this area since it was apparent from aerial photographs that these roadways had been oiled in the past. These samples were A11S-038 (soil) and A11S-039 (soil). It was assumed that the top 6 inches of roadbed materials were disturbed, so both samples were collected from a minimum depth of at least 6 inches.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-A11S-038-SS-02 Sample was offset several times, however field personnel were still unable to auger through road bed, so sample was not collected.

Miscellaneous Drainage in AUS-A11S

Most of AUS-A11S drains into the Main Drainage Ditch/Creek (see Figure 19-1), which flows off site to the north. All of the Support Area south of the Service Area Road and east of the former driveway that led to former Building 56 drains to the east.

Three samples were located in the west flowing ditch on the north side of Chemical Area Road: A11S-002 (sediment), A11S-006 (sediment), and A11S-007 (sediment).

There were at least four sample locations in the Main Drainage Ditch/Creek: A11S-001 (sediment and surface water), A11S-008 (sediment and surface water), A11S-024 (sediment and surface water), and A11S-041 (sediment). Sample A11S-001 is located at the confluence of the Main Drainage Ditch/Creek and three other ditches, on the south side of Chemical Area Road. Samples A11S-042 (sediment and surface water), A11S-043 (sediment and surface water), and A11S-044 (sediment) area also located in this same ditch, to the north of the main portion of AUS-A11S. Sample A11A-024 is located just north of the border between the Support Area and the Nitroglycerin Area, in the Main Drainage Ditch/Creek.

Sample location A11S-028 (sediment) is in a drainage ditch on the west side of a generally northwest-southeast trending roadway that runs along the west side of both former laboratories (Buildings 77-1 and 80). Sample location A11S-013 (sediment and surface water) is located in a drainage ditch on the south side of the Service Area Road, next to a culvert which connects this drainage ditch with the drainage ditch located on the north side of this road. The culvert is just south of the former Cleaning and Painting Building (Building 66).

Sample location A11S-023 (sediment)was located in a ponded area of the drainage ditch, which is located on the north side of former Building 65. The vegetation in this area is a brownish-orange color.

Sample location A11S-031 (soil) was located to the northeast of former Building 60 in a drainage ditch on the south side of the former railroad spur that serviced former Building 60. The sample was collected from next to a culvert that connected this drainage ditch with the drainage ditch located on the north side of the Service Area Road. Sample A11S-030 (soil) was collected from a sewer manhole that was located just to the southwest of sample location A11S-031.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-A11S-023-SW-00 This sample was not collected because surface water was present at time of sampling.

19.2.2 Field Results

19.2.2.1 Site Conditions

19.2.2.1.1 Geologic Conditions

A geologic cross-section (Figure15-10) was made for the site using the soil boring information was obtained from three of the four monitoring wells installed at this site. Boring logs and monitoring well construction diagrams are included in Appendices A and B, respectively.

The four borings indicate that the site is overlain with a fill material (topsoil, etc) ranging from 1.5 to 9 ft thick. There was a strong solvent odor detected from 5 ft to approximately 9 ft in Boring A11S-W02. The first 6 inches of material in A11S-W03 includes broken coal, cinders, and 1-inch rock. Beneath the fill is a layer low plastic silty clay that ranges from 11 to 19 ft thick[66]. At seventeen ft below ground surface (bgs) in A11S-W03 there is a 1-foot layer of sandy clay that overlays weathered sandstone. The boring for A11S-W04 encountered low plastic sandy clay at 18.5 ft bgs.

19.2.2.1.2 Hydrogeologic Conditions

Groundwater was encountered during drilling at three of the four borings, between depths of 13 to 18 ft as shown on Figure 15-10. The groundwater measurements taken at Site AUS-A11S are presented on Table 15-4.

A groundwater contour map (Figure 15-12) was made for Area 11 using groundwater elevations obtained from October 2000. As seen in this groundwater contour map, the overall flow direction of the groundwater is toward the north. Groundwater elevations were collected several different times during this investigation as seen in Table 15-4, and the flow direction was generally the same each time. Slug tests were performed on each of the four wells that were installed in Area 11S during the AUS OU investigation, resulting in hydraulic conductivities that ranged from 2.62E-06 to 6.83E-05 centimeters per second (cm/sec). Slug tests are presented in Table 19-2. Slug tests are included in Appendix C.

Hydraulic conductivity values from slug tests are less than the trigger values for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)). Based on the borings at the site, the aquifer does not appear to meet any of the other criteria for Class I Groundwater (35 IAC 620), although one trigger criterion has not been measured. That criterion is "sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less" (35 IAC 620.210(a)(4)(A)). Based on the slow recovery of wells at this site, yields that would indicate Class I groundwater

[66] This material was described as loess on the boring log, but it probably consists of both loess and till.

by that criterion would definitely not be expected. In accordance with 35 IAC 620.220, groundwater that does not meet the criteria for Class I, III, or IV is classified as Class II. Based on the available data, the groundwater at this site appears to be Class II as defined by the State of Illinois. This classification could change based on additional data.

19.2.2.1.3 Hydrologic Conditions

In general the drainage at A11S tends to flow north. The Main Drainage Ditch/Creek flows from the southern portion of the site to the north under the Chemical Area Road and then trends east at the most northern portion of the site. Several drainageways flow into the Main Drainage Ditch/Creek including: one drainageway that flows north along the west side of the north-south road (located at the southern portion of the site) then turns west parallel to the southern side of the Service Area Road; one that starts from a possible former loading dock (see Figure 19-1) and flows north to the Chemical Area Road; then two former drainage ways combine and flow northwest following the Chemical Area Road; and another drainage ditch follows the northern side of the Chemical Area Road starting at the eastern portion of the site. Another drainage ditch runs along the eastern side of the north-south road that is located in the southern portion of the site. Along the former railroad beds located in the center of the site (running east-west) are several areas of ponded surface water.

19.2.2.2 Chemical Results

The sample analytical results are summarized as follows:

- Table 19-4 – soil samples results,
- Table 19-5 – sediment samples results,
- Table 19-6 – groundwater samples results, and
- Table 19-7 – surface water samples results.

These tables list all the chemicals detected at Site AUS-A11S during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the QCSR.

Sample results are presented on figures as follows:

- Figure 19-1 – organic results for soil and sediment samples,
- Figure 19-2 – inorganic results for soil and sediment samples, and
- Figure 19-3 – all results for surface water and groundwater samples at this site.

19.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 19-8 through 19-14 as follows:

- Table 19-8--human health risk screening for soils,
- Table 19-9--human health risk screening for sediment,
- Table 19-10--human health risk screening for groundwater,
- Table 19-11--human health risk screening for surface water,
- Table 19-12--ecological risk screening for soils,
- Table 19-13--ecological risk screening for sediment, and

- Table 19-14--ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 11S. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 19-1 through 19-3, the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 19-15 (human health risk) and 19-16 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 19-15) and COPECs (Table 19-16) are shaded in the tables. USEPA 1998 analytical results are included when the USEPA data results in a chemical being classified as a COPC/COPEC and that chemical was not classified as a COPC/COPEC based on the AUS SI data. These chemicals are coded with "J" on both tables. Otherwise the USEPA data are not included. Note that for this site there are no chemicals with the "J" code in the COPC/COPEC tables.

19.3.1 Human Health Risk

19.3.1.1 Soil/Sediment

Human health screening results for soil and sediment samples are presented in Tables 19-8 and 19-9, respectively. Soil screening values were conservatively used to screen the sediment samples.

For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1 x 10^{-6}. In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

19.3.1.2 Groundwater

Human health screening results for groundwater are presented in Table 19-10. The maximum groundwater concentrations from AUS-A11S were screened against maximum contaminant levels (MCLs) and Illinois Class I groundwater standards.

19.3.1.3 Surface Water

Human health risk screening results for chemicals in surface water from Area 11S are presented in Table 19-11. The maximum concentrations from AUS-A11S were screened against the IEPA General Use Surface Water Quality Criteria – Human Health.

19.3.2 Ecological Risk

19.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 19-12. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[67]
- Environment Canada (1995)[68]
- Talmage *et al.* (1999)[69]
- Efroymson *et al.* (1997a, 1997b)[70]
- CCME (1999)[71]
- MHSPE (1994)[72]

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[67] USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

[68] Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

[69] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. Rev Environ. Contam. Toxicol 161:1-156.

[70] Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

[71] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)[73] used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

19.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 19-13. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)[74]
- USEPA (1996 – summarized by Ingersoll *et al.* 1996)[75]
- Ontario Ministry of the Environment and Energy (1995)[76]
- NOAA (1999)[77]
- Ecotox (USEPA 1996)[78]
- Long *et al.* (1995)[79]
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

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[72] Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards.* Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

[73] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

[74] MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. MacDonald Environmental Services Ltd., British Columbia, Canada.

[75] Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfirld, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22(3):602-623.

[76] Ontario Ministry of Environment and Energy. 1995. Ontario's Approach to Sediment Assessment and Remediation. Second SETAC World Congress (16TH Annual Meeting). Vancouver, British Columbia, Canada.

[77] NOAA. 1999. Screening quick Reference Tables. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

[78] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

[79] Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management. 19(1): 81-97.

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed "consensus-based" freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the "equilibrium-partitioning" (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 19.3.2.1.

19.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 19-14. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)[80]
- EcoTox (USEPA 1996[81])
- USEPA Region IV Freshwater Screening Values (1999b)[82]
- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)[83]

[80] USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.
[81] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.
[82] USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at http://www.epa.gov/region4/waste/oftecser/ecolbul.htm.

- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 19.3.2.1.

19.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-A11S, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 19-15; and on the COPEC list, Table 19-16. COPCs in this category include barium and beryllium in sediment. COPECs coded with "D" on Table 19-16 include cadmium and thallium in surface water; and mercury in sediment. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be evaluated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 19-17.

Other areas of the site and media and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

[83] ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

TABLE 19-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11S

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11S-001	366992.3	782243.5	428.36	NA	
A11S-002	366945.8	782428.8	431.56	NA	
A11S-003	367158.0	782521.0	431.67	NA	
A11S-004	367228.6	782820.4	433.82	NA	
A11S-005	367157.3	782790.8	433.81	NA	
A11S-006	367096.4	782875.7	433.21	NA	
A11S-007	367287.9	783262.8	432.87	NA	
A11S-008	366759.1	782169.4	431.19	NA	
A11S-009	366623.1	782222.4	434.70	NA	
A11S-010	366535.4	782253.7	433.83	NA	
A11S-011	366879.4	782301.3	428.60	NA	
A11S-012	366649.5	782445.8	434.01	NA	
A11S-013	366598.9	782559.5	432.32	NA	
A11S-014	366914.2	782553.2	435.04	NA	
A11S-015	366895.3	782583.8	437.00	NA	
A11S-016	366971.3	782658.6	431.93	NA	
A11S-017	366956.6	782709.8	437.82	NA	
A11S-018	366905.7	782806.8	431.57	NA	
A11S-019	366761.2	782756.4	434.99	NA	
A11S-020	367022.9	782905.4	436.03	NA	
A11S-021	366953.5	782933.7	436.84	NA	
A11S-022	367053.8	783274.3	432.25	NA	
A11S-023	367222.3	783252.7	432.59	NA	
A11S-024	366028.4	782413.6	434.87	NA	
A11S-025	366684.9	782867.4	436.39	NA	
A11S-026	366766.4	783006.9	438.81	NA	
A11S-027	366719.2	783088.3	438.12	NA	
A11S-028	366474.3	782942.4	436.72	NA	
A11S-029	366384.6	783234.6	435.69	NA	
A11S-030	366933.2	783290.6	435.56	NA	
A11S-031	366998.2	783300.0	433.44	NA	
A11S-032	366665.3	782380.3	437.28	NA	
A11S-033	366957.7	782861.3	437.05	NA	
A11S-034	366915.3	782515.5	434.62	NA	
A11S-035	366678.4	782945.8	439.43	NA	
A11S-036	366546.6	783004.2	438.93	NA	
A11S-037	366646.1	783116.4	438.05	NA	
A11S-038	366798.9	782887.4	435.97	NA	
A11S-039	367103.0	783322.5	433.98	NA	
A11S-040	366796.9	782520.9	436.28	NA	
A11S-041	367259.6	782195.7	425.94	NA	
A11S-042	367436.4	782141.0	424.60	NA	
A11S-043	367577.7	782273.7	423.89	NA	

Sheet 1 of 2

TABLE 19-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-A11S

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
A11S-044	367724.9	782455.6	423.69	NA	
A11S-045	366640.0	783475.2	428.64	NA	
A11S-046	366661.3	783524.0	426.25	NA	
A11S-047	366250.1	783100.4	438.89	NA	
A11S-048	366804.8	782352.9	430.81	NA	
A11S-W01	367221.0	782977.2	435.71	438.53	New monitoring well
A11S-W02	366848.8	782560.4	436.61	439.55	New monitoring well
A11S-W03	366735.6	782979.4	438.19	440.81	New monitoring well
A11S-W04	366685.8	782536.9	435.16	438.02	New monitoring well

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NA = Not Applicable

TABLE 19-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
44-01	2-Methylnaphthalene	14[1,2]
	Anthracene	0.32J
	Benzo[a]anthracene	0.83J
	Benzo[a]pyrene	0.37J
	Benzo[b]fluoranthene	0.62J
	Chrysene	0.82J
	Dibenzofuran	3.5
	Fluoranthene	0.84J
	Naphthalene	4.5
	Phenanthrene	4.8
	Pyrene	1.6
	Aluminum	4,900
	Barium	53
	Beryllium	0.8
	Calcium	3,900
	Chromium	9.7
	Cobalt	5.6
	Copper	10
	Iron	16,000
	Lead	42
	Magnesium	1,300
	Manganese	360
	Mercury	0.26
	Nickel	13
	Potassium	730
	Vanadium	24
	Zinc	78
44-02	2-Methylnaphthalene	0.84
	Bis(2-Ethylhexyl)phthalate	0.29JB
	Dibenzofuran	0.24J
	Aluminum	10,000
	Barium	75
	Beryllium	0.9
	Calcium	5,000
	Chromium	14
	Cobalt	8.1
	Copper	12
	Iron	19,000
	Lead	38
	Magnesium	1,900
	Manganese	17
	Mercury	0.36
	Nickel	17
	Potassium	850
	Vanadium	33
	Zinc	110
44-03	2-Methylnaphthalene	0.79
	Benzo[b]fluoranthene	0.32J

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TABLE 19-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
44-03	Bis(2-Ethylhexyl)phthalate	1.1B
	Chrysene	0.22J
	Di-n-octylphthalate	0.23J
	Fluoranthene	0.28J
	Naphthalene	0.3J
	Phenanthrene	0.34J
	Pyrene	0.19J
	Aluminum	9,700
	Barium	96
	Beryllium	0.7
	Calcium	4,000
	Chromium	13
	Cobalt	13
	Copper	10
	Iron	16,000
	Lead	17
	Magnesium	2,400
	Manganese	800
	Mercury	0.13
	Nickel	14
	Potassium	1,200
	Vanadium	29
	Zinc	53
46-01C	2-Methylnaphthalene	0.094J
	Benzoic Acid	0.097J
	Bis(2-Ethylhexyl)phthalate	0.56B
	Di-n-butylphthalate	0.091J
	Aluminum	9,500
	Barium	110
	Beryllium	0.7
	Calcium	3,000
	Chromium	15
	Cobalt	7.6
	Copper	12
	Iron	17,000
	Lead	20
	Magnesium	2,400
	Manganese	370
	Nickel	20
	Potassium	730
	Vanadium	28
	Zinc	92
46-02	Aluminum	11,000
	Barium	130
	Beryllium	0.7
	Calcium	12,000
	Chromium	24
	Cobalt	9
	Copper	22

Sheet 2 of 4

TABLE 19-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
46-02	Iron	20,000
	Lead	73
	Magnesium	5000
	Manganese	420
	Mercury	0.12
	Nickel	19
	Potassium	1,100
	Vanadium	29
	Zinc	410
46-03	Dibenz[a,h]anthracene	3.0J
	Aluminum	9,000
	Barium	110
	Beryllium	0.6
	Calcium	42,000
	Chromium	19
	Cobalt	10
	Copper	16
	Iron	20,000
	Lead	38
	Magnesium	20,000
	Manganese	630
	Mercury	0.12
	Nickel	14
	Potassium	1,000
	Vanadium	28
	Zinc	530
46-04C	Benzo[b]fluoranthene	0.13J
	Bis(2-Ethylhexyl)phthalate	0.41B
	Aluminum	15,000
	Barium	170
	Beryllium	0.8
	Calcium	24,000
	Chromium	47
	Cobalt	12
	Copper	25
	Iron	24,000
	Lead	290
	Magnesium	15,000
	Manganese	600
49-01	Di-n-butylphthalate	0.20J
	Aluminum	10,000
	Barium	140
	Beryllium	0.7
	Calcium	75,000
	Chromium	14
	Cobalt	6.4
	Copper	8.3
	Iron	25,000

Sheet 3 of 4

TABLE 19-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
49-01	Lead	18
	Magnesium	9,100
	Manganese	450
	Nickel	13
	Potassium	1,200
	Vanadium	23
	Zinc	52
	Potassium	1,600
	Vanadium	35
	Zinc	340

Sheet 4 of 4

mg/kg = milligrams per kilogram
J = Estimated
B = No explanation of "B" qualifier in report
[1] This sample was noted with a qualifier of "E" replaced manually with a "D" qualifier. No information was found defining "D" or "E" qualifiers.
[2] The original laboratory result was manually replaced with the number shown in this table. Refer to USEPA laboratory analysis data sheets for original result.

TABLE 19-2
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
A11S-W01	6.38E-05
A11S-W02	4.59E-05
A11S-W03	2.62E-06
A11S-W04	6.83E-05

Sheet 1 of 1

cm/sec = centimeters per second

TABLE 19-3
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-A11S

Soil	Sediment	Groundwater	Surface Water
AUS-A11S-004	AUS-A11S-001	AUS-A11S-W01	AUS-A11S-001
AUS-A11S-005	AUS-A11S-002	AUS-A11S-W02	AUS-A11S-008
AUS-A11S-014	AUS-A11S-003	AUS-A11S-W03	AUS-A11S-009
AUS-A11S-015	AUS-A11S-006	AUS-A11S-W04	AUS-A11S-010
AUS-A11S-017	AUS-A11S-007		AUS-A11S-011
AUS-A11S-018	AUS-A11S-008		AUS-A11S-012
AUS-A11S-020	AUS-A11S-009		AUS-A11S-013
AUS-A11S-021	AUS-A11S-010		AUS-A11S-019
AUS-A11S-026*	AUS-A11S-011		AUS-A11S-022
AUS-A11S-027	AUS-A11S-012		AUS-A11S-024
AUS-A11S-030	AUS-A11S-013		AUS-A11S-042
AUS-A11S-031*	AUS-A11S-016		AUS-A11S-043
AUS-A11S-032	AUS-A11S-019		
AUS-A11S-033	AUS-A11S-022		
AUS-A11S-034*	AUS-A11S-023		
AUS-A11S-035	AUS-A11S-024		
AUS-A11S-036	AUS-A11S-025		
AUS-A11S-037	AUS-A11S-028		
AUS-A11S-038	AUS-A11S-029		
AUS-A11S-039	AUS-A11S-041		
AUS-A11S-040*	AUS-A11S-042		
AUS-A11S-045*	AUS-A11S-043		
AUS-A11S-047*	AUS-A11S-044		
AUS-A11S-048	AUS-A11S-046		
AUS-A11S-W01			
AUS-A11S-W02			
AUS-A11S-W03			
AUS-A11S-W04			

Sheet 1 of 1

* Note that the samples at this location were originally designated as sediment, but are actually soil samples.

TABLE 19-4
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
1,1,2-Trichloroethane	1/28	53 ug/kg
Cis-1,2-Dichloroethylene	4/28	750 ug/kg to 1,300 ug/kg
Ethylbenzene	2/28	57 ug/kg to 110 ug/kg
Methyl Ethyl Ketone (2-Butanone)	1/28	1,100 ug/kg
Tetrachloroethylene(PCE)	3/28	2 ug/kg to 12 ug/kg
Toluene	3/28	19 ug/kg to 98 ug/kg
Total 1,2-Dichloroethene	4/28	790 ug/kg to 1,300 ug/kg
Trans-1,2-Dichloroethene	4/28	1 ug/kg to 9 ug/kg
Trichloroethylene (TCE)	5/28	2 ug/kg to 21,000 ug/kg
Xylenes, Total	2/28	240 ug/kg to 450 ug/kg
Semivolatile Organic Compounds		
1-Methylnaphthalene	1/7	1,000 ug/kg
2-Methylnaphthalene	13/29	50 ug/kg to 11,000 ug/kg
Acenaphthylene	5/29	110 ug/kg to 500 ug/kg
Anthracene	8/29	14 ug/kg to 700 ug/kg
Benzo(a)anthracene	15/29	7.4 ug/kg to 3,700 ug/kg
Benzo(a)Pyrene	15/29	7.3 ug/kg to 4,200 ug/kg
Benzo(b)Fluoranthene	15/29	16 ug/kg to 6,700 ug/kg
Benzo(g,h,i)Perylene	10/29	9.6 ug/kg to 2,500 ug/kg
Benzo(k)Fluoranthene	11/29	8.2 ug/kg to 2,200 ug/kg
Bis(2-Ethylhexyl) Phthalate	7/22	43 ug/kg to 1,700 ug/kg
Carbazole	6/22	51 ug/kg to 630 ug/kg
Chrysene	16/29	11 ug/kg to 4,000 ug/kg
Dibenz(a,h)Anthracene	4/29	100 ug/kg to 790 ug/kg
Dibenzofuran	10/22	82 ug/kg to 3,000 ug/kg
Dimethyl Phthalate	1/22	1,300 ug/kg
Di-N-Butyl Phthalate	6/22	65 ug/kg to 1,600 ug/kg
Fluoranthene	14/29	19 ug/kg to 5,500 ug/kg
Fluorene	2/29	70 ug/kg to 180 ug/kg
Indeno(1,2,3-c,d)Pyrene	8/29	9.9 ug/kg to 2,800 ug/kg
Naphthalene	12/29	62 ug/kg to 6,200 ug/kg
Phenanthrene	13/29	7.8 ug/kg to 4,300 ug/kg
Pyrene	15/29	18 ug/kg to 6,500 ug/kg
Explosives		
2,4-Dinitrotoluene	1/27	74 ug/kg
Metals		
Aluminum	35/35	1,930 mg/kg to 20,900 mg/kg
Antimony	17/35	0.24 mg/kg to 2.6 mg/kg
Arsenic	34/35	3.1 mg/kg to 27.4 mg/kg
Barium	34/35	20.8 mg/kg to 513 mg/kg
Beryllium	23/35	0.36 mg/kg to 2.8 mg/kg

Sheet 1 of 2

TABLE 19-4
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Boron	23/35	0.95 mg/kg to 41.9 mg/kg
Cadmium	11/35	0.47 mg/kg to 26.8 mg/kg
Calcium	35/35	1,150 mg/kg to 234,000 mg/kg
Chromium, Total	34/35	5.4 mg/kg to 28.7 mg/kg
Cobalt	32/35	1.4 mg/kg to 110 mg/kg
Copper	34/35	3.6 mg/kg to 39.5 mg/kg
Iron	35/35	6,490 mg/kg to 35,900 mg/kg
Lead	30/35	4.5 mg/kg to 180 mg/kg
Magnesium	35/35	616 mg/kg to 85,700 mg/kg
Manganese	35/35	43.5 mg/kg to 8,930 mg/kg
Mercury	26/35	0.013 mg/kg to 5.1 mg/kg
Nickel	34/35	6.1 mg/kg to 151 mg/kg
Potassium	34/35	154 mg/kg to 1,350 mg/kg
Selenium	19/35	0.24 mg/kg to 5.2 mg/kg
Silver	7/35	0.27 mg/kg to 1.4 mg/kg
Sodium	23/35	42.7 mg/kg to 243 mg/kg
Thallium	10/35	0.15 mg/kg to 2.9 mg/kg
Vanadium	34/35	5.6 mg/kg to 57.4 mg/kg
Zinc	35/35	11.6 mg/kg to 685 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 19-5
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	7/14	70 ug/kg to 11,000 ug/kg
Acenaphthene	1/14	180 ug/kg
Acenaphthylene	1/14	250 ug/kg
Anthracene	3/14	63 ug/kg to 370 ug/kg
Benzo(a)Anthracene	6/14	110 ug/kg to 630 ug/kg
Benzo(a)Pyrene	6/14	130 ug/kg to 1,000 ug/kg
Benzo(b)Fluoranthene	8/14	62 ug/kg to 2,600 ug/kg
Benzo(g,h,i)Perylene	5/14	72 ug/kg to 1,500 ug/kg
Benzo(k)Fluoranthene	7/14	69 ug/kg to 750 ug/kg
Bis(2-Ethylhexyl) Phthalate	7/14	74 ug/kg to 2,600 ug/kg
Carbazole	2/14	100 ug/kg to 320 ug/kg
Chrysene	8/14	61 ug/kg to 1,200 ug/kg
Dibenz(a,h)Anthracene	1/14	340 ug/kg
Dibenzofuran	4/14	63 ug/kg to 3,100 ug/kg
Di-N-Butyl Phthalate	2/14	53 ug/kg to 56 ug/kg
Fluoranthene	7/14	52 ug/kg to 550 ug/kg
Indeno(1,2,3-c,d)Pyrene	5/14	68 ug/kg to 1,500 ug/kg
Naphthalene	5/14	76 ug/kg to 5,600 ug/kg
Phenanthrene	7/14	52 mg/kg to 3,700 mg/kg
Pyrene	8/14	63 ug/kg to 1,300 ug/kg
Explosives		
HMX	1/17	2,900 ug/kg
Metals		
Aluminum	24/24	6,470 mg/kg to 18,500 mg/kg
Antimony	20/24	0.23 mg/kg to 6.4 mg/kg
Arsenic	24/24	0.75 mg/kg to 15.2 mg/kg
Barium	24/24	76.5 mg/kg to 178 mg/kg
Beryllium	23/24	0.24 mg/kg to 1 mg/kg
Boron	14/24	1 mg/kg to 9.4 mg/kg
Cadmium	3/24	0.72 mg/kg to 6.3 mg/kg
Calcium	24/24	1,650 mg/kg to 120,000 mg/kg
Chromium, Total	24/24	8.4 mg/kg to 634 mg/kg
Cobalt	24/24	3.1 mg/kg to 17.3 mg/kg
Copper	24/24	8.6 mg/kg to 35 mg/kg
Iron	24/24	8,950 mg/kg to 30,100 mg/kg
Lead	24/24	12.2 mg/kg to 187 mg/kg
Magnesium	24/24	1,380 mg/kg to 28,800 mg/kg
Manganese	24/24	118 mg/kg to 2,770 mg/kg
Mercury	24/24	0.011 mg/kg to 0.11 mg/kg
Nickel	24/24	7.7 mg/kg to 24.9 mg/kg

Sheet 1 of 2

TABLE 19-5
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Potassium	24/24	503 mg/kg to 1,620 mg/kg
Selenium	10/24	0.39 mg/kg to 2.3 mg/kg
Sodium	24/24	46.3 mg/kg to 196 mg/kg
Thallium	3/24	0.58 mg/kg to 0.64 mg/kg
Vanadium	24/24	17.1 mg/kg to 49 mg/kg
Zinc	24/24	31.9 mg/kg to 221 mg/kg
Other Inorganics		
Total Organic Carbon	2/2	37,400 mg/kg to 47,600 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 19-6
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Cis-1,2-Dichloroethylene	2/4	78 ug/L to 10,000 ug/L
Trichloroethylene (TCE)	3/4	6 ug/L to 280,000 ug/L
Semivolatile Organic Compounds		
1-Methylnaphthalene	1/2	1.6 ug/L
2-Methylnaphthalene	1/3	7.9 ug/L
Acenaphthylene	1/3	4.6 ug/L
Naphthalene	1/3	59 ug/L
Phenanthrene	1/3	0.59 ug/L
Explosives		
2,4,6-Trinitrotoluene	1/4	9.5 ug/L
2,6-Dinitrotoluene	1/4	1 ug/L
2-Amino-4,6-Dinitrotoluene	1/4	0.93 ug/L
4-Amino-2,6-Dinitrotoluene	1/4	17 ug/L
Tetryl	1/4	4.5 ug/L
Metals		
Aluminum	3/4	228 ug/L to 2,140 ug/L
Barium	2/4	20.8 ug/L to 41.3 ug/L
Boron	2/4	12 ug/L to 283 ug/L
Calcium	4/4	77,300 ug/L to 364,000 ug/L
Chromium, Total	1/4	3 ug/L
Copper	1/4	1.1 ug/L
Iron	4/4	243 ug/L to 1,430 ug/L
Magnesium	4/4	30,900 ug/L to 227,000 ug/L
Manganese	4/4	195 ug/L to 1,580 ug/L
Nickel	3/4	2.1 ug/L to 14.9 ug/L
Potassium	1/4	1,030 ug/L
Selenium	1/4	5.9 ug/L
Sodium	4/4	11,700 ug/L to 194,000 ug/L
Zinc	1/4	5.1 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	1/1	304 mg/L
Nitrogen, Nitrate-Nitrite	2/3	0.23 mg/L to 0.61 mg/L
Phosphorus, Total (as P)	1/1	0.07 mg/L
Sulfate (as SO4)	1/1	720,000 ug/L

Sheet 1 of 2

TABLE 19-6
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Suspended Solids (Residue, Non-Filterable)	1/1	5.5 mg/L
Total Dissolved Solids (Residue, Filterable)	2/2	1,470 mg/L to 3,140 mg/L

Sheet 2 of 2

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 19-7
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Carbon Tetrachloride	1/1	1 ug/L
Chloroform	1/1	0.5 ug/L
Cis-1,2-Dichloroethylene	1/1	7 ug/L
Toluene	1/1	1 ug/L
Trichloroethylene (TCE)	1/1	22 ug/L
Semivolatile Organic Compounds		
Bis(2-Ethylhexyl) phthalate (DEHP)	1/9	1.9 ug/L
Butyl benzyl phthalate	1/10	1.6 ug/L
Phenol	1/9	1.5 ug/L
Explosives		
2-Amino-4,6-Dinitrotoluene	1/10	5.5 ug/L
4-Amino-2,6-Dinitrotoluene	1/10	18 ug/L
HMX	1/10	0.68 ug/L
Nitrobenzene	1/10	0.73 ug/L
Metals		
Aluminum	7/12	241 ug/L to 68,600 ug/L
Antimony	2/12	2.3 ug/L to 4.7 ug/L
Arsenic	8/12	5.1 ug/L to 37.5 ug/L
Barium	12/12	31.6 ug/L to 1,270 ug/L
Beryllium	4/12	1.8 ug/L to 13.2 ug/L
Boron	12/12	22.7 ug/L to 135 ug/L
Cadmium	1/12	4.9 ug/L
Calcium	12/12	15,100 ug/L to 299,000 ug/L
Chromium, Total	7/12	3.3 ug/L to 214 ug/L
Cobalt	6/12	9.3 ug/L to 231 ug/L
Copper	6/12	2.7 ug/L to 119 ug/L
Iron	10/12	701 ug/L to 87,800 ug/L
Lead	6/12	2 ug/L to 104 ug/L
Magnesium	12/12	5,900 ug/L to 122,000 ug/L
Manganese	12/12	23 ug/L to 22,200 ug/L
Mercury	4/12	0.11 ug/L to 0.87 ug/L
Nickel	7/12	1.3 ug/L to 153 ug/L
Potassium	12/12	1140 ug/L to 9,220 ug/L
Selenium	4/12	4.1 ug/L to 16.1 ug/L
Sodium	12/12	890 ug/L to 86,400 ug/L
Thallium	1/12	4.7 ug/L
Vanadium	7/12	3.5 ug/L to 132 ug/L
Zinc	6/12	45.8 ug/L to 1,760 ug/L
Other Inorganics		
Alkalinity, Total (as CaCO3)	4/4	38.2 mg/L to 142 mg/L
Nitrogen, Ammonia (as N)	5/5	0.17 mg/L to 2.1 mg/L

Sheet 1 of 2

TABLE 19-7
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Nitrogen, Nitrate-Nitrite	2/6	0.056 mg/L to 1.7 mg/L
Phosphorus, Total (as P)	2/2	0.058 mg/L to 0.095 mg/L
Sulfate (as SO4)	5/6	420 ug/L to 520,000 ug/L
Suspended Solids (Residue, Non-Filterable)	2/2	14.5 mg/L to 56 mg/L
Total Dissolved Solids (Residue, Filterable)	8/8	73 mg/L to 825 mg/L

Sheet 2 of 2

mg/L = milligrams per Liter
ug/L = micrograms per Liter

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Checked by: SEA 7/31/01

TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	10	U	UG/KG			3.00E-06	1.00E-01
79-34-5	1,1,2,2-Tetrachloroethane	10	U	UG/KG		1.11E-08	2.56E-06	5.00E+01
79-00-5	1,1,2-Trichloroethane	53		UG/KG		2.79E-08	3.48E-04	5.89E+01
75-34-3	1,1-Dichloroethane	10	U	UG/KG			4.85E-06	1.00E-02
75-35-4	1,1-Dichloroethene	10	U	UG/KG		8.42E-08	1.48E-04	3.33E+00
107-06-2	1,2-Dichloroethane (EDC)	10	U	UG/KG		1.31E-08	2.84E-04	1.00E+01
540-59-0	1,2-Dichloroethene (total)	1300	E	UG/KG			8.82E-03	6.50E+01
78-87-5	1,2-Dichloropropane	10	U	UG/KG		1.30E-08	4.69E-04	1.00E+01
78-93-3	2-Butanone (MEK)	1100	J	UG/KG			3.97E-05	
591-78-6	2-Hexanone	20	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	20	U	UG/KG			6.93E-06	
67-64-1	Acetone	20	U	UG/KG			3.22E-06	2.50E-02
71-43-2	Benzene	10	U	UG/KG		6.83E-09	4.13E-04	5.00E+00
75-27-4	Bromodichloromethane	10	U	UG/KG		4.24E-09	9.58E-06	3.33E-01
75-25-2	Bromoform	10	U	UG/KG		3.20E-11	5.68E-07	2.50E-01
74-83-9	Bromomethane	10	U	UG/KG			7.61E-04	1.00E+00
75-15-0	Carbon disulfide	10	U	UG/KG			8.27E-06	5.00E-03
56-23-5	Carbon tetrachloride	10	U	UG/KG		1.89E-08	1.43E-03	3.33E+00
108-90-7	Chlorobenzene	10	U	UG/KG			1.84E-05	1.43E-01
75-00-3	Chloroethane	10	U	UG/KG		1.54E-09	5.30E-07	
67-66-3	Chloroform	10	U	UG/KG		1.92E-08	7.76E-03	3.33E-01
74-87-3	Chloromethane	10	U	UG/KG		3.76E-09		
156-59-2	cis-1,2-Dichloroethene	1300	E	UG/KG			8.82E-03	6.50E+01
10061-01-5	cis-1,3-Dichloropropene	10	U	UG/KG		5.62E-08	2.27E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	10	U	UG/KG		3.77E-09	6.28E-06	5.00E-01
100-41-4	Ethylbenzene	110		UG/KG			1.84E-05	1.57E-01
75-09-2	Methylene chloride	10	U	UG/KG		4.87E-10	1.02E-06	1.00E+01
110-54-3	N-Hexane	10	U	UG/KG			2.48E-05	
100-42-5	Styrene	10	U	UG/KG			4.89E-07	5.00E-02
127-18-4	Tetrachloroethylene (PCE)	12		UG/KG		6.43E-10	7.05E-06	4.00E+00
108-88-3	Toluene	98		UG/KG			4.93E-05	1.63E-01
1330-20-7	total Xylenes	450		UG/KG			1.01E-04	4.50E-02
156-60-5	trans-1,2-Dichloroethene	9		UG/KG			4.20E-05	3.00E-01
10061-02-6	trans-1,3-Dichloropropene	10	U	UG/KG		5.62E-08	2.27E-04	
79-01-6	Trichloroethylene (TCE)	21000		UG/KG		3.43E-06	2.66E-01	7.00E+03
75-01-4	Vinyl chloride	10	U	UG/KG		2.05E-07		1.43E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	560	U	UG/KG			7.35E-05	1.87E+00
95-50-1	1,2-Dichlorobenzene	560	U	UG/KG			1.69E-04	6.22E-01
541-73-1	1,3-Dichlorobenzene	560	U	UG/KG			1.08E-02	
106-46-7	1,4-Dichlorobenzene	560	U	UG/KG		6.89E-08	2.91E-04	5.60E+00
95-95-4	2,4,5-Trichlorophenol	2800	U	UG/KG			3.18E-05	2.80E-01
88-06-2	2,4,6-Trichlorophenol	560	U	UG/KG		2.50E-09		7.00E+01
120-83-2	2,4-Dichlorophenol	560	U	UG/KG			2.12E-04	1.12E+01
105-67-9	2,4-Dimethylphenol	560	U	UG/KG			3.18E-05	1.40E+00
51-28-5	2,4-Dinitrophenol	2800	U	UG/KG			1.59E-03	2.80E+02
91-58-7	2-Chloronaphthalene	560	U	UG/KG			2.05E-05	
95-57-8	2-Chlorophenol	560	U	UG/KG			2.32E-03	2.80E+00
90-12-0	1-Methylnaphthalene	1000		UG/KG			5.30E-03	2.50E-01

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J = Estimated U = Nondetect

TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
91-57-6	2-Methylnaphthalene	11000		UG/KG			2.03E-04	5.50E-02
95-48-7	2-Methylphenol	560	U	UG/KG			1.27E-05	7.00E-01
88-74-4	2-Nitroaniline	2800	U	UG/KG			5.56E-02	
88-75-5	2-Nitrophenol	560	U	UG/KG			7.95E-05	
91-94-1	3,3'-Dichlorobenzidine	560	U	UG/KG		1.02E-07		1.87E+03
99-09-2	3-Nitroaniline	2800	U	UG/KG			5.56E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2800	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	560	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	560	U	UG/KG			1.27E-05	
106-47-8	4-Chloroaniline	1100	U	UG/KG			3.12E-04	3.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	560	U	UG/KG				
106-44-5	4-Methylphenol	560	U	UG/KG			1.27E-04	
100-01-6	4-Nitroaniline	2800	U	UG/KG			5.56E-02	
100-02-7	4-Nitrophenol	2800	U	UG/KG			3.97E-04	
83-32-9	Acenaphthene	560	U	UG/KG			1.46E-05	1.87E-02
208-96-8	Acenaphthylene	500		UG/KG			9.22E-06	2.50E-03
120-12-7	Anthracene	700		UG/KG			1.80E-06	1.17E-03
56-55-3	Benzo(a)anthracene	3700		UG/KG		1.28E-06		4.63E+01
50-32-8	Benzo(a)pyrene	4200		UG/KG		1.46E-05		1.05E+01
205-99-2	Benzo(b)fluoranthene	6700		UG/KG		2.32E-06		3.35E+01
191-24-2	Benzo(g,h,i)perylene	2500		UG/KG			4.61E-05	1.25E-02
207-08-9	Benzo(k)fluoranthene	2200		UG/KG		7.62E-08		1.10E+00
111-91-1	bis(2-Chloroethoxy)methane	560	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	560	U	UG/KG		9.03E-07		2.80E+04
108-60-1	bis(2-Chloroisopropyl) ether	560	U	UG/KG		6.93E-08	1.32E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1700		UG/KG		9.65E-09	9.65E-05	
85-68-7	Butyl benzyl phthalate	560	U	UG/KG			3.18E-06	7.00E-04
86-74-8	Carbazole	630		UG/KG		5.11E-09		2.10E+01
218-01-9	Chrysene	4000		UG/KG		1.39E-08		5.00E-01
84-74-2	Di-n-butyl phthalate	1600		UG/KG			1.82E-05	5.33E-03
117-84-0	Di-n-octyl phthalate	560	U	UG/KG			3.18E-05	5.60E-05
53-70-3	Dibenz(a,h)anthracene	790		UG/KG		2.74E-06		9.88E+00
132-64-9	Dibenzofuran	3000		UG/KG			5.93E-04	
84-66-2	Diethyl phthalate	560	U	UG/KG			7.95E-07	
131-11-3	Dimethyl phthalate	1300		UG/KG			1.48E-07	
206-44-0	Fluoranthene	5500		UG/KG			1.83E-04	2.75E-02
86-73-7	Fluorene	180	J	UG/KG			5.43E-06	6.00E-03
118-74-1	Hexachlorobenzene	560	U	UG/KG		3.63E-07	7.95E-04	5.60E+00
87-68-3	Hexachlorobutadiene	560	U	UG/KG		1.77E-08	3.18E-03	5.60E+00
77-47-4	Hexachlorocyclopentadiene	560	U	UG/KG			9.50E-05	2.80E-02
67-72-1	Hexachloroethane	560	U	UG/KG		3.18E-09	6.36E-04	2.80E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	2800		UG/KG		9.70E-07		4.00E+00
78-59-1	Isophorone	560	U	UG/KG		2.16E-10	3.18E-06	1.87E+01
621-64-7	N-Nitroso-di-n-propylamine	560	U	UG/KG		1.59E-06		2.80E+05
86-30-6	N-Nitrosodiphenylamine	560	U	UG/KG		1.11E-09		9.33E+00
91-20-3	Naphthalene	6200		UG/KG			3.29E-02	1.55E+00
87-86-5	Pentachlorophenol	2800	U	UG/KG		2.52E-07	1.96E-04	2.80E+03
85-01-8	Phenanthrene	4300		UG/KG			7.93E-05	2.15E-02
108-95-2	Phenol	560	U	UG/KG			1.06E-06	1.12E-01
129-00-0	Pyrene	6500		UG/KG			1.20E-04	3.25E-02

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J = Estimated U = Nondetect

TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	420	UJ	UG/KG			1.59E-05	
99-65-0	1,3-Dinitrobenzene	420	UJ	UG/KG			4.77E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	850	UJ	UG/KG		1.03E-08	1.93E-03	
121-14-2	2,4-Dinitrotoluene	74	J	UG/KG			4.20E-05	1.85E+03
606-20-2	2,6-Dinitrotoluene	660	UJ	UG/KG			7.49E-04	2.20E+04
	Dinitrotoluene Mixture	74	J	UG/KG		2.06E-08		1.85E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	850	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	850	UJ	UG/KG				
99-08-1	3-Nitrotoluene	850	UJ	UG/KG			4.18E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	850	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	850	UJ	UG/KG			4.18E-04	
2691-41-0	HMX	850	UJ	UG/KG			1.93E-05	
98-95-3	Nitrobenzene	510	U	UG/KG			4.46E-03	
55-63-0	Nitroglycerin	1300	U	UG/KG		7.38E-09		
78-11-5	Pentaerythritol tetranitrate (PETN)	2500	U	UG/KG				
121-82-4	RDX	850	UJ	UG/KG		3.79E-08	3.22E-04	
479-45-8	Tetryl	1300	UJ	UG/KG			1.48E-04	
Metals								
7429-90-5	Aluminum	20900		MG/KG	7.26E-01		1.25E-02	
7440-36-0	Antimony	2.6		MG/KG	3.13E+00		3.18E-03	8.67E+00
7440-38-2	Arsenic	27.4		MG/KG	2.03E+00	1.00E-05	6.24E-02	2.74E+01
7440-39-3	Barium	513		MG/KG	2.63E+00		4.12E-03	6.41E+00
7440-41-7	Beryllium	2.8		MG/KG	3.68E+00	1.25E-09	7.58E-04	9.33E-01
7440-42-8	Boron	41.9		MG/KG	7.91E+00		5.30E-04	

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TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-43-9	Cadmium	26.8		MG/KG	1.41E+02	8.97E-09	3.31E-02	6.70E+01
7440-70-2	Calcium	234000		MG/KG	9.37E+01			
7440-47-3	Chromium	28.7		MG/KG	1.14E+00	6.40E-08		1.44E+01
7440-48-4	Cobalt	110		MG/KG	5.07E+00		8.97E-04	
7440-50-8	Copper	39.5		MG/KG	3.50E+00		5.20E-04	
7439-89-6	Iron	35900		MG/KG	1.86E+00		5.86E-02	
7439-92-1	Lead	180		MG/KG	7.69E+00			
7439-95-4	Magnesium	85700		MG/KG	5.52E+01			
7439-96-5	Manganese	8930	J	MG/KG	2.45E+00		2.77E-01	
7439-97-6	Mercury	5.1	J	MG/KG	8.50E+01			
7440-02-0	Nickel	151		MG/KG	7.99E+00		3.69E-03	2.16E+01
2023695	Potassium	1350		MG/KG	2.16E+00			
7782-49-2	Selenium	5.2		MG/KG	2.22E+00		5.09E-04	1.73E+01
7440-22-4	Silver	1.4		MG/KG	2.41E+00		1.37E-04	7.00E-01
7440-23-5	Sodium	243		MG/KG	1.43E+00			
7440-28-0	Thallium	2.9	J	MG/KG	7.07E+00		2.03E-05	
7440-62-2	Vanadium	57.4	J	MG/KG	1.22E+00		4.01E-03	1.91E-01
7440-66-6	Zinc	685		MG/KG	1.33E+01		1.12E-03	1.14E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	10	U	UG/KG			5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	10	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	53		UG/KG	6.46E-06	6.46E-06	2.65E+00
75-34-3	1,1-Dichloroethane	10	U	UG/KG	5.00E-08	5.00E-08	4.35E-04
75-35-4	1,1-Dichloroethene	10	U	UG/KG	5.56E-07	5.56E-06	1.67E-01
107-06-2	1,2-Dichloroethane (EDC)	10	U	UG/KG	1.59E-04	7.14E-06	5.00E-01
540-59-0	1,2-Dichloroethene (total)	1300	E	UG/KG	6.50E-05	6.50E-05	3.25E+00
78-87-5	1,2-Dichloropropane	10	U	UG/KG	1.19E-04	5.56E-06	3.33E-01
78-93-3	2-Butanone (MEK)	1100	J	UG/KG			
591-78-6	2-Hexanone	20	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	20	U	UG/KG			
67-64-1	Acetone	20	U	UG/KG	1.00E-07	1.00E-07	1.25E-03
71-43-2	Benzene	10	U	UG/KG	5.00E-05	2.33E-06	3.33E-01
75-27-4	Bromodichloromethane	10	U	UG/KG	1.09E-04	5.00E-06	1.67E-02
75-25-2	Bromoform	10	U	UG/KG	1.39E-05	6.25E-07	1.25E-02
74-83-9	Bromomethane	10	U	UG/KG	3.45E-06	1.00E-05	5.00E-02
75-15-0	Carbon disulfide	10	U	UG/KG	5.00E-08	5.00E-07	3.13E-04
56-23-5	Carbon tetrachloride	10	U	UG/KG	2.27E-04	2.44E-05	1.43E-01
108-90-7	Chlorobenzene	10	U	UG/KG	2.44E-07	2.44E-06	1.00E-02
75-00-3	Chloroethane	10	U	UG/KG			
67-66-3	Chloroform	10	U	UG/KG	1.06E-05	5.00E-06	1.67E-02
74-87-3	Chloromethane	10	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	1300	E	UG/KG	6.50E-05	6.50E-05	3.25E+00
10061-01-5	cis-1,3-Dichloropropene	10	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	10	U	UG/KG	2.44E-07	2.44E-07	2.50E-02
100-41-4	Ethylbenzene	110		UG/KG	5.50E-07	5.50E-06	8.46E-03
75-09-2	Methylene chloride	10	U	UG/KG	1.32E-05	8.33E-07	5.00E-01
110-54-3	N-Hexane	10	U	UG/KG			
100-42-5	Styrene	10	U	UG/KG	2.44E-08	2.44E-07	2.50E-03
127-18-4	Tetrachloroethylene (PCE)	12		UG/KG	1.09E-04	5.00E-06	2.00E-01
108-88-3	Toluene	98		UG/KG	2.39E-07	2.39E-07	8.17E-03
1330-20-7	total Xylenes	450		UG/KG	4.50E-07	1.10E-06	3.00E-03
156-60-5	trans-1,2-Dichloroethene	9		UG/KG	2.20E-07	2.20E-07	1.29E-02
10061-02-6	trans-1,3-Dichloropropene	10	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	21000		UG/KG	4.04E-02	1.75E-02	3.50E+02
75-01-4	Vinyl chloride	10	U	UG/KG	3.33E-03	1.54E-04	1.00E+00
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	560	U	UG/KG	2.80E-05	2.80E-04	1.12E-01
95-50-1	1,2-Dichlorobenzene	560	U	UG/KG	3.11E-06	3.11E-05	3.29E-02
541-73-1	1,3-Dichlorobenzene	560	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	560	U	UG/KG			2.80E-01
95-95-4	2,4,5-Trichlorophenol	2800	U	UG/KG	1.40E-05	1.40E-05	1.04E-02
88-06-2	2,4,6-Trichlorophenol	560	U	UG/KG	1.08E-03	5.09E-05	2.80E+00
120-83-2	2,4-Dichlorophenol	560	U	UG/KG	9.18E-05	9.18E-04	5.60E-01
105-67-9	2,4-Dimethylphenol	560	U	UG/KG	1.37E-05	1.37E-05	6.22E-02
51-28-5	2,4-Dinitrophenol	2800	U	UG/KG	6.83E-04	6.83E-03	1.40E+01
91-58-7	2-Chloronaphthalene	560	U	UG/KG			
95-57-8	2-Chlorophenol	560	U	UG/KG	5.60E-05	5.60E-05	1.40E-01
90-12-0	1-Methylnaphthalene	1000		UG/KG	1.22E-05	1.22E-04	1.19E-02

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TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
91-57-6	2-Methylnaphthalene	11000		UG/KG	1.80E-04	1.80E-04	2.62E-03
95-48-7	2-Methylphenol	560	U	UG/KG	5.60E-06	5.60E-06	3.73E-02
88-74-4	2-Nitroaniline	2800	U	UG/KG			
88-75-5	2-Nitrophenol	560	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	560	U	UG/KG	4.31E-02	2.00E-03	8.00E+01
99-09-2	3-Nitroaniline	2800	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2800	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	560	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	560	U	UG/KG			
106-47-8	4-Chloroaniline	1100	U	UG/KG	1.34E-04	1.34E-03	1.57E+00
7005-72-3	4-Chlorophenyl phenyl ether	560	U	UG/KG			
106-44-5	4-Methylphenol	560	U	UG/KG			
100-01-6	4-Nitroaniline	2800	U	UG/KG			
100-02-7	4-Nitrophenol	2800	U	UG/KG			
83-32-9	Acenaphthene	560	U	UG/KG	4.67E-06	4.67E-06	9.82E-04
208-96-8	Acenaphthylene	500		UG/KG	8.20E-06	8.20E-06	1.19E-04
120-12-7	Anthracene	700		UG/KG	1.15E-06	1.15E-06	5.83E-05
56-55-3	Benzo(a)anthracene	3700		UG/KG	4.63E-01	2.18E-02	1.85E+00
50-32-8	Benzo(a)pyrene	4200		UG/KG	5.25E+00	2.47E-01	5.25E-01
205-99-2	Benzo(b)fluoranthene	6700		UG/KG	8.38E-01	3.94E-02	1.34E+00
191-24-2	Benzo(g,h,i)perylene	2500		UG/KG	4.10E-05	4.10E-05	5.95E-04
207-08-9	Benzo(k)fluoranthene	2200		UG/KG	2.82E-02	1.29E-03	4.49E-02
111-91-1	bis(2-Chloroethoxy)methane	560	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	560	U	UG/KG	1.12E-01	7.47E-03	1.40E+03
108-60-1	bis(2-Chloroisopropyl) ether	560	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1700		UG/KG	4.15E-03	4.15E-04	4.72E-04
85-68-7	Butyl benzyl phthalate	560	U	UG/KG	1.37E-06	1.37E-06	6.02E-04
86-74-8	Carbazole	630		UG/KG	2.17E-03	1.02E-04	1.05E+00
218-01-9	Chrysene	4000		UG/KG	5.13E-03	2.35E-04	2.50E-02
84-74-2	Di-n-butyl phthalate	1600		UG/KG	8.00E-06	8.00E-06	6.96E-04
117-84-0	Di-n-octyl phthalate	560	U	UG/KG	1.37E-05	1.37E-04	5.60E-05
53-70-3	Dibenz(a,h)anthracene	790		UG/KG	9.88E-01	4.65E-02	3.95E-01
132-64-9	Dibenzofuran	3000		UG/KG			
84-66-2	Diethyl phthalate	560	U	UG/KG	5.60E-07	5.60E-07	1.19E-03
131-11-3	Dimethyl phthalate	1300		UG/KG			
206-44-0	Fluoranthene	5500		UG/KG	6.71E-05	6.71E-05	1.28E-03
86-73-7	Fluorene	180	J	UG/KG	2.20E-06	2.20E-06	3.21E-04
118-74-1	Hexachlorobenzene	560	U	UG/KG	1.40E-01	7.18E-03	2.80E-01
87-68-3	Hexachlorobutadiene	560	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	560	U	UG/KG	4.00E-05	4.00E-05	1.40E-03
67-72-1	Hexachloroethane	560	U	UG/KG	2.80E-04	2.80E-04	1.12E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	2800		UG/KG	3.50E-01	1.65E-02	2.00E-01
78-59-1	Isophorone	560	U	UG/KG	1.37E-06	1.37E-06	7.00E-02
621-64-7	N-Nitroso-di-n-propylamine	560	U	UG/KG	7.00E-01	3.11E-02	1.12E+04
86-30-6	N-Nitrosodiphenylamine	560	U	UG/KG	4.67E-04	2.24E-05	5.60E-01
91-20-3	Naphthalene	6200		UG/KG	7.56E-05	7.56E-04	7.38E-02
87-86-5	Pentachlorophenol	2800	U	UG/KG	1.17E-01	5.38E-03	9.33E+01
85-01-8	Phenanthrene	4300		UG/KG	7.05E-05	7.05E-05	1.02E-03
108-95-2	Phenol	560	U	UG/KG	5.60E-07	4.67E-06	5.60E-03
129-00-0	Pyrene	6500		UG/KG	1.07E-04	1.07E-04	1.55E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	420	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	420	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	850	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	74	J	UG/KG	8.81E-03	4.11E-04	9.25E+01
606-20-2	2,6-Dinitrotoluene	660	UJ	UG/KG	7.86E-02	3.67E-03	9.43E+02
	Dinitrotoluene Mixture	74	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	850	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	850	UJ	UG/KG			
99-08-1	3-Nitrotoluene	850	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	850	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	850	UJ	UG/KG			
2691-41-0	HMX	850	UJ	UG/KG			
98-95-3	Nitrobenzene	510	U	UG/KG	5.10E-04	5.10E-04	5.10E+00
55-63-0	Nitroglycerin	1300	U	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	2500	U	UG/KG			
121-82-4	RDX	850	UJ	UG/KG			
479-45-8	Tetryl	1300	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	20900		MG/KG			
7440-36-0	Antimony	2.6		MG/KG	3.17E-03	3.17E-02	5.20E-01
7440-38-2	Arsenic	27.4		MG/KG	9.13E+00	4.49E-01	9.79E-01
7440-39-3	Barium	513		MG/KG	3.66E-03	3.66E-02	4.28E-01
7440-41-7	Beryllium	2.8		MG/KG	2.80E+00	9.66E-02	4.24E-01
7440-42-8	Boron	41.9		MG/KG	2.33E-04	2.33E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 19-8
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-43-9	Cadmium	26.8		MG/KG	1.34E-02	1.34E-01	7.24E+00
7440-70-2	Calcium	234000		MG/KG			
7440-47-3	Chromium	28.7		MG/KG	2.87E-03	7.00E-03	1.03E+00
7440-48-4	Cobalt	110		MG/KG	9.17E-04	9.17E-03	
7440-50-8	Copper	39.5		MG/KG	4.82E-04	4.82E-03	3.59E-03
7439-89-6	Iron	35900		MG/KG			
7439-92-1	Lead	180		MG/KG	4.50E-01	4.50E-01	
7439-95-4	Magnesium	85700		MG/KG			
7439-96-5	Manganese	8930	J	MG/KG	9.30E-02	9.30E-01	
7439-97-6	Mercury	5.1	J	MG/KG	8.36E-03	8.36E-02	3.40E+01
7440-02-0	Nickel	151		MG/KG	3.68E-03	3.68E-02	1.99E+00
2023695	Potassium	1350		MG/KG			
7782-49-2	Selenium	5.2		MG/KG	5.20E-04	5.20E-03	2.17E+00
7440-22-4	Silver	1.4		MG/KG	1.40E-04	1.40E-03	9.33E-01
7440-23-5	Sodium	243		MG/KG			
7440-28-0	Thallium	2.9	J	MG/KG	1.81E-02	1.81E-02	1.21E+00
7440-62-2	Vanadium	57.4	J	MG/KG	4.10E-03	4.10E-02	5.86E-02
7440-66-6	Zinc	685		MG/KG	1.12E-03	1.12E-02	1.90E-01

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	8	U	UG/KG			2.40E-06	8.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG		8.91E-09	2.05E-06	4.00E+01
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG		4.21E-09	5.26E-05	8.89E+00
75-34-3	1,1-Dichloroethane	8	U	UG/KG			3.88E-06	8.00E-03
75-35-4	1,1-Dichloroethene	8	U	UG/KG		6.74E-08	1.19E-04	2.67E+00
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG		1.05E-08	2.27E-04	8.00E+00
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG			5.43E-05	4.00E-01
78-87-5	1,2-Dichloropropane	8	U	UG/KG		1.04E-08	3.76E-04	8.00E+00
78-93-3	2-Butanone (MEK)	16	U	UG/KG			5.77E-07	
591-78-6	2-Hexanone	16	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			5.54E-06	
67-64-1	Acetone	16	U	UG/KG			2.57E-06	2.00E-02
71-43-2	Benzene	8	U	UG/KG		5.46E-09	3.30E-04	4.00E+00
75-27-4	Bromodichloromethane	8	U	UG/KG		3.39E-09	7.66E-06	2.67E-01
75-25-2	Bromoform	8	U	UG/KG		2.56E-11	4.54E-07	2.00E-01
74-83-9	Bromomethane	8	U	UG/KG			6.09E-04	8.00E-01
75-15-0	Carbon disulfide	8	U	UG/KG			6.62E-06	4.00E-03
56-23-5	Carbon tetrachloride	8	U	UG/KG		1.51E-08	1.14E-03	2.67E+00
108-90-7	Chlorobenzene	8	U	UG/KG			1.47E-05	1.14E-01
75-00-3	Chloroethane	8	U	UG/KG		1.23E-09	4.24E-07	
67-66-3	Chloroform	8	U	UG/KG		1.54E-08	6.21E-03	2.67E-01
74-87-3	Chloromethane	8	U	UG/KG		3.01E-09		
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG			5.43E-05	4.00E-01
10061-01-5	cis-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	8	U	UG/KG		3.01E-09	5.02E-06	4.00E-01
100-41-4	Ethylbenzene	8	U	UG/KG			1.34E-06	1.14E-02
75-09-2	Methylene chloride	8	U	UG/KG		3.90E-10	8.18E-07	8.00E+00
110-54-3	N-Hexane	8	U	UG/KG			1.98E-05	
100-42-5	Styrene	8	U	UG/KG			3.91E-07	4.00E-02
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG		4.29E-10	4.70E-06	2.67E+00
108-88-3	Toluene	8	U	UG/KG			4.03E-06	1.33E-02
1330-20-7	total Xylenes	8	U	UG/KG			1.80E-06	8.00E-04
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG			3.74E-05	2.67E-01
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG		1.31E-09	1.01E-04	2.67E+00
75-01-4	Vinyl chloride	8	U	UG/KG		1.64E-07		1.14E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	670	U	UG/KG			8.80E-05	2.23E+00
95-50-1	1,2-Dichlorobenzene	670	U	UG/KG			2.02E-04	7.44E-01
541-73-1	1,3-Dichlorobenzene	670	U	UG/KG			1.29E-02	
106-46-7	1,4-Dichlorobenzene	670	U	UG/KG		8.24E-08	3.49E-04	6.70E+00
95-95-4	2,4,5-Trichlorophenol	3300	U	UG/KG			3.75E-05	3.30E-01
88-06-2	2,4,6-Trichlorophenol	670	U	UG/KG		2.99E-09		8.38E+01
120-83-2	2,4-Dichlorophenol	670	U	UG/KG			2.54E-04	1.34E+01
105-67-9	2,4-Dimethylphenol	670	U	UG/KG			3.80E-05	1.68E+00
51-28-5	2,4-Dinitrophenol	3300	U	UG/KG			1.87E-03	3.30E+02
91-58-7	2-Chloronaphthalene	670	U	UG/KG			2.46E-05	
95-57-8	2-Chlorophenol	670	U	UG/KG			2.78E-03	3.35E+00
91-57-6	2-Methylnaphthalene	11000		UG/KG			2.03E-04	5.50E-02

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-48-7	2-Methylphenol	670	U	UG/KG			1.52E-05	8.38E-01
88-74-4	2-Nitroaniline	3300	U	UG/KG			6.56E-02	
88-75-5	2-Nitrophenol	670	U	UG/KG			9.51E-05	
91-94-1	3,3'-Dichlorobenzidine	670	U	UG/KG		1.22E-07		2.23E+03
99-09-2	3-Nitroaniline	3300	U	UG/KG			6.56E-02	
534-52-1	4,6-Dinitro-2-methylphenol	3300	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	670	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	670	U	UG/KG			1.52E-05	
106-47-8	4-Chloroaniline	1300	U	UG/KG			3.69E-04	4.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	670	U	UG/KG				
106-44-5	4-Methylphenol	670	U	UG/KG			1.52E-04	
100-01-6	4-Nitroaniline	3300	U	UG/KG			6.56E-02	
100-02-7	4-Nitrophenol	3300	U	UG/KG			4.68E-04	
83-32-9	Acenaphthene	180	J	UG/KG			4.69E-06	6.00E-03
208-96-8	Acenaphthylene	250	J	UG/KG			4.61E-06	1.25E-03
120-12-7	Anthracene	370	J	UG/KG			9.49E-07	6.17E-04
56-55-3	Benzo(a)anthracene	630		UG/KG		2.18E-07		7.88E+00
50-32-8	Benzo(a)pyrene	1000		UG/KG		3.46E-06		2.50E+00
205-99-2	Benzo(b)fluoranthene	2600		UG/KG		9.01E-07		1.30E+01
191-24-2	Benzo(g,h,i)perylene	1500		UG/KG			2.77E-05	7.50E-03
207-08-9	Benzo(k)fluoranthene	750		UG/KG		2.60E-08		3.75E-01
111-91-1	bis(2-Chloroethoxy)methane	670	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	670	U	UG/KG		1.08E-06		3.35E+04
108-60-1	bis(2-Chloroisopropyl) ether	670	U	UG/KG		8.29E-08	1.58E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	2600		UG/KG		1.48E-08	1.48E-04	

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-68-7	Butyl benzyl phthalate	670	U	UG/KG			3.80E-06	8.38E-04
86-74-8	Carbazole	320	J	UG/KG		2.59E-09		1.07E+01
218-01-9	Chrysene	1200		UG/KG		4.16E-09		1.50E-01
84-74-2	Di-n-butyl phthalate	56	J	UG/KG			6.36E-07	1.87E-04
117-84-0	Di-n-octyl phthalate	670	U	UG/KG			3.80E-05	6.70E-05
53-70-3	Dibenz(a,h)anthracene	340	J	UG/KG		1.18E-06		4.25E+00
132-64-9	Dibenzofuran	3100		UG/KG			6.12E-04	
84-66-2	Diethyl phthalate	670	U	UG/KG			9.51E-07	
131-11-3	Dimethyl phthalate	670	U	UG/KG			7.61E-08	
206-44-0	Fluoranthene	550	J	UG/KG			1.83E-05	2.75E-03
86-73-7	Fluorene	670	U	UG/KG			2.02E-05	2.23E-02
118-74-1	Hexachlorobenzene	670	U	UG/KG		4.35E-07	9.51E-04	6.70E+00
87-68-3	Hexachlorobutadiene	670	U	UG/KG		2.12E-08	3.80E-03	6.70E+00
77-47-4	Hexachlorocyclopentadiene	670	U	UG/KG			1.14E-04	3.35E-02
67-72-1	Hexachloroethane	670	U	UG/KG		3.80E-09	7.61E-04	3.35E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	1500		UG/KG		5.20E-07		2.14E+00
78-59-1	Isophorone	670	U	UG/KG		2.58E-10	3.80E-06	2.23E+01
621-64-7	N-Nitroso-di-n-propylamine	670	U	UG/KG		1.90E-06		3.35E+05
86-30-6	N-Nitrosodiphenylamine	670	U	UG/KG		1.33E-09		1.12E+01
91-20-3	Naphthalene	5600		UG/KG			2.97E-02	1.40E+00
87-86-5	Pentachlorophenol	3300	U	UG/KG		2.98E-07	2.31E-04	3.30E+03
85-01-8	Phenanthrene	3700		UG/KG			6.82E-05	1.85E-02
108-95-2	Phenol	670	U	UG/KG			1.27E-06	1.34E-01
129-00-0	Pyrene	1300		UG/KG			2.40E-05	6.50E-03

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	720	UJ	UG/KG			2.72E-05	
99-65-0	1,3-Dinitrobenzene	500	U	UG/KG			5.68E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	1000	U	UG/KG		1.22E-08	2.27E-03	
121-14-2	2,4-Dinitrotoluene	500	U	UG/KG			2.84E-04	1.25E+04
606-20-2	2,6-Dinitrotoluene	960	UJ	UG/KG			1.09E-03	3.20E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	1000	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	1000	U	UG/KG				
99-08-1	3-Nitrotoluene	1000	U	UG/KG			4.92E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	1000	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	1000	U	UG/KG			4.92E-04	
2691-41-0	HMX	2900		UG/KG			6.58E-05	
98-95-3	Nitrobenzene	500	U	UG/KG			4.37E-03	
55-63-0	Nitroglycerin	1900	U	UG/KG		1.08E-08		
78-11-5	Pentaerythritol tetranitrate (PETN)	3700	U	UG/KG				
121-82-4	RDX	1000	U	UG/KG		4.46E-08	3.78E-04	
479-45-8	Tetryl	1500	U	UG/KG			1.70E-04	
Metals								
7429-90-5	Aluminum	18500		MG/KG	1.65E+00		1.10E-02	
7440-36-0	Antimony	6.4		MG/KG	3.37E+00		7.83E-03	2.13E+01
7440-38-2	Arsenic	15.2		MG/KG	1.48E+00	5.57E-06	3.46E-02	1.52E+01
7440-39-3	Barium	178		MG/KG	9.08E-01		1.43E-03	2.23E+00
7440-41-7	Beryllium	1		MG/KG	6.25E-01	4.46E-10	2.71E-04	3.33E-01
7440-42-8	Boron	15.4		MG/KG			1.95E-04	
7440-43-9	Cadmium	6.3		MG/KG	3.94E+00	2.11E-09	7.78E-03	1.58E+01

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-70-2	Calcium	120000		MG/KG	8.29E+01			
7440-47-3	Chromium	634		MG/KG	3.69E+01	1.41E-06		3.17E+02
7440-48-4	Cobalt	17.3		MG/KG	1.90E+00		1.41E-04	
7440-50-8	Copper	35		MG/KG	2.08E+00		4.61E-04	
7439-89-6	Iron	30100		MG/KG	1.45E+00		4.91E-02	
7439-92-1	Lead	187		MG/KG	7.79E+00			
7439-95-4	Magnesium	28800		MG/KG	1.51E+01			
7439-96-5	Manganese	2770		MG/KG	2.66E+00		8.59E-02	
7439-97-6	Mercury	0.11	J	MG/KG	7.33E-01			
7440-02-0	Nickel	24.9		MG/KG	1.47E+00		6.09E-04	3.56E+00
2023695	Potassium	1620		MG/KG	1.14E+00			
7782-49-2	Selenium	2.3		MG/KG	3.59E+00		2.25E-04	7.67E+00
7440-22-4	Silver	2	U	MG/KG	6.67E-01		1.96E-04	1.00E+00
7440-23-5	Sodium	207		MG/KG	1.43E-01			
7440-28-0	Thallium	0.64	J	MG/KG	2.06E+00		4.47E-06	
7440-62-2	Vanadium	49		MG/KG	1.75E+00		3.42E-03	1.63E-01
7440-66-6	Zinc	221		MG/KG	3.87E+00		3.61E-04	3.68E-01
Other Parameters								
7601-90-3	Perchlorate	10000	U	UG/KG			9.78E-03	
TOC	TOC	47600		MG/KG	7.58E-01			

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CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	8	U	UG/KG			4.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG	9.76E-07	9.76E-07	4.00E-01
75-34-3	1,1-Dichloroethane	8	U	UG/KG	4.00E-08	4.00E-08	3.48E-04
75-35-4	1,1-Dichloroethene	8	U	UG/KG	4.44E-07	4.44E-06	1.33E-01
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG	1.27E-04	5.71E-06	4.00E-01
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02
78-87-5	1,2-Dichloropropane	8	U	UG/KG	9.52E-05	4.44E-06	2.67E-01
78-93-3	2-Butanone (MEK)	16	U	UG/KG			
591-78-6	2-Hexanone	16	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			
67-64-1	Acetone	16	U	UG/KG	8.00E-08	8.00E-08	1.00E-03
71-43-2	Benzene	8	U	UG/KG	4.00E-05	1.86E-06	2.67E-01
75-27-4	Bromodichloromethane	8	U	UG/KG	8.70E-05	4.00E-06	1.33E-02
75-25-2	Bromoform	8	U	UG/KG	1.11E-05	5.00E-07	1.00E-02
74-83-9	Bromomethane	8	U	UG/KG	2.76E-06	8.00E-06	4.00E-02
75-15-0	Carbon disulfide	8	U	UG/KG	4.00E-08	4.00E-07	2.50E-04
56-23-5	Carbon tetrachloride	8	U	UG/KG	1.82E-04	1.95E-05	1.14E-01
108-90-7	Chlorobenzene	8	U	UG/KG	1.95E-07	1.95E-06	8.00E-03
75-00-3	Chloroethane	8	U	UG/KG			
67-66-3	Chloroform	8	U	UG/KG	8.51E-06	4.00E-06	1.33E-02
74-87-3	Chloromethane	8	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02
10061-01-5	cis-1,3-Dichloropropene	8	U	UG/KG			

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

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CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	8	U	UG/KG	1.95E-07	1.95E-07	2.00E-02
100-41-4	Ethylbenzene	8	U	UG/KG	4.00E-08	4.00E-07	6.15E-04
75-09-2	Methylene chloride	8	U	UG/KG	1.05E-05	6.67E-07	4.00E-01
110-54-3	N-Hexane	8	U	UG/KG			
100-42-5	Styrene	8	U	UG/KG	1.95E-08	1.95E-07	2.00E-03
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG	7.27E-05	3.33E-06	1.33E-01
108-88-3	Toluene	8	U	UG/KG	1.95E-08	1.95E-08	6.67E-04
1330-20-7	total Xylenes	8	U	UG/KG	8.00E-09	1.95E-08	5.33E-05
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG	1.95E-07	1.95E-07	1.14E-02
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG	1.54E-05	6.67E-06	1.33E-01
75-01-4	Vinyl chloride	8	U	UG/KG	2.67E-03	1.23E-04	8.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	670	U	UG/KG	3.35E-05	3.35E-04	1.34E-01
95-50-1	1,2-Dichlorobenzene	670	U	UG/KG	3.72E-06	3.72E-05	3.94E-02
541-73-1	1,3-Dichlorobenzene	670	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	670	U	UG/KG			3.35E-01
95-95-4	2,4,5-Trichlorophenol	3300	U	UG/KG	1.65E-05	1.65E-05	1.22E-02
88-06-2	2,4,6-Trichlorophenol	670	U	UG/KG	1.29E-03	6.09E-05	3.35E+00
120-83-2	2,4-Dichlorophenol	670	U	UG/KG	1.10E-04	1.10E-03	6.70E-01
105-67-9	2,4-Dimethylphenol	670	U	UG/KG	1.63E-05	1.63E-05	7.44E-02
51-28-5	2,4-Dinitrophenol	3300	U	UG/KG	8.05E-04	8.05E-03	1.65E+01
91-58-7	2-Chloronaphthalene	670	U	UG/KG			
95-57-8	2-Chlorophenol	670	U	UG/KG	6.70E-05	6.70E-05	1.68E-01
91-57-6	2-Methylnaphthalene	11000		UG/KG	1.80E-04	1.80E-04	2.62E-03

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95-48-7	2-Methylphenol	670	U	UG/KG	6.70E-06	6.70E-06	4.47E-02
88-74-4	2-Nitroaniline	3300	U	UG/KG			
88-75-5	2-Nitrophenol	670	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	670	U	UG/KG	5.15E-02	2.39E-03	9.57E+01
99-09-2	3-Nitroaniline	3300	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	3300	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	670	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	670	U	UG/KG			
106-47-8	4-Chloroaniline	1300	U	UG/KG	1.59E-04	1.59E-03	1.86E+00
7005-72-3	4-Chlorophenyl phenyl ether	670	U	UG/KG			
106-44-5	4-Methylphenol	670	U	UG/KG			
100-01-6	4-Nitroaniline	3300	U	UG/KG			
100-02-7	4-Nitrophenol	3300	U	UG/KG			
83-32-9	Acenaphthene	180	J	UG/KG	1.50E-06	1.50E-06	3.16E-04
208-96-8	Acenaphthylene	250	J	UG/KG	4.10E-06	4.10E-06	5.95E-05
120-12-7	Anthracene	370	J	UG/KG	6.07E-07	6.07E-07	3.08E-05
56-55-3	Benzo(a)anthracene	630		UG/KG	7.88E-02	3.71E-03	3.15E-01
50-32-8	Benzo(a)pyrene	1000		UG/KG	1.25E+00	5.88E-02	1.25E-01
205-99-2	Benzo(b)fluoranthene	2600		UG/KG	3.25E-01	1.53E-02	5.20E-01
191-24-2	Benzo(g,h,i)perylene	1500		UG/KG	2.46E-05	2.46E-05	3.57E-04
207-08-9	Benzo(k)fluoranthene	750		UG/KG	9.62E-03	4.41E-04	1.53E-02
111-91-1	bis(2-Chloroethoxy)methane	670	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	670	U	UG/KG	1.34E-01	8.93E-03	1.68E+03
108-60-1	bis(2-Chloroisopropyl) ether	670	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	2600		UG/KG	6.34E-03	6.34E-04	7.22E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-68-7	Butyl benzyl phthalate	670	U	UG/KG	1.63E-06	1.63E-06	7.20E-04
86-74-8	Carbazole	320	J	UG/KG	1.10E-03	5.16E-05	5.33E-01
218-01-9	Chrysene	1200		UG/KG	1.54E-03	7.06E-05	7.50E-03
84-74-2	Di-n-butyl phthalate	56	J	UG/KG	2.80E-07	2.80E-07	2.43E-05
117-84-0	Di-n-octyl phthalate	670	U	UG/KG	1.63E-05	1.63E-04	6.70E-05
53-70-3	Dibenz(a,h)anthracene	340	J	UG/KG	4.25E-01	2.00E-02	1.70E-01
132-64-9	Dibenzofuran	3100		UG/KG			
84-66-2	Diethyl phthalate	670	U	UG/KG	6.70E-07	6.70E-07	1.43E-03
131-11-3	Dimethyl phthalate	670	U	UG/KG			
206-44-0	Fluoranthene	550	J	UG/KG	6.71E-06	6.71E-06	1.28E-04
86-73-7	Fluorene	670	U	UG/KG	8.17E-06	8.17E-06	1.20E-03
118-74-1	Hexachlorobenzene	670	U	UG/KG	1.68E-01	8.59E-03	3.35E-01
87-68-3	Hexachlorobutadiene	670	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	670	U	UG/KG	4.79E-05	4.79E-05	1.68E-03
67-72-1	Hexachloroethane	670	U	UG/KG	3.35E-04	3.35E-04	1.34E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	1500		UG/KG	1.88E-01	8.82E-03	1.07E-01
78-59-1	Isophorone	670	U	UG/KG	1.63E-06	1.63E-06	8.38E-02
621-64-7	N-Nitroso-di-n-propylamine	670	U	UG/KG	8.38E-01	3.72E-02	1.34E+04
86-30-6	N-Nitrosodiphenylamine	670	U	UG/KG	5.58E-04	2.68E-05	6.70E-01
91-20-3	Naphthalene	5600		UG/KG	6.83E-05	6.83E-04	6.67E-02
87-86-5	Pentachlorophenol	3300	U	UG/KG	1.38E-01	6.35E-03	1.10E+02
85-01-8	Phenanthrene	3700		UG/KG	6.07E-05	6.07E-05	8.81E-04
108-95-2	Phenol	670	U	UG/KG	6.70E-07	5.58E-06	6.70E-03
129-00-0	Pyrene	1300		UG/KG	2.13E-05	2.13E-05	3.10E-04

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	720	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	500	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	1000	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	500	U	UG/KG	5.95E-02	2.78E-03	6.25E+02
606-20-2	2,6-Dinitrotoluene	960	UJ	UG/KG	1.14E-01	5.33E-03	1.37E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	1000	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	1000	U	UG/KG			
99-08-1	3-Nitrotoluene	1000	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	1000	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	1000	U	UG/KG			
2691-41-0	HMX	2900		UG/KG			
98-95-3	Nitrobenzene	500	U	UG/KG	5.00E-04	5.00E-04	5.00E+00
55-63-0	Nitroglycerin	1900	U	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	3700	U	UG/KG			
121-82-4	RDX	1000	U	UG/KG			
479-45-8	Tetryl	1500	U	UG/KG			
Metals							
7429-90-5	Aluminum	18500		MG/KG			
7440-36-0	Antimony	6.4		MG/KG	7.80E-03	7.80E-02	1.28E+00
7440-38-2	Arsenic	15.2		MG/KG	5.07E+00	2.49E-01	5.43E-01
7440-39-3	Barium	178		MG/KG	1.27E-03	1.27E-02	1.48E-01
7440-41-7	Beryllium	1		MG/KG	1.00E+00	3.45E-02	1.52E-01
7440-42-8	Boron	15.4		MG/KG	8.56E-05	8.56E-04	
7440-43-9	Cadmium	6.3		MG/KG	3.15E-03	3.15E-02	1.70E+00

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TABLE 19-9
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-70-2	Calcium	120000		MG/KG			
7440-47-3	Chromium	634		MG/KG	6.34E-02	1.55E-01	2.26E+01
7440-48-4	Cobalt	17.3		MG/KG	1.44E-04	1.44E-03	
7440-50-8	Copper	35		MG/KG	4.27E-04	4.27E-03	3.18E-03
7439-89-6	Iron	30100		MG/KG			
7439-92-1	Lead	187		MG/KG	4.68E-01	4.68E-01	
7439-95-4	Magnesium	28800		MG/KG			
7439-96-5	Manganese	2770		MG/KG	2.89E-02	2.89E-01	
7439-97-6	Mercury	0.11	J	MG/KG	1.80E-04	1.80E-03	7.33E-01
7440-02-0	Nickel	24.9		MG/KG	6.07E-04	6.07E-03	3.28E-01
2023695	Potassium	1620		MG/KG			
7782-49-2	Selenium	2.3		MG/KG	2.30E-04	2.30E-03	9.58E-01
7440-22-4	Silver	2	U	MG/KG	2.00E-04	2.00E-03	1.33E+00
7440-23-5	Sodium	207		MG/KG			
7440-28-0	Thallium	0.64	J	MG/KG	4.00E-03	4.00E-03	2.67E-01
7440-62-2	Vanadium	49		MG/KG	3.50E-03	3.50E-02	5.00E-02
7440-66-6	Zinc	221		MG/KG	3.62E-04	3.62E-03	6.14E-02
Other Parameters							
7601-90-3	Perchlorate	10000	U	UG/KG			
TOC	TOC	47600		MG/KG			

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TABLE 19-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	5000	U	UG/L		6.31E+00	2.50E+01
79-34-5	1,1,2,2-Tetrachloroethane	5000	U	UG/L	9.04E-02	1.37E+01	
79-00-5	1,1,2-Trichloroethane	5000	U	UG/L	2.51E-02	2.05E+02	1.00E+03
75-34-3	1,1-Dichloroethane	5000	U	UG/L		6.16E+00	
75-35-4	1,1-Dichloroethene	5000	U	UG/L	1.10E-01	9.13E+01	7.14E+02
107-06-2	1,2-Dichloroethane (EDC)	5000	U	UG/L	4.06E-02	4.94E+02	1.00E+03
78-87-5	1,2-Dichloropropane	5000	U	UG/L	3.03E-02	7.24E+02	1.00E+03
78-93-3	2-Butanone (MEK)	25000	U	UG/L		1.31E+01	
591-78-6	2-Hexanone	25000	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	25000	U	UG/L		1.58E+02	
67-64-1	Acetone	25000	U	UG/L		4.11E+01	
71-43-2	Benzene	5000	U	UG/L	1.22E-02	4.46E+02	1.00E+03
75-27-4	Bromodichloromethane	5000	U	UG/L	2.77E-02	4.11E+01	
75-25-2	Bromoform	5000	U	UG/L	5.88E-04	6.85E+00	
74-83-9	Bromomethane	5000	U	UG/L		5.77E+02	
75-15-0	Carbon disulfide	5000	U	UG/L		4.79E+00	
56-23-5	Carbon tetrachloride	5000	U	UG/L	2.92E-02	1.17E+03	1.00E+03
108-90-7	Chlorobenzene	5000	U	UG/L		4.71E+01	5.00E+01
75-00-3	Chloroethane	5000	U	UG/L	1.08E-03	5.82E-01	
67-66-3	Chloroform	5000	U	UG/L	3.04E-02	7.98E+03	
74-87-3	Chloromethane	5000	U	UG/L	3.31E-03		
156-59-2	cis-1,2-Dichloroethene	10000		UG/L		1.64E+02	1.43E+02
10061-01-5	cis-1,3-Dichloropropene	5000	U	UG/L	6.17E-02	5.76E+02	
124-48-1	Dibromochloromethane	5000	U	UG/L	3.75E-02	4.11E+01	
100-41-4	Ethylbenzene	5000	U	UG/L		3.73E+00	7.14E+00

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TABLE 19-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
75-09-2	Methylene chloride	5000	U	UG/L	1.17E-03	3.08E+00	1.00E+03
110-54-3	N-Hexane	5000	U	UG/L		1.43E+01	
100-42-5	Styrene	5000	U	UG/L		3.05E+00	5.00E+01
127-18-4	Tetrachloroethylene (PCE)	5000	U	UG/L	4.62E-03	1.97E+01	1.00E+03
108-88-3	Toluene	5000	U	UG/L		6.91E+00	5.00E+00
1330-20-7	total Xylenes	5000	U	UG/L		3.49E+00	5.00E-01
156-60-5	trans-1,2-Dichloroethene	5000	U	UG/L		4.11E+01	5.00E+01
10061-02-6	trans-1,3-Dichloropropene	5000	U	UG/L	6.17E-02	5.76E+02	
79-01-6	Trichloroethylene (TCE)	280000		UG/L	1.71E-01	7.67E+03	5.60E+04
75-01-4	Vinyl chloride	5000	U	UG/L	2.53E-01		2.50E+03
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		1.37E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	50	U	UG/L		6.85E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
90-12-0	1-Methylnaphthalene	1.6	J	UG/L		2.58E-01	
91-57-6	2-Methylnaphthalene	7.9		UG/L		4.33E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	
88-74-4	2-Nitroaniline	50	U	UG/L		2.40E+01	

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TABLE 19-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L	1.34E-04		
99-09-2	3-Nitroaniline	50	U	UG/L		2.40E+01	
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	20	U	UG/L		1.37E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	50	U	UG/L		2.40E+01	
100-02-7	4-Nitrophenol	50	U	UG/L		1.71E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	4.6		UG/L		2.52E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	10	U	UG/L	1.09E-04		
50-32-8	Benzo(a)pyrene	10	U	UG/L	1.09E-03		5.00E+01
205-99-2	Benzo(b)fluoranthene	10	U	UG/L	1.09E-04		
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		5.48E-02	
207-08-9	Benzo(k)fluoranthene	10	U	UG/L	1.09E-05		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	U	UG/L	2.08E-06	1.37E-02	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	10	U	UG/L	1.09E-06		

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TABLE 19-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
84-74-2	Di-n-butyl phthalate	10	U	UG/L		2.74E-03	
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	10	U	UG/L		3.42E-04	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	10	U	UG/L		6.85E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L	1.09E-04		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	UJ	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	59		UG/L		9.51E+00	
87-86-5	Pentachlorophenol	50	U	UG/L	8.92E-05	4.57E-02	5.00E+01
85-01-8	Phenanthrene	0.59		UG/L		3.23E-03	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	10	U	UG/L		5.48E-02	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	U	UG/L		2.28E-04	
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	9.5		UG/L	4.24E-06	5.21E-01	
121-14-2	2,4-Dinitrotoluene	10	U	UG/L		1.37E-01	

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J = Estimated U = Nondetect

TABLE 19-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
606-20-2	2,6-Dinitrotoluene	1		UG/L		2.74E-02	
	Dinitrotoluene Mixture	1		UG/L	1.01E-05		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.93		UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	17		UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		8.22E-03	
2691-41-0	HMX	0.5	U	UG/L		2.74E-04	
98-95-3	Nitrobenzene	10	U	UG/L		2.95E+00	
55-63-0	Nitroglycerin	1	U	UG/L	2.08E-07		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L			
121-82-4	RDX	0.5	U	UG/L	8.18E-07	4.57E-03	
479-45-8	Tetryl	4.5		UG/L		1.23E-02	
Metals							
7429-90-5	Aluminum	2140		UG/L		5.86E-02	
7440-36-0	Antimony	6	U	UG/L		4.11E-01	1.00E+00
7440-38-2	Arsenic	10	U	UG/L	2.23E-04	9.13E-01	2.00E-01
7440-39-3	Barium	41.3	J	UG/L		1.62E-02	2.07E-02
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	283		UG/L		8.61E-02	1.42E-01
7440-43-9	Cadmium	5	U	UG/L		2.74E-01	1.00E+00
7440-70-2	Calcium	364000		UG/L			
7440-47-3	Chromium	3	J	UG/L			3.00E-02
7440-48-4	Cobalt	50	U	UG/L		2.28E-02	5.00E-02
7440-50-8	Copper	1.1	J	UG/L		8.11E-04	1.69E-03
7439-89-6	Iron	1430		UG/L		1.31E-01	2.86E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-10
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7439-92-1	Lead	3	U	UG/L			4.00E-01
7439-95-4	Magnesium	227000		UG/L			
7439-96-5	Manganese	1580		UG/L		1.80E+00	1.05E+01
7439-97-6	Mercury	0.2	U	UG/L			1.00E-01
7440-02-0	Nickel	14.9		UG/L		2.04E-02	1.49E-01
2023695	Potassium	1030	J	UG/L			
7782-49-2	Selenium	5.9		UG/L		3.23E-02	1.18E-01
7440-22-4	Silver	10	U	UG/L		5.48E-02	2.00E-01
7440-23-5	Sodium	194000		UG/L			
7440-28-0	Thallium	10	U	UG/L		3.91E+00	5.00E+00
7440-62-2	Vanadium	50	U	UG/L		1.96E-01	
7440-66-6	Zinc	5.1	J	UG/L		4.66E-04	1.02E-03
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	316	J	MG/L			
7664-41-7	Nitrogen, Ammonia (as N)	0.1	U	MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.61	J	MG/L		6.10E-01	6.10E-01
7601-90-3	Perchlorate	500	U	UG/L		2.74E+01	
7723-14-0	Phosphorus, Total (as P)	0.07		MG/L		9.59E+01	
14808-79-8	Sulfate (as SO4)	720000		UG/L			1.80E+00
TDS	TDS	3140		MG/L			2.62E+00
TSS	TSS	5.5		MG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	5	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		
67-64-1	Acetone	5	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1		UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	0.5	J	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	7		UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	1		UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	22		UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1.9	J	UG/L		
85-68-7	Butyl benzyl phthalate	1.6	J	UG/L		
86-74-8	Carbazole	10	U	UG/L		
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		

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TABLE 19-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	1.5	J	UG/L	1.50E-01	1.50E-02
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	U	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L		
121-14-2	2,4-Dinitrotoluene	0.25	U	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	5.5		UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L		
99-08-1	3-Nitrotoluene	0.5	U	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	18		UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		
2691-41-0	HMX	0.68		UG/L		
98-95-3	Nitrobenzene	0.73		UG/L		
55-63-0	Nitroglycerin	1	U	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L		
121-82-4	RDX	0.5	U	UG/L		
479-45-8	Tetryl	0.75	U	UG/L		
Metals						
7429-90-5	Aluminum	68600		UG/L	3.43E+02	
7440-36-0	Antimony	4.7	J	UG/L	7.83E-01	
7440-38-2	Arsenic	37.5		UG/L	3.75E+00	
7440-39-3	Barium	1270		UG/L	5.59E+01	2.54E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-11
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7440-41-7	Beryllium	13.2		UG/L	2.64E+00	
7440-42-8	Boron	135		UG/L		1.35E-01
7440-43-9	Cadmium	4.9	J	UG/L	9.80E-01	
7440-70-2	Calcium	299000		UG/L	4.15E+01	
7440-47-3	Chromium	214		UG/L	2.14E+01	
7440-48-4	Cobalt	231		UG/L	4.62E+00	
7440-50-8	Copper	119		UG/L	1.19E+01	
7439-89-6	Iron	87800		UG/L	8.78E+02	8.78E+01
7439-92-1	Lead	104		UG/L	5.20E+01	
7439-95-4	Magnesium	122000		UG/L	4.81E+01	
7439-96-5	Manganese	22200		UG/L	3.81E+01	2.22E+01
7439-97-6	Mercury	0.87	J	UG/L	4.35E+00	7.25E+01
7440-02-0	Nickel	153		UG/L	1.53E+01	1.53E-01
2023695	Potassium	9220		UG/L	5.72E+00	
7782-49-2	Selenium	16.1		UG/L	5.96E+00	1.61E-02
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	86400		UG/L	2.73E+01	
7440-28-0	Thallium	4.7	J	UG/L	4.70E-01	
7440-62-2	Vanadium	132		UG/L	2.64E+00	
7440-66-6	Zinc	1760		UG/L	8.80E+01	1.76E+00
Other Parameters						
ALK	Alkalinity, Total (as CaCO3)	142		MG/L	4.63E+00	
7664-41-7	Nitrogen, Ammonia (as N)	2.1		MG/L	8.08E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	1.7		MG/L	3.40E+01	
7601-90-3	Perchlorate	500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.095		MG/L	1.90E+00	
14808-79-8	Sulfate (as SO4)	520000		UG/L		1.04E+00
TDS	TDS	825		MG/L	1.15E+01	8.25E-01
TSS	TSS	56		MG/L	7.00E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SIES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		10	U	UG/KG	3.36E-04	
79-34-5	1,1,2,2-Tetrachloroethane		10	U	UG/KG	7.86E-02	
79-00-5	1,1,2-Trichloroethane		53		UG/KG	1.85E-03	
75-34-3	1,1-Dichloroethane		10	U	UG/KG	4.98E-04	
75-35-4	1,1-Dichloroethene		10	U	UG/KG	1.21E-03	
107-06-2	1,2-Dichloroethane (EDC)		10	U	UG/KG	4.72E-04	
540-59-0	1,2-Dichloroethene (total)		1300	E	UG/KG	1.65E+00	
78-87-5	1,2-Dichloropropane		10	U	UG/KG	1.43E-05	
78-93-3	2-Butanone (MEK)		1100	J	UG/KG	1.23E-02	
591-78-6	2-Hexanone		20	U	UG/KG	1.59E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		20	U	UG/KG	4.51E-05	
67-64-1	Acetone		20	U	UG/KG	8.00E-03	
71-43-2	Benzene		10	U	UG/KG	6.25E-04	
75-27-4	Bromodichloromethane		10	U	UG/KG	1.85E-02	
75-25-2	Bromoform		10	U	UG/KG	6.29E-04	
74-83-9	Bromomethane		10	U	UG/KG	4.25E-02	
75-15-0	Carbon disulfide		10	U	UG/KG	1.06E-01	
56-23-5	Carbon tetrachloride		10	U	UG/KG	1.00E-05	
108-90-7	Chlorobenzene		10	U	UG/KG	2.50E-04	
75-00-3	Chloroethane		10	U	UG/KG		
67-66-3	Chloroform		10	U	UG/KG	8.40E-03	
74-87-3	Chloromethane		10	U	UG/KG	9.62E-04	
156-59-2	cis-1,2-Dichloroethene		1300	E	UG/KG	1.65E+00	
10061-01-5	cis-1,3-Dichloropropene		10	U	UG/KG	2.51E-02	
124-48-1	Dibromochloromethane		10	U	UG/KG	4.88E-03	
100-41-4	Ethylbenzene		110		UG/KG	2.20E-02	
75-09-2	Methylene chloride		10	U	UG/KG	2.47E-03	
110-54-3	N-Hexane		10	U	UG/KG		
100-42-5	Styrene		10	U	UG/KG	3.33E-05	
127-18-4	Tetrachloroethylene (PCE)		12		UG/KG	9.23E-04	
108-88-3	Toluene		98		UG/KG	3.27E-02	
1330-20-7	total Xylenes		450		UG/KG	7.50E-01	
156-60-5	trans-1,2-Dichloroethene		9		UG/KG	1.14E-02	
10061-02-6	trans-1,3-Dichloropropene		10	U	UG/KG	2.51E-02	
79-01-6	Trichloroethylene (TCE)		21000		UG/KG	2.33E+00	
75-01-4	Vinyl chloride		10	U	UG/KG	1.55E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		560	U	UG/KG	2.80E-02	
95-50-1	1,2-Dichlorobenzene		560	U	UG/KG	1.89E-01	
541-73-1	1,3-Dichlorobenzene		560	U	UG/KG	1.49E-02	
106-46-7	1,4-Dichlorobenzene		560	U	UG/KG	2.80E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SIES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2800	U	UG/KG	7.00E-01	
88-06-2	2,4,6-Trichlorophenol		560	U	UG/KG	5.60E-02	
120-83-2	2,4-Dichlorophenol		560	U	UG/KG	6.40E-03	
105-67-9	2,4-Dimethylphenol		560	U	UG/KG	5.60E+01	
51-28-5	2,4-Dinitrophenol		2800	U	UG/KG	1.40E-01	
91-58-7	2-Chloronaphthalene		560	U	UG/KG	4.60E+01	
95-57-8	2-Chlorophenol		560	U	UG/KG	2.31E+00	
90-12-0	1-Methylnaphthalene		1000		UG/KG		
91-57-6	2-Methylnaphthalene		11000		UG/KG	3.40E+00	YES
95-48-7	2-Methylphenol		560	U	UG/KG	1.39E-02	
88-74-4	2-Nitroaniline		2800	U	UG/KG	3.78E-02	
88-75-5	2-Nitrophenol		560	U	UG/KG	3.50E-01	
91-94-1	3,3'-Dichlorobenzidine		560	U	UG/KG	8.66E-01	
99-09-2	3-Nitroaniline		2800	U	UG/KG	8.86E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2800	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		560	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		560	U	UG/KG	7.04E-02	
106-47-8	4-Chloroaniline		1100	U	UG/KG	1.00E+00	
7005-72-3	4-Chlorophenyl phenyl ether		560	U	UG/KG		
106-44-5	4-Methylphenol		560	U	UG/KG	3.44E-03	
100-01-6	4-Nitroaniline		2800	U	UG/KG	1.28E-01	
100-02-7	4-Nitrophenol		2800	U	UG/KG	4.00E-01	
83-32-9	Acenaphthene		560	U	UG/KG	8.21E-04	
208-96-8	Acenaphthylene		500		UG/KG	7.33E-04	
120-12-7	Anthracene		700		UG/KG	4.73E-04	YES
56-55-3	Benzo(a)anthracene		3700		UG/KG	7.10E-01	YES
50-32-8	Benzo(a)pyrene		4200		UG/KG	9.55E-04	YES
205-99-2	Benzo(b)fluoranthene		6700		UG/KG	1.12E-01	YES
191-24-2	Benzo(g,h,i)perylene		2500		UG/KG	2.10E-02	YES
207-08-9	Benzo(k)fluoranthene		2200		UG/KG	3.68E-02	YES
111-91-1	bis(2-Chloroethoxy)methane		560	U	UG/KG	1.85E+00	
111-44-4	bis(2-Chloroethyl) ether		560	U	UG/KG	2.36E-02	
108-60-1	bis(2-Chloroisopropyl) ether		560	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1700		UG/KG	1.84E+00	YES
85-68-7	Butyl benzyl phthalate		560	U	UG/KG	2.34E+00	
86-74-8	Carbazole		630		UG/KG		YES
218-01-9	Chrysene		4000		UG/KG	8.46E-01	YES
84-74-2	Di-n-butyl phthalate		1600		UG/KG	8.00E-03	YES
117-84-0	Di-n-octyl phthalate		560	U	UG/KG	7.90E-04	
53-70-3	Dibenz(a,h)anthracene		790		UG/KG	4.29E-02	YES
132-64-9	Dibenzofuran		3000		UG/KG		YES
84-66-2	Diethyl phthalate		560	U	UG/KG	5.60E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SIES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		1300		UG/KG	6.50E-03	
206-44-0	Fluoranthene		5500		UG/KG	4.51E-02	YES
86-73-7	Fluorene		180	J	UG/KG	6.00E-03	YES
118-74-1	Hexachlorobenzene		560	U	UG/KG	5.60E-04	
87-68-3	Hexachlorobutadiene		560	U	UG/KG	1.41E+01	
77-47-4	Hexachlorocyclopentadiene		560	U	UG/KG	5.60E-02	
67-72-1	Hexachloroethane		560	U	UG/KG	9.39E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		2800		UG/KG	2.57E-02	YES
78-59-1	Isophorone		560	U	UG/KG	4.03E-03	
621-64-7	N-Nitroso-di-n-propylamine		560	U	UG/KG	1.03E+00	
86-30-6	N-Nitrosodiphenylamine		560	U	UG/KG	2.80E-02	
91-20-3	Naphthalene		6200		UG/KG	2.49E-02	
98-95-3	Nitrobenzene		510	U	UG/KG	1.28E-02	
87-86-5	Pentachlorophenol		2800	U	UG/KG	4.67E-01	
85-01-8	Phenanthrene		4300		UG/KG	9.41E-02	YES
108-95-2	Phenol		560	U	UG/KG	1.40E-02	
129-00-0	Pyrene		6500		UG/KG	8.28E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		420	UJ	UG/KG	1.12E+00	
99-65-0	1,3-Dinitrobenzene		420	UJ	UG/KG	6.42E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		850	UJ	UG/KG	2.83E-02	
121-14-2	2,4-Dinitrotoluene		74	J	UG/KG	5.78E-02	
606-20-2	2,6-Dinitrotoluene		660	UJ	UG/KG	2.01E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		850	UJ	UG/KG	1.06E-02	
88-72-2	2-Nitrotoluene (ONT)		850	UJ	UG/KG		
99-08-1	3-Nitrotoluene		850	UJ	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		850	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		850	UJ	UG/KG		
2691-41-0	HMX		850	UJ	UG/KG	3.40E-02	
55-63-0	Nitroglycerin		1300	U	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		2500	U	UG/KG		
121-82-4	RDX		850	UJ	UG/KG	8.50E-03	
479-45-8	Tetryl		1300	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	20900		MG/KG		
7440-36-0	Antimony	0.83	2.6		MG/KG	5.20E-01	
7440-38-2	Arsenic	13.5	27.4		MG/KG	3.04E+00	
7440-39-3	Barium	195	513		MG/KG	1.03E+00	
7440-41-7	Beryllium	0.76	2.8		MG/KG	2.80E-01	
7440-42-8	Boron	5.3	41.9		MG/KG	8.38E+01	
7440-43-9	Cadmium	0.19	26.8		MG/KG	9.24E-01	
7440-70-2	Calcium	2497	234000		MG/KG		

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TABLE 19-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SIES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-47-3	Chromium	25.2	28.7		MG/KG	5.74E+00	
7440-48-4	Cobalt	21.7	110		MG/KG	5.50E+00	
7440-50-8	Copper	11.3	39.5		MG/KG	1.27E+00	
7439-89-6	Iron	19306	35900		MG/KG	1.80E+02	
7439-92-1	Lead	23.4	180		MG/KG	4.16E-01	
7439-95-4	Magnesium	1552	85700		MG/KG		
7439-96-5	Manganese	3640	8930	J	MG/KG	8.93E+01	
7439-97-6	Mercury	0.06	5.1	J	MG/KG	7.29E-01	YES
7440-02-0	Nickel	18.9	151		MG/KG	5.03E+00	
2023695	Potassium	625	1350		MG/KG		
7782-49-2	Selenium	2.34	5.2		MG/KG	5.20E+00	YES
7440-22-4	Silver	0.58	1.4		MG/KG	7.00E-01	
7440-23-5	Sodium	170	243		MG/KG		
7440-28-0	Thallium	0.41	2.9	J	MG/KG	2.90E+00	
7440-62-2	Vanadium	47.2	57.4	J	MG/KG	1.25E+00	
7440-66-6	Zinc	51.4	685		MG/KG	5.71E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		8	U	UG/KG	4.71E-02	
79-34-5	1,1,2,2-Tetrachloroethane		8	U	UG/KG	8.51E-03	
79-00-5	1,1,2-Trichloroethane		8	U	UG/KG	7.52E-03	
75-34-3	1,1-Dichloroethane		8	U	UG/KG	8.53E-02	
75-35-4	1,1-Dichloroethene		8	U	UG/KG	7.50E-02	
107-06-2	1,2-Dichloroethane (EDC)		8	U	UG/KG	6.52E-03	
540-59-0	1,2-Dichloroethene (total)		8	U	UG/KG	3.23E-02	
78-87-5	1,2-Dichloropropane		8	U	UG/KG	5.80E-03	
78-93-3	2-Butanone (MEK)		16	U	UG/KG	3.64E-03	
591-78-6	2-Hexanone		16	U	UG/KG	1.21E-01	
108-10-1	4-Methyl-2-pentanone (MIBK)		16	U	UG/KG	7.65E-02	
67-64-1	Acetone		16	U	UG/KG	1.90E-01	
71-43-2	Benzene		8	U	UG/KG	1.40E-01	
75-27-4	Bromodichloromethane		8	U	UG/KG	4.56E-04	
75-25-2	Bromoform		8	U	UG/KG	6.40E-03	
74-83-9	Bromomethane		8	U	UG/KG	7.64E-04	
75-15-0	Carbon disulfide		8	U	UG/KG	4.00E+00	
56-23-5	Carbon tetrachloride		8	U	UG/KG	1.03E-01	
108-90-7	Chlorobenzene		8	U	UG/KG	9.76E-03	
75-00-3	Chloroethane		8	U	UG/KG	5.53E-04	
67-66-3	Chloroform		8	U	UG/KG	1.14E-01	
74-87-3	Chloromethane		8	U	UG/KG	1.67E-04	
156-59-2	cis-1,2-Dichloroethene		8	U	UG/KG	6.80E-03	
10061-01-5	cis-1,3-Dichloropropene		8	U	UG/KG	3.20E+01	
124-48-1	Dibromochloromethane		8	U	UG/KG	2.60E-04	
100-41-4	Ethylbenzene		8	U	UG/KG	2.22E-03	
75-09-2	Methylene chloride		8	U	UG/KG	8.66E-03	
110-54-3	N-Hexane		8	U	UG/KG		
100-42-5	Styrene		8	U	UG/KG	3.70E-04	
127-18-4	Tetrachloroethylene (PCE)		8	U	UG/KG	1.50E-02	
108-88-3	Toluene		8	U	UG/KG	1.19E-02	
1330-20-7	total Xylenes		8	U	UG/KG	3.20E-01	
156-60-5	trans-1,2-Dichloroethene		8	U	UG/KG	6.80E-03	
10061-02-6	trans-1,3-Dichloropropene		8	U	UG/KG	1.64E-01	
79-01-6	Trichloroethylene (TCE)		8	U	UG/KG	5.00E-03	
75-01-4	Vinyl chloride		8	U	UG/KG	3.03E-04	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		670	U	UG/KG	7.28E-02	
95-50-1	1,2-Dichlorobenzene		670	U	UG/KG	1.97E+00	
541-73-1	1,3-Dichlorobenzene		670	U	UG/KG	3.94E-01	
106-46-7	1,4-Dichlorobenzene		670	U	UG/KG	1.91E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 19-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		3300	U	UG/KG	2.28E+00	
88-06-2	2,4,6-Trichlorophenol		670	U	UG/KG	3.65E+01	
120-83-2	2,4-Dichlorophenol		670	U	UG/KG	1.84E+00	
105-67-9	2,4-Dimethylphenol		670	U	UG/KG	1.49E+01	
51-28-5	2,4-Dinitrophenol		3300	U	UG/KG	2.66E+02	
91-58-7	2-Chloronaphthalene		670	U	UG/KG	1.91E-01	
95-57-8	2-Chlorophenol		670	U	UG/KG	3.03E+00	
91-57-6	2-Methylnaphthalene		11000		UG/KG	1.57E+02	YES
95-48-7	2-Methylphenol		670	U	UG/KG	1.47E+02	
88-74-4	2-Nitroaniline		3300	U	UG/KG	6.83E-02	
88-75-5	2-Nitrophenol		670	U	UG/KG	2.10E-01	
91-94-1	3,3'-Dichlorobenzidine		670	U	UG/KG	3.35E-01	
99-09-2	3-Nitroaniline		3300	U	UG/KG	5.55E-02	
534-52-1	4,6-Dinitro-2-methylphenol		3300	U	UG/KG	3.94E+02	
101-55-3	4-Bromophenyl phenyl ether		670	U	UG/KG	5.15E-01	
59-50-7	4-Chloro-3-methylphenol		670	U	UG/KG	4.47E+03	
106-47-8	4-Chloroaniline		1300	U	UG/KG	7.93E-02	
7005-72-3	4-Chlorophenyl phenyl ether		670	U	UG/KG	4.87E-01	
106-44-5	4-Methylphenol		670	U	UG/KG	1.67E-01	
100-01-6	4-Nitroaniline		3300	U	UG/KG	9.11E-02	
100-02-7	4-Nitrophenol		3300	U	UG/KG	7.95E+01	
83-32-9	Acenaphthene		180	J	UG/KG	1.13E+01	YES
208-96-8	Acenaphthylene		250	J	UG/KG	5.68E+00	
120-12-7	Anthracene		370	J	UG/KG	6.49E+00	YES
56-55-3	Benzo(a)anthracene		630		UG/KG	5.83E+00	YES
50-32-8	Benzo(a)pyrene		1000		UG/KG	6.67E+00	YES
205-99-2	Benzo(b)fluoranthene		2600		UG/KG	9.63E+01	YES
191-24-2	Benzo(g,h,i)perylene		1500		UG/KG	9.38E+01	YES
207-08-9	Benzo(k)fluoranthene		750		UG/KG	2.78E+01	YES
111-91-1	bis(2-Chloroethoxy)methane		670	U	UG/KG	5.15E-01	
111-44-4	bis(2-Chloroethyl) ether		670	U	UG/KG	2.35E-01	
108-60-1	bis(2-Chloroisopropyl) ether		670	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		2600		UG/KG	3.47E+00	YES
85-68-7	Butyl benzyl phthalate		670	U	UG/KG	6.09E-02	
86-74-8	Carbazole		320	J	UG/KG	9.70E-02	YES
218-01-9	Chrysene		1200		UG/KG	7.23E+00	YES
84-74-2	Di-n-butyl phthalate		56	J	UG/KG	5.09E-03	YES
117-84-0	Di-n-octyl phthalate		670	U	UG/KG	9.46E-04	
53-70-3	Dibenz(a,h)anthracene		340	J	UG/KG	1.03E+01	YES
132-64-9	Dibenzofuran		3100		UG/KG	1.55E+00	YES
84-66-2	Diethyl phthalate		670	U	UG/KG	1.06E+00	
131-11-3	Dimethyl phthalate		670	U	UG/KG	1.28E-03	

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TABLE 19-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		550	J	UG/KG	1.30E+00	YES
86-73-7	Fluorene		670	U	UG/KG	8.66E+00	
118-74-1	Hexachlorobenzene		670	U	UG/KG	6.70E+00	
87-68-3	Hexachlorobutadiene		670	U	UG/KG	1.40E+01	
77-47-4	Hexachlorocyclopentadiene		670	U	UG/KG	2.24E+02	
67-72-1	Hexachloroethane		670	U	UG/KG	9.85E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		1500		UG/KG	8.82E+01	YES
78-59-1	Isophorone		670	U	UG/KG	5.84E-01	
621-64-7	N-Nitroso-di-n-propylamine		670	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		670	U	UG/KG	9.57E-01	
91-20-3	Naphthalene		5600		UG/KG	3.18E+01	
87-86-5	Pentachlorophenol		3300	U	UG/KG	4.46E+01	
85-01-8	Phenanthrene		3700		UG/KG	1.81E+01	YES
108-95-2	Phenol		670	U	UG/KG	1.40E+01	
129-00-0	Pyrene		1300		UG/KG	6.67E+00	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		720	UJ	UG/KG	1.76E+01	
99-65-0	1,3-Dinitrobenzene		500	U	UG/KG	1.00E+02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		1000	U	UG/KG	1.72E+00	
121-14-2	2,4-Dinitrotoluene		500	U	UG/KG	7.71E-01	
606-20-2	2,6-Dinitrotoluene		960	UJ	UG/KG	1.12E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		1000	U	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		1000	U	UG/KG	5.95E-02	
99-08-1	3-Nitrotoluene		1000	U	UG/KG	8.40E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		1000	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		1000	U	UG/KG	5.35E-02	
2691-41-0	HMX		2900		UG/KG	2.90E+02	
98-95-3	Nitrobenzene		500	U	UG/KG	8.54E-01	
55-63-0	Nitroglycerin		1900	U	UG/KG	5.76E+00	
78-11-5	Pentaerythritol tetranitrate (PETN)		3700	U	UG/KG	7.84E-03	
121-82-4	RDX		1000	U	UG/KG	5.00E+00	
479-45-8	Tetryl		1500	U	UG/KG		
Metals							
7429-90-5	Aluminum	11241	18500		MG/KG	7.12E-01	
7440-36-0	Antimony	1.9	6.4		MG/KG	2.13E+00	
7440-38-2	Arsenic	10.3	15.2		MG/KG	1.55E+00	
7440-39-3	Barium	196	178		MG/KG		
7440-41-7	Beryllium	1.6	1		MG/KG		
7440-42-8	Boron		15.4		MG/KG		
7440-43-9	Cadmium	1.6	6.3		MG/KG	6.36E+00	
7440-70-2	Calcium	1448	120000		MG/KG		
7440-47-3	Chromium	17.2	634		MG/KG	1.46E+01	

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TABLE 19-13
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-48-4	Cobalt	9.1	17.3		MG/KG	3.46E-01	
7440-50-8	Copper	16.8	35		MG/KG	1.11E+00	
7439-89-6	Iron	20750	30100		MG/KG	1.58E-01	
7439-92-1	Lead	24	187		MG/KG	5.22E+00	
7439-95-4	Magnesium	1909	28800		MG/KG		
7439-96-5	Manganese	1043	2770		MG/KG	4.40E+00	
7439-97-6	Mercury	0.15	0.11	J	MG/KG	6.11E-01	YES
7440-02-0	Nickel	16.9	24.9		MG/KG	1.10E+00	
2023695	Potassium	1421	1620		MG/KG		
7782-49-2	Selenium	0.64	2.3		MG/KG		YES
7440-22-4	Silver	3	2	U	MG/KG	2.00E+00	
7440-23-5	Sodium	1450	207		MG/KG		
7440-28-0	Thallium	0.31	0.64	J	MG/KG		
7440-62-2	Vanadium	28	49		MG/KG		
7440-66-6	Zinc	57.1	221		MG/KG	1.83E+00	
Other Parameters							
7601-90-3	Perchlorate		10000	U	UG/KG		
TOC	TOC	62778	47600		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		5	U	UG/L	3.57E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		5	U	UG/L	2.94E-02	
67-64-1	Acetone		5	U	UG/L	9.86E-03	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1		UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		0.5	J	UG/L	1.79E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		7		UG/L	1.19E-02	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		1		UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		22		UG/L	4.68E-01	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1.9	J	UG/L	6.33E-01	YES
85-68-7	Butyl benzyl phthalate		1.6	J	UG/L	8.42E-02	YES
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	1.5	J	UG/L	1.50E-02	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	UJ	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	U	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	UJ	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	U	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	UJ	UG/L	1.19E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		5.5		UG/L	2.75E-01	
88-72-2	2-Nitrotoluene (ONT)		0.5	U	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	U	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		18		UG/L	3.33E-02	
99-99-0	4-Nitrotoluene (PNT)		0.5	UJ	UG/L	7.14E-05	
2691-41-0	HMX		0.68		UG/L	2.06E-03	
98-95-3	Nitrobenzene		0.73		UG/L	2.70E-03	
55-63-0	Nitroglycerin		1	U	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		2	U	UG/L	2.35E-05	
121-82-4	RDX		0.5	U	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	U	UG/L		
Metals							
7429-90-5	Aluminum	200	68600		UG/L	7.89E+02	
7440-36-0	Antimony	6	4.7	J	UG/L	1.57E-01	
7440-38-2	Arsenic	10	37.5		UG/L	1.97E-01	
7440-39-3	Barium	22.7	1270		UG/L	2.54E-01	
7440-41-7	Beryllium	5	13.2		UG/L	2.49E+01	
7440-42-8	Boron		135		UG/L	1.35E-01	
7440-43-9	Cadmium	5	4.9	J	UG/L	4.45E+00	
7440-70-2	Calcium	7197	299000		UG/L	2.58E+00	
7440-47-3	Chromium	10	214		UG/L	1.03E+00	
7440-48-4	Cobalt	50	231		UG/L	1.00E+02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-14
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 11S (AUS-A11S)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7440-50-8	Copper	10	119		UG/L	1.01E+01	
7439-89-6	Iron	100	87800		UG/L	8.78E+01	
7439-92-1	Lead	2	104		UG/L	5.17E+00	
7439-95-4	Magnesium	2534	122000		UG/L	1.49E+00	
7439-96-5	Manganese	582	22200		UG/L	2.22E+01	
7439-97-6	Mercury	0.2	0.87	J	UG/L	6.69E-01	YES
7440-02-0	Nickel	10	153		UG/L	1.53E-01	
2023695	Potassium	1613	9220		UG/L	1.74E-01	
7782-49-2	Selenium	2.7	16.1		UG/L	1.61E-02	YES
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	86400		UG/L	1.27E-01	
7440-28-0	Thallium	10	4.7	J	UG/L	1.18E+00	
7440-62-2	Vanadium	50	132		UG/L	6.95E+00	
7440-66-6	Zinc	20	1760		UG/L	1.76E+00	
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	30.7	142		MG/L		
7664-41-7	Nitrogen, Ammonia (as N)	0.26	2.1		MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	1.7		MG/L		
7601-90-3	Perchlorate		500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.05	0.095		MG/L		
14808-79-8	Sulfate (as SO4)		520000		UG/L		
TDS	TDS	71.7	825		MG/L		
TSS	TSS	8	56		MG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 19-15, AUS-A11S
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	Uncertainty	B	No	A	No	A
1,1,2,2-Tetrachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,1,2-Trichloroethane	No	C	Uncertainty	B	Uncertainty	B	Yes	E
1,1-Dichloroethane	No	C	Uncertainty	B	No	A	No	A
1,1-Dichloroethene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A	Yes	E
1,2-Dichloropropane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2-Butanone (MEK)	No	C	Uncertainty	B	No	A	No	F
2-Hexanone	No	C	No	C	No	C	No	C
4-Methyl-2-pentanone (MIBK)	No	C	Uncertainty	B	No	A	No	A
Acetone	No	C	Uncertainty	B	No	A	No	A
Benzene	No	A	Uncertainty	B	Uncertainty	B	Uncertainty	B
Bromodichloromethane	No	C	Uncertainty	B	No	A	No	A
Bromoform	No	C	Uncertainty	B	No	A	No	A
Bromomethane	No	C	Uncertainty	B	No	A	Uncertainty	B
Carbon disulfide	No	C	Uncertainty	B	No	A	No	A
Carbon tetrachloride	Uncertainty	G	Uncertainty	B	Uncertainty	B	Uncertainty	B
Chlorobenzene	No	C	Uncertainty	B	No	A	No	A
Chloroethane	No	C	Uncertainty	B	No	A	No	A
Chloroform	Uncertainty	G	Uncertainty	B	No	A	No	A
Chloromethane	No	C	Uncertainty	B	No	A	No	A
cis-1,2-Dichloroethene	Uncertainty	G	Yes	E	No	A	Yes	E
cis-1,3-Dichloropropene	No	C	Uncertainty	B	No	A	No	A
Dibromochloromethane	No	C	Uncertainty	B	No	A	No	A
Ethylbenzene	No	A	Uncertainty	B	No	A	No	F
Methylene chloride	No	A	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Hexane	No	C	Uncertainty	B	No	A	No	A
Styrene	No	C	Uncertainty	B	No	A	No	A
Tetrachloroethylene (PCE)	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Toluene	No	F	Uncertainty	B	No	A	No	F
total Xylenes	No	A	Uncertainty	B	No	A	No	F
trans-1,2-Dichloroethene	No	C	Uncertainty	B	No	A	No	F
trans-1,3-Dichloropropene	No	C	Uncertainty	B	No	A	No	A
Trichloroethylene (TCE)	Uncertainty	G	Yes	E	Uncertainty	B	Yes	E
Vinyl chloride	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	No	A	No	A	No	A
1,3-Dichlorobenzene	No	C	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	No	A	No	A	No	A

TABLE 19-15, AUS-A11S
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	No	A	No	A	No	A
2-Chlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	No	F	NA	NA	No	F
2-Methylnaphthalene	No	A	No	F	No	F	No	F
2-Methylphenol	No	C	No	A	No	A	No	A
2-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
2-Nitrophenol	No	C	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	No	C	No	C	No	C
4-Bromophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Chloro-3-methylphenol	No	C	No	A	No	A	No	A
4-Chloroaniline	No	C	No	A	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Methylphenol	No	C	No	A	No	A	No	A
4-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4-Nitrophenol	No	C	No	A	No	A	No	A
Acenaphthene	No	C	No	A	No	F	No	A
Acenaphthylene	No	A	No	F	No	F	No	F
Anthracene	No	A	No	A	No	F	No	F
Benzo(a)anthracene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	No	A	No	A	No	F	No	F
Benzo(k)fluoranthene	No	C	Uncertainty	B	No	F	Yes	E
bis(2-Chloroethoxy)methane	No	C	No	C	No	C	No	C
bis(2-Chloroethyl) ether	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	Uncertainty	G	Uncertainty	B	No	F	No	F
Butyl benzyl phthalate	Uncertainty	G	No	A	No	A	No	A
Carbazole	No	C	Uncertainty	B	Yes	E	Yes	E
Chrysene	Uncertainty	B	Uncertainty	B	No	F	No	F
Di-n-butyl phthalate	No	C	No	A	No	F	No	F
Di-n-octyl phthalate	No	C	No	A	No	A	No	A
Dibenz(a,h)anthracene	No	C	Uncertainty	B	Yes	E	Yes	E
Dibenzofuran	No	C	No	A	No	F	No	F
Diethyl phthalate	No	C	No	A	No	A	No	A
Dimethyl phthalate	No	C	No	A	No	A	No	F
Fluoranthene	No	A	No	A	No	F	No	F

TABLE 19-15, AUS-A11S
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	No	A	No	A	No	F
Hexachlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	No	A	No	A	No	A
Hexachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Isophorone	No	C	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	No	A	Uncertainty	B	Uncertainty	B
Naphthalene	No	C	Yes	E	Yes	E	Yes	E
Pentachlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Phenanthrene	No	A	No	F	No	F	No	F
Phenol	No	F	No	A	No	A	No	A
Pyrene	No	A	No	A	No	F	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	No	F	No	F	No	F
Antimony	Uncertainty	G	Uncertainty	B	Yes	E	Yes	E
Arsenic	Uncertainty	G	Uncertainty	B	Yes	E	Yes	E
Barium	No	F	No	F	Yes	D	Yes	E
Beryllium	Uncertainty	G	Uncertainty	B	Yes	D	Yes	E
Boron	No	F	No	F	No	F	No	F
Cadmium	Uncertainty	G	Uncertainty	B	Yes	E	Yes	E
Calcium	No	H	No	H	No	H	No	H
Chromium	Uncertainty	G	No	F	Yes	E	Yes	E
Cobalt	Uncertainty	G	No	A	No	F	No	F
Copper	Uncertainty	G	No	F	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	No	F	No	F
Lead	Uncertainty	G	No	A	No	F	No	F
Magnesium	No	H	No	H	No	H	No	H
Manganese	Yes	E	Yes	E	No	F	No	F
Mercury	Yes	E	No	A	No	F	Yes	E
Nickel	No	F	No	F	Yes	E	Yes	E
Potassium	No	H	No	H	No	H	No	H
Selenium	No	F	No	F	Yes	E	Yes	E
Silver	Uncertainty	B	No	A	Uncertainty	B	No	F
Sodium	No	H	No	H	No	H	No	H
Thallium	Uncertainty	G	Uncertainty	B	No	F	Yes	E
Vanadium	Uncertainty	G	No	A	No	F	No	F
Zinc	Yes	E	No	F	No	F	Yes	E
Explosives								
1,3,5-Trinitrobenzene	No	C	No	A	No	A	No	A
1,3-Dinitrobenzene	No	C	No	A	No	A	No	A

TABLE 19-15, AUS-A11S
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	Yes	E	No	A	No	A
2,4-Dinitrotoluene	No	C	No	A	Uncertainty	B	Yes	E
2,6-Dinitrotoluene	No	C	No	F	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	Uncertainty	G	Uncertainty	G	No	C	No	C
2-Nitrotoluene (ONT)	No	C	No	C	No	C	No	C
3-Nitrotoluene	No	C	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	Uncertainty	G	Uncertainty	G	No	C	No	C
4-Nitrotoluene (PNT)	No	C	No	A	No	A	No	A
HMX	Uncertainty	G	No	A	No	F	No	A
Nitrobenzene	Uncertainty	G	Uncertainty	B	Uncertainty	B	Uncertainty	B
Nitroglycerin	No	C	No	A	No	A	No	A
Pentaerythritol tetranitrate (PETN)	No	C	No	C	No	C	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	No	A	No	A	No	A
Tetryl	No	C	No	F	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	Uncertainty	G	No	F	NA	NA	NA	NA
Phosphorus, Total (as P)	Uncertainty	G	Yes	E	NA	NA	NA	NA
Sulfate (as SO4)	Yes	E	Yes	E	NA	NA	NA	NA

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceceded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 19-16, AUS-A11S
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	No	A	No	A
1,1,2,2-Tetrachloroethane	No	A	No	A	No	A
1,1,2-Trichloroethane	No	A	No	A	No	F
1,1-Dichloroethane	No	A	No	A	No	A
1,1-Dichloroethene	No	A	No	A	No	A
1,2-Dichloroethane (EDC)	No	A	No	A	No	A
1,2-Dichloroethene (total)	NA	NA	No	A	Yes	E
1,2-Dichloropropane	No	A	No	A	No	A
2-Butanone (MEK)	No	A	No	A	No	F
2-Hexanone	No	A	No	A	No	A
4-Methyl-2-pentanone (MIBK)	No	A	No	A	No	A
Acetone	No	A	No	A	No	A
Benzene	No	A	No	A	No	A
Bromodichloromethane	No	A	No	A	No	A
Bromoform	No	A	No	A	No	A
Bromomethane	No	A	No	A	No	A
Carbon disulfide	Uncertainty	B	Uncertainty	B	No	A
Carbon tetrachloride	No	F	No	A	No	A
Chlorobenzene	No	A	No	A	No	A
Chloroethane	No	A	No	A	No	C
Chloroform	No	F	No	A	No	A
Chloromethane	No	A	No	A	No	A
cis-1,2-Dichloroethene	No	F	No	A	Yes	E
cis-1,3-Dichloropropene	Uncertainty	B	Uncertainty	B	No	A
Dibromochloromethane	No	A	No	A	No	A
Ethylbenzene	No	A	No	A	No	F
Methylene chloride	No	A	No	A	No	A
N-Hexane	No	C	No	C	No	C
Styrene	No	A	No	A	No	A
Tetrachloroethylene (PCE)	No	A	No	A	No	F
Toluene	No	F	No	A	No	F
total Xylenes	No	A	No	A	No	F
trans-1,2-Dichloroethene	No	A	No	A	No	F
trans-1,3-Dichloropropene	No	A	No	A	No	A
Trichloroethylene (TCE)	No	F	No	A	Yes	E
Vinyl chloride	No	A	No	A	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	No	A	No	A
1,2-Dichlorobenzene	No	A	Uncertainty	B	No	A
1,3-Dichlorobenzene	No	A	No	A	No	A
1,4-Dichlorobenzene	No	A	Uncertainty	B	No	A
2,4,5-Trichlorophenol	No	A	Uncertainty	B	No	A

TABLE 19-16, AUS-A11S
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	Uncertainty	B	No	A
2,4-Dichlorophenol	No	A	Uncertainty	B	No	A
2,4-Dimethylphenol	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	Uncertainty	B	No	A
2-Chloronaphthalene	No	A	No	A	Uncertainty	B
2-Chlorophenol	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	Uncertainty	G
2-Methylnaphthalene	No	A	Yes	E	Yes	E
2-Methylphenol	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	A	No	A	No	A
2-Nitrophenol	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	A	No	A	No	A
3-Nitroaniline	No	A	No	A	No	A
4,6-Dinitro-2-methylphenol	Uncertainty	B	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	No	A	No	C
4-Chloro-3-methylphenol	Uncertainty	B	Uncertainty	B	No	A
4-Chloroaniline	No	A	No	A	Uncertainty	B
4-Chlorophenyl phenyl ether	No	A	No	A	No	C
4-Methylphenol	No	A	No	A	No	A
4-Nitroaniline	No	A	No	A	No	A
4-Nitrophenol	No	A	Uncertainty	B	No	A
Acenaphthene	No	A	Yes	E	No	A
Acenaphthylene	No	A	Yes	E	No	F
Anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Yes	E	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	Yes	E	Yes	E
bis(2-Chloroethoxy)methane	No	A	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	No	A	No	A
bis(2-Chloroisopropyl) ether	No	C	No	C	No	C
bis(2-Ethylhexyl) phthalate	Yes	E	Yes	E	Yes	E
Butyl benzyl phthalate	Yes	E	No	A	Uncertainty	B
Carbazole	No	A	Yes	E	Yes	E
Chrysene	No	A	Yes	E	Yes	E
Di-n-butyl phthalate	Uncertainty	B	Yes	E	Yes	E
Di-n-octyl phthalate	No	A	No	A	No	A
Dibenz(a,h)anthracene	Uncertainty	B	Yes	E	Yes	E
Dibenzofuran	Uncertainty	B	Yes	E	Yes	E
Diethyl phthalate	No	A	Uncertainty	B	No	A
Dimethyl phthalate	No	A	No	A	No	F
Fluoranthene	Uncertainty	B	Yes	E	Yes	E

TABLE 19-16, AUS-A11S
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	Uncertainty	B	Yes	E
Hexachlorobenzene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobutadiene	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	Uncertainty	B	No	A
Hexachloroethane	Uncertainty	B	Uncertainty	B	No	A
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Yes	E	Yes	E
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	Uncertainty	B
N-Nitrosodiphenylamine	No	A	No	A	No	A
Naphthalene	No	A	Yes	E	No	F
Pentachlorophenol	Uncertainty	B	Uncertainty	B	No	A
Phenanthrene	Uncertainty	B	Yes	E	Yes	E
Phenol	No	F	Uncertainty	B	No	A
Pyrene	No	A	Yes	E	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	F	Yes	E	No	F
Arsenic	No	F	Yes	E	Yes	E
Barium	No	F	Uncertainty	G	Yes	E
Beryllium	Yes	E	Uncertainty	G	No	F
Boron	No	F	Uncertainty	G	Yes	E
Cadmium	Yes	D	Yes	E	No	F
Calcium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	Yes	E	Yes	E	Yes	E
Cobalt	Yes	E	No	F	Yes	E
Copper	Yes	E	Yes	E	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	Yes	E
Lead	Yes	E	Yes	E	No	F
Magnesium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	Yes	E	Yes	E	Yes	E
Mercury	Yes	E	Yes	D	Yes	E
Nickel	No	F	Yes	E	Yes	E
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	Yes	E	Yes	E	Yes	E
Silver	Uncertainty	B	Uncertainty	B	No	F
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Yes	D	Uncertainty	G	Yes	E
Vanadium	Yes	E	Uncertainty	G	Yes	E
Zinc	Yes	E	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	Uncertainty	B
1,3-Dinitrobenzene	No	A	Uncertainty	B	No	A

TABLE 19-16, AUS-A11S
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Uncertainty	B	No	A
2,4-Dinitrotoluene	No	A	No	A	No	F
2,6-Dinitrotoluene	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	F	No	C	No	A
2-Nitrotoluene (ONT)	No	A	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	F	No	C	No	C
4-Nitrotoluene (PNT)	No	A	No	A	No	C
HMX	No	F	Yes	E	No	A
Nitrobenzene	No	F	No	A	No	A
Nitroglycerin	No	A	Uncertainty	B	No	C
Pentaerythritol tetranitrate (PETN)	No	A	No	A	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	Uncertainty	B	No	A
Tetryl	No	C	No	C	No	C

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 19-17
AUS-A11S - IOP GROUP II MELT LOADING LINE (SUPPORT AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

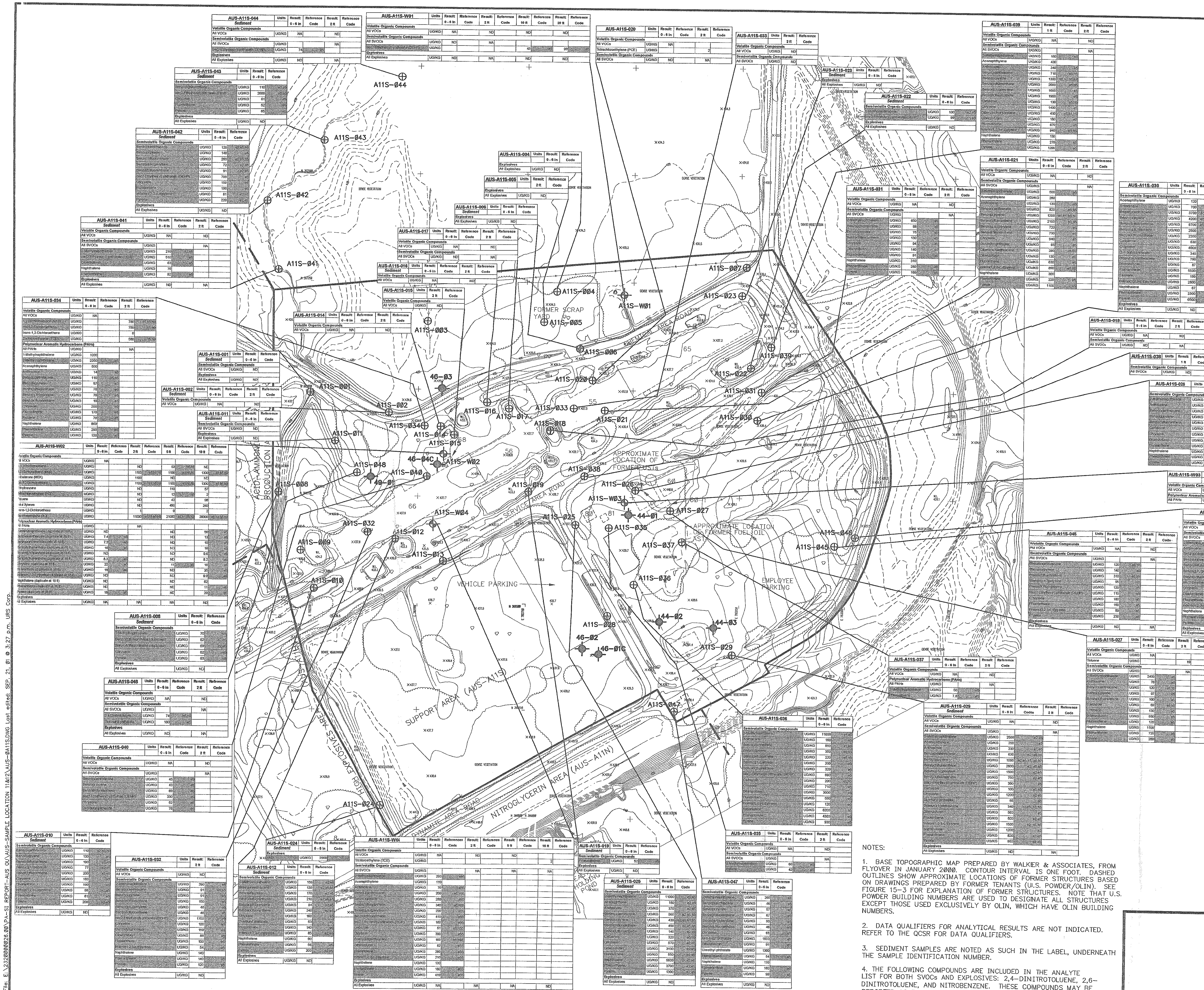
Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
VOCs					
1,1,2-Trichloroethane		H			
1,2-Dichloroethene (total)		H,E		NA	NA
cis-1,2-Dichloroethene		H,E		H	
Tetrachloroethylene (PCE)		H			
Trichloroethylene (TCE)		H,E		H	
SVOCs					
2-Methylnaphthalene		E	E		
Acenaphthene			E		
Acenaphthylene			E		
Anthracene		E	E		
Benzo(a)anthracene		H,E	H,E		
Benzo(a)pyrene		H,E	H,E		
Benzo(b)fluoranthene		H,E	H,E		
Benzo(g,h,i)perylene		E	E		
Benzo(k)fluoranthene		H,E	E		
bis(2-Ethylhexyl)phthalate (DEHP)		E	E		E
Butyl benzyl phthalate					E
Carbazole		H,E	H,E		
Chrysene		E	E		
Di-n-butyl phthalate		E	E		
Dibenz(a,h)anthracene		H,E	H,E		
Dibenzofuran		E	E		
Fluoranthene		E	E		
Fluorene		E			
Indeno(1,2,3-c,d)pyrene		H,E	H,E		
Naphthalene		H	H,E	H	
Phenanthrene		E	E		
Pyrene		E	E		
Metals					
Aluminum					E
Antimony		H	H,E		
Arsenic		H,E	H,E		
Barium		H,E			
Beryllium		H			E
Boron		E			
Cadmium		H	H,E		
Calcium					E
Chromium		H,E	H,E		E
Cobalt		E			E
Copper		E	E		E
Iron		E			H,E
Lead			E		E

TABLE 19-17
AUS-A11S - IOP GROUP II MELT LOADING LINE (SUPPORT AREA)
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum[1]	Soil	Sediment	Ground Water	Surface Water
Magnesium					E
Manganese		E	E	H	H,E
Mercury		H,E			H,E
Nickel		H,E	H,E		
Selenium		H,E	H,E		E
Thallium		H,E			
Vanadium		E			E
Zinc		H,E	E		H,E
Explosives					
2,4,6-Trinitrotoluene (TNT)				H	
2,4-Dinitrotoluene		H			
HMX			E		
Other Parameters					
Phosphorus, Total (as P)		NA	NA	H	
Sulfate (as SO4)		NA	NA	H	H

Key:
[1] Drums were not present at this site.
NA = not analyzed
H = human health screening criteria exceeded
E = ecological screening criteria exceeded



LEGEND

MONITORING WELL LOCATION

HAND AUGER LOCATION

USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-A11S

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11S Sample Locations and Detections of Organic Compounds in Soils/Sediments

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 19-1
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATIONS

100 Ø 100
SCALE FEET

N

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2ØØØ. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11S
Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

Date: 06-26-2000	Project Number: 23200000026.00	Figure Number: 19-2
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

AUS-A11S

URS

File: E:\23200000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11x17\AUS-A11S.DWG Last edited: AUG. 14, 01 @ 09:58 a.m. URS Corp.

AUS-A11S-043-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	7	
Trichloroethylene (TCE)	UG/L	22	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	26600	b3,e3
Antimony	UG/L	4.7	
Arsenic	UG/L	15.4	b3
Barium	UG/L	397	b3
Beryllium	UG/L	1.8	e3
Boron	UG/L	32.8	
Calcium	UG/L	65200	b3
Chromium	UG/L	209	b3,e3
Cobalt	UG/L	31.5	e3
Copper	UG/L	62.3	b3,e3,e4
Iron	UG/L	36100	b3,e3,e4,h10
Lead	UG/L	48.3	b3,e3,e4
Magnesium	UG/L	28600	b3
Manganese	UG/L	8780	b3,e3,e4,h10
Mercury	UG/L	0.13	e5,h10
Nickel	UG/L	46.4	b3
Potassium	UG/L	3440	b3
Selenium	UG/L	6.9	b3,e5
Sodium	UG/L	26300	b3
Vanadium	UG/L	53.4	b3,e3
Zinc	UG/L	405	b3
Other Parameters			
TDS	MG/L	310	b3

AUS-A11S-042-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	28400	b3,e3
Antimony	UG/L	2.3	
Arsenic	UG/L	16.9	b3
Barium	UG/L	469	b3
Beryllium	UG/L	2.5	e3
Boron	UG/L	30.7	
Calcium	UG/L	46000	b3
Chromium	UG/L	214	b3,e3,e4
Cobalt	UG/L	34.6	e3
Copper	UG/L	65.9	b3,e3,e4
Iron	UG/L	34700	b3,e3,e4,h10
Lead	UG/L	52.7	b3,e3,e4
Magnesium	UG/L	15300	b3
Manganese	UG/L	7420	b3,e3,e4,h10
Mercury	UG/L	0.11	e5,h10
Nickel	UG/L	67.2	b3
Potassium	UG/L	3930	b3
Selenium	UG/L	6.1	b3,e5
Sodium	UG/L	9570	b3
Vanadium	UG/L	65.8	b3,e3
Zinc	UG/L	748	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.37	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
TDS	MG/L	156	b3

AUS-A11S-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Trichloroethylene (TCE)	UG/L	6	h3,h6
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	228	
Barium	UG/L	20.8	
Boron	UG/L	12	
Calcium	UG/L	172000	
Copper	UG/L	1.1	
Iron	UG/L	244	
Magnesium	UG/L	103000	
Manganese	UG/L	195	h6
Nickel	UG/L	2.1	
Sodium	UG/L	114000	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	304	
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	0.23	
Phosphorus, Total (as P) (duplicate)	MG/L	0.07	h4
Sulfate (as SO4)	UG/L	720000	h6
TDS	MG/L	1470	h6
TSS	MG/L	5.6	

LEGEND

MONITORING WELL LOCATION

HAND AUGER LOCATION

USEPA 1998 SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-A11S-001-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Toluene	UG/L	1	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	0.68	
Metals			
Aluminum	UG/L	48700	b3,e3
Arsenic	UG/L	17.9	b3
Barium	UG/L	636	b3
Beryllium	UG/L	13.2	b3,e3
Boron	UG/L	46.3	
Calcium	UG/L	132000	b3,e3
Chromium	UG/L	53.6	b3
Cobalt	UG/L	231	b3,e3
Copper	UG/L	75.4	b3,e3,e4
Iron	UG/L	27400	b3,e3,e4,h10
Lead	UG/L	104	b3,e3,e4
Magnesium	UG/L	58500	b3
Manganese	UG/L	12600	b3,e3,e4,h10
Mercury	UG/L	0.87	b3,e5,h10
Nickel	UG/L	135	b3
Potassium	UG/L	6010	b3
Sodium	UG/L	34000	b3
Thallium	UG/L	4.7	e3
Vanadium	UG/L	118	b3,e3
Zinc	UG/L	505	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	142	b3
Nitrogen, Ammonia (as N)	MG/L	2.1	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.056	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	170000	
TDS	MG/L	825	b3

AUS-A11S-011-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Barium	UG/L	41.5	b3
Boron	UG/L	23.1	
Calcium	UG/L	58900	b3
Magnesium	UG/L	30300	b3
Manganese	UG/L	296	
Potassium	UG/L	3620	b3
Sodium	UG/L	30100	b3

AUS-A11S-008-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Carbon tetrachloride	UG/L	1	
Chloroform	UG/L	0.5	
Semivolatile Organic Compounds			
Phenol	UG/L	1.5	
Explosives			
2-Amino-4,6-Dinitrotoluene	UG/L	5.5	
4-Amino-2,6-Dinitrotoluene	UG/L	18	
Nitrobenzene	UG/L	0.73	
Metals			
Aluminum	UG/L	68600	b3,e3
Arsenic	UG/L	37.5	b3
Barium	UG/L	1270	b3
Beryllium	UG/L	4.7	e3
Boron	UG/L	135	
Cadmium	UG/L	4.9	e3,e4
Calcium	UG/L	299000	b3,e3
Chromium	UG/L	97	b3
Cobalt	UG/L	116	b3,e3
Copper	UG/L	119	b3,e3,e4
Iron	UG/L	87800	b3,e3,e4,h10
Lead	UG/L	101	b3,e3,e4
Magnesium	UG/L	122000	b3,e3
Manganese	UG/L	22200	b3,e3,e4,h10
Mercury	UG/L	0.43	b3,e5,h10
Nickel	UG/L	153	b3
Potassium	UG/L	9220	b3
Selenium	UG/L	16.1	b3,e5
Sodium	UG/L	86400	b3
Vanadium	UG/L	132	b3,e3
Zinc	UG/L	1760	b3,e3,e4,h10
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.74	b3
Nitrogen, Nitrate-Nitrite	MG/L	1.7	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	520000	h10
TDS	MG/L	789	b3

AUS-A11S-022-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	241	b3,e3
Barium	UG/L	49	b3
Boron	UG/L	30.4	
Calcium	UG/L	24400	b3
Iron	UG/L	1360	b3,e3,e4,h10
Magnesium	UG/L	7160	b3
Manganese	UG/L	322	
Nickel	UG/L	1.3	
Potassium	UG/L	1140	
Sodium	UG/L	1030	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	83.2	b3
Nitrogen, Ammonia (as N)	MG/L	0.17	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.095	b3
Sulfate (as SO4)	UG/L	5200	
TDS	MG/L	112	b3
TSS	MG/L	56	b3

AUS-A11S-W02-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	10000	h4,h6
Trichloroethylene (TCE)	UG/L	280000	h3,h4,h6
Polynuclear Aromatic Hydrocarbons (PAHs)			
1-Methylnaphthalene	UG/L	1.6	
2-Methylnaphthalene	UG/L	7.9	
Acenaphthylene	UG/L	4.6	
Naphthalene	UG/L	59	h4
Phenanthrene	UG/L	0.59	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	9.5	h3
2,6-Dinitrotoluene	UG/L	1	
2-Amino-4,6-Dinitrotoluene	UG/L	0.93	
4-Amino-2,6-Dinitrotoluene	UG/L	17	
Tetryl	UG/L	4.5	
Metals			
Aluminum	UG/L	300	
Calcium	UG/L	95700	
Iron	UG/L	243	
Magnesium	UG/L	40400	
Manganese	UG/L	1580	h4,h6
Sodium	UG/L	68800	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-A11S-W03-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2140	
Barium	UG/L	41.3	
Boron	UG/L	283	
Calcium	UG/L	77300	
Chromium	UG/L	3	
Iron	UG/L	1430	
Magnesium	UG/L	30900	
Manganese	UG/L	208	h6
Nickel	UG/L	4.2	
Potassium	UG/L	1030	
Selenium	UG/L	5.9	
Sodium	UG/L	11700	
Zinc	UG/L	5.1	
Other Parameters			
Nitrogen, Nitrate-Nitrite	MG/L	0.61	

N

100 0 100

SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-A11S-009-SW-00	Units	Result	Screening Codes
Metals			
Arsenic	UG/L	5.6	
Barium	UG/L	43.3	b3
Boron	UG/L	22.7	
Calcium	UG/L	17500	b3
Chromium	UG/L	3.3	
Iron	UG/L	701	b3
Magnesium	UG/L	11500	b3
Manganese	UG/L	243	
Potassium	UG/L	2260	b3
Sodium	UG/L	890	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	95.6	b3
Nitrogen, Ammonia (as N)	MG/L	0.25	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Phosphorus, Total (as P)	MG/L	0.058	b3
Sulfate (as SO4)	UG/L	1400	
TDS	MG/L	102	b3
TSS	MG/L	14.5	b3

AUS-A11S-010-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Arsenic	UG/L	5.1	
Barium	UG/L	31.6	b3
Boron	UG/L	38.3	
Calcium	UG/L	38200	b3
Iron	UG/L	1280	b3,e3,e4,h10
Magnesium	UG/L	11100	b3
Manganese	UG/L	186	
Potassium	UG/L	3530	b3
Sodium	UG/L	976	

AUS-A11S-012-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Barium	UG/L	44.1	b3
Boron	UG/L	38	
Calcium	UG/L	15100	b3
Magnesium	UG/L	7030	b3
Manganese	UG/L	23	
Potassium	UG/L	1500	
Sodium	UG/L	2180	
Other Parameters			
Perchlorate	UG/L	ND	
TDS	MG/L	73	b3

AUS-A11S-013-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Metals			
Arsenic	UG/L	5.4	
Barium	UG/L	62.7	b3
Boron	UG/L	55.4	
Calcium	UG/L	74100	b3
Iron	UG/L	2210	b3,e3,e4,h10
Magnesium	UG/L	18600	b3
Manganese	UG/L	506	
Potassium	UG/L	1160	
Sodium	UG/L	7320	b3
Vanadium	UG/L	3.5	
Zinc	UG/L	45.8	b3

AUS-A11S-024-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	10300	b3,e3
Arsenic	UG/L	7.7	
Barium	UG/L	356	b3
Boron	UG/L	37.1	
Calcium	UG/L	25900	b3
Chromium	UG/L	9.7	
Cobalt	UG/L	12.3	e3
Copper	UG/L	15	b3,e3,e4
Iron	UG/L	20900	b3,e3,e4,h10
Lead	UG/L	9.5	b3
Magnesium	UG/L	5900	b3
Manganese	UG/L	3490	b3,e3,e4,h10
Nickel	UG/L	18.4	b3
Potassium	UG/L	6540	b3
Selenium	UG/L	4.1	b3,e5
Sodium	UG/L	3400	b3
Vanadium	UG/L	16.5	
Zinc	UG/L	102	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	38.2	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Sulfate (as SO4)	UG/L	420	
TDS	MG/L	185	b3

AUS-A11S-W04-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	78	h4,h6
Trichloroethylene (TCE)	UG/L	520	h3,h4,h6
Explosives			
All Explosives	UG/L	ND	
Metals			
Calcium	UG/L	364000	
Iron	UG/L	636	
Magnesium	UG/L	227000	
Manganese	UG/L	1490	h4,h6
Nickel	UG/L	14.9	
Sodium	UG/L	194000	
Other Parameters			
Nitrogen, Nitrate-Nitrite	MG/L	ND	
TDS	MG/L	3140	h6

AUS-A11S-019-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP) (duplicate)	UG/L	1.9	e5
Butyl benzyl phthalate (duplicate)	UG/L	1.6	e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1660	b3,e3
Barium	UG/L	108	b3
Boron	UG/L	29.1	
Calcium	UG/L	19200	b3
Chromium	UG/L	4.7	
Cobalt	UG/L	9.3	e3
Copper	UG/L	2.7	
Iron	UG/L	2700	b3,e3,e4,h10
Lead	UG/L	2	
Magnesium	UG/L	6530	b3
Manganese	UG/L	132	
Nickel	UG/L	4.7	
Potassium	UG/L	1800	b3
Sodium	UG/L	1080	
Vanadium	UG/L	5.9	

AUS-A11S

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-A11S
Sample Locations and Detections in Surface Water and Groundwater

Date: 06-26-2000	Project Number: 2320000026.00	Figure Number: 19-3
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11x17\AUS-A11S.DWG Last edited: AUG. 14, 01 @ 09:50 a.m. URS Corp.

Area 12 is located immediately south of Area 11 and is accessible by way of Area 11 roadways (Figure 20-1).

AUS Original Site Designations

Six of the original Additional and Uncharacterized Sites Operable Unit (AUS OU) sites designated in 1997-1999 by the United States Fish and Wildlife Service (USFWS) were located within the boundaries of Area 12: AUS-0051 through AUS-0055, and AUS-0058. These were all incorporated into Site AUS-0A12, which includes all of Area 12.

20.1 HISTORIC SEARCH INFORMATION

20.1.1 Site Description

Area 12 was the former Illinois Ordnance Plant (IOP) Ammonium Nitrate Plant. Industrial tenants later used it for explosives manufacturing and testing, and burning explosive wastes.

The area has been unoccupied since 1982, and all buildings have been removed.

20.1.2 Operational History and Waste Characteristics

20.1.2.1 IOP Ammonium Nitrate Plant Operations

The Sherwin Williams Defense Corporation, under contract with the War Department (SWDC/War Department), used Area 12 for ammonium nitrate production during World War II from August 1942 through May 1943.[1,2] The IOP was a "melt-pour" facility. Explosives that were produced elsewhere were melted and poured into various ordnance shells and bombs. Trinitrotoluene (TNT) was the preferred explosive, but because of a TNT shortage many ordnance plants, including the IOP, were designed and built to use amatol, a mixture of TNT and ammonium nitrate.[3] Unlike the TNT, the ammonium nitrate was produced at the plant. When the TNT shortage ended in 1943, TNT alone was used for the main ordnance explosive, and ammonium nitrate production stopped.[4]

The ammonium nitrate plant originally consisted of 12 buildings (Figure 20-2).[5]

Ammonia and nitric acid, the raw materials used to produce ammonium nitrate, were brought on site by rail and delivered to Building ANP-1-7, the Neutral Liquor Building (Figure 20-2).[6]

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[1] NAR 0769. Memorandum to the Field Director of Ammunition Plants regarding "Report on Status of Projects Submitted under Industrial Division Order No. 10" dated May 17, 1943, Page 1.

[2] NAR 000167. Illinois Ordnance Plant, Illinois Ordnance Plant Historical Record, April 1, 1943 through August 17, 1943, Page 18.

[3] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 2-14 and 8-98 to 8-100. Amatols are less stable and less powerful than TNT alone.

[4] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin Williams Company, Illinois Ordnance Plant, Page B-2.

[5] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant Carbondale, Illinois, Part I, Section 5, Page 12.

[6] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 12.

Another rail spur led to the coal bin at Building ANP-1-8, the Boiler House, which contained 2 coal-fired boilers.[7] According to the War Department Facilities Inventory, fuel oil may have also been used.[8]

Inside the neutral liquor building the ammonia and nitric acid were stored in large aboveground tanks. The building also housed a heat exchanger and five pumps.[9] The ammonia gas was passed through the nitric acid in this building, creating a solution that was piped to the pan houses (ANP-1-2, ANP-1-4 and ANP-1-6) which each contained four evaporating pans equipped with air agitation and heating coils.[10,11] The material was then transferred to the Kettle Houses, ANP-1-1, ANP-1-3 and ANP-1-5, each of which contained 8 kettles.[12] Stirring the material in the kettles completed the evaporation process. The resulting small rounded crystals of ammonium nitrate[13] were then passed through a gyrating screen,[14] and trucked to other areas of the plant.

Other IOP buildings in Area 12:[15]

- ANP-1-9 Office Building – office space
- ANP-1-10 Change House – locker rooms and lunch room
- ANP-1-11 Timekeeper Building - guard room, office space, utility room and time clocks
- ANP-1-12 Guard House

There was also a water tower north of the main complex.[16]

IOP Decontamination

After the IOP operations ended at CONWR, the IOP was to be decontaminated in accordance with standard Army procedures. For a discussion of the procedures, see Section 3.1.2.3. Post-World War II military records are insufficient to determine if these procedures were followed.

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[7] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 22.
[8] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 11, Page 3.
[9] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 3.
[10] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-94.
[11] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 22.
[12] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 12; and Part 3, Section 2, Page 3.
[13] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-94.
[14] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 3.
[15] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Pages 1, 28, and 31; and Part 1, Section 5, Page 12.
[16] DPRA Document No. 00009449. U.S. Department of the Interior, Fish and Wildlife Service, National Wildlife Refuge System, Annual Narrative Report, Calendar Year 1983, Page 26. This report describes it as a "250,000-gallon tank and on the base map used for Figure 15-3 it is described as a "150,000-gallon tank."

20.1.2.2 Silas Mason Operations

20.1.2.2.1 Production Operations

Silas Mason Company, under contract with the War Department, began manufacturing fertilizer-grade ammonium nitrate on November 14, 1946.[17] The areas included in this operation were to be Area 12, two warehouses in Area 11, and several other structures that were to be moved to Area 12.[18] Silas Mason installed the following additional equipment in the ammonium nitrate manufacturing plant, before beginning production: screening and gyrating machines, scales, activators, pumps, pulverizers, shaker screens, conveyors, elevators, car pullers, hoppers and bag sewing machines.[19]

Silas Mason used the former IOP buildings for the same purposes that they were used for during the IOP era, except that the IOP Time Keepers Building, ANP-1-11 was made into an office.[20] Silas Mason apparently built a new building, ANP-1-13 that was designated as a Clock House. The location of this building was not determined.[21]

The 1951 aerial photograph of Area 12 showed all the IOP buildings still on site, plus some new buildings[22] that Silas Mason added. Two new structures were built south of the IOP Boiler House, Building ANP-1-8. Seven new structures were built south of the IOP Neutral Liquor Building ANP-1-7.[23] Two new structures were built northeast of Building ANP-1-7[24] and one of these is identified as Building ANP-1-15, the Central Bag Loading Building.[25] Building ANP-1-15 was relocated from Area 7 (it was formerly Building IN-6-7).[26] Three new structures were built just east of Building ANP-1-11.[27] There were also four possible aboveground storage tanks

[17] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 1, Page1 and Part 2, Section 1, Page 1.

[18] ACL 000637 through ACL 000643. Agreement RE Transfer of Illinois Ordnance Plant from the War Department to the War Assets Administration, dated July 24, 1946; and, U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part I, Section 1, Page 1.

[19] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part III, Section 2, Pages 1 through 5.

[20] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 9, Page 1.

[21] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 9, Page 1.

[22] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3. The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

[23] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 1.

[24] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

[25] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 1.

[26] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 7, Page 1.

[27] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

(ASTs) identified on site on the 1951 aerial photograph (two west of Building ANP-1-15 and two east of Building ANP-1-7). One of these new ASTs, ANP-1-14 was a 19,200-gallon P.R.P.[28] Storage Tank.[29,30] Two new rail spurs were constructed to service Building ANP-1-15.[31]

In 1950, fertilizer production ended, and control and jurisdiction of the facility was transferred to the United States Department of Interior (USDOI), in accordance with Public Law 80-361.[32] The 1951 aerial photograph shows no activity in Area 12.

20.1.2.2.2 Waste Disposal

The following discussion summarizes observations from the 1951 aerial photograph.[33]

There were two areas of surface discoloration noted in the 1951 aerial photograph. The first was located just west of the Boiler House, Building ANP-1-8 and was likely due to residual coal stocks used to fire the coal-fired boilers; however, it could possibly be from a liquid release. The second area of surficial discoloration is south-southwest of Building ANP-1-8. This area appeared to be a surface disposal area with a roadway leading to it.

Several possible liquid release areas were identified in the 1951 aerial photograph. The first is just northeast of Building ANP-1-8 where there appeared to be an enclosure with standing water. The possible liquid release appeared to be just southeast of this enclosure and east of Building ANP-1-7. Possible liquid releases were also noted in drainage ditches surrounding Buildings ANP-1-1 through ANP-1-6. It is likely that these possible liquid releases were associated with production of ammonium nitrate in these buildings.

20.1.2.3 Universal Match Corporation

Area 12 was not used again for industrial purposes until 1955, when Universal Match Corporation (UMC) (later Crane/Unidynamics-Phoenix, now Crane Co.) temporarily used the area for testing.[34] They apparently used this area only from about January to August, 1955.[35,36] According to Mr. Harvey Pitt, a former UMC employee, UMC used Area 12 for about six

[28] It was not determined what "P.R.P." stood for.

[29] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 1 and Part 1, Section 7, Page 1.

[30] U.S. Army Corps of Engineers, 1947, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 9, Page 1.

[31] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

[32] ACL 000654. Department of the Army, Illinois Ordnance Plant, Letter to the U.S. Fish and Wildlife Service, Department of Interior, regarding transferring the ammonium nitrate facilities to the DOI, dated May 31, 1950.

[33] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

[34] DPRA Document No. 00008430. USFWS, Letter to Olin Mathieson Chemical Corporation dated August 4, 1955, Page 1.

[35] DPRA Document No. 00013026. USFWS Memorandum regarding Special Use Permit 20012, dated January 3, 1955.

[36] DPRA Document No. 00008430. USFWS, Letter to Olin Mathieson Chemical Corporation dated August 4, 1955, Page 1.

months as a test range for photo flash signals.[37] According to Mr. Pitt, barium nitrate and potassium perchlorate were waste products from the manufacture of photo flash signals.[38]

20.1.2.4 Olin Operations

From January 1956 through March 1964, Olin leased the property in Area 12. According to John Miller, a former Olin chemist and manager, most of the IOP buildings were gone when Olin moved in and Olin used the area mostly for storage and burning.[39]

Table 20-1 identifies all of the IOP, Olin, and U.S. Powder building designations that have been used for each of the buildings on the sites. See Section 15 for a discussion of the Olin and U.S. Powder Maps.

Olin Site Layout

The Olin Map designates IOP Building ANP-1-10 as Building 70, "Stores-Change House". One new building was built in Area 12 –Olin Building 28 – the Burning House, ANP-1-19.[40] Olin renamed Silas Mason Building ANP-1-15 as Building 71 and used it for paper stores.

Olin razed former IOP Buildings ANP-1-1 and ANP-1-7 in 1960.[41] In addition to those buildings razed by Olin, the following buildings were no longer on site in the 1960 aerial photograph: Buildings ANP-1-2 through ANP-1-6, ANP-1-9 and ANP-1-11, the two Silas Mason buildings south of Building ANP-1-8, the seven Silas Mason buildings south of former ANP-1-7 and the three Silas Mason buildings east of former ANP-1-11.[42]

20.1.2.4.1 Explosives Manufacturing

Olin manufactured explosives in Area 12 in 1957 and 1958, according to Mr. Robert Meyers, a former Olin truck driver and laborer. Olinite 7, which was manufactured in Area 12, was a form of dynamite made with ammonium nitrate and diesel fuel which was packaged in cardboard tubing and used in the strip mining industry.[43]

According to Mr. Harry Stiles, a former Refuge manager, Olin used this area for ammonium nitrate production before moving that operation to Area 11 in 1957.[44,45] This is consistent with

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[37] Deposition of Harvey Pitt, November 19, 1997, Pages 132-133. Pitt thought that UMC used this area in about 1957 or 1958; it was actually 1955.
[38] Deposition of Harvey Pitt, November 19, 1997, Page 75.
[39] Deposition of John Miller, April 9, 1998, Page 31.
[40] PRI-00503. Olin Mathieson Chemical Corporation, Plant Building Directory, dated March 1963, Page 2.
[41] U.S. Department of the Interior, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, January Thru April, 1960, Page 24.
[42] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[43] Deposition of Robert Meyers, April 10, 1998, Pages 12, 20, 29, and 68.
[44] Deposition of Harry Stiles, November 18, 1997, Pages 99 and 100.
[45] U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, September thru December, 1957, Page 31.

Refuge documents which indicate that the old ammonium nitrate plant in Area 12 was reactivated in 1956.[46]

20.1.2.4.2 Powder Storage Ponds

Olin constructed and filled eight powder storage ponds in 1960.[47] Aerial photographs indicate that they were constructed after May 1960. The eight storage ponds were located just north of Smokeless Powder Road and east of Old Contractor Road. On Figure 15-3, these ponds are labeled #1 through #7, with #6 including two units.

The material stored in the ponds was most likely the 5,300,000 lbs of flashless non-hydroscopic (FNH) powder which was included in Olin's sale of its business to CSC.[48,49]

According to Harry Stiles, the powder stored in the ponds was cylindrical in shape and about 3-inches long by ¾-inches in diameter.[50] The ponds were excavated, lined with a black plastic,[51] filled with powder and then filled with water. According to John Miller, old cannon powder that Olin bought from the U.S. government was stored in these ponds for use as an inexpensive source of nitrocellulose for dynamite production. According to Harry Stiles, smokeless powder from the government was stored in these ponds.[52] According to Mr. Richard Altekruse, a former Olin engineer and manager, these ponds were used for storage of double-based propellant powder that was stored underwater to prevent degradation.[53] According to the Olin's response to a CERCLA Section 104(e) request, several of the constituents of double-based propellants were lead resorcinol, lead resorcylate, lead salicylate, lead stearate and lead 2-ethyl hexoate.[54]

20.1.2.4.3 Area 12 Railroads

As seen in the 1960 aerial photograph,[55] most of the Area 12 railroads that were still in use during Silas Mason's tenure appeared to be abandoned. The Olin Map shows no functioning railroads in Area 12.

20.1.2.4.4 Area West of Area 12

Olin Buildings 80-D (the Cap Magazine) and 80-E (the Shooting House) are located on the far western side of Site AUS-0A12.[56] Olin apparently built these buildings. The caps stored in

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[46] DPRA Document No. 00009402. U.S. Department of the Interior, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, January Thru April, 1956, Page 17.
[47] U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, September thru December, 1960, Page 21.
[48] DOI 004980. Bill of Sale, Conveyance and Assignment, between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated October 1, 1963, Page 4, Paragraph 2(c).
[49] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Pages 8-101 through 8-111.
[50] Deposition of Harry Stiles, November 18, 1997, Page 98.
[51] Thomas Throgmorton, personal interview, November 9, 1999.
[52] Deposition of Harry Stiles, November 18, 1997, Pages 95-96.
[53] Richard Altekruse, personal interview, July 14, 1999.
[54] DOI 001216. Olin 104(e) response, dated September 12, 1989, Page 21.
[55] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.

Building 80-D may have come from Olin's cap production facility which was located in East Alton, Illinois at that time.

20.1.2.4.5 Waste Disposal

Burning Grounds

Olin has reported that open burning began in this area in 1956 and continued up until 1964.[57] According to George Wisely, a former Olin chemist and manager, the burning grounds located in Area 12 were Olin's only burning grounds through 1964.[58] Olin estimated that 4,000,000 lbs of explosives, pyrotechnics and propellants were burned in these burning grounds from 1956 through 1964.[59] They also estimated that approximately 40,000 lbs of primarily metal oxides remained at the burning grounds.

The specific location(s) of the Area 12 burning grounds from 1956 to 1960 has not been determined. The 1960 aerial photograph showed what appeared to be two liquid filled trenches in the eastern part of Area 12, northwest of former Buildings ANP-1-3 and ANP-1-4.[60] The northern trench is approximately 65-ft long and 10-ft wide and the southern trench is approximately 25-ft long and 18-ft wide. There appeared to be vehicular tracks leading to both of these possible trenches. These may have been used for burning before 1960.

According to the Refuge records[61] and the 1960 aerial photograph,[62] the burning grounds shown in Figure 15-3 were used from 1960 to 1964. The burning house (Olin Map Building 28) was associated with these burning grounds. The Olin Map and the 1960 aerial photograph show three to five separate burning areas in these burning grounds. On the 1960 aerial photograph, these burning areas appeared to be pads, not trenches.[63] The 1965 aerial photograph showed a possible trench in the burning grounds.[64]

Robert Meyers, who began working for Olin as a truck driver in 1957, described the burning grounds.[65] It is not known whether his descriptions apply to the burning grounds shown in Figure 15-3, or to those used earlier. According to Robert Meyers, the burning grounds consisted of a large burn pit approximately 16- to 20-ft deep. Truck drivers backed up to the pit and dumped both non-explosive waste such as office trash and explosive wastes. He indicated

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[56] On Figure 15-3 these are labeled 83 and 84 respectively. The figure shows the building numbers designated on the U.S. Powder Map. Corresponding Olin building numbers are listed on the left side of the figure.
[57] DOI 004466. Description of disposal sites and Olin's actions as part of their 104(e) response, November 1981.
[58] Deposition of George Wisely, June 28, 1999, Page 171.
[59] DOI 004466. Description of disposal sites and Olin's actions as part of their 104(e) response, November 1981.
[60] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[61] U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, January thru April, 1960, Page 22.
[62] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[63] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[64] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.
[65] Deposition of Robert Meyers, April 10, 1998, Pages 34, 38, and 57.

that 25-lb fiber packs and 55 gallon drums were dumped in the pit. Mr. Meyers did not know what was contained in these fiber packs and drums. Ashes were left in the pit according to Mr. Meyers.

Other Potential Disposal Areas

The features discussed below were observed on the 1960 aerial photograph of Area 12.[66]

The two areas of surface discoloration noted during Silas Mason's tenure were still visible. Just west of the disposal area that was located south of Building ANP-1-8, the 1960 photograph showed what appeared to be recent deposits – possibly of soil – and the disposal area appeared to be covered with some vegetation. There is also a discolored area just southwest of these deposits.

Two possible dumping/disposal areas were identified in the 1960 aerial photograph. One of these is on the south side of the South Perimeter Road, and one is on the north side. The area on the south side of the road was identified as a possible disposal area based on the irregular topography. The area observed on the north side may have resulted from dumping or from limited burning.

Two probable surface dumping areas were noted in the 1960 aerial photograph. The first is inside the northeast corner of the Area 12 perimeter fence. The second is just west of the East Perimeter Road, south of former Buildings ANP-1-1 and ANP-1-2.

There is an area of ground scarring observed on the 1960 aerial photograph, just southwest of the intersection of the South Perimeter Road and the Old Contractor Road. The ground scarring might have been due to disposal or burning, or it might have been related to a diesel fuel UST identified in this area.

20.1.2.5 Commercial Solvents Corporation Operations

CSC and its successors conducted operations in Area 12 from 1964 until they shut down the operation, probably around 1971.[67]

Based on the building descriptions on the Olin and U.S. Powder Maps (Figure 15-3), 4 of the 5 buildings Olin used in this area were used for the same purposes by CSC, although CSC changed some building numbers. The fifth building, Olin's Cap Magazine, is shown on the U.S. Powder Map, but the building is not named.

CSC apparently used the burning grounds in Area 12, and the agreement between CSC and Olin gave Olin use of the burning grounds until December 1964.[68]

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[66] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[67] ACO 000330. IMC memorandum from J.M. Kelly to R.R. Barra entitled "Shut Down – Decontamination – Marion," dated April 2, 1981, Page 1.
[68] DOI 005023. Olin Mathieson Chemical Corporation, Letter to Commercial Solvents Corporation regarding supplements to the Agreement between Olin and Commercial Solvents, dated September 30, 1963, Page 2, Paragraph No. 5.

20.1.2.5.1 RDX Production

Olin did not manufacture RDX (Royal Demolition Explosives) at this site. Olin's RDX production equipment, supplies, and materials were part of the sale to CSC, but they were located in East Alton, Illinois.[69] CSC apparently moved this operation to the Refuge.

The RDX Separation Building (U.S. Powder Map Building 76) was an original IOP building. CSC added the following buildings related to RDX production: Buildings 76-1, 76-2, 76-3, and 76-5. Buildings 76-1 and 76-3 were dryers. Building 76-2 was a mixer, and Building 76-5 was an electric control house. See Figure 15-3 for building locations.

Some piping and at least one vertical tank were associated with the production in Building 76.[70] There appeared to be piping that connected Building 76 to Building 76-1, as seen in the 1965 aerial photograph.[71] In 1971 there appeared to be six ASTs of varying sizes located on the south side of Building 76; these were removed sometime before 1980.[72] The 1965 aerial photograph identified blast walls around Buildings 76-2 and 76-3.[73]

The specific RDX manufacturing process was not determined, but could have potentially included any of the following chemicals:[74]

- Hexamethylenetetramine.
- Nitric Acid.
- Ammonium Nitrate.
- Acetic Anhydride.
- Phosphorous Pentoxide.
- Ammonium Sulfate.
- Nitrogen Pentoxide.
- Hydrocarbons or Chlorinated Hydrocarbons.
- Formaldehyde.
- Ammonia.
- Cyclohexanone.
- Acetone.
- HMX (Her Majesty's Explosive).

[69] DOI 004977. Bill of Sale, Conveyance and Assignment, between Olin Mathieson Chemical Corporation and Commercial Solvents Corporation, dated October 1, 1963, Page 1, Paragraph 1.
[70] ACO 000338. IMC, Letter to Mr. Wayne Adams of USFWS regarding a decontamination project at IMC's Marion, Illinois plant, dated February 14, 1979, Page 1.
[71] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 5 and 6. The interpretation of the 1965 aerial photograph indicates Building 76-1 as a possible AST, but the 1971 aerial photograph clearly shows a building in this location.
[72] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 6 and 7.
[73] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.
[74] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-34.

Other Explosives Containing RDX

Both RDX and TNT were identified by CSC/IMC as potential contaminants in Buildings 76, 76-1, 76-2 and 76-3.[75] TNT would not necessarily be expected at an RDX manufacturing facility, unless it was also used to produce compositions. Compositions are explosives in which two or more explosive compounds are mixed to produce an explosive with more suitable characteristics for a particular application. In military applications, pure RDX is press-loaded because of extensive decomposition at the melting point. When blended with TNT, it can be cast into shells or bombs or solidified into chips. In the production of the TNT blends, RDX is added to melted TNT. Mixtures of RDX and TNT include Compostion B and Cyclotol. Other compositions involve adding wax ("A" types) or plasticizers ("C" types) to RDX.[76]

Decontamination of RDX Facilities

In 1971, after production ended in Areas 11 and 12, CSC/IMC began decontamination which involved removing or destroying the remaining explosive materials on site.[77] IMC decontaminated, by burning, the following four buildings:[78,79,80]

- Building 76 – Initially decontaminated in 1976. Final decontamination was completed in 1981
- Building 76-1 – Decontaminated in 1977
- Building 76-2 – Decontaminated in 1977
- Building 76-3 – Decontaminated in 1977

IMC records[81] indicated there was a vertical tank that may have contained explosives located in or near Building 76 that was not decontaminated because they could not remove the manhole. The piping associated with this tank was also still in place and it may have also contained explosives.[82] There was no definite documentation that the tank and the piping were ever decontaminated or removed from the premises. IMC records did indicate that final decontamination was done at Building 76 in 1981. This may mean that the tank and piping were decontaminated.

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[75] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1.
[76] Department of the Army, September 1984, Department of the Army Technical Manual TM 9-1300-214, Military Explosives, Page 8-32, 8-100, and 8-103.
[77] ACO 000283. Decontamination History for Trojan Powder Company.
[78] CRO 001713. IMC, Letter to Mr. Wayne Adams of USFWS regarding completion of the burning some buildings, dated June 25, 1981.
[79] CRO 001703. IMC, Letter to Mr. Walter Franke of IEPA submitting the August monthly report, dated September 1, 1978.
[80] DOI 006722. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 1.
[81] ACO 000338. IMC, Letter to Mr. Wayne Adams of USFWS regarding a decontamination project at IMC's Marion, Illinois plant, dated February 14, 1979, Page 1.
[82] ACO 000338. IMC, Letter to Mr. Wayne Adams of USFWS regarding a decontamination project at IMC's Marion, Illinois plant, dated February 14, 1979, Page 1.

20.1.2.5.2 Powder Storage Ponds

USFWS and CSC personnel toured Area 12 in November 1975 during decontamination activities.[83] During this tour, there were reportedly three open pits that contained between two and three million lbs of propellant, submerged under water.[84] Based on the aerial photography, these were apparently Pond #6 (consisting of two units) and Pond #7.[85] According to Mr. Wayne Adams, a former Refuge manager, there were five different kinds of propellant stored in these ponds ranging in size from about 1-inch long and 1/8-inch in diameter up to 2.5-inches long and 5/8-inch in diameter.[86] Documentation from the tenant indicates that in addition to Pond #6 (2 units) and Pond #7, Pond #5 was also contaminated with FNH. All three ponds were scheduled for decontamination of the FNH.[87]

Picatinny Arsenal tested the propellant stored in these ponds; the tests indicated that the stabilizer was gone from the propellant.[88] As a result, the propellant was classified as a Class D explosive, and it needed to be destroyed as soon as possible.[89] CSC/IMC burned the materials from these ponds during the late 1970s and early 1980s. Approximately 4,000,000 lbs of unstable powder pellets were removed from these ponds and burned in small amounts.[90] The ponds were decontaminated by adding 6 inches of straw and spraying No. 2 fuel oil over the sides and bottom of the ponds and then igniting the straw and fuel oil.[91] The area adjacent to the ponds was disked to reduce future risk of fire.[92] These four ponds were then covered and seeded by June 25, 1981.[93]

Mr. Wayne Adams indicated that there were five designated burn areas in Areas 11 and 12 used by IMC for burning the propellant that had been left in the ponds and other leftover explosives from these areas.[94] He located these burn areas southeast of Area 12 (south of the Southern Perimeter Road and inside the fence line). However, he was unable to identify the location of these burn areas; some of them might have been located in Area 11 also. He said that the vegetation at the burn areas was scraped off with a dozer and the materials were piled on the dirt

[83] CSC explosive decontamination activities were discussed in detail in Section 16.
[84] DPRA Document No. 00021278. United States Government Memorandum from USFWS Safety Manager to Regional Director regarding explosive decontamination activities at Crab Orchard NWR, dated November 19, 1975, Page 2.
[85] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6
[86] Wayne Adams, personal interview, March 23, 2000.
[87] DOI 006721. IMC, Letter to Mr. Walter Franke of IEPA submitting the second progress report regarding the destruction of contaminated structures at IMC's Marion, Illinois plant, dated July 14, 1977, Page 2.
[88] Wayne Adams, personal interview, March 23, 2000.
[89] ACC 000008 – Memorandum to LTC Milton from Dean M. Dickey (Assessments Branch, Technology Division), dated June 11, 1979.
[90] U.S. Department of the Interior, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, Calendar Year 1980, Page 28.
[91] CRO 001684. Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), September 1977, Page 4.
[92] CRO 001684. Petition for Variance to the Illinois Pollution Control Board, IMC Chemical Group, Inc. (petitioner) vs. Illinois Environmental Protection Agency (respondent), September 1977, Page 4.
[93] CRO 001713. IMC, Letter to Mr. Wayne Adams of USFWS regarding completion of the burning some buildings, dated June 25, 1981.
[94] Wayne Adams, personal interview, on March 23, 2000.

in the center of the area and allowed to dry. The explosives were then burned using diesel fuel and straw to ignite the burns.

20.1.2.5.3 Area 12 Housekeeping

Surface/Subsurface Disposal Areas

The following discussion is based on interpretation of the 1960, 1965, 1971, and 1980 aerial photographs.[95]

A disposal area was identified just south-southwest of the RDX production area in the 1965 aerial photograph. There appears to be a roadway leading from the RDX production area to this disposal area, which would suggest the possibility of disposal of RDX production wastes in this area. By 1971, evidence of recent disposal activity in this area is very limited. By 1971, CSC had ceased all operations in Areas 11 and 12.

There is evidence of both open storage and disposal activities on the foundation of former Building ANP-1-7 (IOP Neutral Liquor Building), as seen in the 1965 aerial photograph. Also in this photograph, there is evidence of disposal activity in the open area just south of this same building (former Building ANP-1-7). The open storage and disposal in this area was no longer evident in the 1971 aerial photograph.

It appeared in the 1965, 1971 and 1980 aerial photographs that debris and refuse had been dumped in the area of the burning grounds. There also appeared to be a trench (approximately 50-ft long by 8-ft wide) located in the southeast portion of the burning grounds. It appeared that the trench was being used frequently in the 1965 aerial photograph. By 1971, this trench appeared only as a ground scar surrounded by dense vegetation.

In the 1965 aerial photograph, there appeared to be another small disposal area located just southeast of the north-south trending firebreak on the south side of the South Perimeter Road. This area was previously noted in the 1960 aerial photograph as a square-shaped feature of unknown purpose. This area appeared to be frequently accessed in the 1965 aerial photograph. By 1971, this area does not appear to be in use.

There was a salvage or "laydown yard" identified for the first time in the 1965 aerial photograph. It was located just west of the powder storage ponds and just east of the Old Contractor Road. It was not discernible what types of objects were present in this yard; however, many of the objects are approximately the size of 55-gallon drums, and it appears that vehicular traffic passed in and out of this area on a regular basis.

The two liquid-filled trenches that were present in the southeastern portion of Area 12 in 1960 are no longer evident in the 1965 aerial photograph.

[95] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 4, 5, 6, and 7.

Also, the probable surface dumping that was located just inside the northeast corner of the Area 12 perimeter fence was no longer evident in 1965. However by 1971, it appeared that there was a possible ditch or trench located in this area, which was accessible via two new vehicular tracks.

The 1980 aerial photograph identified a trench approximately 140-ft long by 12-ft wide, just west of former Building 28 (which had been removed sometime between 1971 and 1980). This trench may have been used for burning or for disposal.

There was a trench identified in the 1980 aerial photograph on the banks of a small lake, located just west of Area 12. This trench appears to have been used for disposal and it may have been located near the disposal area that was identified near this lake by USFWS during the 1999 site reconnaissance.[96]

Miscellaneous Housekeeping Concerns

According to Mr. William E. Webb, a retired USFWS fire chief and safety officer, there was a diesel fuel spill at Area 12.[97] There was no other information about this spill.

20.1.2.6 U.S. Fish and Wildlife Service Demolition

All the remaining buildings in Area 12 were demolished under two contracts with USFWS, as discussed below. Based on site observations and discussions with Refuge personnel, it was determined that after demolition, the buildings, their foundations, and the building debris were buried in place. Both contracts required that all debris be covered with soil fill for the 1983 demolition, at least 24 inches of fill material; and for the 1989 contract, with at least 36 inches of fill material. This demolition information was obtained from USFWS files.[98,99]

November 1983 Demolition

USFWS hired a contractor in 1983 to demolish and bury Olin/U.S. Powder Map Building 70 (IOP change house, ANP-1-10). The demolition was completed in 1984.

Also in 1983, the IOP-era water tower was removed from Area 12.[100]

September 1989 Demolition

USFWS hired a contractor in 1989, to demolish the following buildings in Area 12 (Building references from the U.S. Powder Map):

- Building 71 (referred to in bid as "Warehouse")
- An unnamed building located just south of Building 71 (referred to in bid as "Building SW")
- Building 76 (referred to in bid as "ANP-1-8")

[96] Entech, Inc., 1999, Site Specific Report on Area 12 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Page 95.
[97] William Webb, personal interview, September 29, 1997.
[98] USFWS file for Contract No. 14-16-0003-83-096, Excavating Services – Building Demolition.
[99] USFWS file for Contract No. 14-16-0003-89-0033, White Equipment – Building Demolition.
[100] DPRA Document No. 00009449. U.S. Department of the Interior, Fish and Wildlife Service, National Wildlife Refuge System, Annual Narrative Report, Calendar Year 1983, Page 26.

- Building 76-1 (referred to in bid as "Small Building S")
- Building 76-3 (referred to in bid as "Small Building SW")
- Building 76-5 (referred to in bid as "Small Building N")

The demolition was completed in 1990.

20.1.3 Area 12 Previous Sampling Results

The following non-AUS OU sites in Area 12 have previously been investigated:

- EMMA OU Site COP-4[101] (investigated by O'Brien & Gere as Site 3)
- EMMA OU Site COP-3
- Water Tower OU Site No. 2

The locations of Sites COP-3 and COP-4 are shown in Figure 20-3. The location of Water Tower No. 2 is shown in Figure 15-3 ("Elevated 150,000-gallon water tank").

Site COP-4 was remediated as part of the EMMA OU. The extent of remediation is shown in Figure 20-10. The analytical results from COP-4 are discussed here because the extent of investigation was much greater than the extent of remediation, and the contaminant types may be indicators of other contaminants in Site AUS-0A12.

Site COP-3 was the Area 12 Powder Ponds. This site was determined to require no further action in the EMMA OU RI. The results are also included here because the contaminant types may be indicators of other contaminants in Site AUS-0A12.

Water Tower OU Site No. 2 was addressed in an investigation as part of the Water Tower OU in 1992, then again in 2000. In the 2000 investigation, 29 soil samples were taken in the vicinity of the former water tower and analyzed for lead. Lead was detected at concentrations from 9.2 mg/kg to an estimated concentration of 968 mg/kg, with an estimated 95 percent upper confidence limit of the mean of 144 mg/kg. Based on the analytical results, it was concluded that the site did not represent unacceptable risk and no further action was necessary. These findings were included in the closure report for the Water Towers OU.[102]

Site COP-4

O'Brien & Gere[103] investigated Site 3, the Area 11 South Field, which was later renamed COP-4 in the Woodward Clyde Consultants (WCC) Confirmation Study.[104] COP-3 was also investigated in the WCC Confirmation Study.[105] COP-3 and COP-4 were further investigated in

[101] COP originally stood for "Crab Orchard Plant."
[102] U.S. Fish and Wildlife Service, 2001. Draft Final Revised Closure Report, Water Towers Operable Unit, Crab Orchard National Wildlife Refuge, June. Prepared by URS.
[103] O'Brien & Gere, 1988, Remedial Investigation Report, Crab Orchard National Wildlife Refuge, Volume I, Final Report
[104] Woodward Clyde Consultants, 1988, Final Confirmation Study at Crab Orchard National Wildlife Refuge, Hampton Cemetery and Ammunition Plant Dera Site.
[105] Woodward Clyde Consultants, 1988, Final Confirmation Study at Crab Orchard National Wildlife Refuge, Hampton Cemetery and Ammunition Plant Dera Site.

the ESE EMMA OU Remedial Investigation/Baseline Risk Assessment (RI/BRA) Report.[106] COP-4 required remedial action based on the results of the ESE RI/BRA. It was also included in the Parsons Engineering Science Engineering Evaluation and Cost Analyses (EECA) report,[107] which only addressed ordnance and explosive waste (OEW) concerns at this site.

O'Brien & Gere, 1988

Three composite soil samples and two composite sediment samples were collected from this area (COP-4, O'Brien and Gere Site No. 3) during this RI.[108] Soil and sediment results are reported in dry weight except where noted. Some results reported by O'Brien and Gere are not included here because they were determined to be not useable. Results reported here are estimated.[109] The following volatile organic compounds (VOCs) were detected above United States Environmental Protection Agency (USEPA) Soil Screening Levels (SSLs) and/or New Dutchlist Soil Optimum Levels (DSOLs) in soil samples: acetone (0.073 milligrams per kilogram (mg/kg)), methylene chloride (0.114 mg/kg), tetrachloroethene (0.049 mg/kg), and toluene (0.002 mg/kg). The following semi-volatile organic compounds (SVOCs) exceeded USEPA SSLs and/or Canadian Soil Quality Guidelines (CSOQGs): 2,6-dinitrotoluene (0.389 mg/kg), benzo[a]anthracene (0.059 mg/kg wet weight (wt)), chrysene (0.064 mg/kg wet wt), naphthalene (0.041 mg/kg wet wt), and pyrene (0.066 mg/kg wet wt). Arochlor 1254 (0.86 mg/kg wet wt) exceeded DSOLs. Barium (1,210 mg/kg) were detected above USEPA SSLs and Refuge background levels.[110] Chromium (59 mg/kg) exceeded CSOQGs and Refuge background levels.

In the sediment samples, tetrachloroethene (0.184 mg/kg) was detected above USEPA ECOTOX levels. Arochlor 1254 (0.15 mg/kg) exceeded USEPA Region IV levels. Chromium (80 mg/kg) exceeded CSEQGs.

Woodward Clyde Consultants (WCC) Confirmation Study, 1988

Soil borings were done and one monitoring well was installed at COP-4. Soil and groundwater samples showed some evidence of chemical contamination. Based on these results, COP-4 was included in the RI/BRA.

ESE RI/BRA, 1994

At COP-4, ESE dug 10 test pits (Figure 20-5) along a linear magnetic anomaly that turned out to be an industrial dumping area. Surficial soil samples were taken in a reported burn area. As the

[106] Environmental Science and Engineering, Inc., 1994, Draft Final Remedial Investigation/Baseline Risk Assessment Report, Explosives/Munitions Manufacturing Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I, Remedial Investigation (RI) Report.
[107] Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis Final Report – Former Illinois Ordnance Plant – Marion, Illinois.
[108] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 9-2.
[109] DPRA Document No. 00018887. Letter from Richard Boice to Dick Ruelle of USFWS regarding Crab Orchard Lake RI/FS, dated February 18, 1987. The letter reports that the data for the following constituents are not useable: 2-butanone, vinyl acetate, 4-methyl-2-pentanone, aniline, bis(2-chloro-isopropyl)ether, 4-chloroaniline, 2-nitro-sodiphenylamine, benzidine, di-n-octyl-phthalate, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, cyanide, Ag, As, Be, Cd, Cu, Ni, Pb, Se, Zn, and Hg.
[110] See Table 1-11 of this report for Refuge background soil values used for the PA.

locations of the surficial samples illustrate, ESE did not have the benefit of the Olin drawing that showed the location of the burn area (Figure 15-3). Wells were installed in sandy glacial material at depths around 23 to 24 ft. Several soil borings were installed. In the soil samples, arsenic (33 mg/kg), barium (386 mg/kg), beryllium (1.2 mg/kg), nickel (43.3 mg/kg), and thallium (1.61 mg/kg) exceeded USEPA SSLs and Refuge background levels. Copper (40 mg/kg) and zinc (254 mg/kg) exceeded DSOLs and Refuge background levels. Calcium (21,600 mg/kg), lead (34.1 mg/kg), and magnesium (13,900 mg/kg) were detected above Refuge background levels. Barium (510 ug/L), chromium (707 ug/L), and cobalt (500 ug/L) exceeded DGOLs in the groundwater samples. Arsenic (77.4 ug/L), cadmium (40 ug/L), copper (479 ug/L), lead 341 ug/L), selenium (3.7 ug/L), silver (50 ug/L), and zinc (1,840 ug/L) were detected above CWQGs. Aluminum (11,900 ug/L), antimony (530 ug/L), beryllium (50 ug/L), and manganese (2,880 ug/L) exceeded MCLs. Iron (2,990 ug/L) exceeded both MCLs and CWQGs. In the test pit soil samples, HMX was detected from 0 to 2 ft at 65 mg/kg in test pit 9 and 10,800 mg/kg in Test Pit 10. RDX was detected from 0 to 2 ft at 10.8 mg/kg in test pit 7, 43,900 mg/kg in Test Pit 9, and 85,600 mg/kg in Test Pit 10. The explosive 1,3,5-TNB was detected at levels of 6.1 mg/kg from 4 to 6 ft in pit 9 and 179 mg/kg from 0 to 2 ft in Test Pit 10. TNT was detected in test pit 7 at 10.4 mg/kg from 0 to 2 ft. In test pit 9, TNT was detected from 0 to 2 ft at 44,600 mg/kg, 4 to 6 ft at 39.4 mg/kg, and 8 to 10 ft at 446 mg/kg. TNT was also detected in test pit 10 from 0 to 2 ft at 77,000 mg/kg and 8 to 10 ft at 11 mg/kg. Test Pits 9 and 10 were included in the remediated area. Figure 20-5 shows the portion of COP-4 that was excavated during the EMMA OU remedial action (1999). Other ESE analytical results are shown in the figure, but analytical results from the excavated area (both pre-and post-remediation) are not included.

Tetrachloroethylene was detected in Test Pit 2 at 0.25 mg/kg, which exceeded USEPA SSLs. The SVOC compound 2,6-dinitrotoluene was detected at levels of 97.7 mg/kg in test pit 10 from 0 to 2 ft and exceeded USEPA SSLs. The following chemicals were detected above USEPA SSLs and Refuge background levels: antimony was detected in test pit 1 at 12.9 mg/kg from 0 to 2 ft, barium was detected at 2,140 mg/kg in test pit 1 from 0 to 2 ft, beryllium was detected at 0.98 mg/kg in test pit 10 from 8 to 10 ft, cadmium was detected at 5.1 mg/kg in test pit 10 from 0 to 2 ft, mercury was detected at 1.07 mg/kg in test pit 1 from 0 to 2 ft, nickel was detected at 83.3 mg/kg in test pit 1 from 0 to 2 ft, silver was detected at 5.1 mg/kg in test pit 1 from 0 to 2 ft, and sodium was detected at 742 mg/kg in test pit 1 from 0 to 2 ft. The following chemicals were detected above DSOLs and Refuge background levels: copper was detected at 639 mg/kg in test pit 1 from 0 to 2 ft, lead was detected at 421 mg/kg in test pit 1 from 0 to 2 ft, and zinc was detected at 2,460 mg/kg in test pit 1 from 0 to 2 ft. Chromium was detected at 107 mg/kg in test pit 2 from 0 to 2 ft and exceeded CSOQGs and Refuge background levels. The following chemicals were detected above Refuge background limits: calcium was detected at 92,900 mg/kg in test pit 3 from 2 to 4 ft, iron was detected at 59,500 mg/kg in test pit 3 from 2 to 4 ft, and magnesium was detected at 14,600 mg/kg in test pit 3 from 2 to 4 ft. Based on the chemical results of this investigation, there were unacceptable human health risks (for 1,3,5-trinitrobenzene, TNT and RDX) and unacceptable ecological risks (for HMX, RDX, TNT and 1,3,5-trinitrobenzene for the small mammal, white-tailed deer and bob white quail, also for zinc for the bob white quail) at this site, so remediation was recommended. This site has been remediated. Nested monitoring wells were being placed around the previously excavated area at the time of the SI.

Based on the water level information obtained as a part of this investigation, the general groundwater flow direction was found to be to the north in Areas 11 and 12. These data is presented in Figure 15-6.

Parsons Engineering, 1997

COP-4 required remedial action based on the results of the ESE RI/BRA; therefore, it was also included in the Parsons Engineering Science EE/CA report,[111] which only addressed OEW concerns at this site. Parsons Engineering conducted an OEW investigation at this site (former COP-4) in 1997. There was no chemical investigation done in this area at this time. Two-100 ft square grids were investigated at this site (the site measured approximately 800ft by 200ft in size) and a total of 87 magnetic anomalies were identified. [112] Twenty-eight of these were intrusively investigated and all were non-ordnance scrap except for two, which were munitions fragments, not unexploded ordnance (UXO).[113] Propellant pellets were also found on the roadways in this area and in the grass and vegetation along the roadways; however, they were only removed from the roadways.[114]

Site COP-3

Woodward Clyde Consultants (WCC) Confirmation Study, 1988

Soil borings were done and one monitoring well was installed at COP-3. Soil and groundwater samples showed some evidence of chemical contamination. Based on these results, COP-3 was included in the RI/BRA.

ESE RI/BRA, 1994

Twelve soil borings were drilled and sampled at COP-3 in the area of the former impoundments, and three sediment samples were taken from the discharge ditch. Soil borings were drilled as closely as possible to the centers of the trenches, and sampling was done at intervals from 4 to 18 ft, except for two borings which were sampled from 0 to 2 ft and from 2 to 4 ft. Shallow samples were not taken in most of the borings because of the assumption that at least the upper 4 ft of soil was fill. All soil samples were analyzed for explosives and metals and a few were also analyzed for VOCs and BNAs. Sediment samples were analyzed for explosives. Two wells were installed to depths of approximately 23 ft in glacial material, in addition to the one monitoring well that had been installed by WCC during the Confirmation Study in 1988. Groundwater samples were analyzed for metals and explosives, and one sample was analyzed for VOCs and base-neutral acids (BNAs). Sample locations are shown in Figure 20-4. In the soil samples, cobalt (23.9 mg/kg) exceeded DSOLs and Refuge background levels. Arsenic (18.2 mg/kg), barium (317 mg/kg), beryllium (1.34 mg/kg), and mercury (0.11 mg/kg) were detected above

[111] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois.
[112] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-34 through 2-40.
[113] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-34 through 2-40.
[114] Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-34 through 2-40.

USEPA SSLs and Refuge background levels. Cadmium (5 micrograms per Liter (ug/L)) exceeded Canadian Water Quality Guidelines (CWQGs) in the groundwater samples. Barium (330 ug/L), chromium (417 ug/L), and cobalt (100 ug/L) exceeded New Dutchlist Groundwater Optimum Levels (DGOLs). Aluminum (21,000 ug/L), antimony (50 ug/L), beryllium (6 ug/L), and manganese (5,480 ug/L) exceeded maximum contaminant levels (MCLs). Iron (10,100 ug/L) was detected above MCLs and CWQGs in the groundwater samples. All three of these monitoring wells have been abandoned. According to this report, there were no human health or ecological risks associated with this site so no further action was recommended.

USEPA Sampling, 1998

USEPA sample locations are shown in Figures 20-6.[115] The results for all detected constituents are listed in Table 20-1A.

Two samples were collected from the original AUS Site 51, Samples 51-01 and 51-02. The samples were analyzed for SVOCs and metals. No SVOC target compounds exceeded limits. Mercury (0.08 mg/kg) exceeded Refuge background values.[116]

Two samples were collected from the original AUS Site 52, Samples 52-01 and 52-02. Samples were analyzed for SVOCs and metals. No SVOC target compounds were detected above limits. Nickel (23 mg/kg) exceeded USEPA SSLs and Refuge background levels. Zinc (230 mg/kg), copper (49 mg/kg), and lead (110 mg/kg) exceeded DSOLs and Refuge background levels. Mercury (0.08 mg/kg) exceeded Refuge background levels.

Sample 58-01 was collected from the original AUS Site 58 and tested for SVOCs and metals. The following SVOC compounds were detected at the site above either USEPA SSLs and/or CSOQGs: benzo[b]fluoranthene (2.5 mg/kg), benzo[k]fluoranthene (2.5 mg/kg), benzo[a]pyrene (2.5 mg/kg), indeno[1,2,3-c,d]pyrene (3.0 mg/kg), and dibenz[a,h]anthracene (1.2 mg/kg). Beryllium (3.6 mg/kg) and nickel (41 mg/kg) exceeded USEPA SSLs and Refuge background levels. Cobalt (48 mg/kg) and copper (150 mg/kg) exceeded DSOLs and Refuge background levels. Chromium (100 mg/kg) exceeded CSOQG and Refuge background level.

20.1.4 Observations During Site Visit

There were numerous ponded areas and mounded areas observed during the site reconnaissance (spring 1999), throughout Area 12, as seen in Figures 20-7 through 20-21. Some of the mounded areas appear to coincide with the location of former buildings which were buried in-place after they were razed. There are also several building foundations still visible on site. Explosives-related debris was observed on two of these foundations. Empty blasting caps and solid propellant were observed on the foundation of former Building ANP-1-11, and solid propellant debris was observed on the foundation of a former Silas Mason building that was located just to the east of former Building ANP-1-11, on the other side of the roadway.

[115] In the information provided by USFWS to URS, there were two sets of survey coordinates for Sample 51-02. Both were included since it is not known which is correct.
[116] See Table 2-6 of this report for Refuge background soil values used for the PA.

Many of the drainage ditches that were used by former industrial tenants are still present on site. In general, most of the surface water in this area drains either to the west or to the northeast via drainage ditches and/or creeks. The eastern part of Area 12 (as divided by a north-south roadway) drains to the northeast and the western part of Area 12 drains toward the west. A sheen was noticed on the water in three of the drainage ditches in Area 12 and on a small ponded area in the Area West of Area 12. One of the sheen locations in a drainage ditch was northeast of former Olin/U.S. Powder Building 71, on the north side of the North Perimeter Road. The second sheen location in a drainage ditch was southeast of former U.S. Powder Building 76-1, on the opposite (east) side of the roadway. The third sheen location (which also contained some foam) was observed in the main drainageway that flows westward through the center of the west half of Area 12, just east of the former burning grounds. This location is downstream of a concrete trough that appears to be a possible former outfall for former Building 76-2.

In general, most of this area is tree-covered and contains very dense vegetation. There is much debris scattered throughout Area 12, including construction debris and some scattered abandoned drums. There was also some solid propellant found on the ground in this area, mainly in the center of Area 12. There was also an overgrown area that was observed in the southeast portion of the site (north of the South Perimeter Road), where some powder can lids were found. There were several potential debris/dumping areas identified during the site reconnaissance. These areas are discussed further in Section 20.2.1 below.

20.1.5 Recommendations Based on Preliminary Assessment

Site AUS-0A12 was retained for inclusion in the SI because it is a former industrial area that has not been previously characterized, and because USEPA sample results exceeded PA screening criteria. The area included in the EMMA OU COP-4 remediation and the area investigated as Water Tower No. 2, as part of the Water Tower OU, are excluded from the site.

20.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0A12 from April 3 through June 26, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[117] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 20.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 20-7 through 20-21. Survey coordinates for all sample locations in Area 12 are listed in Table 20-2. Table 20-4 lists the sample locations and the matrix sampled at that location. All samples were soil unless otherwise noted. Groundwater samples were taken from monitoring wells.

[117] U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

20.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. There were several areas of concern investigated during the SI. They are as follows:

Water Tower No. 2

Sample 0A12-095 was taken southwest of the former Water Tower No. 2 location. This sample was analyzed for metals.

Powder Storage Ponds (former EMMA OU Site COP-3)

It was determined that the fill material placed into the former powder storage ponds after they had been flashed was of unknown origin and, therefore, it should be tested since this was not done during the EMMA OU investigations. As a result, four soil samples were planned to be collected from the former pond locations: 0A12-085 (former Pond #7), 0A12-086 (former Pond #6 – western portion), 0A12-089 (former Pond #3) and 0A12-091 (former Pond #2). There was also a sample (0A12-087) that was planned to be collected from between the two portions of Pond #6, and Pond #5 to see if the area between these ponds may have received overflow from the ponds. Survey coordinates from sample locations were obtained from aerial photographs[118]. The locations of the ponds on Figures 20-16 through 20-18 are approximate.

There were two samples (0A12-083 and 0A12-084) collected from along the former railroad line, that was reportedly used to bring in the cannon powder.

There appears to be an outfall for the powder storage pond area that drains into a short ditch that flows southeastward into a nearby creek that receives drainage from the eastern half of Area 12. Sample 0A12-088 was collected from right next to this outfall in the short ditch that leads to the creek and sample 0A12-090 was collected from further downstream in this same short ditch.

There were two monitoring wells installed in the area of the Powder Storage Ponds: 0A12-W01 and 0A12-W02. Monitoring well 0A12-W01 was placed in a location that is downgradient of most of Area 12 and upgradient of AUS-A11N. Monitoring well 0A12-W02 was supposed to be placed in the reported location of two buried tanks that were identified near the northeast corner of the powder storage ponds during the WCC Confirmation Study.[119] It was not determined what was stored in these tanks and there have been no subsequent investigations of these tanks. An ESE report[120] identified a rusted electric motor and an apparent pump possibly located on a concrete pad that was buried in this area. This equipment may have been associated with the two

[118] At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few feet; acceptable for of locating site features such as these ponds.

[119] Woodward Clyde Consultants, 1988, Final Confirmation Study at Crab Orchard National Wildlife Refuge, Hampton Cemetery and Ammunition Plant Dera Site, Figure 3.47.

[120] Environmental Science and Engineering, Inc., 1994, Draft Final Remedial Investigation/Baseline Risk Assessment Report, Explosives/Munitions Manufacturing Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I, Remedial Investigation (RI) Report, Page 4-89.

tanks. A magnetometer survey was done to try to find the location of these two tanks, assuming that they are still in place. The survey did not identify these two tanks, or the rusted electric motor and apparent pump. As a result, monitoring well 0A12-W02, was placed in the assumed general area of the reported buried tanks. This assumption was made based on descriptions from the above-mentioned reports.

There were three previous monitoring wells installed at former EMMA OU Site COP-3 (MW-COP3-1, MW-COP3-2, MW-COP3-3); however they are no longer present on site.

All samples were collected in accordance to the tables in the Field Sampling Plan (FSP) with the following exceptions:

- AUS-0A12-090-SW-00 — This sample was not collected because no surface water was present at this location at the time of sampling.
- AUS-0A12-W02-TK-00 — This sample was not collected because this tank was not located in the field during the SI field investigation.
- AUS-0A12-MW-COP3-1-GW-00 — This sample was not collected because this well is no longer present on site.
- AUS-0A12-MW-COP3-2-GW-00 — This sample was not collected because this well is no longer present on site.
- AUS-0A12-MW-COP3-3-GW-00 — This sample was not collected because this well is no longer present on site.

Possible Burn Pads

There were two former building foundations identified during the site reconnaissance, on the north side of the North Perimeter Road in Area 12. The westernmost building foundation was former Building ANP-1-11 (former IOP Timekeepers Building). There were empty blasting caps and solid propellant found on this building foundation, thus indicating that explosive materials may have been ignited on this foundation. Sample 0A12-045 was collected from the ground surface next to this foundation.

The easternmost building foundation was a former building that was present on site during Silas Mason's tenure in Area 12. The use of this former building was not identified. There was solid propellant debris found on this building foundation, thus indicating that this foundation may have been used to ignite explosives. Sample 0A12-050 was located next to a 5-inch drain that may have originated at this former building.

Olin/U.S. Powder Map Building 70

Sample location 0A12-021 (soil and surface water) is located in what appears to be the origin of a west flowing ditch/creek that runs along the north side of the former burning grounds. This ditch/creek may have received drainage from former Building 70 (former IOP Change House (Building ANP-1-10) and Olin/CSC Storage (Building 70)). Sample location 0A12-024 was located further downstream of sample 0A12-021, in the same drainageway.

Building ANP-1-9

Sample 0A12-049 was located in a east-flowing ditch that runs along the south side of the North Perimeter Road, near former Building ANP-1-9. This building was a former IOP Office Building and it may have been used by Silas Mason also. This building was razed sometime between 1951 and 1960. This ditch may have received runoff from the ammonium nitrate production area.

Burning Grounds

Both Olin and CSC records indicate that there were burning grounds in Area 12 along the former IOP railroad spur that entered the site from the west. These burning grounds were a part of EMMA OU Site COP-4; however they were not fully investigated in the EMMA OU because their presence was not previously identified. There were three or four burning pads or possibly pits identified in aerial photographs and historical Olin and U.S. Powder maps. There was a fairly deep drainage ditch that appears to originate just south of the RDX Plant and it continues westward, through the center of the former burning grounds. Sample locations 0A12-007, 0A12-093, 0A12-009, 0A12-010 and 0A12-012 all appear to line up with the former burning pads/pits. Since there was no evidence of these burn pads/pits on site, these five sample locations were identified using coordinates obtained from historical aerial photographs.[121]

Sample 0A12-007 was collected from a ponded area that appeared to line up with the westernmost pad/pit. Test pit 0A12-093 was excavated in the location of this same westernmost burning pad/pit, outside of the ponded area to determined if this was a former burning pit or if it was actually just a burning pad. Another test pit (0A12-010) was excavated at another former burning pad/pit location for the same reason. Samples 0A12-009 and 0A12-012 were both collected from the deep drainageway that flows westward through this area, and both were located in possible former burning pad/pit areas, as identified by historical aerial photographs. Sample locations 0A12-006 and 0A12-016 were also both collected from this same deep drainageway. Sample 0A12-006 was collected from downstream of the former burning pads/pits. Sample 0A12-016 was located upstream of these former burning pads/pits, just south of another possible burning trench (found at test pit location 0A12-015 (soil and trench water)) that was identified during the historical aerial photograph interpretation. There was foam and a sheen observed on the water at this location (0A12-016) during the site reconnaissance in 1999.

Previous investigations done at EMMA OU Site COP-4, detected volatile organics in the deeper soils, to the south of the former burning pads/pits. Test pits 0A12-008 and 0A12-013 were excavated in this area to help determine the source of this possible contamination. Sample 0A12-013 was also located in a debris field. Sample location 0A12-011 was collected from a soil mound that is also located to the south of the former burning pads/pits. The origin of this

[121] At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few feet.

mound was not identified. It is possible that this mound was related to the former burning operations that were reportedly conducted in this area.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-010-SS-05 — This sample was not collected because the bottom of the trench was encountered above five ft.
- AUS-0A12-012-SW-00 — This sample was not analyzed for phosphorus, although it was called for in the FSP.

Possible Burning Trenches

There were four possible burning trenches identified in aerial photographs in Area 12. Two were located on the eastern half of Area 12 and two were located on the western half. Both of the trenches on the eastern half of Area 12 (in southeast portion if Area 12) were located in an overgrown area where powder can lids were identified during the site reconnaissance. There was no evidence of these trenches observed at the site during the site reconnaissance, so they were located using survey coordinates obtained from the historical aerial photographs. These trenches may have been used for either burning or disposal activities. Test pits 0A12-064 and 0A12-099 were excavated in the locations of these two former trenches.

The other two possible burning trenches were located on the western half of Area 12, in the area of the former burning grounds. There was no evidence of these trenches observed during the site reconnaissance, so they were located using survey coordinates obtained from the historical aerial photographs. These trenches may have been used for either burning or disposal activities. Test pits 0A12-015 and 0A12-100 (soil and trench water) were excavated in these two former trench locations. These two test pits may have been associated with the former burning grounds (discussed above).

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-064-GW-00 — This sample was not collected because groundwater was not encountered during excavation.
- AUS-0A12-099-GW-00 — This sample was not collected because groundwater was not encountered during excavation.
- AUS-0A12-099-SS-02 — Sample was added during field investigation.

RDX Plant

Building 76 (former IOP/Olin Boiler House and CSC RDX Separation Building) was located in the center of Area 12, on the west side of the north-south running road. This building was razed and buried on site. Both TNT and RDX were identified as potential contaminants in this building, so it was also flashed prior to razing. There is a mounded area in the former location of this building. Sample 0A12-034 was collected from this mounded area because it is believed that RDX was produced in this building. During IOP operations, there was likely a transformer located just off the southwest corner of this building. Sample 0A12-096 was collected from this location to determine whether or not PCB contaminated oils may have been spilled from the transformer in this location.

Samples were collected from each side of this building (Building 76) for different reasons. Sample 0A12-032 was collected along the north side of this building, along the former IOP railroad spur that went through this area. Sample 0A12-033 and 0A12-036 were planned to be collected from the west and east sides of the building, respectively; to identify potential contamination associated with spillage from this building. Both these samples were actually collected just north of the building, because this is where the aerial coordinates located the points. There may have been a former loading dock located on the west side of the building and there appears to have been some scarring, historically located on the east side of the former building. Sample 0A12-035 (soil and trench water) was located on the south side of former Building 76, in the area of the former IOP Boiler House blow-off basin which was also the area of six former ASTs that were present on site during RDX production.

There were four buildings associated with the RDX production building: 76-1 (Air Dryer and Steam Generator), 76-2 (RDX Mixer House), 76-3 (Tray Drier Building) and 76-5 (Electric Control House). Both RDX and TNT were identified as potential contaminants in the first three of these buildings, and as a result all three of these buildings were flashed prior to razing them. Sample 0A12-037 was planned to be located next to former Building 76-1 where there is a likelihood for contamination related to spillage of materials. This sample was actually located about 30 ft to the northwest of this building. Sample 0A12-038 was collected from a depressed area just south of this building.

It is likely that there is contamination resulting from spillage of materials next to Building 76-2 (RDX Mixer House). Sample 0A12-031 was located on the southeast side of this building. A test pit (0A12-029) was excavated on the north side of this building in another likely location of spillage of materials, to determine the vertical extent of contamination in this area. A test pit was excavated instead of drilling a soil boring, because the ordnance subcontractor believed that it would be safer not to use a drill rig in this area.

There were two sample locations near Building 76-3 (Tray Drier Building). Sample 0A12-027 was located on the east side of this building in an area that was likely to have received spillage of materials. Sample 0A12-026 was located to the north of Building 76-5 at the outfall in a dry drainage ditch that may have received drainage from this building.

Between former Buildings 76-2 and 76-3 and slightly to the west, there were a couple of partially crushed drums that had been disposed of in a debris area. Sample 0A12-028 was located at the location of these drums.

Just south of Buildings 76-1 and 76-2, there is a fairly deep drainage ditch, which runs westward through the burning grounds from this area. This drainage ditch appears to originate to the southwest of former Building 76-1, and it continues to flow westward off site. Sample 0A12-038 was supposed to be located at what appears to be the origin of this deep drainage ditch, however, it was actually collected from a depression just south of former Building 76-1 as discussed above. Sample 0A12-030 is located in this ditch near Building 76-2, next to a concrete trough which appears to be an outfall for this former building.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-029-GW-00 This sample was not taken because no groundwater was encountered during excavation.
- AUS-0A12-038-SW-00 This sample was not taken because surface water was present at this location.
- AUS-0A12-030-SW-00 This sample was not analyzed for phosphorus, although it was called for in the FSP.

Building ANP-1-7

Former Building ANP-1-7 was the former IOP Neutral Liquor Building. It was also used by Silas Mason. Sample location 0A12-052 was located on one of the mounded areas that surround the foundation of this former building. There were previously two former ASTs that were located on the east side of former Building ANP-1-7. The tanks were likely only used by Silas Mason and the contents of these former tanks were not identified. Sample 0A12-098 was collected from the location of these former tanks.

There appeared to be a former enclosure with probable standing liquid, located to the northeast of former Building ANP-1-7. This enclosure was identified in the 1951 historical aerial photograph, thus indicating that it was initially related to Silas Mason activities. There was a scarred area just to the east of this enclosure, which may have been the result of a liquid release from this enclosure. Sample 0A12-051 was located within this previously scarred area.

Sample 0A12-046 was located in a drainage ditch to the southwest of former Building ANP-1-7, which appears to have received drainage from this building. Samples 0A12-053 and 0A12-054 were located in an apparent construction debris area, south of former Building ANP-1-7. There were several buildings present in this area during Silas Mason's tenure at the site, as seen in the 1951 aerial photographs.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-0A12-046-SW-00 This sample was not taken because no surface water was present at this location.

Olin/U.S. Powder Map Building 71

Building 71 was the former Olin/CSC Warehouse and Paper Stores Building. It is assumed that Silas Mason originally built this building based on historical aerial photographs; however, it was not determined what they used this building for. The areas surrounding this building appeared to be scarred during Silas Mason's tenure at the site, also as seen in historical aerial photographs. The building was razed in 1989 and it was buried on site. There is currently a large mounded area in the location of the former building. Sample 0A12-059 was collected from this mounded area. There were previously two former ASTs that were located on the west side of former Building 71. The tanks were likely used only by Silas Mason and the contents of these former tanks were not identified. Sample 0A12-097 was collected from the location of these former tanks.

To the south and east of this mounded area is a large ponded area. Samples 0A12-060 (soil and surface water) and 0A12-061 were located in this ponded area. Sample 0A12-060 was located in a previously scarred area along the former railroad spur that ran along the south side of the building. Sample 0A12-061 was located in a previously scarred area on the east side of the former building. Sample 0A12-055 was located in a ditch that headed south from this ponded area into another ditch that flowed to the east, and eventually flowed off site.

All samples were collected in accordance with the table in the Field Sampling Plan with the following exception:

- AUS-0A12-060-SW-00 Phosphorus was not indicated on the COC.

Miscellaneous Debris Areas in AUS-0A12

There were many debris areas noted throughout Area 12 during the site reconnaissance and in historical aerial photographs. Samples were collected from many of these debris areas, as discussed below.

There is an overgrown area observed in the southwest portion of Area 12 (bounded by Southern Perimeter Road to south and east-flowing ditch to the north), where propellant can lids were observed during the site reconnaissance. This area includes former building locations ANP-1-3 through ANP-1-6 (two former Pan and Kettle House locations). There were two possible former burning trench locations identified nearby this area as discussed above (sample locations 0A12-064 and 0A12-099). There were three samples collected from this area: 0A12-056, 0A12-057 and 0A12-058. Sample 0A12-057 was collected from a ponded area in this debris area. Sample 0A12-058 was collected from nearby some buried propellant can lids that were identified during the site reconnaissance.

There was an un-vegetated area observed during the site reconnaissance, to the south of former Building 76-1, on the south side of the west-flowing deep drainage ditch discussed above. There was debris identified throughout this area (i.e. coal, slag, scrap) during the site reconnaissance. This area was also identified as a potential disposal area in the historical aerial photograph interpretation. There were two samples collected from this area: 0A12-039 and 0A12-040.

There was another small debris area observed during the site reconnaissance, just to the east of the area that is being remediated (as EMMA OU Site COP-4). There was a drum observed in this area that contained a tar-like material. Both the tar-like material and the soil beneath the drum were sampled (sample location 0A12-023). There was also a shallow burn pit observed in this debris area, to the east of existing monitoring well MW-COP4-2. A sample (0A12-022) was collected from this small burn area.

There is another debris area located to the west of area 12 (which was identified as the U.S. Powder Dump – original AUS OU Site AUS-0054), just west of the perimeter road and east of the perimeter fence. There are also several drainage ditches located in this debris area. There were several empty abandoned drums observed throughout this debris area and samples 0A12-002 and 0A12-005 (sediment) were located next to several of these drums. Sample 0A12-005 was actually located in a drainage ditch next to three drums. Sample locations 0A12-001 (sediment and surface water) and 0A12-003 (sediment) were located in drainage ditches that flowed through this area. Sample 0A12-001 was located near an abandoned drum, in a drainage ditch that also appears to receive drainage from the former burning grounds. Sample 0A12-004 is located in a small debris area located near a north-flowing drainage ditch that runs just east of the perimeter fence.

There was an area of irregular topography (numerous mounds and depressions) observed just south of the south perimeter road and west of the north-south running road (inside the Area 12 perimeter fence). Four samples were collected from this area. Two samples were collected from mounded areas (0A12-041 and 0A12-042) and two samples were collected from ponded depressions (0A12-043 and 0A12-044).

There was a potential former dumping area observed during the site reconnaissance, to the south of the South Perimeter Road in Area 12. The USFWS also reported a former powder burning area in the vicinity of this potential former dumping area and it was included with the original AUS OU sites as Site AUS-0055. The exact location of this reported burning area is not known. Sample location 0A12-067 was located in the area that was observed during the site reconnaissance, however there was no evidence of any burning activities in this area so it is not certain if this was the location of the reported powder burning.

There was a drum observed during the site reconnaissance near the confluence of two ditches, just southeast of the Area 12 perimeter road. This drum was initially identified by the USFWS and it was included in the AUS OU investigation as original Site AUS-0058. Sample 0A12-076 was collected from the soil beneath this drum.

There was a debris/disposal area observed during the site reconnaissance, just to the northeast of the main part of Area 12, northeast of the junction of the North and East Perimeter Roads. This area was also observed in the historical aerial photographs. Construction debris was observed in this area during the site reconnaissance. The historical aerial photographs identified a potential trench in this disposal area. The use of this possible trench was not identified. A test pit (0A12-071) was excavated in the location of this possible former trench. The location of this possible trench was identified using GPS coordinates obtained from historical aerial photographs. Sample 0A12-072 was collected from a drainage ditch that ran northward along the east side of this debris area.

There was a former Salvage Yard/Laydown Yard identified in historical aerial photographs, just west of the former Powder Storage Ponds. Drums may have been stored in this area. Sample 0A12-094 was collected from this area.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-043-SW-00 This sample was not taken because no surface water was present at this location.
- AUS-0A12-044-SW-00 This sample was not taken because no surface water was present at this location.
- AUS-0A12-057-SW-00 This sample was not taken because no surface water was present at this location.
- AUS-0A12-071-GW-00 This sample was not taken because groundwater was not encountered during excavation.

Miscellaneous Drainage in AUS-0A12

The western half of Area 12 (as divided by the north-south running road in the center of Area 12) drains to the west via drainage ditches/creeks. The eastern half of Area 12 drains off site to the northeast via drainage ditches/creeks.

Western Half of Area 12: There appear to be three major drainageways that flow westward through the western half of Area 12. These three drainageways appear to flow together before heading westward off site. The northernmost main drainageway is located just south of the former North Perimeter Road (north of the former railroad right-of-way. There were two samples collected from a large ponded area of this drainageway (0A12-014 and 0A12-024 (both soil and surface water). This drainageway may receive drainage from both former Building 70 and the former RDX production area. Sample 0A12-024 is included with the Building 70 discussion above.

The second main drainageway runs through the former burning grounds and is located to the south of the former railroad right of way. This drainageway receives drainage from the former RDX production area and from the former burning grounds. Samples 0A12-006, 0A12-007 (soil and surface water), 0A12-009, 0A12-012 (soil and surface water), and 0A12-016 (soil and surface water) were located in this drainageway. These samples are discussed above in the "Burning Grounds" section. Samples 0A12-030 (soil and surface water) and 0A12-038 were also located in this drainageway, however these are discussed in the "RDX Plant" section, above.

The third main drainageway runs along the south side of the South Perimeter Road. It enters the site from the south and it has a large ponded area located along it. Samples 0A12-017 and 0A12-078 (soil and surface water) are located in this ponded area. Sample location 0A12-017 was located in a potential former dumping area according to historical aerial photographs.

There is a smaller drainage ditch located on the north side of the North Perimeter Road. Sample 0A12-019 is located in this ditch to detect for spillage of organic materials because methylene chloride was previously detected in existing monitoring well MW-COP4-1, which is located on the south side of the North Perimeter Road. There is another small drainage ditch located on the south side of the South perimeter road, to the south of the former RDX production area. There were two samples collected from this ditch 0A12-025 and 0A12-048.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-017-SW-00 This sample was not collected because no surface water was present at this location.
- AUS-0A12-038-SW-00 This sample was not collected because no surface water was present at this location.
- AUS-0A12-048-SW-00 This sample was not collected because no surface water was present at this location.
- AUS-0A12-012-SW-00 This sample was not analyzed for phosphorus, although it was called for in the FSP.
- AUS-0A12-024-SW-00 This sample was not analyzed for phosphorus, although it was called for in the FSP.
- AUS-0A12-030-SW-00 This sample was not analyzed for phosphorus, although it was called for in the FSP.

Eastern Half of Area 12: There is a main drainage ditch that runs east-northeast through the center of this area. The portion of the main drainage ditch that is located within the perimeter roads, contains two sample locations: 0A12-068 and 0A12-069. Sample 0A12-069 is located at the confluence of this main drainage ditch with a smaller ditch that appears to have received drainage from the area of former Building 71. It appears that all of the roadside ditches also drain into this main drainage ditch and off-site to the northeast. Sample location 0A12-070 is located in this main drainage ditch, to the northeast of the perimeter roads, at the confluence of this ditch with the roadside ditch that runs along the north side of the North Perimeter Road. Sample location 0A12-092 (soil and surface water) is located at the northeast end of a culvert that diverts this main drainage ditch off-site to the northeast. This location is downstream of the entire eastern half of Area 12, except for the former powder storage ponds.

Drainage ditches run along both sides of all of the perimeter roads in the eastern half of Area 12. These ditches are referred to as "roadside ditches". Two samples (0A12-062 and 0A12-063) are located in the roadside ditches that are on either side of the North Perimeter Road. Sample 0A12-062 is located on the north side of the road and 0A12-063 is located on the south side of the road. There was a slight sheen on the water at location 0A12-062, as seen during the site reconnaissance in 1999.

There is one sample located along the East Perimeter Road. This is sample 0A12-073 and it is located on the east side of this road, across from former Pan and Kettle House Buildings ANP-1-1 and ANP-1-2.

There were two samples located along the north side of the South Perimeter Road (0A12-065 and 0A12-075) and one sample located on the south side of the South Perimeter Road (0A12-066). Both samples 0A12-065 and 0A12-075 appear to be in locations that may have received drainage from former Pan and Kettle House Buildings ANP-1-3 and ANP-1-4. Sample 0A12-075 appears to be located in a scarred area of the roadside ditch that may have been the result of liquid release (according to 1951 aerial photograph interpretation).

Sample 0A12-047 was located on the east side of the north-south running roadway that is located in the center of Area 12. The surface water in this location had a slight sheen on it as seen during the site reconnaissance in 1999.

Finally, there is a creek that enters this half of Area 12 from the south, and it generally flows northward through the area that is located east of the perimeter roads and west of the perimeter fence (to the east of the roadside ditch). There were two samples collected from this creek: 0A12-074 (soil and surface water) and 0A12-077 (soil and surface water). Sample 0A12-077 was collected from the creek, south of the South Perimeter Road and just downstream of a soil mound (of unknown origin) that is located next to the creek. Sample 0A12-074 is located to the east of the East Perimeter Road in a location of the creek that appears to receive drainage from both the ditches inside and outside of the perimeter roads, in the area of the former Pan and Kettle Houses.

There is a former sewer manhole located on the eastern half of Area 12, north of the North Perimeter Road. This former manhole is filled with water and sample 0A12-079 was a surface water sample to be collected from this former manhole.

All samples were collected in accordance with the tables in the Field Sampling Plan except that the following surface water samples were not collected because no surface water was present.

- AUS-0A12-047-SW-00
- AUS-0A12-062-SW-00
- AUS-0A12-063-SW-00
- AUS-0A12-066-SW-00
- AUS-0A12-068-SW-00
- AUS-0A12-070-SW-00

Existing Monitoring Wells

There were four existing monitoring wells located in the western half of Area 12, that were left from previous investigations at this site: MW-COP4-1, MW-COP4-2, MW-COP4-3, MW-COP4-4. These four wells were associated with former EMMA OU Site COP-4, which is currently undergoing remediation. Two of the monitoring wells are located nearby the remediated area: MW-COP4-2 and MW-COP4-3. All four of these monitoring wells were to be sampled for a better characterization of groundwater in Area 12.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-MW-COP4-1-GW-00 — This sample was not collected because this well is no longer on site.
- AUS-0A12-MW-COP4-3-GW-00 — This sample was not collected because this well is no longer on site.

Far Western Part of Site AUS-0A12

There were three hand auger borings (0A12-080 (soil and surface water), 0A12-081 and 0A12-082), one test pit (0A12-018 (soil and trench water) and one lake water sample (0A12-020) collected from this area.

Sample 0A12-080 was collected from a ponded area that had a sheen on the water. Both a soil sample and a surface water sample were collected from this location. Sample 0A12-081 was collected from a 5ft tall mounded area that was identified during the site reconnaissance. The purpose of this mounded area was not identified, however this area does appear to be disturbed in historical aerial photographs. Sample 0A12-082 was located in what appeared to be a barren area during the site reconnaissance. This area also appeared to be disturbed in historical aerial photographs and there were a couple of drum lids observed in this area during the site reconnaissance.

There was a possible former trench identified in this area in historical aerial photographs. This trench could possibly have been used for either burning or disposal. Test pit 0A12-018 was excavated in the area of this former trench. There was no evidence of the trench observed on site during the site reconnaissance, so this sample location was identified using GPS coordinates that were obtained from historical aerial photographs.

Surface water sample 0A12-020 was collected from the un-named lake that was located along the western side of this area. There may have been dumping of materials into this lake in the past.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-0A12-020-SW-00 — This sample was not analyzed for phosphorus, although the FSP did call for this analysis.

20.2.2 Field Results

20.2.2.1 Site Conditions

20.2.2.1.1 Geologic Conditions

The available information on the geologic conditions at AUS-0A12 were obtained from the soil borings of two monitoring wells and from the excavation of 13 test pits as shown on Figure 20-6. The two monitoring wells are located in the northern portion of the site and the test pits are located in center and southern portions of the site. A geologic cross-section (Figure 15-11) was made for the site using the monitoring well soil boring information. Boring logs and test pit logs are included in Appendix A. Monitoring well construction diagrams are in Appendix B.

As seen on the geologic cross-section in Figure 15-11, 1.5 to 3 ft of fill material (topsoil, etc.) overlay the site. At 0A12-W01, the fill material contains medium gravel. Beneath the fill there is a 9 to 10.5 ft thick layer of loess (clayey silt). The loess layer continues for another three to four feet but transitions into a silty low plastic clay. In the boring for 0A12-W01 the next layer

Sample 0A12-047 was located on the east side of the north-south running roadway that is located in the center of Area 12. The surface water in this location had a slight sheen on it as seen during the site reconnaissance in 1999.

Finally, there is a creek that enters this half of Area 12 from the south, and it generally flows northward through the area that is located east of the perimeter roads and west of the perimeter fence (to the east of the roadside ditch). There were two samples collected from this creek: 0A12-074 (soil and surface water) and 0A12-077 (soil and surface water). Sample 0A12-077 was collected from the creek, south of the South Perimeter Road and just downstream of a soil mound (of unknown origin) that is located next to the creek. Sample 0A12-074 is located to the east of the East Perimeter Road in a location of the creek that appears to receive drainage from both the ditches inside and outside of the perimeter roads, in the area of the former Pan and Kettle Houses.

There is a former sewer manhole located on the eastern half of Area 12, north of the North Perimeter Road. This former manhole is filled with water and sample 0A12-079 was a surface water sample to be collected from this former manhole.

All samples were collected in accordance with the tables in the Field Sampling Plan except that the following surface water samples were not collected because no surface water was present.

- AUS-0A12-047-SW-00
- AUS-0A12-062-SW-00
- AUS-0A12-063-SW-00
- AUS-0A12-066-SW-00
- AUS-0A12-068-SW-00
- AUS-0A12-070-SW-00

Existing Monitoring Wells

There were four existing monitoring wells located in the western half of Area 12, that were left from previous investigations at this site: MW-COP4-1, MW-COP4-2, MW-COP4-3, MW-COP4-4. These four wells were associated with former EMMA OU Site COP-4, which is currently undergoing remediation. Two of the monitoring wells are located nearby the remediated area: MW-COP4-2 and MW-COP4-3. All four of these monitoring wells were to be sampled for a better characterization of groundwater in Area 12.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0A12-MW-COP4-1-GW-00 — This sample was not collected because this well is no longer on site.
- AUS-0A12-MW-COP4-3-GW-00 — This sample was not collected because this well is no longer on site.

Far Western Part of Site AUS-0A12

There were three hand auger borings (0A12-080 (soil and surface water), 0A12-081 and 0A12-082), one test pit (0A12-018 (soil and trench water) and one lake water sample (0A12-020) collected from this area.

Sample 0A12-080 was collected from a ponded area that had a sheen on the water. Both a soil sample and a surface water sample were collected from this location. Sample 0A12-081 was collected from a 5ft tall mounded area that was identified during the site reconnaissance. The purpose of this mounded area was not identified, however this area does appear to be disturbed in historical aerial photographs. Sample 0A12-082 was located in what appeared to be a barren area during the site reconnaissance. This area also appeared to be disturbed in historical aerial photographs and there were a couple of drum lids observed in this area during the site reconnaissance.

There was a possible former trench identified in this area in historical aerial photographs. This trench could possibly have been used for either burning or disposal. Test pit 0A12-018 was excavated in the area of this former trench. There was no evidence of the trench observed on site during the site reconnaissance, so this sample location was identified using GPS coordinates that were obtained from historical aerial photographs.

Surface water sample 0A12-020 was collected from the un-named lake that was located along the western side of this area. There may have been dumping of materials into this lake in the past.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exception:

- AUS-0A12-020-SW-00 This sample was not analyzed for phosphorus, although the FSP did call for this analysis.

20.2.2 Field Results

20.2.2.1 Site Conditions

20.2.2.1.1 Geologic Conditions

The available information on the geologic conditions at AUS-0A12 were obtained from the soil borings of two monitoring wells and from the excavation of 13 test pits as shown on Figure 20-6. The two monitoring wells are located in the northern portion of the site and the test pits are located in center and southern portions of the site. A geologic cross-section (Figure 15-11) was made for the site using the monitoring well soil boring information. Boring logs and test pit logs are included in Appendix A. Monitoring well construction diagrams are in Appendix B.

As seen on the geologic cross-section in Figure 15-11, 1.5 to 3 ft of fill material (topsoil, etc.) overlay the site. At 0A12-W01, the fill material contains medium gravel. Beneath the fill there is a 9 to 10.5 ft thick layer of loess (clayey silt). The loess layer continues for another three to four feet but transitions into a silty low plastic clay. In the boring for 0A12-W01 the next layer is still silty low plastic clay till with gravel and limestone cobbles to the bottom of the boring at 19 ft below ground surface (bgs) (refusal at 19 ft bgs). At 0A12-W02, the next layer is 3 ft of silty clay till with sand followed by sandy clay till to the bottom of the boring at 20 ft bgs.

The twelve test pit logs indicate, as did the boring logs, that the site is overlain with from 2 inches to 4 ft of fill which overlays a layer of loess (clayey silt and silty clay). Test pit 0A12-093 (soil and trench water) is located at the eastern edge of the site between the North and South Perimeter Road Test. The log for this test pit indicates that black burnt material (metal and glass) was present from 0.5 to 1 ft bgs. Black burnt material (glass, metal, brick) was also encountered at depth ranging from 0 to 3 ft bgs in test pits 0A12-008, 0A12-010, and 0A12-013 (all three soil and trench water samples), which are located east of 0A12-093. Test pit 0A12-029, which is located west of the Old Contractor Road approximately halfway between the North and South Perimeter Roads, encountered loose black, burnt material and gravel from 0.5 to 1.5 ft bgs and at approximately 4.5 ft bgs the loess material becomes olive green. Near 0A12-029 are test pits 0A12-035 and 0A12-035b. 0A12-035 had building debris from 0 to 6 inches and encountered a concrete slab at 6 ft bgs. 0A12-035b had silty clay with burnt debris from 0 to 3 ft bgs. Located in the southeast portion of the site, test pit 0A12-099 had black burnt material with 2-inch rock from 0.25 to 1-ft bgs.

In Area 12 West, test pit 0A12-018 was excavated and black ash material with 2-inch rock was encountered from approximately 0.5 to 1-ft bgs.

20.2.2.1.2 Hydrogeologic Conditions

At AUS-0A12 groundwater was encounter in both soil borings during drilling at depths of 10.3 and 14 ft (elevations ranging from 435.58 to 439.45 ft mean sea level (msl)) as seen in Figure 15-11. In addition, groundwater was encountered in seven of the 13 test pits during excavation at depths ranging from two to 11 ft bgs (elevations ranging from 431.31 to 441.86 ft msl). A groundwater contour map (Figure 15-12) was made for Areas 11 and 12 using groundwater elevations obtained from October 2000. As seen in this groundwater contour map, the overall flow direction of the groundwater appears to be toward the northwest. Groundwater elevations were collected several different times during this investigation as seen in Table 15-4, and the flow direction was generally the same each time. Slug tests were performed on both of the wells installed in Area 12 during the AUS OU investigation, resulting in hydraulic conductivities that ranged from 3.71E-06 to 2.18E-04 centimeters per second (cm/sec). Slug test results are presented in Table 20-3. The hydraulic conductivity value from one of the slug tests is greater than the trigger value for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)). Therefore this groundwater would probably be considered Class I.

20.2.2.1.3 Hydrologic Conditions

AUS-0A12 has two separate drainage areas. These two areas are divided by the Old Contractor Road, which runs north-south through the center of the site. To the west of the Old Contractor Road, the overall surface flow is to the west. There is one drainage way that is located to the south of the South Perimeter Road, which connects with the other two main drainage ways at the most western portion of the site. This ditch flows west through a ponded area, see Figure 20-6.

The other two drainage ditches flow west through the former burning ground and the other through the area south of the North Perimeter Road through a ponded area. On the eastern portion of the site the general drainage flow is to the east and north. Like the western portion of the site the east has three main drainage ditches that converge in the northeastern corner of the North Perimeter Road and flow northeast out of the site. The first drainage ditch flows east along the North Perimeter Road, second flows through the middle of the site through a large ponded area, and the third flows following the South and East Perimeter roads on the south side.

20.2.2.2 Chemical Results

The sample analytical results are summarized in the following tables:

- Table 20-5 -- soil samples results,
- Table 20-6 -- sediment samples results,
- Table 20-7 -- drum samples results,
- Table 20-8 -- groundwater results,
- Table 20-9 -- trench water samples results, and
- Table 20-10 -- surface water samples results.

These tables list all the chemicals detected in Area 12 during this investigation, along with the frequency and range of detections.

Tetrachlorodibenzo-p-Dioxin (TCDD) equivalent results for Area 12 are not shown in the screening tables. They are instead included in Table 20-20, and are discussed in the following human health and ecological risk sections.

Sample results are presented on the following figures:

- Figure 20-7 -- organic results for soil samples for Section 1,
- Figure 20-8 -- inorganic results for soil samples for Section 1,
- Figure 20-9 -- sample results for surface water and trench water for Section 1,
- Figure 20-10 -- organic results for soil and sediment samples for Section 2,
- Figure 20-11 -- inorganic results for soil and sediment samples for Section 2,
- Figure 20-12 -- sample results for surface water, trench water, and groundwater for Section 2,
- Figure 20-13 -- organic results for soil and drum samples for Section 3,
- Figure 20-14 -- inorganic results for soil and drum samples for Section 3,
- Figure 20-15 -- sample results for surface water and trench water for Section 3,
- Figure 20-16 -- organic results for soil samples for Section 4,
- Figure 20-17 -- inorganic results for soil samples for Section 4,
- Figure 20-18 -- sample results for surface water and groundwater for Section 4,
- Figure 20-19 -- organic results for soil samples for Section 5,
- Figure 20-20 -- inorganic results for soil samples for Section 5, and
- Figure 20-21 -- sample results for surface water for Section 5.

20.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 20-11 through 20-19 as follows:

- Table 20-11--human health risk screening for soils,

- Table 20-12--human health risk screening for sediment,
- Table 20-13--human health risk screening for drum samples,
- Table 20-14--human health risk screening for groundwater and trench water,
- Table 20-15--human health risk screening for surface water,
- Table 20-16--ecological risk screening for soils,
- Table 20-17--ecological risk screening for sediment,
- Table 20-18--ecological risk screening for drum samples, and
- Table 20-19--ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 12. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 20-7 through 20-21 the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 20-21 and 20-21A (human health risk), and 20-22 and 20-22A (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Tables 20-21 and 20-21A) and COPECs (Tables 20-22 and 20-22A) are shaded in the tables. USEPA 1998 analytical results are included when the USEPA data results in a chemical being classified as a COPC/COPEC and that chemical was not classified as a COPC/COPEC based on the AUS SI data. These chemicals are coded with "J" on both tables. Otherwise the USEPA data are not included.

20.3.1 Human Health Risk

20.3.1.1 Soil/Sediment/Drum

Human health screening results for soil, sediment, and drum samples are presented in Tables 20-11, 20-12, and 20-13, respectively. Soil screening values were conservatively used to screen drum and sediment samples.

For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6}. In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

Dioxin/furan congener concentrations were converted to 2,3,7,8-TCDD equivalents, for comparison against a 2,3,7,8-TCDD screening value. A toxic equivalency (TEQ) was calculated for each dioxin/furan congener by multiplying a congener-specific toxic equivalency factor (TEF) value by the congener's observed concentration. The TEQs for all congeners in a sample were summed. The summed TEQ values were then compared to the 2,3,7,8-TCDD screening value of 1 ppb. Refer to Table 20-20.

There were four soil samples analyzed for dioxin/furan congeners with detections noted in all four samples. However, none of the TEQ values calculated for the congeners exceeded the 2,3,7,8-TCDD screening level. Therefore, none of the dioxin/furan congeners detected within Area 12 are assumed to pose potential risk to human health.

20.3.1.2 Groundwater and Trench Water

Human health screening results for groundwater and trench water are presented in Table 20-14. The maximum groundwater and trench water concentrations from Area 12 were screened against MCLs and Illinois Class I groundwater standards.

20.3.1.3 Surface Water

Human health risk screening results for chemicals in surface water from Area 12 are presented in Table 20-15. The maximum concentrations from Area 12 were screened against the IEPA General Use Surface Water Quality Criteria – Human Health.

20.3.2 Ecological Risk

20.3.2.1 Soil/Drum

Ecological screening results for soil and drum samples are presented in Tables 20-16 and 20-18, respectively. Soil screening values were conservatively used to screen the drum samples.

Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[122]
- Environment Canada (1995)[123]
- Talmage *et al.* (1999)[124]
- Efroymson *et al.* (1997a, 1997b)[125]
- CCME (1999)[126]
- MHSPE (1994)[127]
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)[128] used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

Direct exposure screening concentrations in soils were available for 2,3,7,8-TCDD, but not for other dioxin/furan congeners. Therefore, the potential for direct exposure effects were only screened in conjunction with 2,3,7,8-TCDD (Table 20-16). Based on the screening results in Table 20-16, 2,3,7,8-TCDD is not a concern relative to direct exposures (it was not detected). Other congeners, if detected, were retained as potentially bioaccumulative COPECs. Results of

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[122] USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

[123] Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

[124] Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. Rev Environ. Contam. Toxicol 161:1-156.

[125] Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. *Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

[126] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

[127] Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards.* Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

[128] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

the dioxin/furan analyses are presented in Table 20-20. Congeners detected are summarized below:

Dioxins/Furans Detected in Soils (AUS-A12)	
1,2,3,6,7,8-HxCDD	1,2,3,7,8-PeCDF
1,2,3,7,8,9-HxCDD	2,3,4,7,8-PeCDF
1,2,3,4,6,7,8-HpCDD	1,2,3,4,7,8-HxCDF
OCDD	1,2,3,6,7,8-HxCDF
	2,3,4,6,7,8-HxCDF
	1,2,3,7,8,9-HxCDF
	1,2,3,4,6,7,8-HpCDF
	1,2,3,4,7,8,9-HpCDF
	OCDF

Each of these congeners is retained as a COPEC (note the individual congeners are not included in the COPEC summary of Table 20-22).

20.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 20-17. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)[129]
- USEPA (1996 – summarized by Ingersoll *et al.* 1996)[130]
- Ontario Ministry of the Environment and Energy (1995)[131]
- NOAA (1999)[132]
- Ecotox (USEPA 1996)[133]
- Long *et al.* (1995)[134]
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects

[129] MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. MacDonald Environmental Services Ltd., British Columbia, Canada.
[130] Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfirld, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22(3):602-623.
[131] Ontario Ministry of Environment and Energy. 1995. Ontario's Approach to Sediment Assessment and Remediation. Second SETAC World Congress (16TH Annual Meeting). Vancouver, British Columbia, Canada.
[132] NOAA. 1999. Screening quick Reference Tables. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.
[133] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.
[134] Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management. 19(1): 81-97.

data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed "consensus-based" freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the "equilibrium-partitioning" (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 20.3.2.1.

20.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 20-19. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)[135]
- EcoTox (USEPA 1996)[136]
- USEPA Region IV Freshwater Screening Values (1999b)[137]
- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)[138]
- Other sources

[135] USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.
[136] USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.
[137] USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at http://www.epa.gov/region4/waste/oftecser/ecolbul.htm.
[138] ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 20.3.2.1.

20.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-0A12, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Tables 20-21 and 20-21A (drum samples); and on the COPEC list, Tables 20-22 and 20-22A (drum samples). COPCs in this category include mercury and silver in surface water; antimony, arsenic, barium, cadmium and nickel in sediment; and arsenic, chromium, nickel, and selenium in drums samples. COPECs coded with "D" on Tables 20-22 and 20-22A include mercury and silver in surface water; cadmium and mercury in sediment; and boron, chromium, iron, and manganese in drum samples. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be evaluated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 20-23.

Other areas of the site and media and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI. The discussion of past usage included in this section should be carefully reviewed during work plan development, since this information was updated after the field investigation, and all potential release areas at this site may not have been investigated in the SI.

TABLE 20-1
AREA 12 – FORMER AMMONIUM NITRATE PLANT HISTORICAL BUILDING NUMBERS AND NAMES

Illinois Ordnance Plant		Olin (1956–1964)		U.S. Powder/CSC (1964-1982)	
Bldg. No.	**Building Name**	**Bldg. No.**	**Building Name**	**Bldg. No.**	**Building Name**
ANP-1-1	Kettle House		Razed by Olin in 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-2	Pan House		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-3	Kettle House		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-4	Pan House		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-5	Kettle House		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-6	Pan House		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-7	Neutral Liquor House		Razed by Olin in 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-8	Boiler House		Still present on site during Olin's tenure - may not be in use.	76	RDX Separation
	No building present in this location at this time.		No building present in this location at this time.	76-1	Air Dryer & Steam Gen. (New)
	No building present in this location at this time.		No building present in this location at this time.	76-2	Mixer House (RDX) (New)
	No building present in this location at this time.		No building present in this location at this time.	76-3	Tray Drier (RDX) (New)
	No building present in this location at this time.		No building present in this location at this time.	76-5	Electric Control House (New)
ANP-1-9	Office Building		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-10	Change House	70	Stores - Change House	70	Storage Bldg.
ANP-1-11	Timekeepers Building		Building no longer present on site by 1960. No information was found regarding Olin's use of this building, if any, prior to 1960.		Building not present during U.S Powder Design's tenure.
ANP-1-12	Guard House		No information was found to determine if this building was present during Olin's tenure.		No information was found to determine if this building was present during U.S Powder Design's tenure.
	No building present in this location at this time (ANP-1-15 was constructed by Silas Mason).	71	Paper Stores	71	Warehouse & Paper Stores
	No building present in this location at this time.	28	Burning House (also called ANP-1-19)	28	Burning House
	No building present in this location at this time.		Storage Ponds (#1-#7)	72	Powder Storage Ponds (#1-#7)
	No building present in this location at this time.	80-D	Cap Magazine	83	(Not Named)
	No building present in this location at this time.	80-E	Shooting House	84	Shooting House

Sheet 1 of 1

TABLE 20-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
51-01	Aluminum	10,000
	Barium	75
	Beryllium	0.5
	Calcium	3,100
	Chromium	14
	Cobalt	7.9
	Copper	9.9
	Iron	15,000
	Magnesium	1,400
	Manganese	550
	Mercury	0.08
	Nickel	10
	Potassium	760
	Vanadium	27
	Zinc	48
51-02	Bis(2-Ethylhexyl)phthalate	0.23J
	Aluminum	12,000
	Barium	120
	Beryllium	0.6
	Calcium	2,500
	Chromium	17
	Cobalt	7.8
	Copper	9.9
	Iron	16,000
	Magnesium	2,000
	Manganese	510
	Mercury	0.05
	Nickel	11
	Potassium	970
	Silver	1.4
	Vanadium	28
	Zinc	53
52-01	Bis(2-Ethylhexyl)phthalate	0.24JB
	Aluminum	14,000
	Barium	120
	Beryllium	0.6
	Calcium	4,800
	Chromium	25
	Cobalt	7.1
	Copper	49
	Iron	32,000
	Lead	110
	Magnesium	3,200
	Manganese	1,000
	Mercury	0.08
	Nickel	23
	Potassium	1,000
	Silver	1.3
	Vanadium	28

Sheet 1 of 2

TABLE 20-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
52-01	Zinc	230
52-02	Bis(2-Ethylhexyl)phthalate	0.43B
	Aluminum	11,000
	Barium	120
	Beryllium	0.7
	Calcium	5,200
	Chromium	15
	Cobalt	6.6
	Copper	27
	Iron	14,000
	Lead	42
	Magnesium	2,700
	Manganese	640
	Mercury	0.05
	Nickel	16
	Potassium	880
	Silver	1.4
	Vanadium	26
	Zinc	150
58-01	Benzo[a]pyrene	2.5J
	Benzo[b]fluoranthene	2.5J
	Benzo[k]fluoranthene	2.5J
	Bis(2-Ethylhexyl)phthalate	0.17J
	Di-n-butylphthalate	0.24J
	Dibenz[a,h]anthracene	1.2J
	Indeno[1,2,3-c,d]pyrene	3.0J
	Aluminum	3,500
	Arsenic	17
	Barium	49
	Beryllium	3.6
	Calcium	1,900
	Chromium	100
	Cobalt	48
	Copper	150
	Iron	320,000
	Magnesium	800
	Manganese	1,500
	Mercury	0.06
	Nickel	41
	Potassium	390
	Vanadium	8.6
	Zinc	24

Sheet 2 of 2

mg/kg = milligrams per kilogram
J = Estimated
B = No explanation of "B" qualifier in report

TABLE 20-2
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0A12

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0A12-001	363505.3	781374.5	432.88	NA	
0A12-002	363500.8	781428.1	436.60	NA	
0A12-003	363449.3	781375.8	433.42	NA	
0A12-004	363330.5	781407.9	441.97	NA	
0A12-005	363355.7	781509.3	439.01	NA	
0A12-006	363465.4	781538.7	437.16	NA	
0A12-007	363471.0	781590.6	448.10	NA	
0A12-008	363336.4	781629.0	440.30	NA	
0A12-009	363447.4	781643.3	443.52	NA	
0A12-010	363392.7	781710.0	439.50	NA	
0A12-011	363288.0	781711.0	440.60	NA	
0A12-012	363338.3	781837.3	441.50	NA	
0A12-013	363245.6	781801.7	441.81	NA	
0A12-014	363416.2	781867.9	442.16	NA	
0A12-015	363328.5	782035.9	446.62	NA	
0A12-016	363265.2	782036.2	442.13	NA	
0A12-017	362926.5	782077.3	445.58	NA	
0A12-018	363920.1	780215.6	439.46	NA	
0A12-019	363580.1	782299.4	445.71	NA	
0A12-020	363713.6	780175.6	434.22	NA	
0A12-021	363493.5	782332.3	444.69	NA	
0A12-022	363075.7	782187.1	449.72	NA	
0A12-023	362991.3	782189.3	449.50	NA	
0A12-024	363481.4	782239.9	443.86	NA	
0A12-025	362864.3	782218.7	447.67	NA	
0A12-026	363307.7	782352.8	447.65	NA	
0A12-027	363208.4	782333	449.34	NA	
0A12-028	363184.4	782328.3	450.02	NA	
0A12-029	363160.1	782344.1	450.19	NA	
0A12-030	363143.0	782330.2	443.53	NA	
0A12-031	363136.8	782374.6	450.98	NA	
0A12-032	363313.7	782460.9	449.12	NA	
0A12-033	363290.1	782414.9	451.45	NA	
0A12-034 (APPROX)	363249.3	782486.6	452.89	NA	Location is approximate
0A12-035	363191.6	782483.2	451.00	NA	
0A12-036	363263.3	782508.1	452.16	NA	
0A12-037	363121.9	782500.9	449.75	NA	
0A12-038	363067.4	782543.6	449.06	NA	
0A12-039	362940.9	782488.7	453.99	NA	
0A12-040	362821.4	782468.8	454.84	NA	
0A12-041				NA	No data for this location
0A12-042	362601.6	782457.4	455.97	NA	

Sheet 1 of 3

TABLE 20-2
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0A12

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0A12-043	362635.2	782396.7	456.01	NA	
0A12-044	362677.5	782336.2	455.42	NA	
0A12-045	363608.0	782543.2	448.60	NA	
0A12-046	363142.5	782596.2	448.74	NA	
0A12-047	362944.8	782590.8	451.09	NA	
0A12-048	362670.3	782492.3	451.53	NA	
0A12-049	363539.3	782686.5	446.20	NA	
0A12-050	363630.5	782688.8	448.69	NA	
0A12-051	363365.9	782847.3	448.68	NA	
0A12-052	363312.8	782725.7	450.48	NA	
0A12-053	363186.8	782650.5	450.56	NA	
0A12-054	363218.6	782801.8	447.83	NA	
0A12-055	363241.8	782891.4	447.66	NA	
0A12-056	362946.0	782757.1	453.05	NA	
0A12-057	362798.8	782839.4	453.36	NA	
0A12-058	362702.8	782818.9	457.55	NA	
0A12-059	363469.1	782966.0	456.60	NA	
0A12-060	363410.1	782862.2	449.71	NA	
0A12-061	363485.5	783084.8	449.31	NA	
0A12-062	363577.2	783090.0	443.64	NA	
0A12-063	363536.5	783188.3	441.97	NA	
0A12-064	363003.5	782945.8	451.85	NA	
0A12-065	362613.8	782927.0	449.17	NA	
0A12-066	362592.3	783065.5	445.32	NA	
0A12-067	362519.9	783023.0	455.68	NA	
0A12-068	363212.4	783141.0	442.88	NA	
0A12-069	363496.3	783339.3	437.84	NA	
0A12-070	363585.3	783408.8	435.47	NA	
0A12-071	363511.4	783404.5	442.31	NA	
0A12-072	363400.6	783487.7	435.1	NA	
0A12-073	363198.9	783471.0	441.30	NA	
0A12-074	363066.7	783521.4	435.08	NA	
0A12-075	363002.9	783411.9	439.52	NA	
0A12-076	362858.7	783364.1	441.67	NA	
0A12-077	362798.9	783451.4	437.80	NA	
0A12-078	363169.5	781760.9	441.37	NA	
0A12-079	363585.4	782993.5	446.96	NA	
0A12-080	363695.1	780269.1	435.87	NA	
0A12-081	364142.8	780061.4	441.00	NA	
0A12-082	363754.4	780203.9	437.98	NA	
0A12-083	363740.7	782904.0	444.94	NA	
0A12-084	363734.0	783487.1	441.69	NA	
0A12-085	364133.7	782935.2	445.60	NA	
0A12-086	364087.8	782700.8	446.98	NA	

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TABLE 20-2
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0A12

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0A12-087	364026.6	783056.7	445.66	NA	
0A12-088	363972.1	783595.1	440.89	NA	
0A12-089	363940.2	783365.1	444.56	NA	
0A12-090	363914.4	783607.7	437.56	NA	
0A12-091	363860.6	782965.5	443.88	NA	
0A12-092	363852.1	783694.3	427.35	NA	
0A12-093	363450.1	781595.0	444.86	NA	
0A12-094	363907.4	782741.7	448.91	NA	
0A12-095	363848.2	782383.3	448.45	NA	
0A12-096	363206.1	782384.7	449.86	NA	
0A12-097	363473.5	782803.9	451.28	NA	
0A12-098	363350.1	782805.0	455.25	NA	
0A12-099	362915.1	783058.0	453.48	NA	
0A12-100	363534.6	781835.6	445.11	NA	
0A12-W01	364013.2	782516.0	453.45	456.19	New monitoring well
0A12-W02	363999.0	783445.5	445.88	448.34	New monitoring well
MW-COP4-2	363080.6	782106.4	449.77	452.33	Existing well that was removed
COP4-MW02R	363084.3	782102.7	449.11	452.48	New well replacing MW-COP4-2
MW-COP4-4	363618.9	781446.4	438.07	440.77	Existing monitoring well

Sheet 3 of 3

NA = Not Applicable

TABLE 20-3
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
A12-W01	3.71E-06
A12-W02	2.18E-04

Sheet 1 of 1

cm/sec = centimeters per second

TABLE 20-4
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0A12

Soil			Sediment	Drum	Groundwater	Trench Water[1]	Surface Water
AUS-0A12-002	AUS-0A12-039	AUS-0A12-073*	AUS-0A12-001	AUS-0A12-023	AUS-0A12-MW-COP4-2	AUS-0A12-008	AUS-0A12-001
AUS-0A12-004	AUS-0A12-040	AUS-0A12-074*	AUS-0A12-003		AUS-0A12-MW-COP4-4	AUS-0A12-010	AUS-0A12-007
AUS-0A12-006*	AUS-0A12-041	AUS-0A12-075*	AUS-0A12-005		AUS-0A12-W01	AUS-0A12-013	AUS-0A12-012
AUS-0A12-007*	AUS-0A12-042	AUS-0A12-076			AUS-0A12-W02	AUS-0A12-015	AUS-0A12-014
AUS-0A12-008	AUS-0A12-043*	AUS-0A12-077				AUS-0A12-018	AUS-0A12-016
AUS-0A12-009*	AUS-0A12-044*	AUS-0A12-078				AUS-0A12-035	AUS-0A12-020
AUS-0A12-010	AUS-0A12-045	AUS-0A12-080				AUS-0A12-093	AUS-0A12-021
AUS-0A12-011	AUS-0A12-046*	AUS-0A12-081				AUS-0A12-100	AUS-0A12-024
AUS-0A12-012*	AUS-0A12-047*	AUS-0A12-082					AUS-0A12-030
AUS-0A12-013	AUS-0A12-048*	AUS-0A12-083					AUS-0A12-060
AUS-0A12-014*	AUS-0A12-049*	AUS-0A12-084					AUS-0A12-074
AUS-0A12-015	AUS-0A12-050*	AUS-0A12-085					AUS-0A12-077
AUS-0A12-016*	AUS-0A12-051	AUS-0A12-086					AUS-0A12-078
AUS-0A12-017*	AUS-0A12-052	AUS-0A12-087					AUS-0A12-079
AUS-0A12-018	AUS-0A12-053	AUS-0A12-088					AUS-0A12-080
AUS-0A12-019*	AUS-0A12-054	AUS-0A12-089					AUS-0A12-092
AUS-0A12-021*	AUS-0A12-055*	AUS-0A12-090					
AUS-0A12-022	AUS-0A12-056	AUS-0A12-091					
AUS-0A12-023	AUS-0A12-057*	AUS-0A12-092					
AUS-0A12-024*	AUS-0A12-058	AUS-0A12-093					
AUS-0A12-025*	AUS-0A12-059	AUS-0A12-094					
AUS-0A12-026*	AUS-0A12-060*	AUS-0A12-095					
AUS-0A12-027	AUS-0A12-061*	AUS-0A12-096					
AUS-0A12-028	AUS-0A12-062*	AUS-0A12-097					
AUS-0A12-029	AUS-0A12-063*	AUS-0A12-098					
AUS-0A12-030*	AUS-0A12-064	AUS-0A12-099					
AUS-0A12-031	AUS-0A12-065*	AUS-0A12-100					
AUS-0A12-032	AUS-0A12-066*	AUS-0A12-W01					
AUS-0A12-033	AUS-0A12-067	AUS-0A12-W02					
AUS-0A12-034	AUS-0A12-068*						
AUS-0A12-035	AUS-0A12-069*						
AUS-0A12-036	AUS-0A12-070*						
AUS-0A12-037	AUS-0A12-071						
AUS-0A12-038*	AUS-0A12-072*						

Sheet 1 of 1

* Note that the samples at this location were originally designated as sediment, but are actually soil samples.
[1] These samples were originally designated as groundwater ("GW"), but are actually trench water samples.

TABLE 20-5
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Acetone	5/67	24 ug/kg to 72 ug/kg
Carbon Tetrachloride	3/67	23 ug/kg to 360 ug/kg
Chloroform	6/67	3 ug/kg to 260 ug/kg
Cis-1,2-Dichloroethene	5/67	5 ug/kg to 490 ug/kg
Methylene Chloride	1/67	34 ug/kg
Tetrachloroethylene(PCE)	9/67	1 ug/kg to 2,200 ug/kg
Toluene	1/67	4 ug/kg
Total 1,2-Dichloroethene	2/67	6 ug/kg
Trans-1,2-Dichloroethene	2/67	3 ug/kg to 5 ug/kg
Trichloroethylene (TCE)	7/67	3 ug/kg to 51 ug/kg
Semivolatile Organic Compounds		
1-Methylnaphthalene	4/25	150 ug/kg to 3,900 ug/kg
2-Methylnaphthalene	30/88	42 ug/kg to 9,100 ug/kg
4-Methylphenol (p-cresol)	1/63	91 ug/kg
Acenaphthene	3/88	120 ug/kg to 1,300 ug/kg
Acenaphthylene	2/88	49 ug/kg to 2,400 ug/kg
Anthracene	12/88	9.4 ug/kg to 590 ug/kg
Benzo(a)Anthracene	21/88	9 ug/kg to 1,100 ug/kg
Benzo(a)Pyrene	20/88	11 ug/kg to 590 ug/kg
Benzo(b)Fluoranthene	25/88	12 ug/kg to 410 ug/kg
Benzo(g,h,i)Perylene	12/88	11 ug/kg to 2,600 ug/kg
Benzo(k)Fluoranthene	16/88	12 ug/kg to 480 ug/kg
Bis(2-ethylhexyl) Phthalate	34/63	46 ug/kg to 9,100 ug/kg
Carbazole	5/63	45 ug/kg to 350 ug/kg
Chrysene	28/88	21 ug/kg to 1,800 ug/kg
Dibenz(a,h) Anthracene	3/88	16 ug/kg to 84 ug/kg
Dibenzofuran	14/63	44 ug/kg to 2800 ug/kg
Di-n-butyl Phthalate	20/63	41 ug/kg to 1,700 ug/kg
Fluoranthene	27/88	8.2 ug/kg to 990 ug/kg
Fluorene	1/88	270 ug/kg
Indeno (1,2,3-c,d)Pyrene	10/88	10 ug/kg to 480 ug/kg
Naphthalene	20/88	45 ug/kg to 3,900 ug/kg
N-Nitrosodiphenylamine	6/63	62 ug/kg to 560 ug/kg
Pentachlorophenol	1/63	1,500 ug/kg
Phenanthrene	31/88	7.6 ug/kg to 4,800 ug/kg
Pyrene	28/88	16 ug/kg to 1,600 ug/kg
Explosives		
2,4,6-Trinitrotoluene	2/121	930 ug/kg to 1,500 ug/kg
2,4-Dinitrotoluene	4/121	48 ug/kg to 3,200 ug/kg
2,6-Dinitrotoluene	1/121	92 ug/kg
4-Amino-2,6-Dinitrotoluene	2/121	1,100 ug/kg to 4,600 ug/kg
4-Nitrotoluene	1/121	6,100 ug/kg
HMX	5/121	780 ug/kg to 39,000 ug/kg
RDX	10/121	640 ug/kg to 17,000 ug/kg

Sheet 1 of 2

TABLE 20-5
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
PCBs		
PCB (Total)	1/1	49 ug/kg
PCB-1254 (Arochlor 1254)	1/1	28 ug/kg
PCB-1260 (Arochlor 1260)	1/1	21 ug/kg
Other Inorganics		
Total Organic Carbon	3/3	15,900 mg/kg to 67,700 mg/kg
Metals		
Aluminum	124/124	2,130 mg/kg to 22,900 mg/kg
Antimony	21/124	0.26 mg/kg to 12.1 mg/kg
Arsenic	120/124	1.1 mg/kg to 32.6 mg/kg
Barium	124/124	26.3 mg/kg to 1,430 mg/kg
Beryllium	10/124	0.44 mg/kg to 1.8 mg/kg
Boron	77/124	1.3 mg/kg to 66.8 mg/kg
Cadmium	86/124	0.15 mg/kg to 15.2 mg/kg
Calcium	124/124	378 mg/kg to 75,100 mg/kg
Chromium, Total	124/124	4 mg/kg to 1,370 mg/kg
Cobalt	69/124	2.6 mg/kg to 68.3 mg/kg
Copper	123/124	3.5 mg/kg to 846 mg/kg
Iron	124/124	2,680 mg/kg to 69,000 mg/kg
Lead	124/124	7.9 mg/kg to 3,330 mg/kg
Magnesium	124/124	451 mg/kg to 27,900 mg/kg
Manganese	124/124	53.8 mg/kg to 20,400 mg/kg
Mercury	51/124	0.019 mg/kg to 1.6 mg/kg
Nickel	124/124	3.1 mg/kg to 53.8 mg/kg
Potassium	124/124	191 mg/kg to 1,550 mg/kg
Selenium	68/124	0.24 mg/kg to 7.7 mg/kg
Silver	33/124	0.19 mg/kg to 4 mg/kg
Sodium	28/124	45 mg/kg to 4,430 mg/kg
Thallium	3/124	0.24 mg/kg to 1.8 mg/kg
Vanadium	123/124	5.2 mg/kg to 86.5 mg/kg
Zinc	124/124	13.4 mg/kg to 1,970 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 20-6
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	1/3	180 ug/kg
Benzo(a)Anthracene	1/3	120 ug/kg
Benzo(a)Pyrene	1/3	130 ug/kg
Benzo(b)Fluoranthene	1/3	200 ug/kg
Benzo(g,h,i)Perylene	1/3	110 ug/kg
Benzo(k)Fluoranthene	1/3	79 ug/kg
Chrysene	1/3	140 ug/kg
Di-n-Butyl Phthalate	1/3	1,700 ug/kg
Fluoranthene	1/3	140 ug/kg
Naphthalene	1/3	75 ug/kg
N-Nitrosodiphenylamine	1/3	420 ug/kg
Phenanthrene	1/3	90 ug/kg
Pyrene	1/3	160 ug/kg
Explosives		
2,4-Dinitrotoluene	1/3	630 ug/kg
Metals		
Aluminum	3/3	4,430 mg/kg to 10,200 mg/kg
Antimony	1/3	0.75 mg/kg
Arsenic	3/3	1.1 mg/kg to 6.2 mg/kg
Barium	3/3	58.5 mg/kg to 115 mg/kg
Cadmium	2/3	0.33 mg/kg to 1.1 mg/kg
Calcium	3/3	1,580 mg/kg to 4,600 mg/kg
Chromium, Total	3/3	5.1 mg/kg to 22 mg/kg
Cobalt	2/3	4.9 mg/kg to 7.3 mg/kg
Copper	2/3	27.3 mg/kg to 88.8 mg/kg
Iron	3/3	3,720 mg/kg to 17,400 mg/kg
Lead	3/3	5.7 mg/kg to 86 mg/kg
Magnesium	3/3	789 mg/kg to 2,810 mg/kg
Manganese	3/3	57.7 mg/kg to 1,720 mg/kg
Mercury	1/3	0.12 mg/kg
Nickel	3/3	3.4 mg/kg to 15.3 mg/kg
Potassium	3/3	207 mg/kg to 687 mg/kg
Selenium	1/3	1.6 mg/kg
Silver	1/3	0.79 mg/kg

Sheet 1 of 2

TABLE 20-6
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Sodium	2/3	315 mg/kg to 417 mg/kg
Vanadium	3/3	7.5 mg/kg to 22.9 mg/kg
Zinc	3/3	12.3 mg/kg to 309 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/31/01

TABLE 20-7
DRUM SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Bis(2-ethylhexyl) Phthalate	1/1	56 ug/kg
Metals		
Aluminum	1/1	5,020 mg/kg
Arsenic	1/1	6.4 mg/kg
Barium	1/1	55.5 mg/kg
Boron	1/1	3.6 mg/kg
Cadmium	1/1	0.63 mg/kg
Calcium	1/1	3,790 mg/kg
Chromium, Total	1/1	9.5 mg/kg
Copper	1/1	16.7 mg/kg
Iron	1/1	15,600 mg/kg
Lead	1/1	29.8 mg/kg
Magnesium	1/1	1,110 mg/kg
Manganese	1/1	623 mg/kg
Nickel	1/1	10.9 mg/kg
Potassium	1/1	509 mg/kg
Selenium	1/1	0.42 mg/kg
Silver	1/1	0.49 mg/kg
Sodium	1/1	116 mg/kg
Vanadium	1/1	18 mg/kg
Zinc	1/1	49.7 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/31/01

TABLE 20-8
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Chloromethane	1/4	0.7 ug/L
Tetrachloroethylene (PCE)	1/4	0.7 ug/L
Explosives		
RDX	1/4	1.1 ug/l
Other Parameters		
Alkalinity, Total (As CACO3)	2/2	490 mg/L to 496 mg/L
Nitrogen, Ammonia (As N)	1/1	0.15 mg/L
Nitrogen, Nitrate-Nitrite	2/2	0.066 mg/L to 69.2 mg/L
Phosphorus, Total (As P)	2/2	0.19 mg/L to 0.82 mg/L
Sulfate (As So4)	2/2	260,000 ug/L to 750,000 ug/L
Suspended Solids (Residue, Non-Filterable)	2/2	11.5 mg/L to 770 mg/L
Total Dissolved Solids (Residue, Filterable)	2/2	888 mg/L to 1,590 mg/L
Metals		
Aluminum	3/4	339 ug/L to 132,000 ug/L
Arsenic	1/4	76.2 ug/L
Barium	4/4	33.4 ug/L to 1,650 ug/L
Beryllium	1/4	12.8 ug/L
Boron	1/4	224 ug/L
Calcium	4/4	74,500 ug/L to 122,000 ug/L
Chromium, Total	2/4	34.1 ug/L to 215 ug/L
Cobalt	1/4	132 ug/L
Copper	1/4	184 ug/L
Iron	3/4	302 ug/L to 298,000 ug/L
Lead	1/4	119 ug/L
Magnesium	4/4	37,100 ug/L to 81,000 ug/L
Manganese	4/4	47.2 ug/L to 7,310 ug/L
Mercury	1/4	0.32 ug/L
Nickel	3/4	1.9 ug/L to 290 ug/L
Potassium	3/4	752 ug/L to 7,850 ug/L
Selenium	1/4	8.2 ug/L
Sodium	4/4	20,800 ug/L to 338,000 ug/L
Vanadium	1/4	270 ug/L
Zinc	4/4	2.4 ug/L to 644 ug/L

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Sheet 1 of 1

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 20-9
TRENCH WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
1,2-Dichloroethane	1/8	39 ug/L
Carbon Tetrachloride	1/8	1,200 ug/L
Chloroform	2/8	28 ug/L to 630 ug/L
Cis-1,2-Dichloroethylene	3/8	7 ug/L to 130 ug/L
Methyl Ethyl Ketone (2-Butanone)	1/8	4 ug/L
Methylene Chloride	1/8	220 ug/L
Tetrachloroethylene(PCE)	2/8	7 ug/L to 54 ug/L
Trans-1,2-Dichloroethene	1/8	1 ug/L
Trichloroethylene (TCE)	2/8	5 ug/L to 6 ug/L
Semivolatile Organic Compounds		
2-Methylnaphthalene	1/8	2.1 ug/L
Bis(2-Ethylhexyl) Phthalate	1/3	1.1 ug/L
Chrysene	1/8	1.8 ug/L
Diethyl Phthalate	1/3	2 ug/L
Di-N-Butyl Phthalate	1/3	1.1 ug/L
Fluoranthene	2/8	0.68 ug/L to 2.1 ug/L
Phenanthrene	2/8	0.37 ug/L to 1.2 ug/L
Pyrene	2/8	0.35 ug/L to 1.5 ug/L
Explosives		
2,4,6-Trinitrotoluene	3/8	1.3 ug/L to 22 ug/L
2-Amino-4,6-Dinitrotoluene	1/8	0.62 ug/L to 0.79 ug/L
4-Amino-2,6-Dinitrotoluene	2/12	0.62 ug/L to 2.6 ug/L
HMX	6/8	3.4 ug/L to 54 ug/L
Nitrobenzene	1/8	1 ug/L
RDX	8/8	1.3 ug/l to 890 ug/L
Other Inorganics		
Nitrogen, Ammonia (As N)	1/1	0.38 mg/L
Nitrogen, Nitrate-Nitrite	1/1	0.27 mg/L
Phosphorus, Total (As P)	2/2	2.2 mg/L to 2.9 mg/L
Phosphorus, Total Orthophosphate (As P)	2/2	1.5 mg/L to 5.6 mg/L
Metals		
Aluminum	8/8	33,400 ug/L to 500,000 ug/L
Antimony	4/12	4.3 ug/L to 17.2 ug/L
Arsenic	7/8	47.5 ug/L to 142 ug/L
Barium	8/8	339 ug/L to 13,300 ug/L
Beryllium	7/8	3.8 ug/L to 23.8 ug/L
Boron	7/8	149 ug/L to 896 ug/L
Cadmium	4/8	4.7 ug/L to 20.5 ug/L
Calcium	8/8	71,300 ug/L to 275,000 ug/L
Chromium, Total	8/8	31.8 ug/L to 738 ug/L
Cobalt	8/8	31.3 ug/L to 302 ug/L

Sheet 1 of 2

TABLE 20-9
TRENCH WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Copper	8/8	30.7 ug/L to 5,150 ug/L
Iron	8/8	39,700 ug/L to 417,000 ug/L
Lead	8/8	45.5 ug/L to 2,880 ug/L
Magnesium	8/8	45,100 ug/L to 137,000 ug/L
Manganese	8/8	2,130 ug/L to 27,400 ug/L
Mercury	4/8	0.78 ug/L to 36.9 ug/L
Nickel	8/8	30.6 ug/L to 515 ug/L
Potassium	8/8	3,360 ug/L to 30,600 ug/L
Selenium	8/8	2.7 ug/L to 29.4 ug/L
Silver	3/8	5.9 ug/L to 23.4 ug/L
Sodium	8/8	48,400 ug/L to 167,000 ug/L
Thallium	3/8	1.8 ug/L to 3.2 ug/L
Vanadium	8/8	52.4 ug/L to 562 ug/L
Zinc	8/8	126 ug/L to 58,500 ug/L

Sheet 2 of 2

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 20-10
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Cis-1,2-Dichloroethylene	1/8	0.8 ug/L
Tetrachloroethylene(PCE)	1/8	22 ug/L
Trichloroethylene (TCE)	1/8	1 ug/L
Semivolatile Organic Compounds		
Bis(2-ethylhexyl) Phthalate	2/7	1.1 ug/L to 1.5 ug/L
Explosives		
2,4-Dinitrotoluene	1/16	0.38 ug/L
2,6-Dinitrotoluene	1/16	2.1 ug/L
2-Nitrotoluene	1/16	1.4 ug/L
HMX	6/16	0.99 ug/L to 7.9 ug/L
RDX	5/16	0.64 ug/L to 25 ug/L
Other Inorganics		
Alkalinity, Total (AS CACO3)	4/4	31.8 mg/L to 201 mg/L
Nitrogen, Ammonia (As N)	10/10	0.24 mg/L to 0.9 mg/L
Nitrogen, Nitrate-Nitrite	5/5	0.063 mg/L to 35.9 mg/L
Phosphorus, Total (As P)	1/1	0.3 mg/L
Sulfate (As SO4)	6/6	9,600 ug/L to 590,000 ug/L
Suspended Solids (Residue, Non-Filterable)	4/4	30 mg/L to 169 mg/L
Total Dissolved Solids (Residue, Filterable)	5/5	52 mg/L to 1,140 mg/L
Metals		
Aluminum	16/16	125 ug/L to 52,000 ug/L
Antimony	4/16	1 ug/L to 8.1 ug/L
Arsenic	2/16	30.6 ug/L to 33.1 ug/L
Barium	16/16	23.3 ug/L to 947 ug/L
Beryllium	6/16	0.13 ug/L to 12.2 ug/L
Boron	10/16	59.1 ug/L to 603 ug/L
Calcium	16/16	6,670 ug/L to 214,000 ug/L
Chromium, Total	8/16	0.98 ug/L to 47.9 ug/L
Cobalt	9/16	3.3 ug/L to 73 ug/L
Copper	8/16	3.7 ug/L to 135 ug/L
Iron	16/16	369 ug/L to 136,000 ug/L
Lead	5/16	1.1 ug/L to 45.9 ug/L
Magnesium	16/16	4,620 ug/L to 107,000 ug/L
Manganese	16/16	46.6 ug/L to 4,700 ug/L
Mercury	1/16	0.14 ug/L
Nickel	8/16	6.8 ug/L to 144 ug/L
Potassium	9/16	2,270 ug/L to 15,100 ug/L
Selenium	9/16	2 ug/L to 31.3 ug/L
Silver	1/16	9 ug/L
Sodium	16/16	2,390 ug/L to 114,000 ug/L

Sheet 1 of 2

TABLE 20-10
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Vanadium	4/16	24.6 ug/L to 234 ug/L
Zinc	13/16	16 ug/L to 667 ug/L

Sheet 2 of 2

mg/L = milligrams per Liter
ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: SEA 7/31/01

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	11	U	UG/KG			3.31E-06	1.10E-01
79-34-5	1,1,2,2-Tetrachloroethane	11	U	UG/KG		1.22E-08	2.82E-06	5.50E+01
79-00-5	1,1,2-Trichloroethane	11	U	UG/KG		5.78E-09	7.23E-05	1.22E+01
75-34-3	1,1-Dichloroethane	11	U	UG/KG			5.34E-06	1.10E-02
75-35-4	1,1-Dichloroethene	11	U	UG/KG		9.27E-08	1.63E-04	3.67E+00
107-06-2	1,2-Dichloroethane (EDC)	11	U	UG/KG		1.44E-08	3.12E-04	1.10E+01
540-59-0	1,2-Dichloroethene (total)	6	J	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	11	U	UG/KG		1.43E-08	5.16E-04	1.10E+01
78-93-3	2-Butanone (MEK)	22	U	UG/KG			7.94E-07	
591-78-6	2-Hexanone	22	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	22	U	UG/KG			7.62E-06	
67-64-1	Acetone	72	J	UG/KG			1.16E-05	9.00E-02
71-43-2	Benzene	11	U	UG/KG		7.51E-09	4.54E-04	5.50E+00
75-27-4	Bromodichloromethane	11	U	UG/KG		4.67E-09	1.05E-05	3.67E-01
75-25-2	Bromoform	11	U	UG/KG		3.52E-11	6.24E-07	2.75E-01
74-83-9	Bromomethane	11	U	UG/KG			8.37E-04	1.10E+00
75-15-0	Carbon disulfide	11	U	UG/KG			9.10E-06	5.50E-03
56-23-5	Carbon tetrachloride	360	E	UG/KG		6.80E-07	5.15E-02	1.20E+02
108-90-7	Chlorobenzene	11	U	UG/KG			2.03E-05	1.57E-01
75-00-3	Chloroethane	11	U	UG/KG		1.69E-09	5.83E-07	
67-66-3	Chloroform	260		UG/KG		4.99E-07	2.02E-01	8.67E+00
74-87-3	Chloromethane	11	U	UG/KG		4.13E-09		
156-59-2	cis-1,2-Dichloroethene	490	E	UG/KG			3.33E-03	2.45E+01
10061-01-5	cis-1,3-Dichloropropene	11	U	UG/KG		6.19E-08	2.50E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	11	U	UG/KG		4.15E-09	6.91E-06	5.50E-01
100-41-4	Ethylbenzene	11	U	UG/KG			1.84E-06	1.57E-02
75-09-2	Methylene chloride	34		UG/KG		1.66E-09	3.48E-06	3.40E+01
110-54-3	N-Hexane	11	U	UG/KG			2.73E-05	
100-42-5	Styrene	11	U	UG/KG			5.38E-07	5.50E-02
127-18-4	Tetrachloroethylene (PCE)	2200		UG/KG		1.18E-07	1.29E-03	7.33E+02
108-88-3	Toluene	4	J	UG/KG			2.01E-06	6.67E-03
1330-20-7	total Xylenes	11	U	UG/KG			2.47E-06	1.10E-03
156-60-5	trans-1,2-Dichloroethene	5	J	UG/KG			2.33E-05	1.67E-01
10061-02-6	trans-1,3-Dichloropropene	11	U	UG/KG		6.19E-08	2.50E-04	
79-01-6	Trichloroethylene (TCE)	51		UG/KG		8.34E-09	6.45E-04	1.70E+01
75-01-4	Vinyl chloride	11	U	UG/KG		2.26E-07		1.57E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	1000	U	UG/KG			1.31E-04	3.33E+00
95-50-1	1,2-Dichlorobenzene	1000	U	UG/KG			3.01E-04	1.11E+00
541-73-1	1,3-Dichlorobenzene	1000	U	UG/KG			1.93E-02	
106-46-7	1,4-Dichlorobenzene	1000	U	UG/KG		1.23E-07	5.20E-04	1.00E+01
95-95-4	2,4,5-Trichlorophenol	5100	U	UG/KG			5.79E-05	5.10E-01
88-06-2	2,4,6-Trichlorophenol	1000	U	UG/KG		4.46E-09		1.25E+02
120-83-2	2,4-Dichlorophenol	1000	U	UG/KG			3.78E-04	2.00E+01
105-67-9	2,4-Dimethylphenol	1000	U	UG/KG			5.68E-05	2.50E+00
51-28-5	2,4-Dinitrophenol	5100	U	UG/KG			2.89E-03	5.10E+02
91-58-7	2-Chloronaphthalene	1000	U	UG/KG			3.67E-05	
95-57-8	2-Chlorophenol	1000	U	UG/KG			4.14E-03	5.00E+00
90-12-0	1-Methylnaphthalene	3900		UG/KG			2.07E-02	9.75E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
91-57-6	2-Methylnaphthalene	9100		UG/KG			1.68E-04	4.55E-02
95-48-7	2-Methylphenol	1000	U	UG/KG			2.27E-05	1.25E+00
88-74-4	2-Nitroaniline	5100	U	UG/KG			1.01E-01	
88-75-5	2-Nitrophenol	1000	U	UG/KG			1.42E-04	
91-94-1	3,3'-Dichlorobenzidine	1000	U	UG/KG		1.82E-07		3.33E+03
99-09-2	3-Nitroaniline	5100	U	UG/KG			1.01E-01	
534-52-1	4,6-Dinitro-2-methylphenol	5100	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	1000	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	1000	U	UG/KG			2.27E-05	
106-47-8	4-Chloroaniline	2000	U	UG/KG			5.68E-04	6.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	1000	U	UG/KG				
106-44-5	4-Methylphenol	91	J	UG/KG			2.07E-05	
100-01-6	4-Nitroaniline	5100	U	UG/KG			1.01E-01	
100-02-7	4-Nitrophenol	5100	U	UG/KG			7.24E-04	
83-32-9	Acenaphthene	1300	J	UG/KG			3.39E-05	4.33E-02
208-96-8	Acenaphthylene	2400	J	UG/KG			4.43E-05	1.20E-02
120-12-7	Anthracene	590		UG/KG			1.51E-06	9.83E-04
56-55-3	Benzo(a)anthracene	1100		UG/KG		3.81E-07		1.38E+01
50-32-8	Benzo(a)pyrene	590		UG/KG		2.04E-06		1.48E+00
205-99-2	Benzo(b)fluoranthene	410	J	UG/KG		1.42E-07		2.05E+00
191-24-2	Benzo(g,h,i)perylene	2600		UG/KG			4.79E-05	1.30E-02
207-08-9	Benzo(k)fluoranthene	480		UG/KG		1.66E-08		2.40E-01
111-91-1	bis(2-Chloroethoxy)methane	1000	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	1000	U	UG/KG		1.61E-06		5.00E+04
108-60-1	bis(2-Chloroisopropyl) ether	1000	U	UG/KG		1.24E-07	2.35E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	9100		UG/KG		5.17E-08	5.16E-04	
85-68-7	Butyl benzyl phthalate	1000	U	UG/KG			5.68E-06	1.25E-03
86-74-8	Carbazole	350	J	UG/KG		2.84E-09		1.17E+01
218-01-9	Chrysene	1800		UG/KG		6.24E-09		2.25E-01
84-74-2	Di-n-butyl phthalate	1700		UG/KG			1.93E-05	5.67E-03
117-84-0	Di-n-octyl phthalate	1000	U	UG/KG			5.68E-05	1.00E-04
53-70-3	Dibenz(a,h)anthracene	88	J	UG/KG		3.05E-07		1.10E+00
132-64-9	Dibenzofuran	2800		UG/KG			5.53E-04	
84-66-2	Diethyl phthalate	1000	U	UG/KG			1.42E-06	
131-11-3	Dimethyl phthalate	1000	U	UG/KG			1.14E-07	
206-44-0	Fluoranthene	990		UG/KG			3.29E-05	4.95E-03
86-73-7	Fluorene	270	J	UG/KG			8.15E-06	9.00E-03
118-74-1	Hexachlorobenzene	1000	U	UG/KG		6.49E-07	1.42E-03	1.00E+01
87-68-3	Hexachlorobutadiene	1000	U	UG/KG		3.16E-08	5.68E-03	1.00E+01
77-47-4	Hexachlorocyclopentadiene	1000	U	UG/KG			1.70E-04	5.00E-02
67-72-1	Hexachloroethane	1000	U	UG/KG		5.68E-09	1.14E-03	5.00E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	480		UG/KG		1.66E-07		6.86E-01
78-59-1	Isophorone	1000	U	UG/KG		3.85E-10	5.68E-06	3.33E+01
621-64-7	N-Nitroso-di-n-propylamine	1000	U	UG/KG		2.84E-06		5.00E+05
86-30-6	N-Nitrosodiphenylamine	560		UG/KG		1.11E-09		9.33E+00
91-20-3	Naphthalene	3900		UG/KG			2.07E-02	9.75E-01
87-86-5	Pentachlorophenol	1500	J	UG/KG		1.35E-07	1.05E-04	1.50E+03
85-01-8	Phenanthrene	4800		UG/KG			8.85E-05	2.40E-02
108-95-2	Phenol	1000	U	UG/KG			1.89E-06	2.00E-01
129-00-0	Pyrene	1600		UG/KG			2.95E-05	8.00E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	760	U	UG/KG			2.88E-05	
99-65-0	1,3-Dinitrobenzene	760	U	UG/KG			8.63E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	1500	J	UG/KG		1.82E-08	3.41E-03	
121-14-2	2,4-Dinitrotoluene	3200	J	UG/KG			1.82E-03	8.00E+04
606-20-2	2,6-Dinitrotoluene	92	J	UG/KG			1.04E-04	3.07E+03
	Dinitrotoluene Mixture	3292	J	UG/KG		9.14E-07		8.23E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	1500	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	1500	U	UG/KG				
99-08-1	3-Nitrotoluene	1500	U	UG/KG			7.38E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	4600		UG/KG				
99-99-0	4-Nitrotoluene (PNT)	6100		UG/KG			3.00E-03	
2691-41-0	HMX	39000		UG/KG			8.85E-04	
98-95-3	Nitrobenzene	760	U	UG/KG			6.64E-03	
55-63-0	Nitroglycerin	1500	U	UG/KG		8.51E-09		
78-11-5	Pentaerythritol tetranitrate (PETN)	3000	U	UG/KG				
121-82-4	RDX	17000		UG/KG		7.58E-07	6.43E-03	
479-45-8	Tetryl	2300	U	UG/KG			2.61E-04	
Metals								
7429-90-5	Aluminum	22900		MG/KG	7.95E-01		1.37E-02	
7440-36-0	Antimony	76.4	J	MG/KG	9.20E+01		9.34E-02	2.55E+02
7440-38-2	Arsenic	32.6		MG/KG	2.41E+00	1.20E-05	7.42E-02	3.26E+01
7440-39-3	Barium	1430		MG/KG	7.33E+00		1.15E-02	1.79E+01
7440-41-7	Beryllium	1.8		MG/KG	2.37E+00	8.03E-10	4.87E-04	6.00E-01
7440-42-8	Boron	66.8		MG/KG	1.26E+01		8.44E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-43-9	Cadmium	15.2		MG/KG	8.00E+01	5.09E-09	1.88E-02	3.80E+01
7440-70-2	Calcium	75100	J	MG/KG	3.01E+01			
7440-47-3	Chromium	4010	J	MG/KG	1.59E+02	8.94E-06		2.01E+03
7440-48-4	Cobalt	68.3		MG/KG	3.15E+00		5.57E-04	
7440-50-8	Copper	846		MG/KG	7.49E+01		1.11E-02	
57-12-5	Cyanide, Total	0.46	U	MG/KG	1.12E+00		2.61E-05	2.30E-01
7439-89-6	Iron	69000		MG/KG	3.57E+00		1.13E-01	
7439-92-1	Lead	7270	J	MG/KG	3.11E+02			
7439-95-4	Magnesium	27900		MG/KG	1.80E+01			
7439-96-5	Manganese	20400		MG/KG	5.60E+00		6.33E-01	
7439-97-6	Mercury	1.6		MG/KG	2.67E+01			
7440-02-0	Nickel	53.8		MG/KG	2.85E+00		1.32E-03	7.69E+00
2023695	Potassium	1550		MG/KG	2.48E+00			
7782-49-2	Selenium	7.7		MG/KG	3.29E+00		7.53E-04	2.57E+01
7440-22-4	Silver	4		MG/KG	6.90E+00		3.91E-04	2.00E+00
7440-23-5	Sodium	4430	J	MG/KG	2.61E+01			
7440-28-0	Thallium	1.8		MG/KG	4.39E+00		1.26E-05	
7440-62-2	Vanadium	86.5		MG/KG	1.83E+00		6.05E-03	2.88E-01
7440-66-6	Zinc	1970		MG/KG	3.83E+01		3.22E-03	3.28E+00
Polychlorinated Biphenyls (PCB)								
12674-11-2	PCB-1016	8.5	U	UG/KG		2.96E-10	1.69E-04	
11104-28-2	PCB-1221	17	U	UG/KG		1.69E-08		
11141-16-5	PCB-1232	8.5	U	UG/KG		8.46E-09		
53469-21-9	PCB-1242	8.5	U	UG/KG		8.46E-09		
12672-29-6	PCB-1248	8.5	U	UG/KG		8.46E-09		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
11097-69-1	PCB-1254	28		UG/KG		2.79E-08	1.95E-03	
11096-82-5	PCB-1260	21		UG/KG		2.09E-08		
Dioxins								
1746-01-6	2,3,7,8-TCDD	0.000248	U	UG/KG				
Other Parameters								
7601-90-3	Perchlorate	8500	U	UG/KG			8.32E-03	
TOC	TOC	67700		MG/KG	2.16E+00			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	11	U	UG/KG			5.50E-03
79-34-5	1,1,2,2-Tetrachloroethane	11	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	11	U	UG/KG	1.34E-06	1.34E-06	5.50E-01
75-34-3	1,1-Dichloroethane	11	U	UG/KG	5.50E-08	5.50E-08	4.78E-04
75-35-4	1,1-Dichloroethene	11	U	UG/KG	6.11E-07	6.11E-06	1.83E-01
107-06-2	1,2-Dichloroethane (EDC)	11	U	UG/KG	1.75E-04	7.86E-06	5.50E-01
540-59-0	1,2-Dichloroethene (total)	6	J	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	11	U	UG/KG	1.31E-04	6.11E-06	3.67E-01
78-93-3	2-Butanone (MEK)	22	U	UG/KG			
591-78-6	2-Hexanone	22	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	22	U	UG/KG			
67-64-1	Acetone	72	J	UG/KG	3.60E-07	3.60E-07	4.50E-03
71-43-2	Benzene	11	U	UG/KG	5.50E-05	2.56E-06	3.67E-01
75-27-4	Bromodichloromethane	11	U	UG/KG	1.20E-04	5.50E-06	1.83E-02
75-25-2	Bromoform	11	U	UG/KG	1.53E-05	6.88E-07	1.38E-02
74-83-9	Bromomethane	11	U	UG/KG	3.79E-06	1.10E-05	5.50E-02
75-15-0	Carbon disulfide	11	U	UG/KG	5.50E-08	5.50E-07	3.44E-04
56-23-5	Carbon tetrachloride	360	E	UG/KG	8.18E-03	8.78E-04	5.14E+00
108-90-7	Chlorobenzene	11	U	UG/KG	2.68E-07	2.68E-06	1.10E-02
75-00-3	Chloroethane	11	U	UG/KG			
67-66-3	Chloroform	260		UG/KG	2.77E-04	1.30E-04	4.33E-01
74-87-3	Chloromethane	11	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	490	E	UG/KG	2.45E-05	2.45E-05	1.23E+00
10061-01-5	cis-1,3-Dichloropropene	11	U	UG/KG			

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TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	11	U	UG/KG	2.68E-07	2.68E-07	2.75E-02
100-41-4	Ethylbenzene	11	U	UG/KG	5.50E-08	5.50E-07	8.46E-04
75-09-2	Methylene chloride	34		UG/KG	4.47E-05	2.83E-06	1.70E+00
110-54-3	N-Hexane	11	U	UG/KG			
100-42-5	Styrene	11	U	UG/KG	2.68E-08	2.68E-07	2.75E-03
127-18-4	Tetrachloroethylene (PCE)	2200		UG/KG	2.00E-02	9.17E-04	3.67E+01
108-88-3	Toluene	4	J	UG/KG	9.76E-09	9.76E-09	3.33E-04
1330-20-7	total Xylenes	11	U	UG/KG	1.10E-08	2.68E-08	7.33E-05
156-60-5	trans-1,2-Dichloroethene	5	J	UG/KG	1.22E-07	1.22E-07	7.14E-03
10061-02-6	trans-1,3-Dichloropropene	11	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	51		UG/KG	9.81E-05	4.25E-05	8.50E-01
75-01-4	Vinyl chloride	11	U	UG/KG	3.67E-03	1.69E-04	1.10E+00
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	1000	U	UG/KG	5.00E-05	5.00E-04	2.00E-01
95-50-1	1,2-Dichlorobenzene	1000	U	UG/KG	5.56E-06	5.56E-05	5.88E-02
541-73-1	1,3-Dichlorobenzene	1000	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	1000	U	UG/KG			5.00E-01
95-95-4	2,4,5-Trichlorophenol	5100	U	UG/KG	2.55E-05	2.55E-05	1.89E-02
88-06-2	2,4,6-Trichlorophenol	1000	U	UG/KG	1.92E-03	9.09E-05	5.00E+00
120-83-2	2,4-Dichlorophenol	1000	U	UG/KG	1.64E-04	1.64E-03	1.00E+00
105-67-9	2,4-Dimethylphenol	1000	U	UG/KG	2.44E-05	2.44E-05	1.11E-01
51-28-5	2,4-Dinitrophenol	5100	U	UG/KG	1.24E-03	1.24E-02	2.55E+01
91-58-7	2-Chloronaphthalene	1000	U	UG/KG			
95-57-8	2-Chlorophenol	1000	U	UG/KG	1.00E-04	1.00E-04	2.50E-01
90-12-0	1-Methylnaphthalene	3900		UG/KG	4.76E-05	4.76E-04	4.64E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
91-57-6	2-Methylnaphthalene	9100		UG/KG	1.49E-04	1.49E-04	2.17E-03
95-48-7	2-Methylphenol	1000	U	UG/KG	1.00E-05	1.00E-05	6.67E-02
88-74-4	2-Nitroaniline	5100	U	UG/KG			
88-75-5	2-Nitrophenol	1000	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	1000	U	UG/KG	7.69E-02	3.57E-03	1.43E+02
99-09-2	3-Nitroaniline	5100	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	5100	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	1000	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	1000	U	UG/KG			
106-47-8	4-Chloroaniline	2000	U	UG/KG	2.44E-04	2.44E-03	2.86E+00
7005-72-3	4-Chlorophenyl phenyl ether	1000	U	UG/KG			
106-44-5	4-Methylphenol	91	J	UG/KG			
100-01-6	4-Nitroaniline	5100	U	UG/KG			
100-02-7	4-Nitrophenol	5100	U	UG/KG			
83-32-9	Acenaphthene	1300	J	UG/KG	1.08E-05	1.08E-05	2.28E-03
208-96-8	Acenaphthylene	2400	J	UG/KG	3.93E-05	3.93E-05	5.71E-04
120-12-7	Anthracene	590		UG/KG	9.67E-07	9.67E-07	4.92E-05
56-55-3	Benzo(a)anthracene	1100		UG/KG	1.38E-01	6.47E-03	5.50E-01
50-32-8	Benzo(a)pyrene	590		UG/KG	7.38E-01	3.47E-02	7.38E-02
205-99-2	Benzo(b)fluoranthene	410	J	UG/KG	5.13E-02	2.41E-03	8.20E-02
191-24-2	Benzo(g,h,i)perylene	2600		UG/KG	4.26E-05	4.26E-05	6.19E-04
207-08-9	Benzo(k)fluoranthene	480		UG/KG	6.15E-03	2.82E-04	9.80E-03
111-91-1	bis(2-Chloroethoxy)methane	1000	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	1000	U	UG/KG	2.00E-01	1.33E-02	2.50E+03
108-60-1	bis(2-Chloroisopropyl) ether	1000	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	9100		UG/KG	2.22E-02	2.22E-03	2.53E-03
85-68-7	Butyl benzyl phthalate	1000	U	UG/KG	2.44E-06	2.44E-06	1.08E-03
86-74-8	Carbazole	350	J	UG/KG	1.21E-03	5.65E-05	5.83E-01
218-01-9	Chrysene	1800		UG/KG	2.31E-03	1.06E-04	1.13E-02
84-74-2	Di-n-butyl phthalate	1700		UG/KG	8.50E-06	8.50E-06	7.39E-04
117-84-0	Di-n-octyl phthalate	1000	U	UG/KG	2.44E-05	2.44E-04	1.00E-04
53-70-3	Dibenz(a,h)anthracene	88	J	UG/KG	1.10E-01	5.18E-03	4.40E-02
132-64-9	Dibenzofuran	2800		UG/KG			
84-66-2	Diethyl phthalate	1000	U	UG/KG	1.00E-06	1.00E-06	2.13E-03
131-11-3	Dimethyl phthalate	1000	U	UG/KG			
206-44-0	Fluoranthene	990		UG/KG	1.21E-05	1.21E-05	2.30E-04
86-73-7	Fluorene	270	J	UG/KG	3.29E-06	3.29E-06	4.82E-04
118-74-1	Hexachlorobenzene	1000	U	UG/KG	2.50E-01	1.28E-02	5.00E-01
87-68-3	Hexachlorobutadiene	1000	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	1000	U	UG/KG	7.14E-05	7.14E-05	2.50E-03
67-72-1	Hexachloroethane	1000	U	UG/KG	5.00E-04	5.00E-04	2.00E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	480		UG/KG	6.00E-02	2.82E-03	3.43E-02
78-59-1	Isophorone	1000	U	UG/KG	2.44E-06	2.44E-06	1.25E-01
621-64-7	N-Nitroso-di-n-propylamine	1000	U	UG/KG	1.25E+00	5.56E-02	2.00E+04
86-30-6	N-Nitrosodiphenylamine	560		UG/KG	4.67E-04	2.24E-05	5.60E-01
91-20-3	Naphthalene	3900		UG/KG	4.76E-05	4.76E-04	4.64E-02
87-86-5	Pentachlorophenol	1500	J	UG/KG	6.25E-02	2.88E-03	5.00E+01
85-01-8	Phenanthrene	4800		UG/KG	7.87E-05	7.87E-05	1.14E-03
108-95-2	Phenol	1000	U	UG/KG	1.00E-06	8.33E-06	1.00E-02
129-00-0	Pyrene	1600		UG/KG	2.62E-05	2.62E-05	3.81E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	760	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	760	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	1500	J	UG/KG			
121-14-2	2,4-Dinitrotoluene	3200	J	UG/KG	3.81E-01	1.78E-02	4.00E+03
606-20-2	2,6-Dinitrotoluene	92	J	UG/KG	1.10E-02	5.11E-04	1.31E+02
	Dinitrotoluene Mixture	3292	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	1500	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	1500	U	UG/KG			
99-08-1	3-Nitrotoluene	1500	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	4600		UG/KG			
99-99-0	4-Nitrotoluene (PNT)	6100		UG/KG			
2691-41-0	HMX	39000		UG/KG			
98-95-3	Nitrobenzene	760	U	UG/KG	7.60E-04	7.60E-04	7.60E+00
55-63-0	Nitroglycerin	1500	U	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	3000	U	UG/KG			
121-82-4	RDX	17000		UG/KG			
479-45-8	Tetryl	2300	U	UG/KG			
Metals							
7429-90-5	Aluminum	22900		MG/KG			
7440-36-0	Antimony	76.4	J	MG/KG	9.32E-02	9.32E-01	1.53E+01
7440-38-2	Arsenic	32.6		MG/KG	1.09E+01	5.34E-01	1.16E+00
7440-39-3	Barium	1430		MG/KG	1.02E-02	1.02E-01	1.19E+00
7440-41-7	Beryllium	1.8		MG/KG	1.80E+00	6.21E-02	2.73E-01
7440-42-8	Boron	66.8		MG/KG	3.71E-04	3.71E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-43-9	Cadmium	15.2		MG/KG	7.60E-03	7.60E-02	4.11E+00
7440-70-2	Calcium	75100	J	MG/KG			
7440-47-3	Chromium	4010	J	MG/KG	4.01E-01	9.78E-01	1.43E+02
7440-48-4	Cobalt	68.3		MG/KG	5.69E-04	5.69E-03	
7440-50-8	Copper	846		MG/KG	1.03E-02	1.03E-01	7.69E-02
57-12-5	Cyanide, Total	0.46	U	MG/KG	1.12E-05	1.12E-04	1.15E-02
7439-89-6	Iron	69000		MG/KG			
7439-92-1	Lead	7270	J	MG/KG	1.82E+01	1.82E+01	
7439-95-4	Magnesium	27900		MG/KG			
7439-96-5	Manganese	20400		MG/KG	2.13E-01	2.13E+00	
7439-97-6	Mercury	1.6		MG/KG	2.62E-03	2.62E-02	1.07E+01
7440-02-0	Nickel	53.8		MG/KG	1.31E-03	1.31E-02	7.08E-01
2023695	Potassium	1550		MG/KG			
7782-49-2	Selenium	7.7		MG/KG	7.70E-04	7.70E-03	3.21E+00
7440-22-4	Silver	4		MG/KG	4.00E-04	4.00E-03	2.67E+00
7440-23-5	Sodium	4430	J	MG/KG			
7440-28-0	Thallium	1.8		MG/KG	1.13E-02	1.13E-02	7.50E-01
7440-62-2	Vanadium	86.5		MG/KG	6.18E-03	6.18E-02	8.83E-02
7440-66-6	Zinc	1970		MG/KG	3.23E-03	3.23E-02	5.47E-01
Polychlorinated Biphenyls (PCB)							
12674-11-2	PCB-1016	8.5	U	UG/KG			
11104-28-2	PCB-1221	17	U	UG/KG			
11141-16-5	PCB-1232	8.5	U	UG/KG			
53469-21-9	PCB-1242	8.5	U	UG/KG			
12672-29-6	PCB-1248	8.5	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-11
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
11097-69-1	PCB-1254	28		UG/KG			
11096-82-5	PCB-1260	21		UG/KG			
Dioxins							
1746-01-6	2,3,7,8-TCDD	0.000248	U	UG/KG			
Other Parameters							
7601-90-3	Perchlorate	8500	U	UG/KG			
TOC	TOC	67700		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	620	U	UG/KG			8.14E-05	2.07E+00
95-50-1	1,2-Dichlorobenzene	620	U	UG/KG			1.87E-04	6.89E-01
541-73-1	1,3-Dichlorobenzene	620	U	UG/KG			1.20E-02	
106-46-7	1,4-Dichlorobenzene	620	U	UG/KG		7.63E-08	3.23E-04	6.20E+00
95-95-4	2,4,5-Trichlorophenol	3100	U	UG/KG			3.52E-05	3.10E-01
88-06-2	2,4,6-Trichlorophenol	620	U	UG/KG		2.76E-09		7.75E+01
120-83-2	2,4-Dichlorophenol	620	U	UG/KG			2.35E-04	1.24E+01
105-67-9	2,4-Dimethylphenol	620	U	UG/KG			3.52E-05	1.55E+00
51-28-5	2,4-Dinitrophenol	3100	U	UG/KG			1.76E-03	3.10E+02
91-58-7	2-Chloronaphthalene	620	U	UG/KG			2.27E-05	
95-57-8	2-Chlorophenol	620	U	UG/KG			2.57E-03	3.10E+00
91-57-6	2-Methylnaphthalene	180	J	UG/KG			3.32E-06	9.00E-04
95-48-7	2-Methylphenol	620	U	UG/KG			1.41E-05	7.75E-01
88-74-4	2-Nitroaniline	3100	U	UG/KG			6.16E-02	
88-75-5	2-Nitrophenol	620	U	UG/KG			8.80E-05	
91-94-1	3,3'-Dichlorobenzidine	620	U	UG/KG		1.13E-07		2.07E+03
99-09-2	3-Nitroaniline	3100	U	UG/KG			6.16E-02	
534-52-1	4,6-Dinitro-2-methylphenol	3100	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	620	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	620	U	UG/KG			1.41E-05	
106-47-8	4-Chloroaniline	1200	U	UG/KG			3.41E-04	4.00E+01
7005-72-3	4-Chlorophenyl phenyl ether	620	U	UG/KG				
106-44-5	4-Methylphenol	620	U	UG/KG			1.41E-04	
100-01-6	4-Nitroaniline	3100	U	UG/KG			6.16E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
100-02-7	4-Nitrophenol	3100	U	UG/KG			4.40E-04	
83-32-9	Acenaphthene	620	U	UG/KG			1.62E-05	2.07E-02
208-96-8	Acenaphthylene	620	U	UG/KG			1.14E-05	3.10E-03
120-12-7	Anthracene	620	U	UG/KG			1.59E-06	1.03E-03
56-55-3	Benzo(a)anthracene	120	J	UG/KG		4.16E-08		1.50E+00
50-32-8	Benzo(a)pyrene	130	J	UG/KG		4.50E-07		3.25E-01
205-99-2	Benzo(b)fluoranthene	200	J	UG/KG		6.93E-08		1.00E+00
191-24-2	Benzo(g,h,i)perylene	110	J	UG/KG			2.03E-06	5.50E-04
207-08-9	Benzo(k)fluoranthene	79	J	UG/KG		2.74E-09		3.95E-02
111-91-1	bis(2-Chloroethoxy)methane	620	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	620	U	UG/KG		1.00E-06		3.10E+04
108-60-1	bis(2-Chloroisopropyl) ether	620	U	UG/KG		7.68E-08	1.46E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	620	U	UG/KG		3.52E-09	3.52E-05	
85-68-7	Butyl benzyl phthalate	620	U	UG/KG			3.52E-06	7.75E-04
86-74-8	Carbazole	620	U	UG/KG		5.03E-09		2.07E+01
218-01-9	Chrysene	140	J	UG/KG		4.85E-10		1.75E-02
84-74-2	Di-n-butyl phthalate	1700		UG/KG			1.93E-05	5.67E-03
117-84-0	Di-n-octyl phthalate	620	U	UG/KG			3.52E-05	6.20E-05
53-70-3	Dibenz(a,h)anthracene	620	U	UG/KG		2.15E-06		7.75E+00
132-64-9	Dibenzofuran	620	U	UG/KG			1.22E-04	
84-66-2	Diethyl phthalate	620	U	UG/KG			8.80E-07	
131-11-3	Dimethyl phthalate	620	U	UG/KG			7.04E-08	
206-44-0	Fluoranthene	140	J	UG/KG			4.65E-06	7.00E-04
86-73-7	Fluorene	620	U	UG/KG			1.87E-05	2.07E-02
118-74-1	Hexachlorobenzene	620	U	UG/KG		4.02E-07	8.80E-04	6.20E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
87-68-3	Hexachlorobutadiene	620	U	UG/KG		1.96E-08	3.52E-03	6.20E+00
77-47-4	Hexachlorocyclopentadiene	620	U	UG/KG			1.05E-04	3.10E-02
67-72-1	Hexachloroethane	620	U	UG/KG		3.52E-09	7.04E-04	3.10E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	620	U	UG/KG		2.15E-07		8.86E-01
78-59-1	Isophorone	620	U	UG/KG		2.39E-10	3.52E-06	2.07E+01
621-64-7	N-Nitroso-di-n-propylamine	620	U	UG/KG		1.76E-06		3.10E+05
86-30-6	N-Nitrosodiphenylamine	420	J	UG/KG		8.34E-10		7.00E+00
91-20-3	Naphthalene	75	J	UG/KG			3.98E-04	1.88E-02
87-86-5	Pentachlorophenol	3100	U	UG/KG		2.80E-07	2.17E-04	3.10E+03
85-01-8	Phenanthrene	90	J	UG/KG			1.66E-06	4.50E-04
108-95-2	Phenol	620	U	UG/KG			1.17E-06	1.24E-01
129-00-0	Pyrene	160	J	UG/KG			2.95E-06	8.00E-04
Explosives								
99-35-4	1,3,5-Trinitrobenzene	470	UJ	UG/KG			1.78E-05	
99-65-0	1,3-Dinitrobenzene	470	UJ	UG/KG			5.34E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	930	UJ	UG/KG		1.13E-08	2.11E-03	
121-14-2	2,4-Dinitrotoluene	630	J	UG/KG			3.58E-04	1.58E+04
606-20-2	2,6-Dinitrotoluene	750	UJ	UG/KG			8.51E-04	2.50E+04
	Dinitrotoluene Mixture	630	J	UG/KG		1.75E-07		1.58E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	930	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	930	UJ	UG/KG				
99-08-1	3-Nitrotoluene	930	UJ	UG/KG			4.58E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	930	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	930	UJ	UG/KG			4.58E-04	
2691-41-0	HMX	930	UJ	UG/KG			2.11E-05	

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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
98-95-3	Nitrobenzene	470	UJ	UG/KG			4.11E-03	
121-82-4	RDX	930	UJ	UG/KG		4.15E-08	3.52E-04	
479-45-8	Tetryl	1400	UJ	UG/KG			1.59E-04	
Metals								
7429-90-5	Aluminum	10200		MG/KG	9.07E-01		6.08E-03	
7440-36-0	Antimony	0.75	J	MG/KG	3.95E-01		9.17E-04	2.50E+00
7440-38-2	Arsenic	6.2		MG/KG	6.02E-01	2.27E-06	1.41E-02	6.20E+00
7440-39-3	Barium	175		MG/KG	8.93E-01		1.41E-03	2.19E+00
7440-41-7	Beryllium	0.93	U	MG/KG	5.81E-01	4.15E-10	2.52E-04	3.10E-01
7440-42-8	Boron	3.8	J	MG/KG			4.80E-05	
7440-43-9	Cadmium	1.1		MG/KG	6.88E-01	3.68E-10	1.36E-03	2.75E+00
7440-70-2	Calcium	4600		MG/KG	3.18E+00			
7440-47-3	Chromium	22		MG/KG	1.28E+00	4.91E-08		1.10E+01
7440-48-4	Cobalt	7.3	J	MG/KG	8.02E-01		5.95E-05	
7440-50-8	Copper	88.8		MG/KG	5.29E+00		1.17E-03	
7439-89-6	Iron	17400		MG/KG	8.39E-01		2.84E-02	
7439-92-1	Lead	86		MG/KG	3.58E+00			
7439-95-4	Magnesium	2810		MG/KG	1.47E+00			
7439-96-5	Manganese	1720		MG/KG	1.65E+00		5.33E-02	
7439-97-6	Mercury	0.12	J	MG/KG	8.00E-01			
7440-02-0	Nickel	15.3		MG/KG	9.05E-01		3.74E-04	2.19E+00
2023695	Potassium	687		MG/KG	4.83E-01			
7782-49-2	Selenium	1.6		MG/KG	2.50E+00		1.57E-04	5.33E+00
7440-22-4	Silver	0.79	J	MG/KG	2.63E-01		7.73E-05	3.95E-01
7440-23-5	Sodium	417		MG/KG	2.88E-01			

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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-28-0	Thallium	1.9	U	MG/KG	6.13E+00		1.33E-05	
7440-62-2	Vanadium	22.9		MG/KG	8.18E-01		1.60E-03	7.63E-02
7440-66-6	Zinc	309		MG/KG	5.41E+00		5.05E-04	5.15E-01
Other Parameters								
7601-90-3	Perchlorate	8100	U	UG/KG			7.93E-03	

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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	620	U	UG/KG	3.10E-05	3.10E-04	1.24E-01
95-50-1	1,2-Dichlorobenzene	620	U	UG/KG	3.44E-06	3.44E-05	3.65E-02
541-73-1	1,3-Dichlorobenzene	620	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	620	U	UG/KG			3.10E-01
95-95-4	2,4,5-Trichlorophenol	3100	U	UG/KG	1.55E-05	1.55E-05	1.15E-02
88-06-2	2,4,6-Trichlorophenol	620	U	UG/KG	1.19E-03	5.64E-05	3.10E+00
120-83-2	2,4-Dichlorophenol	620	U	UG/KG	1.02E-04	1.02E-03	6.20E-01
105-67-9	2,4-Dimethylphenol	620	U	UG/KG	1.51E-05	1.51E-05	6.89E-02
51-28-5	2,4-Dinitrophenol	3100	U	UG/KG	7.56E-04	7.56E-03	1.55E+01
91-58-7	2-Chloronaphthalene	620	U	UG/KG			
95-57-8	2-Chlorophenol	620	U	UG/KG	6.20E-05	6.20E-05	1.55E-01
91-57-6	2-Methylnaphthalene	180	J	UG/KG	2.95E-06	2.95E-06	4.29E-05
95-48-7	2-Methylphenol	620	U	UG/KG	6.20E-06	6.20E-06	4.13E-02
88-74-4	2-Nitroaniline	3100	U	UG/KG			
88-75-5	2-Nitrophenol	620	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	620	U	UG/KG	4.77E-02	2.21E-03	8.86E+01
99-09-2	3-Nitroaniline	3100	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	3100	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	620	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	620	U	UG/KG			
106-47-8	4-Chloroaniline	1200	U	UG/KG	1.46E-04	1.46E-03	1.71E+00
7005-72-3	4-Chlorophenyl phenyl ether	620	U	UG/KG			
106-44-5	4-Methylphenol	620	U	UG/KG			
100-01-6	4-Nitroaniline	3100	U	UG/KG			

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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
100-02-7	4-Nitrophenol	3100	U	UG/KG			
83-32-9	Acenaphthene	620	U	UG/KG	5.17E-06	5.17E-06	1.09E-03
208-96-8	Acenaphthylene	620	U	UG/KG	1.02E-05	1.02E-05	1.48E-04
120-12-7	Anthracene	620	U	UG/KG	1.02E-06	1.02E-06	5.17E-05
56-55-3	Benzo(a)anthracene	120	J	UG/KG	1.50E-02	7.06E-04	6.00E-02
50-32-8	Benzo(a)pyrene	130	J	UG/KG	1.63E-01	7.65E-03	1.63E-02
205-99-2	Benzo(b)fluoranthene	200	J	UG/KG	2.50E-02	1.18E-03	4.00E-02
191-24-2	Benzo(g,h,i)perylene	110	J	UG/KG	1.80E-06	1.80E-06	2.62E-05
207-08-9	Benzo(k)fluoranthene	79	J	UG/KG	1.01E-03	4.65E-05	1.61E-03
111-91-1	bis(2-Chloroethoxy)methane	620	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	620	U	UG/KG	1.24E-01	8.27E-03	1.55E+03
108-60-1	bis(2-Chloroisopropyl) ether	620	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	620	U	UG/KG	1.51E-03	1.51E-04	1.72E-04
85-68-7	Butyl benzyl phthalate	620	U	UG/KG	1.51E-06	1.51E-06	6.67E-04
86-74-8	Carbazole	620	U	UG/KG	2.14E-03	1.00E-04	1.03E+00
218-01-9	Chrysene	140	J	UG/KG	1.79E-04	8.24E-06	8.75E-04
84-74-2	Di-n-butyl phthalate	1700		UG/KG	8.50E-06	8.50E-06	7.39E-04
117-84-0	Di-n-octyl phthalate	620	U	UG/KG	1.51E-05	1.51E-04	6.20E-05
53-70-3	Dibenz(a,h)anthracene	620	U	UG/KG	7.75E-01	3.65E-02	3.10E-01
132-64-9	Dibenzofuran	620	U	UG/KG			
84-66-2	Diethyl phthalate	620	U	UG/KG	6.20E-07	6.20E-07	1.32E-03
131-11-3	Dimethyl phthalate	620	U	UG/KG			
206-44-0	Fluoranthene	140	J	UG/KG	1.71E-06	1.71E-06	3.26E-05
86-73-7	Fluorene	620	U	UG/KG	7.56E-06	7.56E-06	1.11E-03
118-74-1	Hexachlorobenzene	620	U	UG/KG	1.55E-01	7.95E-03	3.10E-01

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J = Estimated U = Nondetect

TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
87-68-3	Hexachlorobutadiene	620	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	620	U	UG/KG	4.43E-05	4.43E-05	1.55E-03
67-72-1	Hexachloroethane	620	U	UG/KG	3.10E-04	3.10E-04	1.24E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	620	U	UG/KG	7.75E-02	3.65E-03	4.43E-02
78-59-1	Isophorone	620	U	UG/KG	1.51E-06	1.51E-06	7.75E-02
621-64-7	N-Nitroso-di-n-propylamine	620	U	UG/KG	7.75E-01	3.44E-02	1.24E+04
86-30-6	N-Nitrosodiphenylamine	420	J	UG/KG	3.50E-04	1.68E-05	4.20E-01
91-20-3	Naphthalene	75	J	UG/KG	9.15E-07	9.15E-06	8.93E-04
87-86-5	Pentachlorophenol	3100	U	UG/KG	1.29E-01	5.96E-03	1.03E+02
85-01-8	Phenanthrene	90	J	UG/KG	1.48E-06	1.48E-06	2.14E-05
108-95-2	Phenol	620	U	UG/KG	6.20E-07	5.17E-06	6.20E-03
129-00-0	Pyrene	160	J	UG/KG	2.62E-06	2.62E-06	3.81E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	470	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	470	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	930	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	630	J	UG/KG	7.50E-02	3.50E-03	7.88E+02
606-20-2	2,6-Dinitrotoluene	750	UJ	UG/KG	8.93E-02	4.17E-03	1.07E+03
	Dinitrotoluene Mixture	630	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	930	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	930	UJ	UG/KG			
99-08-1	3-Nitrotoluene	930	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	930	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	930	UJ	UG/KG			
2691-41-0	HMX	930	UJ	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
98-95-3	Nitrobenzene	470	UJ	UG/KG	4.70E-04	4.70E-04	4.70E+00
121-82-4	RDX	930	UJ	UG/KG			
479-45-8	Tetryl	1400	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	10200		MG/KG			
7440-36-0	Antimony	0.75	J	MG/KG	9.15E-04	9.15E-03	1.50E-01
7440-38-2	Arsenic	6.2		MG/KG	2.07E+00	1.02E-01	2.21E-01
7440-39-3	Barium	175		MG/KG	1.25E-03	1.25E-02	1.46E-01
7440-41-7	Beryllium	0.93	U	MG/KG	9.30E-01	3.21E-02	1.41E-01
7440-42-8	Boron	3.8	J	MG/KG	2.11E-05	2.11E-04	
7440-43-9	Cadmium	1.1		MG/KG	5.50E-04	5.50E-03	2.97E-01
7440-70-2	Calcium	4600		MG/KG			
7440-47-3	Chromium	22		MG/KG	2.20E-03	5.37E-03	7.86E-01
7440-48-4	Cobalt	7.3	J	MG/KG	6.08E-05	6.08E-04	
7440-50-8	Copper	88.8		MG/KG	1.08E-03	1.08E-02	8.07E-03
7439-89-6	Iron	17400		MG/KG			
7439-92-1	Lead	86		MG/KG	2.15E-01	2.15E-01	
7439-95-4	Magnesium	2810		MG/KG			
7439-96-5	Manganese	1720		MG/KG	1.79E-02	1.79E-01	
7439-97-6	Mercury	0.12	J	MG/KG	1.97E-04	1.97E-03	8.00E-01
7440-02-0	Nickel	15.3		MG/KG	3.73E-04	3.73E-03	2.01E-01
2023695	Potassium	687		MG/KG			
7782-49-2	Selenium	1.6		MG/KG	1.60E-04	1.60E-03	6.67E-01
7440-22-4	Silver	0.79	J	MG/KG	7.90E-05	7.90E-04	5.27E-01
7440-23-5	Sodium	417		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 20-12
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-28-0	Thallium	1.9	U	MG/KG	1.19E-02	1.19E-02	7.92E-01
7440-62-2	Vanadium	22.9		MG/KG	1.64E-03	1.64E-02	2.34E-02
7440-66-6	Zinc	309		MG/KG	5.07E-04	5.07E-03	8.58E-02
Other Parameters							
7601-90-3	Perchlorate	8100	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			1.80E-06	6.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG		6.68E-09	1.54E-06	3.00E+01
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG		3.16E-09	3.94E-05	6.67E+00
75-34-3	1,1-Dichloroethane	6	U	UG/KG			2.91E-06	6.00E-03
75-35-4	1,1-Dichloroethene	6	U	UG/KG		5.05E-08	8.91E-05	2.00E+00
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG		7.85E-09	1.70E-04	6.00E+00
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	6	U	UG/KG		7.81E-09	2.82E-04	6.00E+00
78-93-3	2-Butanone (MEK)	12	U	UG/KG			4.33E-07	
591-78-6	2-Hexanone	12	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			4.16E-06	
67-64-1	Acetone	29	U	UG/KG			4.66E-06	3.63E-02
71-43-2	Benzene	6	U	UG/KG		4.10E-09	2.48E-04	3.00E+00
75-27-4	Bromodichloromethane	6	U	UG/KG		2.55E-09	5.75E-06	2.00E-01
75-25-2	Bromoform	6	U	UG/KG		1.92E-11	3.41E-07	1.50E-01
74-83-9	Bromomethane	6	U	UG/KG			4.57E-04	6.00E-01
75-15-0	Carbon disulfide	6	U	UG/KG			4.96E-06	3.00E-03
56-23-5	Carbon tetrachloride	6	U	UG/KG		1.13E-08	8.58E-04	2.00E+00
108-90-7	Chlorobenzene	6	U	UG/KG			1.11E-05	8.57E-02
75-00-3	Chloroethane	6	U	UG/KG		9.22E-10	3.18E-07	
67-66-3	Chloroform	6	U	UG/KG		1.15E-08	4.66E-03	2.00E-01
74-87-3	Chloromethane	6	U	UG/KG		2.25E-09		
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG			4.07E-05	3.00E-01
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	

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TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
124-48-1	Dibromochloromethane	6	U	UG/KG		2.26E-09	3.77E-06	3.00E-01
100-41-4	Ethylbenzene	6	U	UG/KG			1.00E-06	8.57E-03
75-09-2	Methylene chloride	6	U	UG/KG		2.92E-10	6.14E-07	6.00E+00
110-54-3	N-Hexane	6	U	UG/KG			1.49E-05	
100-42-5	Styrene	6	U	UG/KG			2.94E-07	3.00E-02
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG		3.21E-10	3.52E-06	2.00E+00
108-88-3	Toluene	6	U	UG/KG			3.02E-06	1.00E-02
1330-20-7	total Xylenes	6	U	UG/KG			1.35E-06	6.00E-04
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG			2.80E-05	2.00E-01
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG		9.81E-10	7.59E-05	2.00E+00
75-01-4	Vinyl chloride	6	U	UG/KG		1.23E-07		8.57E+00
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	430	U	UG/KG			5.64E-05	1.43E+00
95-50-1	1,2-Dichlorobenzene	430	U	UG/KG			1.30E-04	4.78E-01
541-73-1	1,3-Dichlorobenzene	430	U	UG/KG			8.31E-03	
106-46-7	1,4-Dichlorobenzene	430	U	UG/KG		5.29E-08	2.24E-04	4.30E+00
95-95-4	2,4,5-Trichlorophenol	2100	U	UG/KG			2.38E-05	2.10E-01
88-06-2	2,4,6-Trichlorophenol	430	U	UG/KG		1.92E-09		5.38E+01
120-83-2	2,4-Dichlorophenol	430	U	UG/KG			1.63E-04	8.60E+00
105-67-9	2,4-Dimethylphenol	430	U	UG/KG			2.44E-05	1.08E+00
51-28-5	2,4-Dinitrophenol	2100	U	UG/KG			1.19E-03	2.10E+02
91-58-7	2-Chloronaphthalene	430	U	UG/KG			1.58E-05	
95-57-8	2-Chlorophenol	430	U	UG/KG			1.78E-03	2.15E+00
91-57-6	2-Methylnaphthalene	430	U	UG/KG			7.93E-06	2.15E-03

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TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-48-7	2-Methylphenol	430	U	UG/KG			9.76E-06	5.38E-01
88-74-4	2-Nitroaniline	2100	U	UG/KG			4.17E-02	
88-75-5	2-Nitrophenol	430	U	UG/KG			6.10E-05	
91-94-1	3,3'-Dichlorobenzidine	430	U	UG/KG		7.84E-08		1.43E+03
99-09-2	3-Nitroaniline	2100	U	UG/KG			4.17E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2100	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	430	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	430	U	UG/KG			9.76E-06	
106-47-8	4-Chloroaniline	850	U	UG/KG			2.41E-04	2.83E+01
7005-72-3	4-Chlorophenyl phenyl ether	430	U	UG/KG				
106-44-5	4-Methylphenol	430	U	UG/KG			9.76E-05	
100-01-6	4-Nitroaniline	2100	U	UG/KG			4.17E-02	
100-02-7	4-Nitrophenol	2100	U	UG/KG			2.98E-04	
83-32-9	Acenaphthene	430	U	UG/KG			1.12E-05	1.43E-02
208-96-8	Acenaphthylene	430	U	UG/KG			7.93E-06	2.15E-03
120-12-7	Anthracene	430	U	UG/KG			1.10E-06	7.17E-04
56-55-3	Benzo(a)anthracene	430	U	UG/KG		1.49E-07		5.38E+00
50-32-8	Benzo(a)pyrene	430	U	UG/KG		1.49E-06		1.08E+00
205-99-2	Benzo(b)fluoranthene	430	U	UG/KG		1.49E-07		2.15E+00
191-24-2	Benzo(g,h,i)perylene	430	U	UG/KG			7.93E-06	2.15E-03
207-08-9	Benzo(k)fluoranthene	430	U	UG/KG		1.49E-08		2.15E-01
111-91-1	bis(2-Chloroethoxy)methane	430	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	430	U	UG/KG		6.94E-07		2.15E+04
108-60-1	bis(2-Chloroisopropyl) ether	430	U	UG/KG		5.32E-08	1.01E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	56	J	UG/KG		3.18E-10	3.18E-06	

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TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-68-7	Butyl benzyl phthalate	430	U	UG/KG			2.44E-06	5.38E-04
86-74-8	Carbazole	430	U	UG/KG		3.49E-09		1.43E+01
218-01-9	Chrysene	430	U	UG/KG		1.49E-09		5.38E-02
84-74-2	Di-n-butyl phthalate	430	U	UG/KG			4.88E-06	1.43E-03
117-84-0	Di-n-octyl phthalate	430	U	UG/KG			2.44E-05	4.30E-05
53-70-3	Dibenz(a,h)anthracene	430	U	UG/KG		1.49E-06		5.38E+00
132-64-9	Dibenzofuran	430	U	UG/KG			8.49E-05	
84-66-2	Diethyl phthalate	430	U	UG/KG			6.10E-07	
131-11-3	Dimethyl phthalate	430	U	UG/KG			4.88E-08	
206-44-0	Fluoranthene	430	U	UG/KG			1.43E-05	2.15E-03
86-73-7	Fluorene	430	U	UG/KG			1.30E-05	1.43E-02
118-74-1	Hexachlorobenzene	430	U	UG/KG		2.79E-07	6.10E-04	4.30E+00
87-68-3	Hexachlorobutadiene	430	U	UG/KG		1.36E-08	2.44E-03	4.30E+00
77-47-4	Hexachlorocyclopentadiene	430	U	UG/KG			7.29E-05	2.15E-02
67-72-1	Hexachloroethane	430	U	UG/KG		2.44E-09	4.88E-04	2.15E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	430	U	UG/KG		1.49E-07		6.14E-01
78-59-1	Isophorone	430	U	UG/KG		1.66E-10	2.44E-06	1.43E+01
621-64-7	N-Nitroso-di-n-propylamine	430	U	UG/KG		1.22E-06		2.15E+05
86-30-6	N-Nitrosodiphenylamine	430	U	UG/KG		8.54E-10		7.17E+00
91-20-3	Naphthalene	430	U	UG/KG			2.28E-03	1.08E-01
87-86-5	Pentachlorophenol	2100	U	UG/KG		1.89E-07	1.47E-04	2.10E+03
85-01-8	Phenanthrene	430	U	UG/KG			7.93E-06	2.15E-03
108-95-2	Phenol	430	U	UG/KG			8.14E-07	8.60E-02
129-00-0	Pyrene	430	U	UG/KG			7.93E-06	2.15E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
121-14-2	2,4-Dinitrotoluene	430	U	UG/KG			2.44E-04	1.08E+04
606-20-2	2,6-Dinitrotoluene	430	U	UG/KG			4.88E-04	1.43E+04
98-95-3	Nitrobenzene	430	U	UG/KG			3.76E-03	
Metals								
7429-90-5	Aluminum	5020		MG/KG	1.74E-01		2.99E-03	
7440-36-0	Antimony	0.77	U	MG/KG	1.10E-01		9.42E-04	2.57E+00
7440-38-2	Arsenic	6.4		MG/KG	4.74E-01	2.35E-06	1.46E-02	6.40E+00
7440-39-3	Barium	55.5		MG/KG	2.85E-01		4.46E-04	6.94E-01
7440-41-7	Beryllium	0.64	U	MG/KG	8.42E-01	2.86E-10	1.73E-04	2.13E-01
7440-42-8	Boron	3.6	J	MG/KG	6.79E-01		4.55E-05	
7440-43-9	Cadmium	0.63	J	MG/KG	3.32E+00	2.11E-10	7.78E-04	1.58E+00
7440-70-2	Calcium	3790		MG/KG	1.52E+00			
7440-47-3	Chromium	9.5		MG/KG	3.77E-01	2.12E-08		4.75E+00
7440-48-4	Cobalt	6.4	U	MG/KG	2.95E-01		5.22E-05	
7440-50-8	Copper	16.7		MG/KG	1.48E+00		2.20E-04	
7439-89-6	Iron	15600		MG/KG	8.08E-01		2.55E-02	
7439-92-1	Lead	29.8		MG/KG	1.27E+00			
7439-95-4	Magnesium	1110		MG/KG	7.15E-01			
7439-96-5	Manganese	623		MG/KG	1.71E-01		1.93E-02	
7439-97-6	Mercury	0.11	U	MG/KG	1.83E+00			
7440-02-0	Nickel	10.9		MG/KG	5.77E-01		2.67E-04	1.56E+00
2023695	Potassium	509		MG/KG	8.14E-01			
7782-49-2	Selenium	0.42	J	MG/KG	1.79E-01		4.11E-05	1.40E+00
7440-22-4	Silver	0.49	J	MG/KG	8.45E-01		4.79E-05	2.45E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-23-5	Sodium	116	J	MG/KG	6.82E-01			
7440-28-0	Thallium	1.3	U	MG/KG	3.17E+00		9.09E-06	
7440-62-2	Vanadium	18		MG/KG	3.81E-01		1.26E-03	6.00E-02
7440-66-6	Zinc	49.7		MG/KG	9.67E-01		8.11E-05	8.28E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			3.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG	7.32E-07	7.32E-07	3.00E-01
75-34-3	1,1-Dichloroethane	6	U	UG/KG	3.00E-08	3.00E-08	2.61E-04
75-35-4	1,1-Dichloroethene	6	U	UG/KG	3.33E-07	3.33E-06	1.00E-01
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG	9.52E-05	4.29E-06	3.00E-01
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	6	U	UG/KG	7.14E-05	3.33E-06	2.00E-01
78-93-3	2-Butanone (MEK)	12	U	UG/KG			
591-78-6	2-Hexanone	12	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			
67-64-1	Acetone	29	U	UG/KG	1.45E-07	1.45E-07	1.81E-03
71-43-2	Benzene	6	U	UG/KG	3.00E-05	1.40E-06	2.00E-01
75-27-4	Bromodichloromethane	6	U	UG/KG	6.52E-05	3.00E-06	1.00E-02
75-25-2	Bromoform	6	U	UG/KG	8.33E-06	3.75E-07	7.50E-03
74-83-9	Bromomethane	6	U	UG/KG	2.07E-06	6.00E-06	3.00E-02
75-15-0	Carbon disulfide	6	U	UG/KG	3.00E-08	3.00E-07	1.88E-04
56-23-5	Carbon tetrachloride	6	U	UG/KG	1.36E-04	1.46E-05	8.57E-02
108-90-7	Chlorobenzene	6	U	UG/KG	1.46E-07	1.46E-06	6.00E-03
75-00-3	Chloroethane	6	U	UG/KG			
67-66-3	Chloroform	6	U	UG/KG	6.38E-06	3.00E-06	1.00E-02
74-87-3	Chloromethane	6	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
124-48-1	Dibromochloromethane	6	U	UG/KG	1.46E-07	1.46E-07	1.50E-02
100-41-4	Ethylbenzene	6	U	UG/KG	3.00E-08	3.00E-07	4.62E-04
75-09-2	Methylene chloride	6	U	UG/KG	7.89E-06	5.00E-07	3.00E-01
110-54-3	N-Hexane	6	U	UG/KG			
100-42-5	Styrene	6	U	UG/KG	1.46E-08	1.46E-07	1.50E-03
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG	5.45E-05	2.50E-06	1.00E-01
108-88-3	Toluene	6	U	UG/KG	1.46E-08	1.46E-08	5.00E-04
1330-20-7	total Xylenes	6	U	UG/KG	6.00E-09	1.46E-08	4.00E-05
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG	1.46E-07	1.46E-07	8.57E-03
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG	1.15E-05	5.00E-06	1.00E-01
75-01-4	Vinyl chloride	6	U	UG/KG	2.00E-03	9.23E-05	6.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	430	U	UG/KG	2.15E-05	2.15E-04	8.60E-02
95-50-1	1,2-Dichlorobenzene	430	U	UG/KG	2.39E-06	2.39E-05	2.53E-02
541-73-1	1,3-Dichlorobenzene	430	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	430	U	UG/KG			2.15E-01
95-95-4	2,4,5-Trichlorophenol	2100	U	UG/KG	1.05E-05	1.05E-05	7.78E-03
88-06-2	2,4,6-Trichlorophenol	430	U	UG/KG	8.27E-04	3.91E-05	2.15E+00
120-83-2	2,4-Dichlorophenol	430	U	UG/KG	7.05E-05	7.05E-04	4.30E-01
105-67-9	2,4-Dimethylphenol	430	U	UG/KG	1.05E-05	1.05E-05	4.78E-02
51-28-5	2,4-Dinitrophenol	2100	U	UG/KG	5.12E-04	5.12E-03	1.05E+01
91-58-7	2-Chloronaphthalene	430	U	UG/KG			
95-57-8	2-Chlorophenol	430	U	UG/KG	4.30E-05	4.30E-05	1.08E-01
91-57-6	2-Methylnaphthalene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-48-7	2-Methylphenol	430	U	UG/KG	4.30E-06	4.30E-06	2.87E-02
88-74-4	2-Nitroaniline	2100	U	UG/KG			
88-75-5	2-Nitrophenol	430	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	430	U	UG/KG	3.31E-02	1.54E-03	6.14E+01
99-09-2	3-Nitroaniline	2100	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2100	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	430	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	430	U	UG/KG			
106-47-8	4-Chloroaniline	850	U	UG/KG	1.04E-04	1.04E-03	1.21E+00
7005-72-3	4-Chlorophenyl phenyl ether	430	U	UG/KG			
106-44-5	4-Methylphenol	430	U	UG/KG			
100-01-6	4-Nitroaniline	2100	U	UG/KG			
100-02-7	4-Nitrophenol	2100	U	UG/KG			
83-32-9	Acenaphthene	430	U	UG/KG	3.58E-06	3.58E-06	7.54E-04
208-96-8	Acenaphthylene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04
120-12-7	Anthracene	430	U	UG/KG	7.05E-07	7.05E-07	3.58E-05
56-55-3	Benzo(a)anthracene	430	U	UG/KG	5.38E-02	2.53E-03	2.15E-01
50-32-8	Benzo(a)pyrene	430	U	UG/KG	5.38E-01	2.53E-02	5.38E-02
205-99-2	Benzo(b)fluoranthene	430	U	UG/KG	5.38E-02	2.53E-03	8.60E-02
191-24-2	Benzo(g,h,i)perylene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04
207-08-9	Benzo(k)fluoranthene	430	U	UG/KG	5.51E-03	2.53E-04	8.78E-03
111-91-1	bis(2-Chloroethoxy)methane	430	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	430	U	UG/KG	8.60E-02	5.73E-03	1.08E+03
108-60-1	bis(2-Chloroisopropyl) ether	430	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	56	J	UG/KG	1.37E-04	1.37E-05	1.56E-05

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-68-7	Butyl benzyl phthalate	430	U	UG/KG	1.05E-06	1.05E-06	4.62E-04
86-74-8	Carbazole	430	U	UG/KG	1.48E-03	6.94E-05	7.17E-01
218-01-9	Chrysene	430	U	UG/KG	5.51E-04	2.53E-05	2.69E-03
84-74-2	Di-n-butyl phthalate	430	U	UG/KG	2.15E-06	2.15E-06	1.87E-04
117-84-0	Di-n-octyl phthalate	430	U	UG/KG	1.05E-05	1.05E-04	4.30E-05
53-70-3	Dibenz(a,h)anthracene	430	U	UG/KG	5.38E-01	2.53E-02	2.15E-01
132-64-9	Dibenzofuran	430	U	UG/KG			
84-66-2	Diethyl phthalate	430	U	UG/KG	4.30E-07	4.30E-07	9.15E-04
131-11-3	Dimethyl phthalate	430	U	UG/KG			
206-44-0	Fluoranthene	430	U	UG/KG	5.24E-06	5.24E-06	1.00E-04
86-73-7	Fluorene	430	U	UG/KG	5.24E-06	5.24E-06	7.68E-04
118-74-1	Hexachlorobenzene	430	U	UG/KG	1.08E-01	5.51E-03	2.15E-01
87-68-3	Hexachlorobutadiene	430	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	430	U	UG/KG	3.07E-05	3.07E-05	1.08E-03
67-72-1	Hexachloroethane	430	U	UG/KG	2.15E-04	2.15E-04	8.60E-01
193-39-5	Indeno(1,2,3-c,d)pyrene	430	U	UG/KG	5.38E-02	2.53E-03	3.07E-02
78-59-1	Isophorone	430	U	UG/KG	1.05E-06	1.05E-06	5.38E-02
621-64-7	N-Nitroso-di-n-propylamine	430	U	UG/KG	5.38E-01	2.39E-02	8.60E+03
86-30-6	N-Nitrosodiphenylamine	430	U	UG/KG	3.58E-04	1.72E-05	4.30E-01
91-20-3	Naphthalene	430	U	UG/KG	5.24E-06	5.24E-05	5.12E-03
87-86-5	Pentachlorophenol	2100	U	UG/KG	8.75E-02	4.04E-03	7.00E+01
85-01-8	Phenanthrene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04
108-95-2	Phenol	430	U	UG/KG	4.30E-07	3.58E-06	4.30E-03
129-00-0	Pyrene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
121-14-2	2,4-Dinitrotoluene	430	U	UG/KG	5.12E-02	2.39E-03	5.38E+02
606-20-2	2,6-Dinitrotoluene	430	U	UG/KG	5.12E-02	2.39E-03	6.14E+02
98-95-3	Nitrobenzene	430	U	UG/KG	4.30E-04	4.30E-04	4.30E+00
Metals							
7429-90-5	Aluminum	5020		MG/KG			
7440-36-0	Antimony	0.77	U	MG/KG	9.39E-04	9.39E-03	1.54E-01
7440-38-2	Arsenic	6.4		MG/KG	2.13E+00	1.05E-01	2.29E-01
7440-39-3	Barium	55.5		MG/KG	3.96E-04	3.96E-03	4.63E-02
7440-41-7	Beryllium	0.64	U	MG/KG	6.40E-01	2.21E-02	9.70E-02
7440-42-8	Boron	3.6	J	MG/KG	2.00E-05	2.00E-04	
7440-43-9	Cadmium	0.63	J	MG/KG	3.15E-04	3.15E-03	1.70E-01
7440-70-2	Calcium	3790		MG/KG			
7440-47-3	Chromium	9.5		MG/KG	9.50E-04	2.32E-03	3.39E-01
7440-48-4	Cobalt	6.4	U	MG/KG	5.33E-05	5.33E-04	
7440-50-8	Copper	16.7		MG/KG	2.04E-04	2.04E-03	1.52E-03
7439-89-6	Iron	15600		MG/KG			
7439-92-1	Lead	29.8		MG/KG	7.45E-02	7.45E-02	
7439-95-4	Magnesium	1110		MG/KG			
7439-96-5	Manganese	623		MG/KG	6.49E-03	6.49E-02	
7439-97-6	Mercury	0.11	U	MG/KG	1.80E-04	1.80E-03	7.33E-01
7440-02-0	Nickel	10.9		MG/KG	2.66E-04	2.66E-03	1.43E-01
2023695	Potassium	509		MG/KG			
7782-49-2	Selenium	0.42	J	MG/KG	4.20E-05	4.20E-04	1.75E-01
7440-22-4	Silver	0.49	J	MG/KG	4.90E-05	4.90E-04	3.27E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-13
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-23-5	Sodium	116	J	MG/KG			
7440-28-0	Thallium	1.3	U	MG/KG	8.13E-03	8.13E-03	5.42E-01
7440-62-2	Vanadium	18		MG/KG	1.29E-03	1.29E-02	1.84E-02
7440-66-6	Zinc	49.7		MG/KG	8.15E-05	8.15E-04	1.38E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-14
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		1.26E-03	5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L	1.81E-05	2.74E-03	
79-00-5	1,1,2-Trichloroethane	1	U	UG/L	5.01E-06	4.11E-02	2.00E-01
75-34-3	1,1-Dichloroethane	1	U	UG/L		1.23E-03	
75-35-4	1,1-Dichloroethene	1	U	UG/L	2.19E-05	1.83E-02	1.43E-01
107-06-2	1,2-Dichloroethane (EDC)	39		UG/L	3.17E-04	3.85E+00	7.80E+00
78-87-5	1,2-Dichloropropane	1	U	UG/L	6.07E-06	1.45E-01	2.00E-01
78-93-3	2-Butanone (MEK)	4	J	UG/L		2.10E-03	
591-78-6	2-Hexanone	5	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		3.17E-02	
67-64-1	Acetone	23	U	UG/L		3.78E-02	
71-43-2	Benzene	1	U	UG/L	2.44E-06	8.92E-02	2.00E-01
75-27-4	Bromodichloromethane	1	U	UG/L	5.53E-06	8.22E-03	
75-25-2	Bromoform	1	U	UG/L	1.18E-07	1.37E-03	
74-83-9	Bromomethane	1	U	UG/L		1.15E-01	
75-15-0	Carbon disulfide	1	U	UG/L		9.59E-04	
56-23-5	Carbon tetrachloride	1200	J	UG/L	7.01E-03	2.82E+02	2.40E+02
108-90-7	Chlorobenzene	1	U	UG/L		9.43E-03	1.00E-02
75-00-3	Chloroethane	1	U	UG/L	2.16E-07	1.16E-04	
67-66-3	Chloroform	630	J	UG/L	3.83E-03	1.01E+03	
74-87-3	Chloromethane	0.7	J	UG/L	4.63E-07		
156-59-2	cis-1,2-Dichloroethene	130	J	UG/L		2.14E+00	1.86E+00
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
124-48-1	Dibromochloromethane	1	U	UG/L	7.50E-06	8.22E-03	
100-41-4	Ethylbenzene	1	U	UG/L		7.46E-04	1.43E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-14
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
75-09-2	Methylene chloride	220	J	UG/L	5.15E-05	1.36E-01	4.40E+01
110-54-3	N-Hexane	1	U	UG/L		2.85E-03	
100-42-5	Styrene	1	U	UG/L		6.09E-04	1.00E-02
127-18-4	Tetrachloroethylene (PCE)	54		UG/L	4.99E-05	2.13E-01	1.08E+01
108-88-3	Toluene	1	U	UG/L		1.38E-03	1.00E-03
1330-20-7	total Xylenes	1	U	UG/L		6.99E-04	1.00E-04
156-60-5	trans-1,2-Dichloroethene	1		UG/L		8.22E-03	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
79-01-6	Trichloroethylene (TCE)	6		UG/L	3.66E-06	1.64E-01	1.20E+00
75-01-4	Vinyl chloride	1	U	UG/L	5.06E-05		5.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	52	U	UG/L		1.42E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	52	U	UG/L		7.12E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
90-12-0	1-Methylnaphthalene	1.5	UJ	UG/L		2.42E-01	
91-57-6	2-Methylnaphthalene	2.1	J	UG/L		1.15E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	
88-74-4	2-Nitroaniline	52	U	UG/L		2.49E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-14

HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	
91-94-1	3,3'-Dichlorobenzidine	21	U	UG/L	1.41E-04		
99-09-2	3-Nitroaniline	52	U	UG/L		2.49E+01	
534-52-1	4,6-Dinitro-2-methylphenol	52	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	21	U	UG/L		1.44E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	52	U	UG/L		2.49E+01	
100-02-7	4-Nitrophenol	52	U	UG/L		1.78E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	10	U	UG/L		5.48E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	10	U	UG/L	1.09E-04		
50-32-8	Benzo(a)pyrene	10	U	UG/L	1.09E-03		5.00E+01
205-99-2	Benzo(b)fluoranthene	10	U	UG/L	1.09E-04		
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		5.48E-02	
207-08-9	Benzo(k)fluoranthene	10	U	UG/L	1.09E-05		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1.1	J	UG/L	2.29E-07	1.51E-03	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	1.8	J	UG/L	1.95E-07		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-14

HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU

CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
84-74-2	Di-n-butyl phthalate	1.1	J	UG/L		3.01E-04	
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	2	J	UG/L		6.85E-05	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	2.1	J	UG/L		1.44E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L	1.09E-04		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	10	U	UG/L		1.61E+00	
87-86-5	Pentachlorophenol	52	U	UG/L	9.28E-05	4.75E-02	5.20E+01
85-01-8	Phenanthrene	1.2	J	UG/L		6.58E-03	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	1.5	J	UG/L		8.22E-03	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	U	UG/L		2.28E-04	
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	22		UG/L	9.82E-06	1.21E+00	
121-14-2	2,4-Dinitrotoluene	0.25	U	UG/L		3.42E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect

J = Estimated U = Nondetect

TABLE 20-14
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
606-20-2	2,6-Dinitrotoluene	0.5	U	UG/L		1.37E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.79		UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	2.6		UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		8.22E-03	
2691-41-0	HMX	54		UG/L		2.96E-02	
98-95-3	Nitrobenzene	1		UG/L		2.95E-01	
55-63-0	Nitroglycerin	1	U	UG/L	2.08E-07		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L			
121-82-4	RDX	890		UG/L	1.46E-03	8.13E+00	
479-45-8	Tetryl	0.75	UJ	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	500000		UG/L		1.37E+01	
7440-36-0	Antimony	17.2		UG/L		1.18E+00	2.87E+00
7440-38-2	Arsenic	142		UG/L	3.17E-03	1.30E+01	2.84E+00
7440-39-3	Barium	13300		UG/L		5.21E+00	6.65E+00
7440-41-7	Beryllium	23.8		UG/L		3.26E-01	5.95E+00
7440-42-8	Boron	896		UG/L		2.73E-01	4.48E-01
7440-43-9	Cadmium	20.5		UG/L		1.12E+00	4.10E+00
7440-70-2	Calcium	275000		UG/L			
7440-47-3	Chromium	738		UG/L			7.38E+00
7440-48-4	Cobalt	302		UG/L		1.38E-01	3.02E-01
7440-50-8	Copper	5150		UG/L		3.80E+00	7.92E+00
7439-89-6	Iron	417000		UG/L		3.81E+01	8.34E+01
7439-92-1	Lead	2880		UG/L			3.84E+02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-14
HUMAN HEALTH SCREENING OF GROUNDWATER AND TRENCH WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7439-95-4	Magnesium	137000		UG/L			
7439-96-5	Manganese	27400		UG/L		3.13E+01	1.83E+02
7439-97-6	Mercury	36.9		UG/L			1.85E+01
7440-02-0	Nickel	515		UG/L		7.05E-01	5.15E+00
2023695	Potassium	30600		UG/L			
7782-49-2	Selenium	29.4		UG/L		1.61E-01	5.88E-01
7440-22-4	Silver	23.4		UG/L		1.28E-01	4.68E-01
7440-23-5	Sodium	338000		UG/L			
7440-28-0	Thallium	3.2	J	UG/L		1.25E+00	1.60E+00
7440-62-2	Vanadium	562		UG/L		2.20E+00	
7440-66-6	Zinc	58500		UG/L		5.34E+00	1.17E+01
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	496		MG/L			
7664-41-7	Nitrogen, Ammonia (as N)	0.38		MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	69.2	J	MG/L		6.92E+01	6.92E+01
7601-90-3	Perchlorate	500	U	UG/L		2.74E+01	
7723-14-0	Phosphorus, Total (as P)	2.9	J	MG/L		3.97E+03	
Ortho P	Phosphorus, Total Orthophosphate (as P)	5.6	J	MG/L			
14808-79-8	Sulfate (as SO4)	750000		UG/L			1.88E+00
TDS	TDS	1590		MG/L			1.33E+00
TSS	TSS	770		MG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-15
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	5	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		
67-64-1	Acetone	5	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	0.8	J	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	22		UG/L		
108-88-3	Toluene	1	U	UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1		UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-15
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
90-12-0	1-Methylnaphthalene	1	U	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1.5	J	UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 20-15
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
98-95-3	Nitrobenzene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	10	U	UG/L	1.00E+00	1.00E-01
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L		
121-14-2	2,4-Dinitrotoluene	0.38	J	UG/L		
606-20-2	2,6-Dinitrotoluene	2.1	J	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L		
88-72-2	2-Nitrotoluene (ONT)	1.4	J	UG/L		
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	UJ	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		
2691-41-0	HMX	7.9	J	UG/L		
55-63-0	Nitroglycerin	1	UJ	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	UJ	UG/L		
121-82-4	RDX	25	J	UG/L		
479-45-8	Tetryl	0.75	UJ	UG/L		
Metals						
7429-90-5	Aluminum	52000		UG/L	2.60E+02	
7440-36-0	Antimony	8.1		UG/L	1.35E+00	
7440-38-2	Arsenic	33.1		UG/L	3.31E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-15
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7440-39-3	Barium	947		UG/L	4.17E+01	1.89E-01
7440-41-7	Beryllium	12.2		UG/L	2.44E+00	
7440-42-8	Boron	603		UG/L		6.03E-01
7440-43-9	Cadmium	5	U	UG/L	1.00E+00	
7440-70-2	Calcium	214000		UG/L	2.97E+01	
7440-47-3	Chromium	47.9		UG/L	4.79E+00	
7440-48-4	Cobalt	73		UG/L	1.46E+00	
7440-50-8	Copper	135	J	UG/L	1.35E+01	
7439-89-6	Iron	136000		UG/L	1.36E+03	1.36E+02
7439-92-1	Lead	45.9		UG/L	2.30E+01	
7439-95-4	Magnesium	107000		UG/L	4.22E+01	
7439-96-5	Manganese	4700		UG/L	8.08E+00	4.70E+00
7439-97-6	Mercury	0.14	J	UG/L	7.00E-01	1.17E+01
7440-02-0	Nickel	144	J	UG/L	1.44E+01	1.44E-01
2023695	Potassium	15100		UG/L	9.36E+00	
7782-49-2	Selenium	31.3		UG/L	1.16E+01	3.13E-02
7440-22-4	Silver	9	J	UG/L	9.00E-01	1.80E+00
7440-23-5	Sodium	114000		UG/L	3.60E+01	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	234		UG/L	4.68E+00	
7440-66-6	Zinc	667		UG/L	3.34E+01	6.67E-01
Other Parameters						
ALK	Alkalinity, Total (as CaCO3)	201		MG/L	6.55E+00	
7664-41-7	Nitrogen, Ammonia (as N)	0.9		MG/L	3.46E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	35.9		MG/L	7.18E+02	
7601-90-3	Perchlorate	500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.3	J	MG/L	6.00E+00	
14808-79-8	Sulfate (as SO4)	590000		UG/L		1.18E+00
TDS	TDS	1140		MG/L	1.59E+01	1.14E+00
TSS	TSS	169		MG/L	2.11E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-16
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 12(AUS-OA12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		11	U	UG/KG	3.69E-04	
79-34-5	1,1,2,2-Tetrachloroethane		11	U	UG/KG	8.65E-02	
79-00-5	1,1,2-Trichloroethane		11	U	UG/KG	3.85E-04	
75-34-3	1,1-Dichloroethane		11	U	UG/KG	5.47E-04	
75-35-4	1,1-Dichloroethene		11	U	UG/KG	1.33E-03	
107-06-2	1,2-Dichloroethane (EDC)		11	U	UG/KG	5.19E-04	
540-59-0	1,2-Dichloroethene (total)		6	J	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		11	U	UG/KG	1.57E-05	
78-93-3	2-Butanone (MEK)		22	U	UG/KG	2.46E-04	
591-78-6	2-Hexanone		22	U	UG/KG	1.75E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		22	U	UG/KG	4.97E-05	
67-64-1	Acetone		72	J	UG/KG	2.88E-02	
71-43-2	Benzene		11	U	UG/KG	6.88E-04	
75-27-4	Bromodichloromethane		11	U	UG/KG	2.04E-02	
75-25-2	Bromoform		11	U	UG/KG	6.92E-04	
74-83-9	Bromomethane		11	U	UG/KG	4.68E-02	
75-15-0	Carbon disulfide		11	U	UG/KG	1.17E-01	
56-23-5	Carbon tetrachloride		360	E	UG/KG	3.60E-04	
108-90-7	Chlorobenzene		11	U	UG/KG	2.75E-04	
75-00-3	Chloroethane		11	U	UG/KG		
67-66-3	Chloroform		260		UG/KG	2.18E-01	
74-87-3	Chloromethane		11	U	UG/KG	1.06E-03	
156-59-2	cis-1,2-Dichloroethene		490	E	UG/KG	6.22E-01	
10061-01-5	cis-1,3-Dichloropropene		11	U	UG/KG	2.76E-02	
124-48-1	Dibromochloromethane		11	U	UG/KG	5.37E-03	
100-41-4	Ethylbenzene		11	U	UG/KG	2.20E-03	
75-09-2	Methylene chloride		34		UG/KG	8.40E-03	
110-54-3	N-Hexane		11	U	UG/KG		
100-42-5	Styrene		11	U	UG/KG	3.67E-05	
127-18-4	Tetrachloroethylene (PCE)		2200		UG/KG	1.69E-01	
108-88-3	Toluene		4	J	UG/KG	1.33E-03	
1330-20-7	total Xylenes		11	U	UG/KG	1.83E-02	
156-60-5	trans-1,2-Dichloroethene		5	J	UG/KG	6.35E-03	
10061-02-6	trans-1,3-Dichloropropene		11	U	UG/KG	2.76E-02	
79-01-6	Trichloroethylene (TCE)		51		UG/KG	5.67E-03	
75-01-4	Vinyl chloride		11	U	UG/KG	1.70E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		1000	U	UG/KG	5.00E-02	
95-50-1	1,2-Dichlorobenzene		1000	U	UG/KG	3.38E-01	
541-73-1	1,3-Dichlorobenzene		1000	U	UG/KG	2.65E-02	
106-46-7	1,4-Dichlorobenzene		1000	U	UG/KG	5.00E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-16
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 12(AUS-OA12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		5100	U	UG/KG	1.28E+00	
88-06-2	2,4,6-Trichlorophenol		1000	U	UG/KG	1.00E-01	
120-83-2	2,4-Dichlorophenol		1000	U	UG/KG	1.14E-02	
105-67-9	2,4-Dimethylphenol		1000	U	UG/KG	1.00E+02	
51-28-5	2,4-Dinitrophenol		5100	U	UG/KG	2.55E-01	
91-58-7	2-Chloronaphthalene		1000	U	UG/KG	8.21E+01	
95-57-8	2-Chlorophenol		1000	U	UG/KG	4.12E+00	
90-12-0	1-Methylnaphthalene		3900		UG/KG		
91-57-6	2-Methylnaphthalene		9100		UG/KG	2.81E+00	YES
95-48-7	2-Methylphenol		1000	U	UG/KG	2.48E-02	
88-74-4	2-Nitroaniline		5100	U	UG/KG	6.88E-02	
88-75-5	2-Nitrophenol		1000	U	UG/KG	6.25E-01	
91-94-1	3,3'-Dichlorobenzidine		1000	U	UG/KG	1.55E+00	
99-09-2	3-Nitroaniline		5100	U	UG/KG	1.61E+00	
534-52-1	4,6-Dinitro-2-methylphenol		5100	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		1000	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		1000	U	UG/KG	1.26E-01	
106-47-8	4-Chloroaniline		2000	U	UG/KG	1.82E+00	
7005-72-3	4-Chlorophenyl phenyl ether		1000	U	UG/KG		
106-44-5	4-Methylphenol		91	J	UG/KG	5.58E-04	
100-01-6	4-Nitroaniline		5100	U	UG/KG	2.33E-01	
100-02-7	4-Nitrophenol		5100	U	UG/KG	7.29E-01	
83-32-9	Acenaphthene		1300	J	UG/KG	1.90E-03	YES
208-96-8	Acenaphthylene		2400	J	UG/KG	3.52E-03	
120-12-7	Anthracene		590		UG/KG	3.99E-04	YES
56-55-3	Benzo(a)anthracene		1100		UG/KG	2.11E-01	YES
50-32-8	Benzo(a)pyrene		590		UG/KG	1.34E-04	YES
205-99-2	Benzo(b)fluoranthene		410	J	UG/KG	6.86E-03	YES
191-24-2	Benzo(g,h,i)perylene		2600		UG/KG	2.18E-02	YES
207-08-9	Benzo(k)fluoranthene		480		UG/KG	8.03E-03	YES
111-91-1	bis(2-Chloroethoxy)methane		1000	U	UG/KG	3.30E+00	
111-44-4	bis(2-Chloroethyl) ether		1000	U	UG/KG	4.22E-02	
108-60-1	bis(2-Chloroisopropyl) ether		1000	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		9100		UG/KG	9.83E+00	YES
85-68-7	Butyl benzyl phthalate		1000	U	UG/KG	4.19E+00	
86-74-8	Carbazole		350	J	UG/KG		YES
218-01-9	Chrysene		1800		UG/KG	3.81E-01	YES
84-74-2	Di-n-butyl phthalate		1700		UG/KG	8.50E-03	YES
117-84-0	Di-n-octyl phthalate		1000	U	UG/KG	1.41E-03	
53-70-3	Dibenz(a,h)anthracene		88	J	UG/KG	4.78E-03	YES
132-64-9	Dibenzofuran		2800		UG/KG		YES
84-66-2	Diethyl phthalate		1000	U	UG/KG	1.00E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-16
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 12(AUS-OA12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
131-11-3	Dimethyl phthalate		1000	U	UG/KG	5.00E-03	
206-44-0	Fluoranthene		990		UG/KG	8.11E-03	YES
86-73-7	Fluorene		270	J	UG/KG	9.00E-03	YES
118-74-1	Hexachlorobenzene		1000	U	UG/KG	1.00E-03	
87-68-3	Hexachlorobutadiene		1000	U	UG/KG	2.52E+01	
77-47-4	Hexachlorocyclopentadiene		1000	U	UG/KG	1.00E-01	
67-72-1	Hexachloroethane		1000	U	UG/KG	1.68E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		480		UG/KG	4.40E-03	YES
78-59-1	Isophorone		1000	U	UG/KG	7.19E-03	
621-64-7	N-Nitroso-di-n-propylamine		1000	U	UG/KG	1.84E+00	
86-30-6	N-Nitrosodiphenylamine		560		UG/KG	2.80E-02	
91-20-3	Naphthalene		3900		UG/KG	1.57E-02	
87-86-5	Pentachlorophenol		1500	J	UG/KG	2.50E-01	YES
85-01-8	Phenanthrene		4800		UG/KG	1.05E-01	YES
108-95-2	Phenol		1000	U	UG/KG	2.50E-02	
129-00-0	Pyrene		1600		UG/KG	2.04E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		760	U	UG/KG	2.02E+00	
99-65-0	1,3-Dinitrobenzene		760	U	UG/KG	1.16E+00	
118-96-7	2,4,6-Trinitrotoluene (TNT)		1500	J	UG/KG	5.00E-02	
121-14-2	2,4-Dinitrotoluene		3200	J	UG/KG	2.50E+00	
606-20-2	2,6-Dinitrotoluene		92	J	UG/KG	2.80E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		1500	U	UG/KG	1.88E-02	
88-72-2	2-Nitrotoluene (ONT)		1500	U	UG/KG		
99-08-1	3-Nitrotoluene		1500	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		4600		UG/KG		
99-99-0	4-Nitrotoluene (PNT)		6100		UG/KG		
2691-41-0	HMX		39000		UG/KG	1.56E+00	
98-95-3	Nitrobenzene		760	U	UG/KG	1.90E-02	
55-63-0	Nitroglycerin		1500	U	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		3000	U	UG/KG		
121-82-4	RDX		17000		UG/KG	1.70E-01	
479-45-8	Tetryl		2300	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	22900		MG/KG		
7440-36-0	Antimony	0.83	76.4	J	MG/KG	1.53E+01	
7440-38-2	Arsenic	13.5	32.6		MG/KG	3.62E+00	
7440-39-3	Barium	195	1430		MG/KG	2.86E+00	
7440-41-7	Beryllium	0.76	1.8		MG/KG	1.80E-01	
7440-42-8	Boron	5.3	66.8		MG/KG	1.34E+02	
7440-43-9	Cadmium	0.19	15.2		MG/KG	5.24E-01	
7440-70-2	Calcium	2497	75100	J	MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-16
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 12(AUS-OA12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-47-3	Chromium	25.2	4010	J	MG/KG	8.02E+02	
7440-48-4	Cobalt	21.7	68.3		MG/KG	3.42E+00	
7440-50-8	Copper	11.3	846		MG/KG	2.73E+01	
57-12-5	Cyanide, Total	0.41	0.46	U	MG/KG	5.11E-01	
7439-89-6	Iron	19306	69000		MG/KG	3.45E+02	
7439-92-1	Lead	23.4	7270	J	MG/KG	1.68E+01	
7439-95-4	Magnesium	1552	27900		MG/KG		
7439-96-5	Manganese	3640	20400		MG/KG	2.04E+02	
7439-97-6	Mercury	0.06	1.6		MG/KG	2.29E-01	YES
7440-02-0	Nickel	18.9	53.8		MG/KG	1.79E+00	
2023695	Potassium	625	1550		MG/KG		
7782-49-2	Selenium	2.34	7.7		MG/KG	7.70E+00	YES
7440-22-4	Silver	0.58	4		MG/KG	2.00E+00	
7440-23-5	Sodium	170	4430	J	MG/KG		
7440-28-0	Thallium	0.41	1.8		MG/KG	1.80E+00	
7440-62-2	Vanadium	47.2	86.5		MG/KG	1.88E+00	
7440-66-6	Zinc	51.4	1970		MG/KG	1.64E+01	
Polychlorinated Biphenyls (PCB)							
12674-11-2	PCB-1016		8.5	U	UG/KG		
11104-28-2	PCB-1221		17	U	UG/KG		
11141-16-5	PCB-1232		8.5	U	UG/KG		
53469-21-9	PCB-1242		8.5	U	UG/KG		
12672-29-6	PCB-1248		8.5	U	UG/KG		
11097-69-1	PCB-1254		28		UG/KG		YES
11096-82-5	PCB-1260		21		UG/KG		YES
Dioxins							
1746-01-6	2,3,7,8-TCDD		0.000248	U	UG/KG	4.96E-08	
Other Parameters							
7601-90-3	Perchlorate		8500	U	UG/KG		
TOC	TOC	31393	67700		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-17
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		620	U	UG/KG	6.74E-02	
95-50-1	1,2-Dichlorobenzene		620	U	UG/KG	1.82E+00	
541-73-1	1,3-Dichlorobenzene		620	U	UG/KG	3.65E-01	
106-46-7	1,4-Dichlorobenzene		620	U	UG/KG	1.77E+00	
95-95-4	2,4,5-Trichlorophenol		3100	U	UG/KG	2.14E+00	
88-06-2	2,4,6-Trichlorophenol		620	U	UG/KG	3.37E+01	
120-83-2	2,4-Dichlorophenol		620	U	UG/KG	1.70E+00	
105-67-9	2,4-Dimethylphenol		620	U	UG/KG	1.38E+01	
51-28-5	2,4-Dinitrophenol		3100	U	UG/KG	2.50E+02	
91-58-7	2-Chloronaphthalene		620	U	UG/KG	1.77E-01	
95-57-8	2-Chlorophenol		620	U	UG/KG	2.80E+00	
91-57-6	2-Methylnaphthalene		180	J	UG/KG	2.57E+00	YES
95-48-7	2-Methylphenol		620	U	UG/KG	1.36E+02	
88-74-4	2-Nitroaniline		3100	U	UG/KG	6.42E-02	
88-75-5	2-Nitrophenol		620	U	UG/KG	1.95E-01	
91-94-1	3,3'-Dichlorobenzidine		620	U	UG/KG	3.10E-01	
99-09-2	3-Nitroaniline		3100	U	UG/KG	5.21E-02	
534-52-1	4,6-Dinitro-2-methylphenol		3100	U	UG/KG	3.70E+02	
101-55-3	4-Bromophenyl phenyl ether		620	U	UG/KG	4.77E-01	
59-50-7	4-Chloro-3-methylphenol		620	U	UG/KG	4.13E+03	
106-47-8	4-Chloroaniline		1200	U	UG/KG	7.32E-02	
7005-72-3	4-Chlorophenyl phenyl ether		620	U	UG/KG	4.51E-01	
106-44-5	4-Methylphenol		620	U	UG/KG	1.55E-01	
100-01-6	4-Nitroaniline		3100	U	UG/KG	8.56E-02	
100-02-7	4-Nitrophenol		3100	U	UG/KG	7.47E+01	
83-32-9	Acenaphthene		620	U	UG/KG	3.88E+01	
208-96-8	Acenaphthylene		620	U	UG/KG	1.41E+01	
120-12-7	Anthracene		620	U	UG/KG	1.09E+01	
56-55-3	Benzo(a)anthracene		120	J	UG/KG	1.11E+00	YES
50-32-8	Benzo(a)pyrene		130	J	UG/KG	8.67E-01	YES
205-99-2	Benzo(b)fluoranthene		200	J	UG/KG	7.41E+00	YES
191-24-2	Benzo(g,h,i)perylene		110	J	UG/KG	6.88E+00	YES
207-08-9	Benzo(k)fluoranthene		79	J	UG/KG	2.93E+00	YES
111-91-1	bis(2-Chloroethoxy)methane		620	U	UG/KG	4.77E-01	
111-44-4	bis(2-Chloroethyl) ether		620	U	UG/KG	2.17E-01	
108-60-1	bis(2-Chloroisopropyl) ether		620	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		620	U	UG/KG	8.27E-01	
85-68-7	Butyl benzyl phthalate		620	U	UG/KG	5.64E-02	
86-74-8	Carbazole		620	U	UG/KG	1.88E-01	
218-01-9	Chrysene		140	J	UG/KG	8.43E-01	YES
84-74-2	Di-n-butyl phthalate		1700		UG/KG	1.55E-01	YES

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-17
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
117-84-0	Di-n-octyl phthalate		620	U	UG/KG	8.76E-04	
53-70-3	Dibenz(a,h)anthracene		620	U	UG/KG	1.88E+01	
132-64-9	Dibenzofuran		620	U	UG/KG	3.10E-01	
84-66-2	Diethyl phthalate		620	U	UG/KG	9.84E-01	
131-11-3	Dimethyl phthalate		620	U	UG/KG	1.19E-03	
206-44-0	Fluoranthene		140	J	UG/KG	3.31E-01	YES
86-73-7	Fluorene		620	U	UG/KG	8.01E+00	
118-74-1	Hexachlorobenzene		620	U	UG/KG	6.20E+00	
87-68-3	Hexachlorobutadiene		620	U	UG/KG	1.30E+01	
77-47-4	Hexachlorocyclopentadiene		620	U	UG/KG	2.07E+02	
67-72-1	Hexachloroethane		620	U	UG/KG	9.12E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		620	U	UG/KG	3.65E+01	
78-59-1	Isophorone		620	U	UG/KG	5.41E-01	
621-64-7	N-Nitroso-di-n-propylamine		620	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		420	J	UG/KG	6.00E-01	
91-20-3	Naphthalene		75	J	UG/KG	4.26E-01	
87-86-5	Pentachlorophenol		3100	U	UG/KG	4.19E+01	
85-01-8	Phenanthrene		90	J	UG/KG	4.41E-01	YES
108-95-2	Phenol		620	U	UG/KG	1.29E+01	
129-00-0	Pyrene		160	J	UG/KG	8.21E-01	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		470	UJ	UG/KG	1.15E+01	
99-65-0	1,3-Dinitrobenzene		470	UJ	UG/KG	9.40E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		930	UJ	UG/KG	1.60E+00	
121-14-2	2,4-Dinitrotoluene		630	J	UG/KG	9.71E-01	
606-20-2	2,6-Dinitrotoluene		750	UJ	UG/KG	8.75E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		930	UJ	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		930	UJ	UG/KG	5.54E-02	
99-08-1	3-Nitrotoluene		930	UJ	UG/KG	7.82E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		930	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		930	UJ	UG/KG	4.97E-02	
2691-41-0	HMX		930	UJ	UG/KG	9.30E+01	
98-95-3	Nitrobenzene		470	UJ	UG/KG	8.03E-01	
121-82-4	RDX		930	UJ	UG/KG	4.65E+00	
479-45-8	Tetryl		1400	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	11241	10200		MG/KG	3.92E-01	
7440-36-0	Antimony	1.9	0.75	J	MG/KG	2.50E-01	
7440-38-2	Arsenic	10.3	6.2		MG/KG	6.33E-01	
7440-39-3	Barium	196	175		MG/KG		
7440-41-7	Beryllium	1.6	0.93	U	MG/KG		
7440-42-8	Boron		3.8	J	MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-17
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-43-9	Cadmium	1.6	1.1		MG/KG	1.11E+00	
7440-70-2	Calcium	1448	4600		MG/KG		
7440-47-3	Chromium	17.2	22		MG/KG	5.07E-01	
7440-48-4	Cobalt	9.1	7.3	J	MG/KG	1.46E-01	
7440-50-8	Copper	16.8	88.8		MG/KG	2.81E+00	
7439-89-6	Iron	20750	17400		MG/KG	9.16E-02	
7439-92-1	Lead	24	86		MG/KG	2.40E+00	
7439-95-4	Magnesium	1909	2810		MG/KG		
7439-96-5	Manganese	1043	1720		MG/KG	2.73E+00	
7439-97-6	Mercury	0.15	0.12	J	MG/KG	6.67E-01	YES
7440-02-0	Nickel	16.9	15.3		MG/KG	6.74E-01	
2023695	Potassium	1421	687		MG/KG		
7782-49-2	Selenium	0.64	1.6		MG/KG		YES
7440-22-4	Silver	3	0.79	J	MG/KG	7.90E-01	
7440-23-5	Sodium	1450	417		MG/KG		
7440-28-0	Thallium	0.31	1.9	U	MG/KG		
7440-62-2	Vanadium	28	22.9		MG/KG		
7440-66-6	Zinc	57.1	309		MG/KG	2.55E+00	
Other Parameters							
7601-90-3	Perchlorate		8100	U	UG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-18
ECOLOGICAL SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		6	U	UG/KG	2.01E-04	
79-34-5	1,1,2,2-Tetrachloroethane		6	U	UG/KG	4.72E-02	
79-00-5	1,1,2-Trichloroethane		6	U	UG/KG	2.10E-04	
75-34-3	1,1-Dichloroethane		6	U	UG/KG	2.99E-04	
75-35-4	1,1-Dichloroethene		6	U	UG/KG	7.25E-04	
107-06-2	1,2-Dichloroethane (EDC)		6	U	UG/KG	2.83E-04	
540-59-0	1,2-Dichloroethene (total)		6	U	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		6	U	UG/KG	8.57E-06	
78-93-3	2-Butanone (MEK)		12	U	UG/KG	1.34E-04	
591-78-6	2-Hexanone		12	U	UG/KG	9.52E-04	
108-10-1	4-Methyl-2-pentanone (MIBK)		12	U	UG/KG	2.71E-05	
67-64-1	Acetone		29	U	UG/KG	1.16E-02	
71-43-2	Benzene		6	U	UG/KG	3.75E-04	
75-27-4	Bromodichloromethane		6	U	UG/KG	1.11E-02	
75-25-2	Bromoform		6	U	UG/KG	3.77E-04	
74-83-9	Bromomethane		6	U	UG/KG	2.55E-02	
75-15-0	Carbon disulfide		6	U	UG/KG	6.37E-02	
56-23-5	Carbon tetrachloride		6	U	UG/KG	6.00E-06	
108-90-7	Chlorobenzene		6	U	UG/KG	1.50E-04	
75-00-3	Chloroethane		6	U	UG/KG		
67-66-3	Chloroform		6	U	UG/KG	5.04E-03	
74-87-3	Chloromethane		6	U	UG/KG	5.77E-04	
156-59-2	cis-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-01-5	cis-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
124-48-1	Dibromochloromethane		6	U	UG/KG	2.93E-03	
100-41-4	Ethylbenzene		6	U	UG/KG	1.20E-03	
75-09-2	Methylene chloride		6	U	UG/KG	1.48E-03	
110-54-3	N-Hexane		6	U	UG/KG		
100-42-5	Styrene		6	U	UG/KG	2.00E-05	
127-18-4	Tetrachloroethylene (PCE)		6	U	UG/KG	4.62E-04	
108-88-3	Toluene		6	U	UG/KG	2.00E-03	
1330-20-7	total Xylenes		6	U	UG/KG	1.00E-02	
156-60-5	trans-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-02-6	trans-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
79-01-6	Trichloroethylene (TCE)		6	U	UG/KG	6.67E-04	
75-01-4	Vinyl chloride		6	U	UG/KG	9.29E-03	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		430	U	UG/KG	2.15E-02	
95-50-1	1,2-Dichlorobenzene		430	U	UG/KG	1.45E-01	
541-73-1	1,3-Dichlorobenzene		430	U	UG/KG	1.14E-02	
106-46-7	1,4-Dichlorobenzene		430	U	UG/KG	2.15E-02	
95-95-4	2,4,5-Trichlorophenol		2100	U	UG/KG	5.25E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-18
ECOLOGICAL SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		430	U	UG/KG	4.30E-02	
120-83-2	2,4-Dichlorophenol		430	U	UG/KG	4.91E-03	
105-67-9	2,4-Dimethylphenol		430	U	UG/KG	4.30E+01	
51-28-5	2,4-Dinitrophenol		2100	U	UG/KG	1.05E-01	
91-58-7	2-Chloronaphthalene		430	U	UG/KG	3.53E+01	
95-57-8	2-Chlorophenol		430	U	UG/KG	1.77E+00	
91-57-6	2-Methylnaphthalene		430	U	UG/KG	1.33E-01	
95-48-7	2-Methylphenol		430	U	UG/KG	1.06E-02	
88-74-4	2-Nitroaniline		2100	U	UG/KG	2.83E-02	
88-75-5	2-Nitrophenol		430	U	UG/KG	2.69E-01	
91-94-1	3,3'-Dichlorobenzidine		430	U	UG/KG	6.65E-01	
99-09-2	3-Nitroaniline		2100	U	UG/KG	6.65E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2100	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		430	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		430	U	UG/KG	5.41E-02	
106-47-8	4-Chloroaniline		850	U	UG/KG	7.73E-01	
7005-72-3	4-Chlorophenyl phenyl ether		430	U	UG/KG		
106-44-5	4-Methylphenol		430	U	UG/KG	2.64E-03	
100-01-6	4-Nitroaniline		2100	U	UG/KG	9.59E-02	
100-02-7	4-Nitrophenol		2100	U	UG/KG	3.00E-01	
83-32-9	Acenaphthene		430	U	UG/KG	6.30E-04	
208-96-8	Acenaphthylene		430	U	UG/KG	6.30E-04	
120-12-7	Anthracene		430	U	UG/KG	2.91E-04	
56-55-3	Benzo(a)anthracene		430	U	UG/KG	8.25E-02	
50-32-8	Benzo(a)pyrene		430	U	UG/KG	9.77E-05	
205-99-2	Benzo(b)fluoranthene		430	U	UG/KG	7.19E-03	
191-24-2	Benzo(g,h,i)perylene		430	U	UG/KG	3.61E-03	
207-08-9	Benzo(k)fluoranthene		430	U	UG/KG	7.19E-03	
111-91-1	bis(2-Chloroethoxy)methane		430	U	UG/KG	1.42E+00	
111-44-4	bis(2-Chloroethyl) ether		430	U	UG/KG	1.81E-02	
108-60-1	bis(2-Chloroisopropyl) ether		430	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		56	J	UG/KG	6.05E-02	YES
85-68-7	Butyl benzyl phthalate		430	U	UG/KG	1.80E+00	
86-74-8	Carbazole		430	U	UG/KG		
218-01-9	Chrysene		430	U	UG/KG	9.09E-02	
84-74-2	Di-n-butyl phthalate		430	U	UG/KG	2.15E-03	
117-84-0	Di-n-octyl phthalate		430	U	UG/KG	6.06E-04	
53-70-3	Dibenz(a,h)anthracene		430	U	UG/KG	2.34E-02	
132-64-9	Dibenzofuran		430	U	UG/KG		
84-66-2	Diethyl phthalate		430	U	UG/KG	4.30E-03	
131-11-3	Dimethyl phthalate		430	U	UG/KG	2.15E-03	
206-44-0	Fluoranthene		430	U	UG/KG	3.52E-03	
86-73-7	Fluorene		430	U	UG/KG	1.43E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-18
ECOLOGICAL SCREENING OF DRUM RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
118-74-1	Hexachlorobenzene		430	U	UG/KG	4.30E-04	
87-68-3	Hexachlorobutadiene		430	U	UG/KG	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		430	U	UG/KG	4.30E-02	
67-72-1	Hexachloroethane		430	U	UG/KG	7.21E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		430	U	UG/KG	3.94E-03	
78-59-1	Isophorone		430	U	UG/KG	3.09E-03	
621-64-7	N-Nitroso-di-n-propylamine		430	U	UG/KG	7.91E-01	
86-30-6	N-Nitrosodiphenylamine		430	U	UG/KG	2.15E-02	
91-20-3	Naphthalene		430	U	UG/KG	1.73E-03	
87-86-5	Pentachlorophenol		2100	U	UG/KG	3.50E-01	
85-01-8	Phenanthrene		430	U	UG/KG	9.41E-03	
108-95-2	Phenol		430	U	UG/KG	1.08E-02	
129-00-0	Pyrene		430	U	UG/KG	5.48E-03	
Explosives							
121-14-2	2,4-Dinitrotoluene		430	U	UG/KG	3.36E-01	
606-20-2	2,6-Dinitrotoluene		430	U	UG/KG	1.31E+01	
98-95-3	Nitrobenzene		430	U	UG/KG	1.08E-02	
Metals							
7429-90-5	Aluminum	28800	5020		MG/KG		
7440-36-0	Antimony	0.83	0.77	U	MG/KG	1.54E-01	
7440-38-2	Arsenic	13.5	6.4		MG/KG	7.11E-01	
7440-39-3	Barium	195	55.5		MG/KG	1.11E-01	
7440-41-7	Beryllium	0.76	0.64	U	MG/KG	6.40E-02	
7440-42-8	Boron	5.3	3.6	J	MG/KG	7.20E+00	
7440-43-9	Cadmium	0.19	0.63	J	MG/KG	2.17E-02	
7440-70-2	Calcium	2497	3790		MG/KG		
7440-47-3	Chromium	25.2	9.5		MG/KG	1.90E+00	
7440-48-4	Cobalt	21.7	6.4	U	MG/KG	3.20E-01	
7440-50-8	Copper	11.3	16.7		MG/KG	5.39E-01	
7439-89-6	Iron	19306	15600		MG/KG	7.80E+01	
7439-92-1	Lead	23.4	29.8		MG/KG	6.88E-02	
7439-95-4	Magnesium	1552	1110		MG/KG		
7439-96-5	Manganese	3640	623		MG/KG	6.23E+00	
7439-97-6	Mercury	0.06	0.11	U	MG/KG	1.57E-02	
7440-02-0	Nickel	18.9	10.9		MG/KG	3.63E-01	
2023695	Potassium	625	509		MG/KG		
7782-49-2	Selenium	2.34	0.42	J	MG/KG	4.20E-01	YES
7440-22-4	Silver	0.58	0.49	J	MG/KG	2.45E-01	
7440-23-5	Sodium	170	116	J	MG/KG		
7440-28-0	Thallium	0.41	1.3	U	MG/KG	1.30E+00	
7440-62-2	Vanadium	47.2	18		MG/KG	3.91E-01	
7440-66-6	Zinc	51.4	49.7		MG/KG	4.14E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-19
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		5	U	UG/L	3.57E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		5	U	UG/L	2.94E-02	
67-64-1	Acetone		5	U	UG/L	9.86E-03	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		0.8	J	UG/L	1.36E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		22		UG/L	2.62E-01	
108-88-3	Toluene		1	U	UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1		UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-19
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
90-12-0	1-Methylnaphthalene		1	U	UG/L		
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1.5	J	UG/L	5.00E-01	YES
85-68-7	Butyl benzyl phthalate		10	U	UG/L	5.26E-01	
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-19
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
98-95-3	Nitrobenzene		10	U	UG/L	3.70E-02	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	10	U	UG/L	1.00E-01	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	UJ	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	UJ	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	UJ	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.38	J	UG/L	1.65E-03	
606-20-2	2,6-Dinitrotoluene		2.1	J	UG/L	5.00E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	UJ	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		1.4	J	UG/L	1.92E-04	
99-08-1	3-Nitrotoluene		0.5	UJ	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	UJ	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	UJ	UG/L	7.14E-05	
2691-41-0	HMX		7.9	J	UG/L	2.39E-02	
55-63-0	Nitroglycerin		1	UJ	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		2	UJ	UG/L	2.35E-05	
121-82-4	RDX		25	J	UG/L	1.32E-01	
479-45-8	Tetryl		0.75	UJ	UG/L		
Metals							
7429-90-5	Aluminum	200	52000		UG/L	5.98E+02	
7440-36-0	Antimony	6	8.1		UG/L	2.70E-01	
7440-38-2	Arsenic	10	33.1		UG/L	1.74E-01	
7440-39-3	Barium	22.7	947		UG/L	1.89E-01	
7440-41-7	Beryllium	5	12.2		UG/L	2.30E+01	
7440-42-8	Boron		603		UG/L	6.03E-01	
7440-43-9	Cadmium	5	5	U	UG/L	4.55E+00	
7440-70-2	Calcium	7197	214000		UG/L	1.84E+00	
7440-47-3	Chromium	10	47.9		UG/L	2.31E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 20-19
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7440-48-4	Cobalt	50	73		UG/L	3.17E+01	
7440-50-8	Copper	10	135	J	UG/L	1.14E+01	
7439-89-6	Iron	100	136000		UG/L	1.36E+02	
7439-92-1	Lead	2	45.9		UG/L	2.28E+00	
7439-95-4	Magnesium	2534	107000		UG/L	1.30E+00	
7439-96-5	Manganese	582	4700		UG/L	4.70E+00	
7439-97-6	Mercury	0.2	0.14	J	UG/L	1.08E-01	YES
7440-02-0	Nickel	10	144	J	UG/L	1.44E-01	
2023695	Potassium	1613	15100		UG/L	2.85E-01	
7782-49-2	Selenium	2.7	31.3		UG/L	3.13E-02	YES
7440-22-4	Silver	10	9	J	UG/L	1.80E+00	
7440-23-5	Sodium	3169	114000		UG/L	1.68E-01	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	234		UG/L	1.23E+01	
7440-66-6	Zinc	20	667		UG/L	6.67E-01	
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	30.7	201		MG/L		
7664-41-7	Nitrogen, Ammonia (as N)	0.26	0.9		MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	35.9		MG/L		
7601-90-3	Perchlorate		500	U	UG/L		
7723-14-0	Phosphorus, Total (as P)	0.05	0.3	J	MG/L		
14808-79-8	Sulfate (as SO4)		590000		UG/L		
TDS	TDS	71.7	1140		MG/L		
TSS	TSS	8	169		MG/L		

ND = Not Detected   E = Outside of Range   UJ = Estimated Nondetect
J = Estimated   U = Nondetect

TABLE 20-20

DIOXIN/FURAN TOXICITY EQUIVALENTS
FOR SOIL SAMPLES FROM AREA 12 (AUS-0A12)

ADDITIONAL AND UNCHARACTERIZED SITES OU

FIELD ID	TEF	AUS-0A12-010-SS-02			AUS-0A12-034-SS-02			AUS-0A12-093-SS-03			AUS-0A12-099-SS-02		
		Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*
DIOXINS / FURANS (ng/kg)													
2,3,7,8-TCDD	1.000	<	U		<	U		<	U		<	U	
1,2,3,7,8-PeCDD	1.000	<	U		<	U		<	U		<	U	
1,2,3,4,7,8-HxCDD	0.100	<	U		<	U		<	U		<	U	
1,2,3,6,7,8-HxCDD	0.100	<	U		0.223	J	*0.0223*	<	U		0.288	J	*0.0288*
1,2,3,7,8,9-HxCDD	0.100	<	U		0.216	J	*0.0216*	<	U		0.213	J	*0.0213*
1,2,3,4,6,7,8-HpCDD	0.010	4.66		*0.0466*	8.93		*0.0893*	3.15		*0.0315*	5.92		*0.0592*
OCDD	0.0001	367		*0.0367*	523		*0.0523*	306		*0.0306*	347	J	*0.0347*
2,3,7,8--TCDF	0.100	<	U		<	U		<	U		<	U	
1,2,3,7,8-PeCDF	0.050	<	U		<	U		<	U		0.878	J	*0.0439*
2,3,4,7,8-PeCDF	0.500	<	U		<	U		<	U		2.11		*1.0550*
1,2,3,4,7,8-HxCDF	0.100	<	U		<	U		<	U		25.6		*2.5600*
1,2,3,6,7,8-HxCDF	0.100	<	U		<	U		<	U		4.3		*0.4300*
2,3,4,6,7,8-HxCDF	0.100	<	U		<	U		<	U		1.09	J	*0.1090*
1,2,3,7,8,9-HxCDF	0.100	<	U		<	U		<	U		0.526	J	*0.0526*
1,2,3,4,6,7,8-HpCDF	0.010	<	U		<	U		<	U		77.6		*0.7760*
1,2,3,4,7,8,9-HpCDF	0.010	<	U		<	U		<	U		1.71	J	*0.0171*
OCDF	0.0001	<	U		<	U		<	U		101		*0.0101*
Total TCDDs		<	U		<	U		<	U		<	U	
Total PeCDDs		<	U		<	U		<	U		0.341	J	
Total HxCDDs		0.961	J		1.15	J		0.839	J		1.7	J	
Total HpCDDs		10.2			19.9			7.69			12		
Total TCDFs		<	U		<	U		<	U		7.48		
Total PeCDFs		<	U		<	U		<	U		16		
Total HxCDFs		0.159	J		<	U		<	U		50.9		
Total HpCDFs		<	U		<	U		0.109	J		85.2		
TOTAL TEQ				***0.0833***			***0.1855***			***0.0621***			***5.1977***

Diluted sample results were used, if available.
E = Value exceeds linear range
EDL = Estimated Detection Limit
J = Estimated
ND = Not Detected
Qual = Qualifier
TEF = Toxic Equivalency Factor
TEQ = Toxicity Equivalent
U = Nondetect
UJ = Estimated Nondetect
X = Estimated Maximum Possible Concentration (EMPC)

TABLE 20-21, AUS-0A12
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,1-Dichloroethane	No	C	No	A	NA	NA	No	A
1,1-Dichloroethene	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	Yes	E	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	F
1,2-Dichloropropane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
2-Butanone (MEK)	No	C	No	F	NA	NA	No	A
2-Hexanone	No	C	No	C	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	No	C	No	A	NA	NA	No	A
Acetone	No	C	No	A	NA	NA	No	F
Benzene	No	A	Uncertainty	B	NA	NA	Uncertainty	B
Bromodichloromethane	No	C	Uncertainty	B	NA	NA	No	A
Bromoform	No	C	No	A	NA	NA	No	A
Bromomethane	No	C	No	A	NA	NA	Uncertainty	B
Carbon disulfide	No	C	No	A	NA	NA	No	A
Carbon tetrachloride	No	C	Yes	E	NA	NA	Yes	E
Chlorobenzene	No	C	No	A	NA	NA	No	A
Chloroethane	No	C	No	A	NA	NA	No	A
Chloroform	No	C	Yes	E	NA	NA	Yes	E
Chloromethane	No	C	No	F	NA	NA	No	A
cis-1,2-Dichloroethene	Uncertainty	G	Yes	E	NA	NA	Yes	E
cis-1,3-Dichloropropene	No	C	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	C	Uncertainty	B	NA	NA	No	A
Ethylbenzene	No	A	No	A	NA	NA	No	A
Methylene chloride	No	A	Yes	E	NA	NA	Yes	E
N-Hexane	No	C	No	A	NA	NA	No	A
Styrene	No	C	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	Uncertainty	G	Yes	E	NA	NA	Yes	E
Toluene	No	A	No	A	NA	NA	No	F
total Xylenes	No	A	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	C	No	F	NA	NA	No	F
trans-1,3-Dichloropropene	No	C	Uncertainty	B	NA	NA	No	A
Trichloroethylene (TCE)	Uncertainty	G	Yes	E	NA	NA	Yes	E
Vinyl chloride	No	C	Uncertainty	B	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	No	A	No	A	Uncertainty	B
1,3-Dichlorobenzene	No	C	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	No	A	No	A	No	A

TABLE 20-21, AUS-0A12
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	No	A	No	A	No	A
2-Chlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	No	C	No	A	NA	NA	No	F
2-Methylnaphthalene	No	A	No	F	No	F	No	F
2-Methylphenol	No	C	No	A	No	A	Uncertainty	B
2-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
2-Nitrophenol	No	C	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	No	C	No	C	No	C
4-Bromophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Chloro-3-methylphenol	No	C	No	A	No	A	No	A
4-Chloroaniline	No	C	No	A	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Methylphenol	No	C	No	A	No	A	No	F
4-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4-Nitrophenol	No	C	No	A	No	A	No	A
Acenaphthene	No	C	No	A	No	A	No	F
Acenaphthylene	No	A	No	A	No	A	No	F
Anthracene	No	A	No	A	No	A	No	F
Benzo(a)anthracene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	No	A	No	A	No	F	No	F
Benzo(k)fluoranthene	No	C	Uncertainty	B	No	F	Yes	J
bis(2-Chloroethoxy)methane	No	C	No	C	No	C	No	C
bis(2-Chloroethyl) ether	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	Uncertainty	G	No	F	No	A	No	F
Butyl benzyl phthalate	No	C	No	A	No	A	No	A
Carbazole	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Chrysene	Uncertainty	B	No	F	No	F	No	F
Di-n-butyl phthalate	No	C	No	F	No	F	No	F
Di-n-octyl phthalate	No	C	No	A	No	A	No	A
Dibenz(a,h)anthracene	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	No	C	No	A	No	A	No	F
Diethyl phthalate	No	C	No	F	No	A	No	A
Dimethyl phthalate	No	C	No	A	No	A	No	A
Fluoranthene	No	A	No	F	No	F	No	F

TABLE 20-21, AUS-0A12
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	No	A	No	A	No	F
Hexachlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	No	A	No	A	No	A
Hexachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	No	A	Yes	J
Isophorone	No	C	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	No	A	Yes	E	Yes	E
Naphthalene	No	C	Uncertainty	B	No	F	No	F
Pentachlorophenol	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Phenanthrene	No	A	No	F	No	F	No	F
Phenol	No	A	No	A	No	A	No	A
Pyrene	No	A	No	F	No	F	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	Yes	E	No	F	No	F
Antimony	Uncertainty	G	Yes	E	Yes	D	Yes	E
Arsenic	Uncertainty	G	Yes	E	Yes	D	Yes	E
Barium	No	F	Yes	E	Yes	D	Yes	E
Beryllium	Uncertainty	G	Yes	E	No	A	Yes	E
Boron	No	F	No	F	No	F	No	F
Cadmium	No	C	Yes	E	Yes	D	Yes	E
Calcium	No	H	No	H	No	H	No	H
Chromium	Uncertainty	G	Yes	E	Yes	E	Yes	E
Cobalt	Uncertainty	G	No	F	No	F	No	F
Copper	Uncertainty	G	Yes	E	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	No	A
Iron	Yes	E	Yes	E	No	F	No	F
Lead	Uncertainty	G	Yes	E	No	F	Yes	E
Magnesium	No	H	No	H	No	H	No	H
Manganese	Yes	E	Yes	E	No	F	Yes	E
Mercury	Yes	D	Yes	E	No	F	Yes	E
Nickel	No	F	Yes	E	Yes	D	Yes	E
Potassium	No	H	No	H	No	H	No	H
Selenium	No	F	No	F	Yes	E	Yes	E
Silver	Yes	D	No	F	No	F	Yes	E
Sodium	No	H	No	H	No	H	No	H
Thallium	No	C	Yes	E	No	A	No	F
Vanadium	Uncertainty	G	Yes	E	No	F	No	F
Zinc	No	F	Yes	E	No	F	Yes	E
Explosives								
1,3,5-Trinitrobenzene	No	C	No	A	No	A	No	A
1,3-Dinitrobenzene	No	C	No	A	No	A	No	A

TABLE 20-21, AUS-0A12
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater & Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	Yes	E	No	A	No	F
2,4-Dinitrotoluene	Uncertainty	G	No	A	Yes	E	Yes	E
2,6-Dinitrotoluene	Uncertainty	G	No	A	Uncertainty	B	Yes	E
2-Amino-4,6-Dinitrotoluene	No	C	Uncertainty	G	No	C	No	C
2-Nitrotoluene (ONT)	Uncertainty	G	No	C	No	C	No	C
3-Nitrotoluene	No	C	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	Uncertainty	G	No	C	Uncertainty	G
4-Nitrotoluene (PNT)	No	C	No	A	No	A	No	F
HMX	Uncertainty	G	No	F	No	A	No	F
Nitrobenzene	No	C	No	F	Uncertainty	B	Uncertainty	B
Nitroglycerin	No	C	No	A	NA	NA	No	A
Pentaerythritol tetranitrate (PETN)	No	C	No	C	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	Uncertainty	G	Yes	E	No	A	No	F
Tetryl	No	C	No	A	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	Uncertainty	G	Yes	E	NA	NA	NA	NA
Phosphorus, Total (as P)	Uncertainty	G	Yes	E	NA	NA	NA	NA
Sulfate (as SO4)	Yes	E	Yes	E	NA	NA	NA	NA
TDS	Yes	E	Yes	E	NA	NA	NA	NA
Polychlorinated Biphenyls (PCB)								
PCB-1016	NA	NA	NA	NA	NA	NA	No	A
PCB-1221	NA	NA	NA	NA	NA	NA	No	A
PCB-1232	NA	NA	NA	NA	NA	NA	No	A
PCB-1242	NA	NA	NA	NA	NA	NA	No	A
PCB-1248	NA	NA	NA	NA	NA	NA	No	A
PCB-1254	NA	NA	NA	NA	NA	NA	No	F
PCB-1260	NA	NA	NA	NA	NA	NA	No	F
Dioxins								
2,3,7,8-TCDD	NA	NA	NA	NA	NA	NA	No	C

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 20-21A, AUS-OA12
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Volatile Organic Compounds		
1,1,1-Trichloroethane	No	A
1,1,2,2-Tetrachloroethane	Uncertainty	B
1,1,2-Trichloroethane	Uncertainty	B
1,1-Dichloroethane	No	A
1,1-Dichloroethene	Uncertainty	B
1,2-Dichloroethane (EDC)	Uncertainty	B
1,2-Dichloroethene (total)	No	A
1,2-Dichloropropane	Uncertainty	B
2-Butanone (MEK)	No	A
2-Hexanone	No	C
4-Methyl-2-pentanone (MIBK)	No	A
Acetone	No	A
Benzene	Uncertainty	B
Bromodichloromethane	No	A
Bromoform	No	A
Bromomethane	No	A
Carbon disulfide	No	A
Carbon tetrachloride	Uncertainty	B
Chlorobenzene	No	A
Chloroethane	No	A
Chloroform	No	A
Chloromethane	No	A
cis-1,2-Dichloroethene	No	A
cis-1,3-Dichloropropene	No	A
Dibromochloromethane	No	A
Ethylbenzene	No	A
Methylene chloride	Uncertainty	B
N-Hexane	No	A
Styrene	No	A
Tetrachloroethylene (PCE)	Uncertainty	B
Toluene	No	A
total Xylenes	No	A
trans-1,2-Dichloroethene	No	A
trans-1,3-Dichloropropene	No	A
Trichloroethylene (TCE)	Uncertainty	B
Vinyl chloride	Uncertainty	B
Semivolatile Organic Compounds		
1,2,4-Trichlorobenzene	Uncertainty	B
1,2-Dichlorobenzene	No	A
1,3-Dichlorobenzene	No	A

TABLE 20-21A, AUS-OA12
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
1,4-Dichlorobenzene	Uncertainty	B
2,4,5-Trichlorophenol	No	A
2,4,6-Trichlorophenol	Uncertainty	B
2,4-Dichlorophenol	Uncertainty	B
2,4-Dimethylphenol	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B
2-Chloronaphthalene	No	A
2-Chlorophenol	Uncertainty	B
1-Methylnaphthalene	NA	NA
2-Methylnaphthalene	No	A
2-Methylphenol	No	A
2-Nitroaniline	No	A
2-Nitrophenol	No	A
3,3'-Dichlorobenzidine	Uncertainty	B
3-Nitroaniline	No	A
4,6-Dinitro-2-methylphenol	No	C
4-Bromophenyl phenyl ether	No	C
4-Chloro-3-methylphenol	No	A
4-Chloroaniline	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C
4-Methylphenol	No	A
4-Nitroaniline	No	A
4-Nitrophenol	No	A
Acenaphthene	No	A
Acenaphthylene	No	A
Anthracene	No	A
Benzo(a)anthracene	Uncertainty	B
Benzo(a)pyrene	Uncertainty	B
Benzo(b)fluoranthene	Uncertainty	B
Benzo(g,h,i)perylene	No	A
Benzo(k)fluoranthene	No	A
bis(2-Chloroethoxy)methane	No	C
bis(2-Chloroethyl) ether	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	A
bis(2-Ethylhexyl) phthalate	No	F
Butyl benzyl phthalate	No	A
Carbazole	Uncertainty	B
Chrysene	No	A
Di-n-butyl phthalate	No	A
Di-n-octyl phthalate	No	A
Dibenz(a,h)anthracene	Uncertainty	B

TABLE 20-21A, AUS-OA12
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Dibenzofuran	No	A
Diethyl phthalate	No	A
Dimethyl phthalate	No	A
Fluoranthene	No	A
Fluorene	No	A
Hexachlorobenzene	Uncertainty	B
Hexachlorobutadiene	Uncertainty	B
Hexachlorocyclopentadiene	No	A
Hexachloroethane	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	No	A
Isophorone	Uncertainty	B
N-Nitroso-di-n-propylamine	Uncertainty	B
N-Nitrosodiphenylamine	Uncertainty	B
Naphthalene	No	A
Pentachlorophenol	Uncertainty	B
Phenanthrene	No	A
Phenol	No	A
Pyrene	No	A
Metals and Inorganics		
Aluminum	No	F
Antimony	Uncertainty	B
Arsenic	Yes	D
Barium	No	F
Beryllium	No	A
Boron	No	F
Cadmium	Yes	E
Calcium	Uncertainty	G
Chromium	Yes	D
Cobalt	No	A
Copper	No	F
Cyanide, Total	NA	NA
Iron	No	F
Lead	No	F
Magnesium	Uncertainty	G
Manganese	No	F
Mercury	No	A
Nickel	Yes	D
Potassium	Uncertainty	G
Selenium	Yes	D
Silver	No	F
Sodium	Uncertainty	G

TABLE 20-21A, AUS-OA12
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Thallium	No	A
Vanadium	No	F
Zinc	No	F
Explosives		
1,3,5-Trinitrobenzene	NA	NA
1,3-Dinitrobenzene	NA	NA
2,4,6-Trinitrotoluene (TNT)	NA	NA
2,4-Dinitrotoluene	Uncertainty	B
2,6-Dinitrotoluene	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA
2-Nitrotoluene (ONT)	NA	NA
3-Nitrotoluene	NA	NA
4-Amino-2,6-Dinitrotoluene	NA	NA
4-Nitrotoluene (PNT)	NA	NA
HMX	NA	NA
Nitrobenzene	Uncertainty	B
Nitroglycerin	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA
Perchloric Acid	NA	NA
RDX	NA	NA
Tetryl	NA	NA

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 20-22, AUS-0A12
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	A	NA	NA	No	A
1,1,2-Trichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethene	No	A	NA	NA	No	A
1,2-Dichloroethane (EDC)	No	A	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	F
1,2-Dichloropropane	No	A	NA	NA	No	A
2-Butanone (MEK)	No	A	NA	NA	No	A
2-Hexanone	No	A	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	No	A	NA	NA	No	A
Acetone	No	A	NA	NA	No	F
Benzene	No	A	NA	NA	No	A
Bromodichloromethane	No	A	NA	NA	No	A
Bromoform	No	A	NA	NA	No	A
Bromomethane	No	A	NA	NA	No	A
Carbon disulfide	Uncertainty	B	NA	NA	No	A
Carbon tetrachloride	No	A	NA	NA	No	F
Chlorobenzene	No	A	NA	NA	No	A
Chloroethane	No	A	NA	NA	No	C
Chloroform	No	A	NA	NA	No	F
Chloromethane	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	No	F	NA	NA	No	F
cis-1,3-Dichloropropene	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	A	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	No	A
Methylene chloride	No	A	NA	NA	No	F
N-Hexane	No	C	NA	NA	No	C
Styrene	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	No	F	NA	NA	No	F
Toluene	No	A	NA	NA	No	F
total Xylenes	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	A	NA	NA	No	F
trans-1,3-Dichloropropene	No	A	NA	NA	No	A
Trichloroethylene (TCE)	No	F	NA	NA	No	F
Vinyl chloride	No	A	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	No	A	No	A
1,2-Dichlorobenzene	No	A	Uncertainty	B	No	A
1,3-Dichlorobenzene	No	A	No	A	No	A
1,4-Dichlorobenzene	No	A	Uncertainty	B	No	A
2,4,5-Trichlorophenol	No	A	Uncertainty	B	Uncertainty	B

TABLE 20-22, AUS-0A12
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	Uncertainty	B	No	A
2,4-Dichlorophenol	No	A	Uncertainty	B	No	A
2,4-Dimethylphenol	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	Uncertainty	B	No	A
2-Chloronaphthalene	No	A	No	A	Uncertainty	B
2-Chlorophenol	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	No	A	NA	NA	Uncertainty	G
2-Methylnaphthalene	No	A	Yes	E	Yes	E
2-Methylphenol	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	A	No	A	No	A
2-Nitrophenol	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	A	No	A	Uncertainty	B
3-Nitroaniline	No	A	No	A	Uncertainty	B
4,6-Dinitro-2-methylphenol	Uncertainty	B	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	No	A	No	C
4-Chloro-3-methylphenol	Uncertainty	B	Uncertainty	B	No	A
4-Chloroaniline	No	A	No	A	Uncertainty	B
4-Chlorophenyl phenyl ether	No	A	No	A	No	C
4-Methylphenol	No	A	No	A	No	F
4-Nitroaniline	No	A	No	A	No	A
4-Nitrophenol	No	A	Uncertainty	B	No	A
Acenaphthene	No	A	Uncertainty	B	Yes	E
Acenaphthylene	No	A	Uncertainty	B	No	F
Anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Benzo(a)anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Yes	E	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	Yes	E	Yes	E
bis(2-Chloroethoxy)methane	No	A	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	No	A	No	A
bis(2-Chloroisopropyl) ether	No	C	No	C	No	C
bis(2-Ethylhexyl) phthalate	Yes	E	No	A	Yes	E
Butyl benzyl phthalate	No	A	No	A	Uncertainty	B
Carbazole	No	A	No	A	Yes	E
Chrysene	No	A	Yes	E	Yes	E
Di-n-butyl phthalate	Uncertainty	B	Yes	E	Yes	E
Di-n-octyl phthalate	No	A	No	A	No	A
Dibenz(a,h)anthracene	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	Uncertainty	B	No	A	Yes	E
Diethyl phthalate	No	A	No	A	No	A
Dimethyl phthalate	No	A	No	A	No	A
Fluoranthene	Uncertainty	B	Yes	E	Yes	E

TABLE 20-22, AUS-0A12
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	Uncertainty	B	Yes	E
Hexachlorobenzene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobutadiene	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	Uncertainty	B	No	A
Hexachloroethane	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	Yes	E
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	Uncertainty	B
N-Nitrosodiphenylamine	No	A	No	F	No	F
Naphthalene	No	A	No	F	No	F
Pentachlorophenol	Uncertainty	B	Uncertainty	B	Yes	E
Phenanthrene	Uncertainty	B	Yes	E	Yes	E
Phenol	No	A	Uncertainty	B	No	A
Pyrene	No	A	Yes	E	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	F	No	F	Yes	E
Arsenic	No	F	No	F	Yes	E
Barium	No	F	Uncertainty	G	Yes	E
Beryllium	Yes	E	No	C	No	F
Boron	No	F	Uncertainty	G	Yes	E
Cadmium	Uncertainty	B	Yes	D	No	F
Calcium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	No	F	Yes	E
Cobalt	Yes	E	No	F	Yes	E
Copper	Yes	E	Yes	E	Yes	E
Cyanide, Total	NA	NA	NA	NA	No	A
Iron	Yes	E	No	F	Yes	E
Lead	Yes	E	Yes	E	Yes	E
Magnesium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	Yes	E	Yes	E	Yes	E
Mercury	Yes	D	Yes	D	Yes	E
Nickel	No	F	No	F	Yes	E
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	Yes	E	Yes	E	Yes	E
Silver	Yes	D	No	F	Yes	E
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Uncertainty	B	No	C	Yes	E
Vanadium	Yes	E	Uncertainty	G	Yes	E
Zinc	No	F	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	Uncertainty	B
1,3-Dinitrobenzene	No	A	Uncertainty	B	Uncertainty	B

TABLE 20-22, AUS-0A12
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Uncertainty	B	No	F
2,4-Dinitrotoluene	No	F	No	F	Yes	E
2,6-Dinitrotoluene	No	F	Uncertainty	B	Yes	E
2-Amino-4,6-Dinitrotoluene	No	A	No	C	No	A
2-Nitrotoluene (ONT)	No	F	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	A	No	C	Uncertainty	G
4-Nitrotoluene (PNT)	No	A	No	A	Uncertainty	G
HMX	No	F	Uncertainty	B	Yes	E
Nitrobenzene	No	A	No	A	No	A
Nitroglycerin	No	A	NA	NA	No	C
Pentaerythritol tetranitrate (PETN)	No	A	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	F	Uncertainty	B	No	F
Tetryl	No	C	No	C	No	C
Polychlorinated Biphenyls (PCB)						
PCB-1016	NA	NA	NA	NA	No	C
PCB-1221	NA	NA	NA	NA	No	C
PCB-1232	NA	NA	NA	NA	No	C
PCB-1242	NA	NA	NA	NA	No	C
PCB-1248	NA	NA	NA	NA	No	C
PCB-1254	NA	NA	NA	NA	Yes	E
PCB-1260	NA	NA	NA	NA	Yes	E
Dioxins						
2,3,7,8-TCDD	NA	NA	NA	NA	No	A

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 20-22A, AUS-0A12
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Volatile Organic Compounds		
1,1,1-Trichloroethane	No	A
1,1,2,2-Tetrachloroethane	No	A
1,1,2-Trichloroethane	No	A
1,1-Dichloroethane	No	A
1,1-Dichloroethene	No	A
1,2-Dichloroethane (EDC)	No	A
1,2-Dichloroethene (total)	No	A
1,2-Dichloropropane	No	A
2-Butanone (MEK)	No	A
2-Hexanone	No	A
4-Methyl-2-pentanone (MIBK)	No	A
Acetone	No	A
Benzene	No	A
Bromodichloromethane	No	A
Bromoform	No	A
Bromomethane	No	A
Carbon disulfide	No	A
Carbon tetrachloride	No	A
Chlorobenzene	No	A
Chloroethane	No	C
Chloroform	No	A
Chloromethane	No	A
cis-1,2-Dichloroethene	No	A
cis-1,3-Dichloropropene	No	A
Dibromochloromethane	No	A
Ethylbenzene	No	A
Methylene chloride	No	A
N-Hexane	No	C
Styrene	No	A
Tetrachloroethylene (PCE)	No	A
Toluene	No	A
total Xylenes	No	A
trans-1,2-Dichloroethene	No	A
trans-1,3-Dichloropropene	No	A
Trichloroethylene (TCE)	No	A
Vinyl chloride	No	A
Semivolatile Organic Compounds		
1,2,4-Trichlorobenzene	No	A
1,2-Dichlorobenzene	No	A
1,3-Dichlorobenzene	No	A

TABLE 20-22A, AUS-0A12
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
1,4-Dichlorobenzene	No	A
2,4,5-Trichlorophenol	No	A
2,4,6-Trichlorophenol	No	A
2,4-Dichlorophenol	No	A
2,4-Dimethylphenol	Uncertainty	B
2,4-Dinitrophenol	No	A
2-Chloronaphthalene	Uncertainty	B
2-Chlorophenol	Uncertainty	B
1-Methylnaphthalene	NA	NA
2-Methylnaphthalene	No	A
2-Methylphenol	No	A
2-Nitroaniline	No	A
2-Nitrophenol	No	A
3,3'-Dichlorobenzidine	No	A
3-Nitroaniline	No	A
4,6-Dinitro-2-methylphenol	No	C
4-Bromophenyl phenyl ether	No	C
4-Chloro-3-methylphenol	No	A
4-Chloroaniline	No	A
4-Chlorophenyl phenyl ether	No	C
4-Methylphenol	No	A
4-Nitroaniline	No	A
4-Nitrophenol	No	A
Acenaphthene	No	A
Acenaphthylene	No	A
Anthracene	No	A
Benzo(a)anthracene	No	A
Benzo(a)pyrene	No	A
Benzo(b)fluoranthene	No	A
Benzo(g,h,i)perylene	No	A
Benzo(k)fluoranthene	No	A
bis(2-Chloroethoxy)methane	Uncertainty	B
bis(2-Chloroethyl) ether	No	A
bis(2-Chloroisopropyl) ether	No	C
bis(2-Ethylhexyl) phthalate	Yes	E
Butyl benzyl phthalate	Uncertainty	B
Carbazole	No	C
Chrysene	No	A
Di-n-butyl phthalate	No	A
Di-n-octyl phthalate	No	A
Dibenz(a,h)anthracene	No	A

TABLE 20-22A, AUS-0A12
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Dibenzofuran	No	C
Diethyl phthalate	No	A
Dimethyl phthalate	No	A
Fluoranthene	No	A
Fluorene	No	A
Hexachlorobenzene	No	A
Hexachlorobutadiene	Uncertainty	B
Hexachlorocyclopentadiene	No	A
Hexachloroethane	No	A
Indeno(1,2,3-c,d)pyrene	No	A
Isophorone	No	A
N-Nitroso-di-n-propylamine	No	A
N-Nitrosodiphenylamine	No	A
Naphthalene	No	A
Pentachlorophenol	No	A
Phenanthrene	No	A
Phenol	No	A
Pyrene	No	A
Metals and Inorganics		
Aluminum	Uncertainty	G
Antimony	No	A
Arsenic	No	F
Barium	No	F
Beryllium	No	A
Boron	Yes	D
Cadmium	No	F
Calcium	Uncertainty	G
Chromium	Yes	D
Cobalt	No	A
Copper	No	F
Cyanide, Total	NA	NA
Iron	Yes	D
Lead	No	F
Magnesium	Uncertainty	G
Manganese	Yes	D
Mercury	No	A
Nickel	No	F
Potassium	Uncertainty	G
Selenium	No	F
Silver	No	F
Sodium	Uncertainty	G

TABLE 20-22A, AUS-0A12
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Thallium	Uncertainty	B
Vanadium	No	F
Zinc	No	F
Explosives		
1,3,5-Trinitrobenzene	NA	NA
1,3-Dinitrobenzene	NA	NA
2,4,6-Trinitrotoluene (TNT)	NA	NA
2,4-Dinitrotoluene	No	A
2,6-Dinitrotoluene	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA
2-Nitrotoluene (ONT)	NA	NA
3-Nitrotoluene	NA	NA
4-Amino-2,6-Dinitrotoluene	NA	NA
4-Nitrotoluene (PNT)	NA	NA
HMX	NA	NA
Nitrobenzene	No	A
Nitroglycerin	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA
Perchloric Acid	NA	NA
RDX	NA	NA
Tetryl	NA	NA

A - Chemical was not detected and the reporting limit does not exceed the screening concentration.

B - Chemical was not detected, but reporting limit was equal to or exceeeded screening concentration.

C - Chemical was not detected and there is no screening concentration.

D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.

E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.

F - Chemical was detected and did not exceed screening concentration.

G - Chemical was detected, but no screening value was available.

H - Chemical was detected, but it is an essential nutrient.

I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.

J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.

NA - Not Analyzed or not applicable.

TABLE 20-23
AUS-0A12 - FORMER IOP AMMONIUM NITRATE PLANT
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

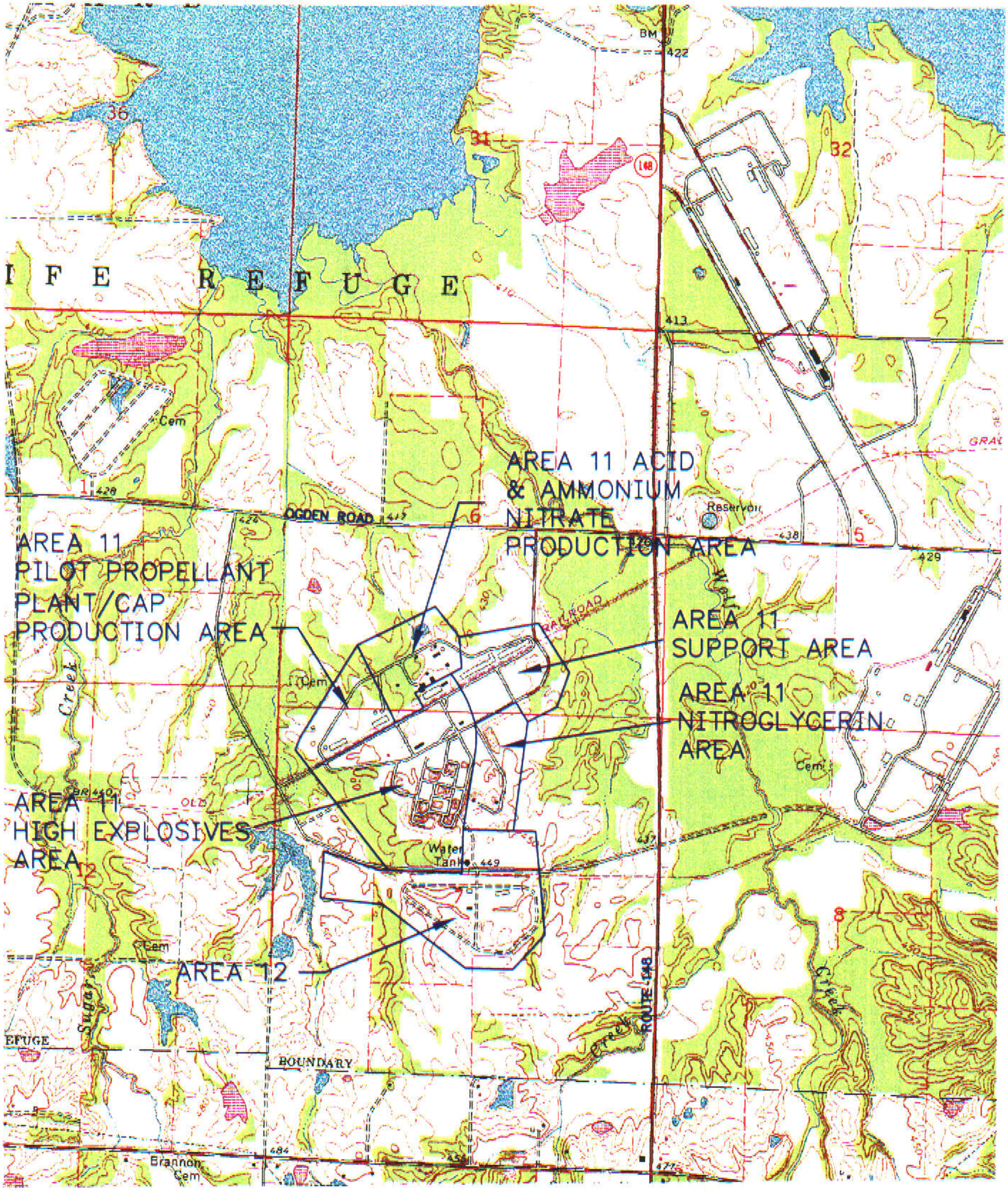
Chemical	Drum	Soil	Sediment	Groundwater & Trench Water	Surface Water
VOCs					
1,2-Dichloroethane (EDC)			NA	H	
Carbon tetrachloride		H	NA	H	
Chloroform		H	NA	H	
cis-1,2-Dichloroethene		H	NA	H	
Methylene chloride		H	NA	H	
Tetrachloroethylene (PCE)		H	NA	H	
Trichloroethylene (TCE)		H	NA	H	
SVOCs					
2-Methylnaphthalene		E	E		
Acenaphthene		E			
Anthracene		E			
Benzo(a)anthracene		H,E	H,E		
Benzo(a)pyrene		H,E	E		
Benzo(b)fluoranthene		H,E	H,E		
Benzo(g,h,i)perylene		E	E		
Benzo(k)fluoranthene		H,E	E		
bis(2-Ethylhexyl) phthalate	E	E			E
Carbazole		H,E			
Chrysene		E	E		
Di-n-butyl phthalate		E	E		
Dibenz(a,h)anthracene		H,E			
Dibenzofuran		E			
Fluoranthene		E	E		
Fluorene		E			
Indeno(1,2,3-c,d)pyrene		H,E			
N-Nitrosodiphenylamine		H	H		
Pentachlorophenol		E			
Phenanthrene		H,E	E		
Pyrene		E	E		
Metals and Inorganics					
Aluminum				H	E
Antimony		H,E		H	
Arsenic		H,E		H	
Barium		H,E		H	
Beryllium		H		H	E
Boron		E			
Cadmium	H	H		H	
Calcium					E
Chromium		H,E	H	H	
Cobalt		E			E
Copper		E	E	H	E
Iron		E		H	H,E

TABLE 20-23
AUS-0A12 - FORMER IOP AMMONIUM NITRATE PLANT
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum	Soil	Sediment	Groundwater & Trench Water	Surface Water
Lead		**H,E**	**E**	**H**	**E**
Magnesium					**E**
Manganese		**H,E**	**E**	**H**	**H,E**
Mercury		**H,E**		**H**	
Nickel		**H,E**		**H**	
Selenium		**H,E**	**H,E**		**E**
Silver		**H,E**			
Thallium		**E**		**H**	
Vanadium		**E**		**H**	**E**
Zinc		**H,E**	**E**	**H**	
Explosives					
2,4,6-trinitrotoluene (TNT)	NA			**H**	
2,4-Dinitrotoluene	NA	**H,E**	**H**		
2,6-Dinitrotoluene	NA	**H,E**			
HMX	NA	**E**			
RDX	NA			**H**	
Other Parameters					
Nitrogen, Nitrate-Nitrite	NA	NA	NA	**H**	
Phosphorus, Total (as P)	NA	NA	NA	**H**	
Sulfate (as SO4)	NA	NA	NA	**H**	**H**
TDS	NA	NA	NA	**H**	**H**
Polychlorinated Biphenyls (PCB)					
PCB-1254	NA	**E**	NA	NA	NA
PCB-1260	NA	**E**	NA	NA	NA

Key:
NA = not analyzed
H = human health screening criteria exceeded
E = ecological screening criteria exceeded

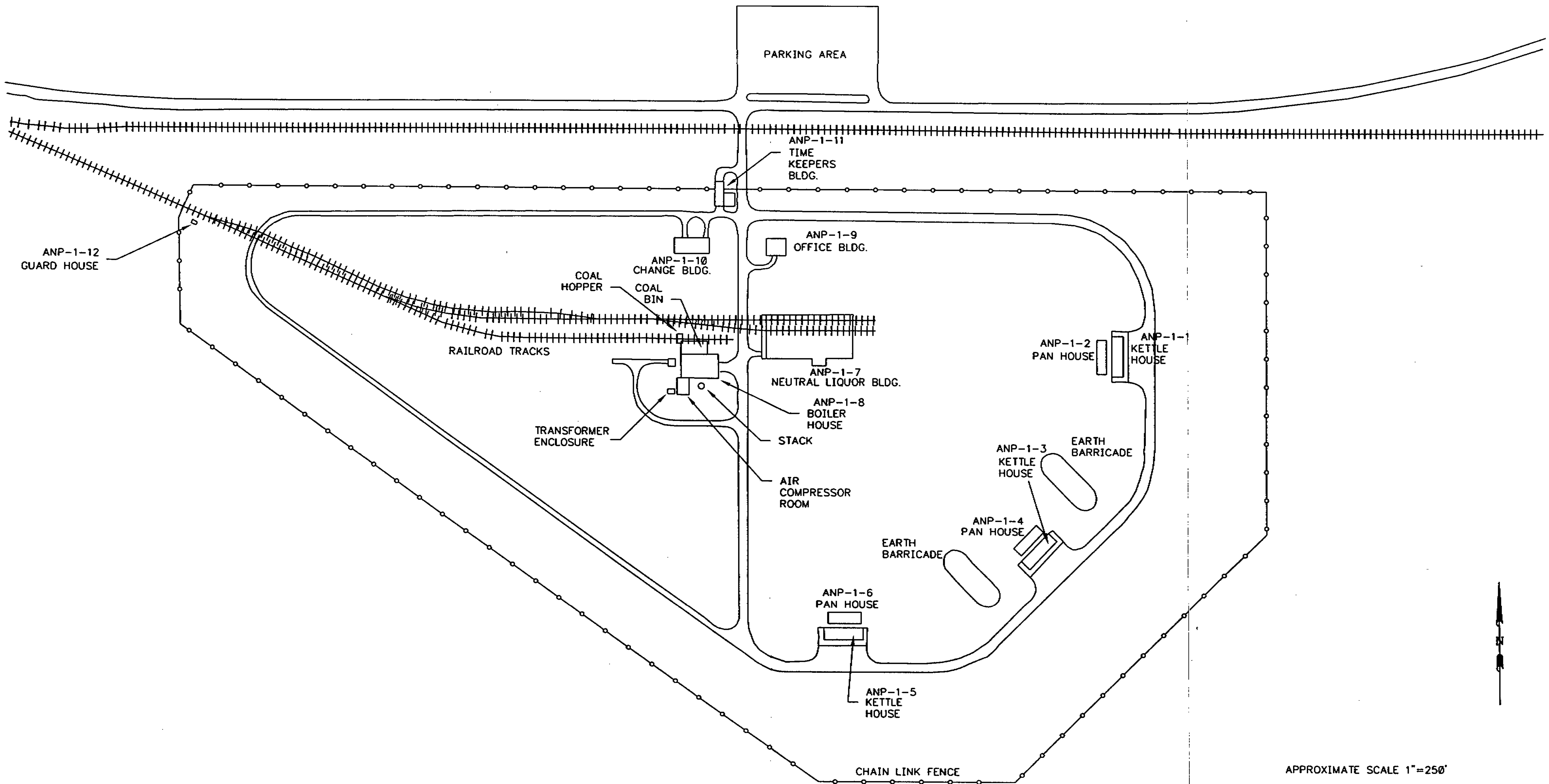


SOURCE: USGS DIGITAL RASTER GRAPHIC

PA/SI REPORT–AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	

DRN. BY: djd 9/16/99 DSGN. BY: mm CHKD. BY: cmw	Area 12 Site Location Map	FIG. NO. 20-1

File: E:\45\JM9602N\FIG 20-1.DWG Last edited: 06/29/01 @ 09:22 a.m. @ WCC-ST.LOUIS

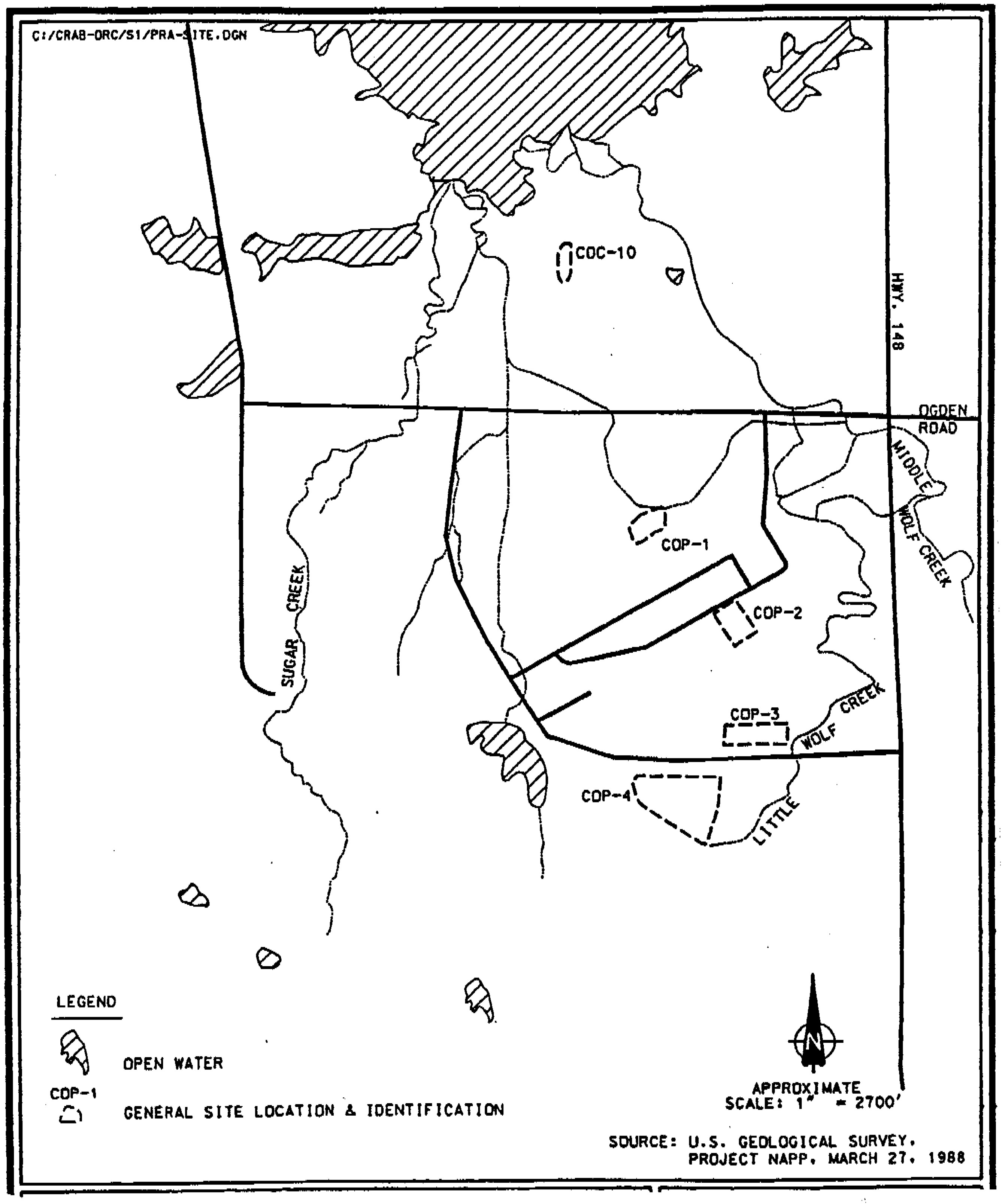


PA/SI REPORT – AUS OU CRAB ORCHARD NATIONAL WILDLIFE REFUGE MARION, ILLINOIS	PROJECT NO. 2320000026.00

URS Corporation

DRN. BY: djd DSGN. BY: ja CHKD. BY: mam 8/23/99	IOP Location Layout Ammonium Nitrate Plant Area 12	FIG. NO. 20-2

File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG20-2LS.DWG Last edited: 06/28/01 @ 5:34 p.m. WC-ST.LOUIS, MO

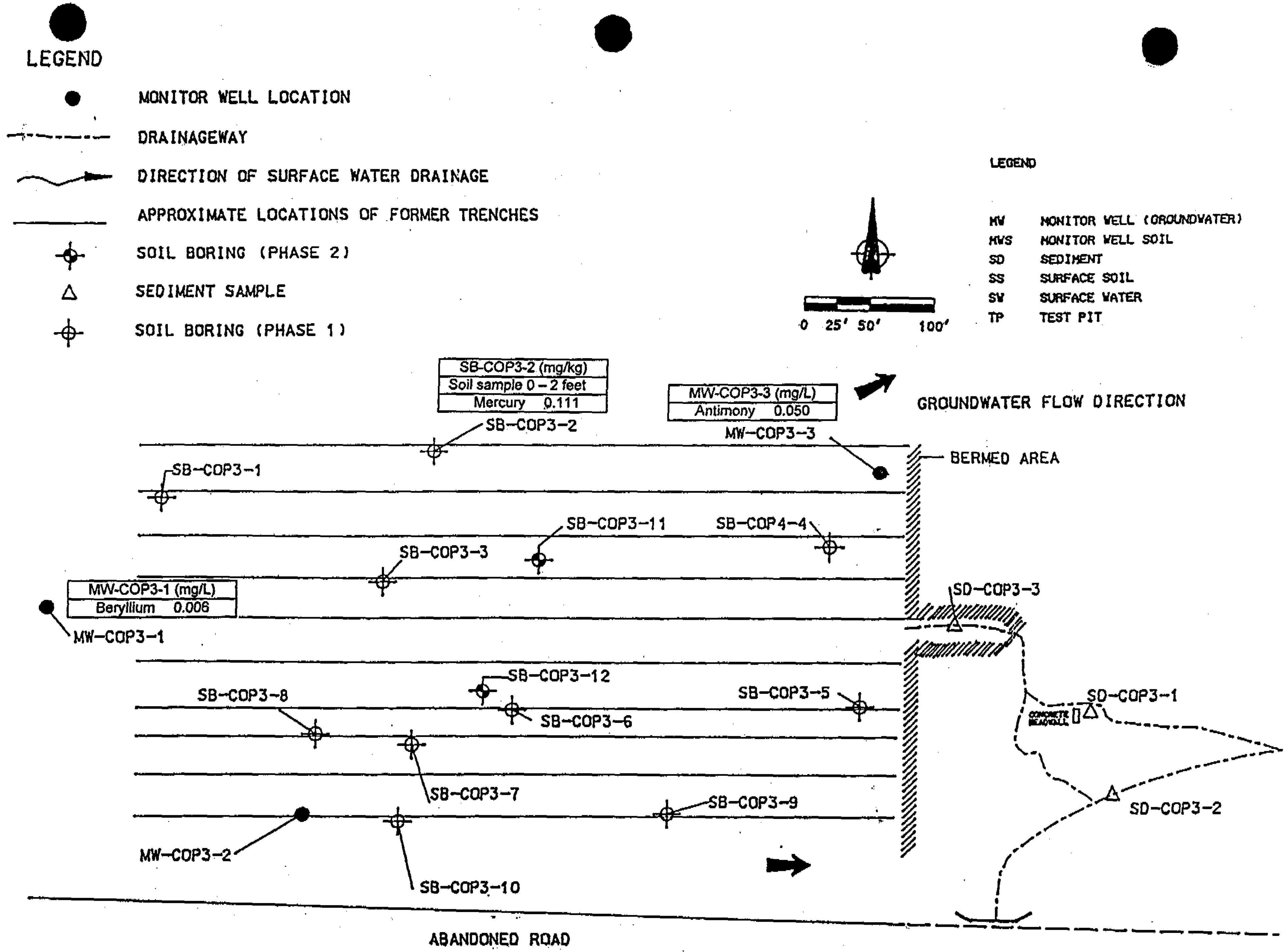


SOURCE: ENVIRONMENTAL SCIENCE & ENGINEERING, INC, SEPTEMBER 1994, DRAFT FINAL REMEDIAL INVESTIGATION/BASELINE RISK ASSESSMENT REPORT, EXPLOSIVES/MUNITIONS MANUFACTURING AREAS OPERABLE UNIT, CRAB ORCHARD NATIONAL WILDLIFE REFUGE, MARION, ILLINOIS, VOLUME I, REMEDIAL INVESTIGATION (RI) REPORT, FIGURE 1-5.

PA/SI REPORT AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00

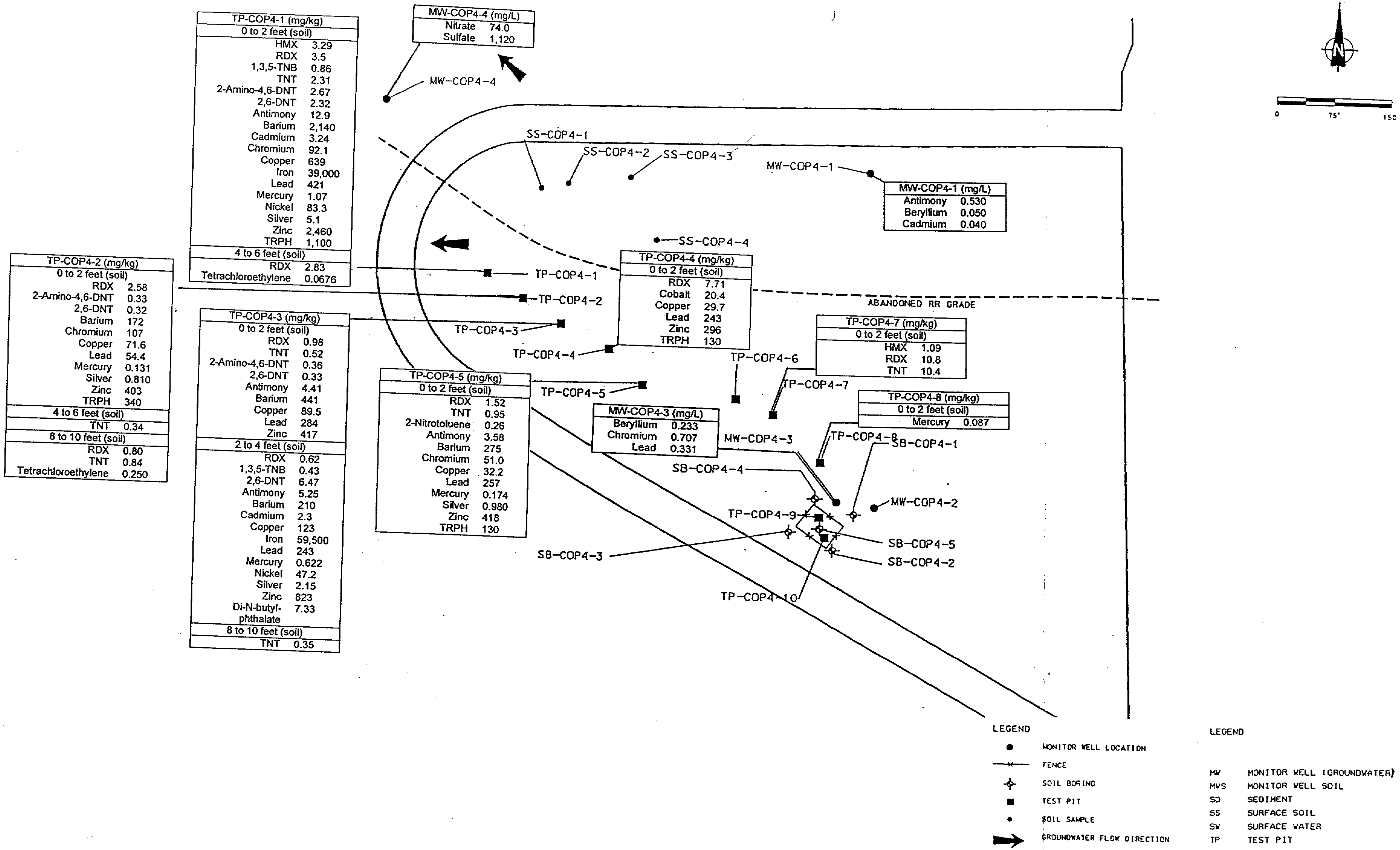
URS

DRN. BY: djd 9/7/99 DSGN. BY: mh CHKD. BY: mch	EMMA OU COP Site Locations	FIG. NO. 20-3



Note: The base map used for this figure is taken from Figure 4-14 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-44 and 4-45 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 20-4
Site COP-3



Note: The base map used for this figure is taken from Figure 4-15 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-46, 4-47, and 4-48 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C. 1995.

Figure 20-5
Site COP-4

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION
- USEPA 1998 SAMPLE LOCATIONS

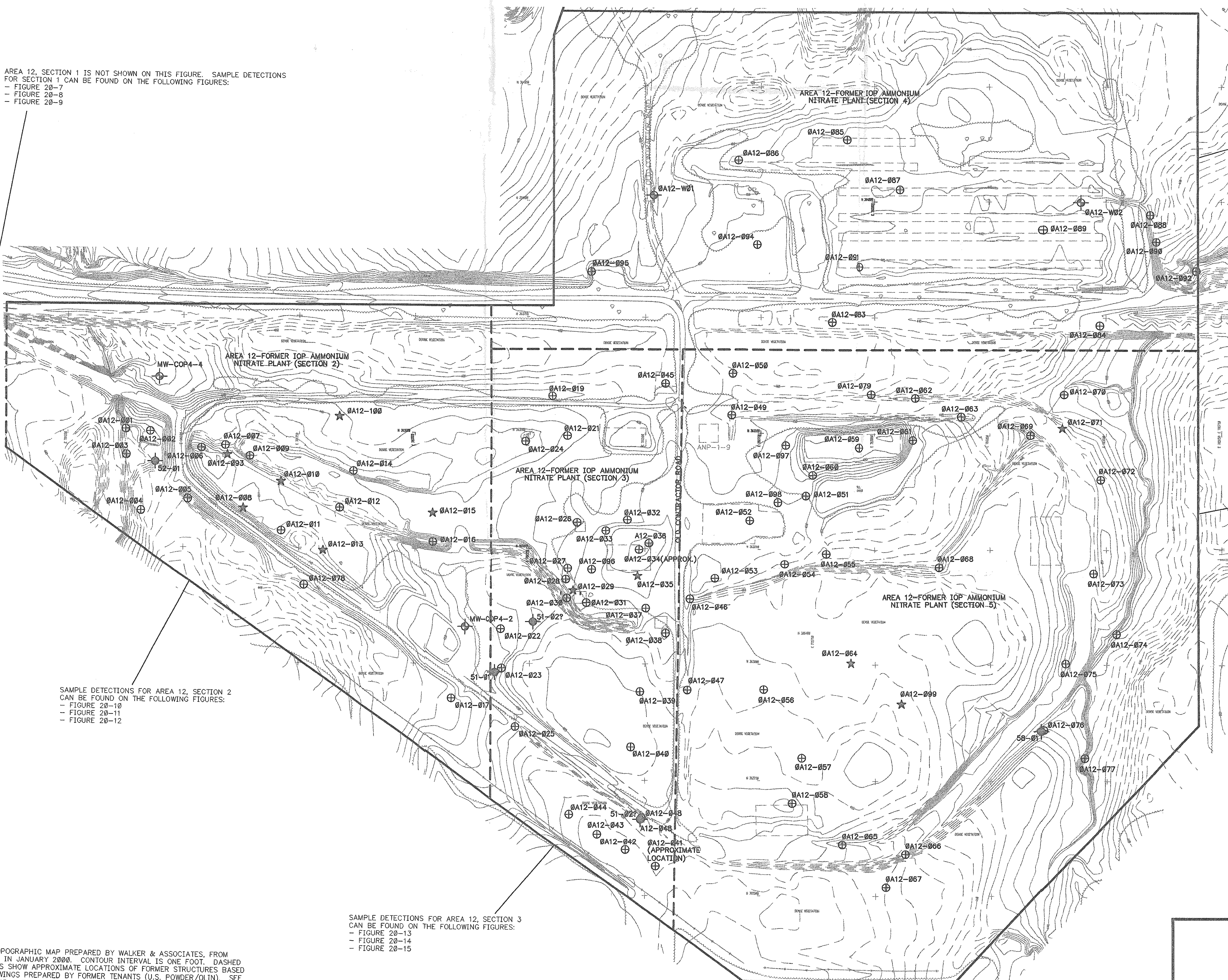
AREA 12, SECTION 1 IS NOT SHOWN ON THIS FIGURE. SAMPLE DETECTIONS FOR SECTION 1 CAN BE FOUND ON THE FOLLOWING FIGURES:
- FIGURE 20-7
- FIGURE 20-8
- FIGURE 20-9

SAMPLE DETECTIONS FOR AREA 12, SECTION 4 CAN BE FOUND ON THE FOLLOWING FIGURES:
- FIGURE 20-16
- FIGURE 20-17
- FIGURE 20-18

SAMPLE DETECTIONS FOR AREA 12, SECTION 5 CAN BE FOUND ON THE FOLLOWING FIGURES:
- FIGURE 20-19
- FIGURE 20-20
- FIGURE 20-21

SAMPLE DETECTIONS FOR AREA 12, SECTION 2 CAN BE FOUND ON THE FOLLOWING FIGURES:
- FIGURE 20-10
- FIGURE 20-11
- FIGURE 20-12

SAMPLE DETECTIONS FOR AREA 12, SECTION 3 CAN BE FOUND ON THE FOLLOWING FIGURES:
- FIGURE 20-13
- FIGURE 20-14
- FIGURE 20-15



NOTE:
BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

Area-12
Sample Location and Section Location Map

Date: 12/28/00	Project Number: 2320000026.00	Figure Number: 20-6
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

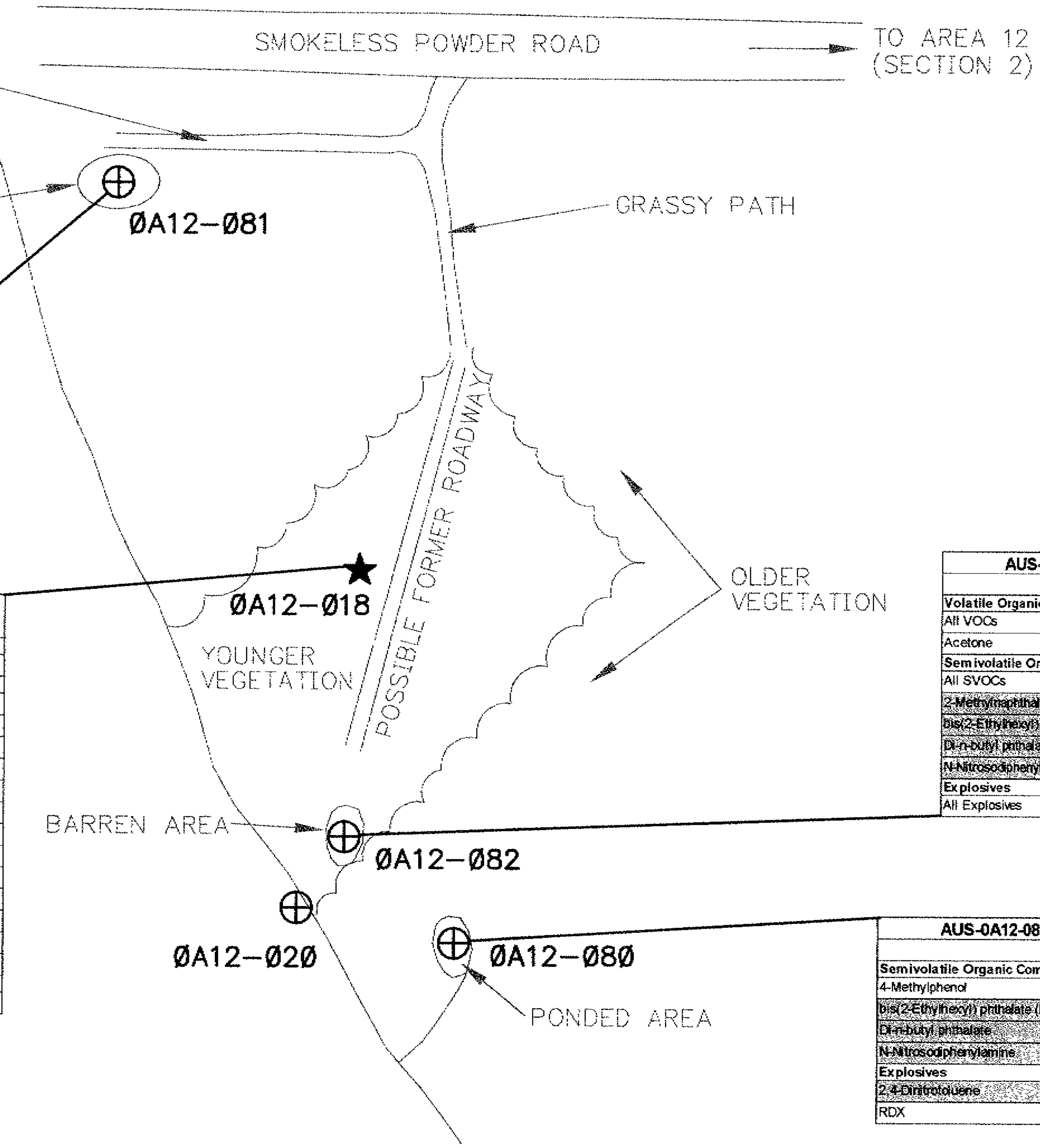
AREA 12 (AREA WEST OF AREA 12) (SECTION 1)

LEGEND

★ TEST PIT LOCATIONS

⊕ HAND SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-081	Units	Result: 2 ft	Reference Code
Volatile Organic Compounds			
Acetone	UG/KG	71	
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	58	e5
Benzo(b)fluoranthene	UG/KG	63	e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	120	e5
Chrysene	UG/KG	45	e5
Dibenzofuran	UG/KG	44	e5
Phenanthrene	UG/KG	67	e5
Pyrene	UG/KG	46	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-018	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code	Result: 5 ft	Reference Code	Result: 8 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)									
All PAHs	UG/KG			NA		ND		ND	
2-Methylnaphthalene	UG/KG	49	e5						
Benzo(a)anthracene	UG/KG	32	e5						
Benzo(a)pyrene	UG/KG	29	e5						
Benzo(b)fluoranthene	UG/KG	54	e5						
Benzo(g,h,i)perylene	UG/KG	26	e5						
Benzo(k)fluoranthene	UG/KG	25	e5						
Chrysene	UG/KG	59	e5						
Fluoranthene	UG/KG	53	e5						
Indeno(1,2,3-c,d)pyrene	UG/KG	24	e5						
Naphthalene	UG/KG	2500							
Phenanthrene	UG/KG	13	e5						
Pyrene	UG/KG	42	e5						
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

AUS-0A12-082	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA			
Acetone	UG/KG			24	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	47	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	150	e5		
Di-n-butyl phthalate	UG/KG	1700	e5		
N-Nitrosodiphenylamine	UG/KG	360	h5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-080	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
4-Methylphenol	UG/KG	91	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	130	e5
Di-n-butyl phthalate	UG/KG	550	e5
N-Nitrosodiphenylamine	UG/KG	62	h5
Explosives			
2,4-Dinitrotoluene	UG/KG	3200	e1,h5,h9
RDX	UG/KG	750	

N

APPROXIMATE SCALE 1"=1ØØ'

NOTES:

1. THIS DRAWING WAS OBTAINED FROM A FIELD SKETCH SO LOCATIONS OF SITE FEATURES ARE APPROXIMATE.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

N 3635ØØ

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PA/SI REPORT–AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 232ØØØØ026.ØØ
URS	
DRN. BY: djd 12/27/ØØ DSGN. BY: mam CHKD. BY: cmw	AUS–ØA12–Section 1 Sample Locations and Detections of Organic Compounds in Soils — FIG. NO. 2Ø–7

File: E:\232000026.00\PA-SI REPORT-AUS OU\FIG 20-7.DWG Last edited: 09/24/01 @ 07:08 a.m. WC-ST.LOUIS, MO

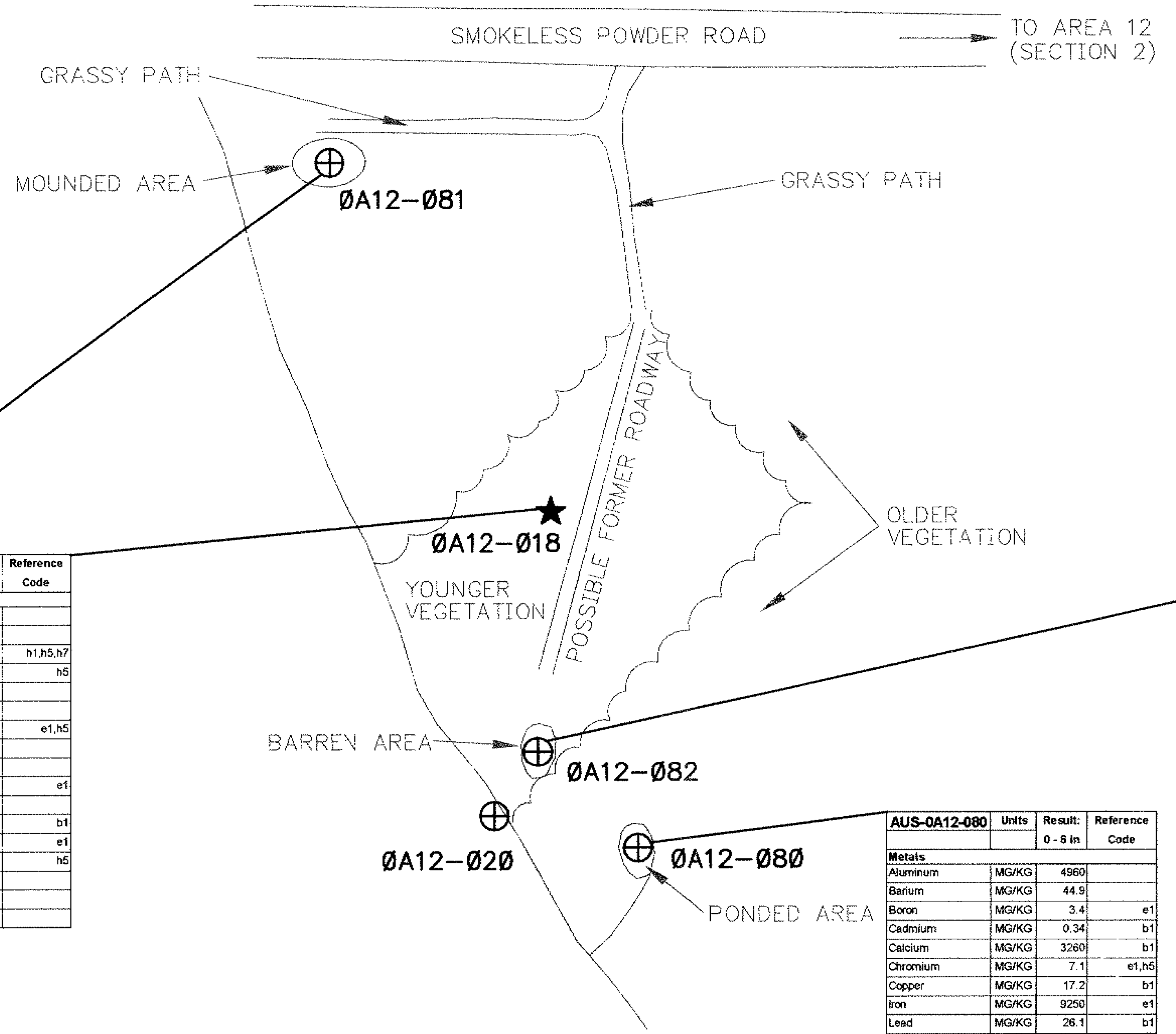
AREA 12 (AREA WEST OF AREA 12) (SECTION 1)

LEGEND

★ TEST PIT LOCATIONS

⊕ HAND SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-081	Units	Result: 2 ft	Reference Code
Metals			
Aluminum	MG/KG	8590	
Arsenic	MG/KG	6.2	h1,h5,h7
Barium	MG/KG	137	h5
Boron	MG/KG	3.2	e1
Cadmium	MG/KG	0.36	b1
Calcium	MG/KG	2530	b1
Chromium	MG/KG	12.9	e1,h5
Cobalt	MG/KG	8.5	
Copper	MG/KG	12.4	b1
Iron	MG/KG	17800	e1
Lead	MG/KG	14.3	
Magnesium	MG/KG	2580	b1
Manganese	MG/KG	725	e1
Nickel	MG/KG	16.3	h5
Potassium	MG/KG	578	
Vanadium	MG/KG	21.9	
Zinc	MG/KG	39	

AUS-0A12-018	Units	Result: 0 - 6 in	Reference Code	Result: 5 ft	Reference Code	Result: 8 ft	Reference Code
Metals							
Aluminum	MG/KG	10500		7250		7520	
Antimony	MG/KG	0.33	h5	ND		ND	
Arsenic	MG/KG	8.1	h1,h5,h7	3.3	h1,h5,h7	3.7	h1,h5,h7
Barium	MG/KG	83.2	h5	104	h5	81.8	h5
Boron	MG/KG	3.8	e1	ND		ND	
Calcium	MG/KG	2170		1420		1640	
Chromium	MG/KG	13	e1,h5	12.2	e1,h5	10.2	e1,h5
Cobalt	MG/KG	8.2		4		4.9	
Copper	MG/KG	18.9	b1	8.3		6.5	
Iron	MG/KG	19100	e1	12600	e1	12300	e1
Lead	MG/KG	77	b1	8.5		10.2	
Magnesium	MG/KG	1750	b1	1920	b1	1600	b1
Manganese	MG/KG	670	e1	255	e1	222	e1
Nickel	MG/KG	10.6	h5	13.4	h5	10.5	h5
Potassium	MG/KG	835	b1	333		425	
Vanadium	MG/KG	24.4		21		20.1	
Zinc	MG/KG	115	b1	27.9		24.1	

AUS-0A12-082	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	14500	
Arsenic	MG/KG	8.5	h1,h5,h7
Barium	MG/KG	58.9	
Boron	MG/KG	3.3	e1
Cadmium	MG/KG	0.41	b1,h5
Calcium	MG/KG	2120	
Chromium	MG/KG	16.4	e1,h5
Copper	MG/KG	17.2	b1
Iron	MG/KG	23300	b1,e1
Lead	MG/KG	12.6	
Magnesium	MG/KG	2500	b1
Manganese	MG/KG	210	e1
Nickel	MG/KG	10.4	h5
Potassium	MG/KG	873	b1
Silver	MG/KG	0.51	
Sodium	MG/KG	3930	b1
Vanadium	MG/KG	29.3	
Zinc	MG/KG	43.5	

AUS-0A12-080	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4960	
Barium	MG/KG	44.9	
Boron	MG/KG	3.4	e1
Cadmium	MG/KG	0.34	b1
Calcium	MG/KG	3260	b1
Chromium	MG/KG	7.1	e1,h5
Copper	MG/KG	17.2	b1
Iron	MG/KG	9250	e1
Lead	MG/KG	26.1	b1
Magnesium	MG/KG	761	
Manganese	MG/KG	333	e1
Nickel	MG/KG	5.8	
Potassium	MG/KG	383	
Selenium	MG/KG	1.3	e1.e5.h5
Silver	MG/KG	0.31	
Vanadium	MG/KG	12.3	
Zinc	MG/KG	76.7	b1

N

APPROXIMATE SCALE 1"=1ØØ'

NOTES:

1. THIS DRAWING WAS OBTAINED FROM A FIELD SKETCH SO LOCATIONS OF SITE FEATURES ARE APPROXIMATE.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00

URS

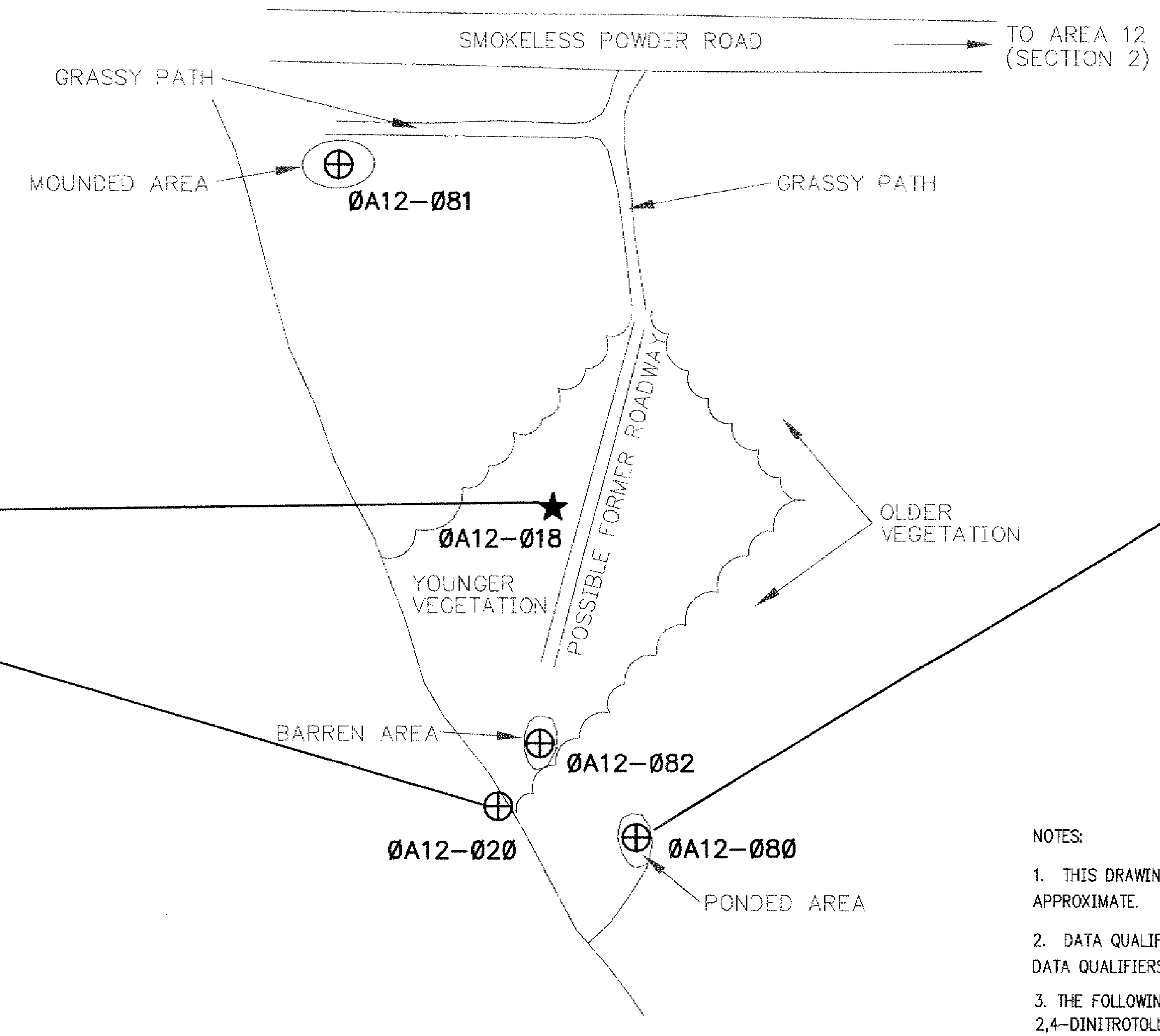
DRN. BY: djd 12/27/ØØ DSGN. BY: mam CHKD. BY: cmw	AUS-ØA12-Section 1 Sample Locations and Detections of Inorganic Compounds in Soils	FIG. NO. 2Ø-8

AREA 12 (AREA WEST OF AREA 12) (SECTION 1)

LEGEND

★ TEST PIT LOCATIONS

⊕ HAND SAMPLE LOCATIONS



AUS-0A12-018-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
RDX	UG/L	4	h3
Metals			
Aluminum	UG/L	162000	h4
Arsenic	UG/L	57.2	h3,h4,h6
Barium	UG/L	1110	
Beryllium	UG/L	8.1	h6
Calcium	UG/L	74400	
Chromium	UG/L	185	h6
Cobalt	UG/L	62.3	
Copper	UG/L	118	
Iron	UG/L	189000	h4,h6
Lead	UG/L	108	h6
Magnesium	UG/L	49700	
Manganese	UG/L	2130	h4,h6
Nickel	UG/L	147	h6
Potassium	UG/L	13500	
Selenium	UG/L	9.8	
Sodium	UG/L	60900	
Vanadium	UG/L	214	
Zinc	UG/L	554	

AUS-0A12-020-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	161	e3
Barium	UG/L	23.3	b3
Calcium	UG/L	21500	b3
Iron	UG/L	657	b3
Magnesium	UG/L	12600	b3
Manganese	UG/L	343	
Sodium	UG/L	15300	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	97.8	b3
Nitrogen, Ammonia (as N)	MG/L	0.9	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	33000	
TDS	MG/L	182	b3
TSS	MG/L	38	b3

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-080-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1910	b3,e3
Antimony	UG/L	1	
Barium	UG/L	61.7	b3
Calcium	UG/L	27300	b3
Cobalt	UG/L	3.3	e3
Iron	UG/L	4510	b3,e3,e4,h10
Magnesium	UG/L	5360	b3
Manganese	UG/L	449	
Sodium	UG/L	7650	b3
Zinc	UG/L	31.2	b3

N

APPROXIMATE SCALE 1"=1ØØ'

N 3635ØØ

E 78Ø2ØØ

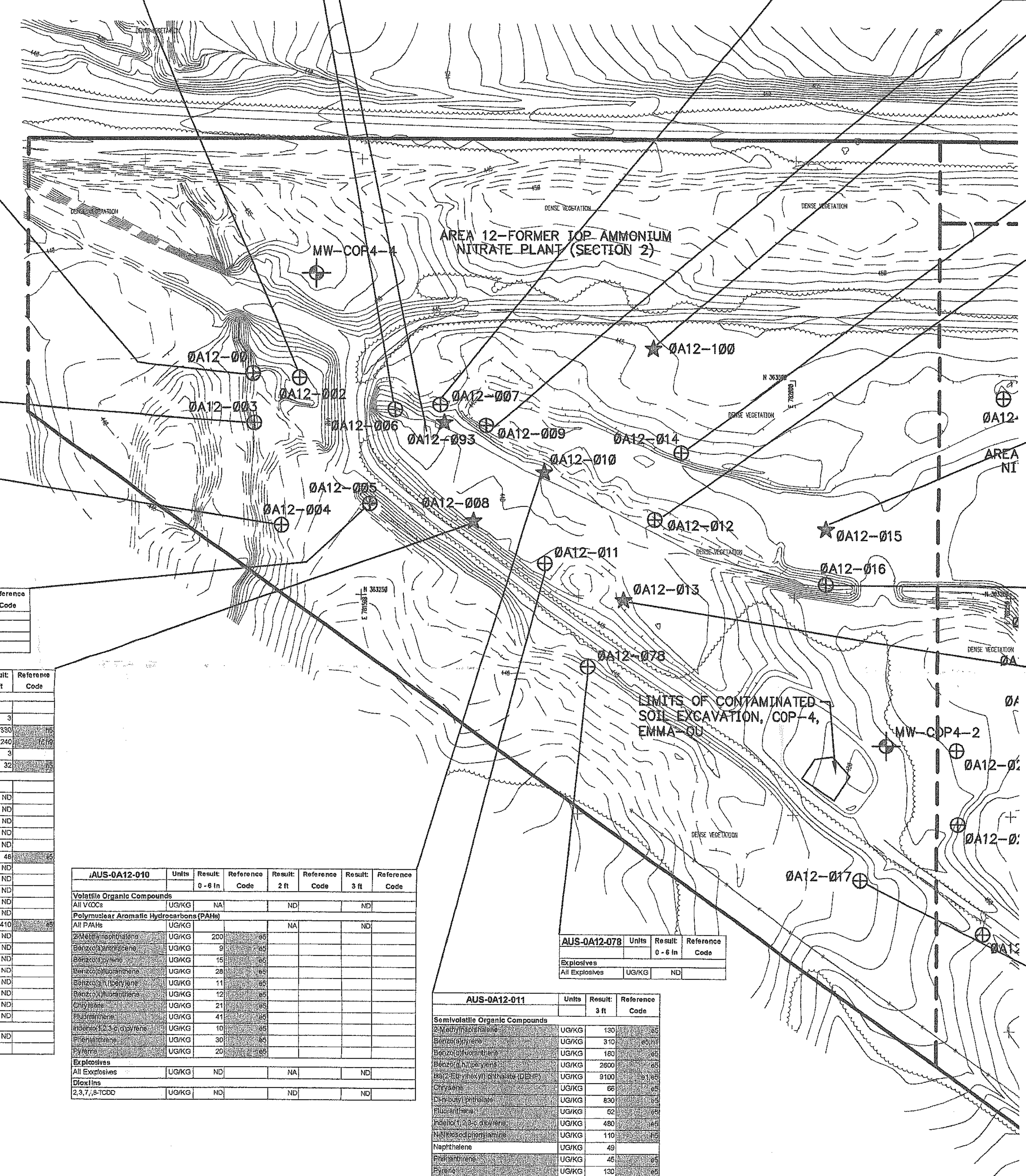
NOTES:

1. THIS DRAWING WAS OBTAINED FROM A FIELD SKETCH SO LOCATIONS OF SITE FEATURES ARE APPROXIMATE.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

PA/SI REPORT–AUS OU CRAB ORCHARD NWR MARION, ILLINOIS		PROJECT NO. 2320000026.00
URS		
DRN. BY: djd 12/27/ØØ DSGN. BY: mam CHKD. BY: cmw	AUS–ØA12–Section 1 Sample Locations and Detections in Surface Water and Trench Water	FIG. NO. 2Ø–9



AUS-0A12-001 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	180	e2,e5
Benzo(a)anthracene	UG/KG	120	e2,e5,h5
Benzo(a)pyrene	UG/KG	130	e5
Benzo(b)fluoranthene	UG/KG	200	e2,e5
Benzo(g,h,i)perylene	UG/KG	110	e2,e5
Benzo(k)fluoranthene	UG/KG	79	e2,e5
Chrysene	UG/KG	140	e5
Di-n-butyl phthalate	UG/KG	1700	e5
Fluoranthene	UG/KG	140	e5
N-Nitrosodiphenylamine	UG/KG	420	h5
Naphthalene	UG/KG	75	
Phenanthrene	UG/KG	90	e5
Pyrene	UG/KG	160	e5
Explosives			
2,4-Dinitrotoluene	UG/KG	630	h5,h9

AUS-0A12-002	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA			
Tetrachloroethylene (PCE)	UG/KG			61	h5,h9
Trichloroethylene (TCE) (duplicate)	UG/KG			6	h5
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	110	e5		
Benzo(a)anthracene	UG/KG	180	e5,h5		
Benzo(a)pyrene	UG/KG	210	e5		
Benzo(b)fluoranthene	UG/KG	320	e5,h5		
Benzo(k)fluoranthene	UG/KG	120	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	64	e5		
Chrysene	UG/KG	200	e5		
Di-n-butyl phthalate	UG/KG	150	e5		
Fluoranthene	UG/KG	170	e5		
N-Nitrosodiphenylamine	UG/KG	560	h5		
Naphthalene	UG/KG	64			
Phenanthrene	UG/KG	110	e5		
Pyrene	UG/KG	220	e5		

AUS-0A12-006	Units	Result: 0 - 6 in	Reference Code
Explosives			
2,4-Dinitrotoluene	UG/KG	1300	e1,h5,h9
RDX	UG/KG	2400	

AUS-0A12-093	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 3 ft	Reference Code	Result: 5 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA							
1,2-Dichloroethene (total)	UG/KG			ND		6		ND	
cis-1,2-Dichloroethene	UG/KG			ND		5		ND	
Tetrachloroethylene (PCE)	UG/KG			4	h5	ND		1	
Trichloroethylene (TCE)	UG/KG			4	h5	5	h5	3	
Polynuclear Aromatic Hydrocarbons (PAHs)									
All PAHs	UG/KG			NA					
1-Methylnaphthalene	UG/KG	3900				ND		150	
2-Methylnaphthalene	UG/KG	9100	e1,e5			48	e5	330	e5
Acenaphthene	UG/KG	1300	e5			ND		ND	
Acenaphthylene	UG/KG	2400				ND		ND	
Anthracene	UG/KG	330	e5			ND		ND	
Benzo(a)anthracene	UG/KG	220	e5,h5			ND		ND	
Benzo(a)pyrene	UG/KG	260	e5			ND		11	e5
Benzo(b)fluoranthene	UG/KG	250	e5,h5			ND		12	e5
Benzo(g,h,i)perylene	UG/KG	98	e5			ND		ND	
Benzo(k)fluoranthene	UG/KG	69	e5			ND		ND	
Chrysene	UG/KG	1800	e5			ND		53	e5
Fluoranthene	UG/KG	990	e5			ND		41	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	61	e5			ND		ND	
Naphthalene	UG/KG	670				ND		72	
Phenanthrene	UG/KG	1900	e5			12	e5	71	e5
Pyrene	UG/KG	400	e5			ND		16	e5
Explosives									
All Explosives	UG/KG			NA		ND		ND	
RDX	UG/KG	2700							
Dioxins									
2,3,7,8-TCDD	UG/KG	ND		ND		ND		ND	

AUS-0A12-007	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
1-Methylnaphthalene	UG/KG	930	
2-Methylnaphthalene	UG/KG	1900	e5
Acenaphthene	UG/KG	120	e5
Anthracene	UG/KG	94	e5
Benzo(a)anthracene	UG/KG	90	e5,h5
Benzo(a)pyrene	UG/KG	78	e5
Benzo(b)fluoranthene	UG/KG	110	e5
Benzo(g,h,i)perylene	UG/KG	47	e5
Benzo(k)fluoranthene	UG/KG	27	e5
Chrysene	UG/KG	290	e5
Fluoranthene	UG/KG	250	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	11	e5
Naphthalene	UG/KG	730	
Phenanthrene	UG/KG	410	e5
Pyrene	UG/KG	99	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-009	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
1-Methylnaphthalene	UG/KG	900	
2-Methylnaphthalene	UG/KG	1900	e5
Anthracene	UG/KG	67	e5
Benzo(a)anthracene	UG/KG	110	e5,h5
Benzo(a)pyrene	UG/KG	140	e5
Benzo(b)fluoranthene	UG/KG	200	e5
Benzo(g,h,i)perylene	UG/KG	110	e5
Benzo(k)fluoranthene	UG/KG	72	e5
Chrysene	UG/KG	340	e5
Dibenz(a,h)anthracene	UG/KG	16	e5
Fluoranthene	UG/KG	260	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	61	e5
Naphthalene	UG/KG	700	
Phenanthrene	UG/KG	460	e5
Pyrene	UG/KG	210	e5
Explosives			
RDX	UG/KG	1600	

AUS-0A12-100	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code	Result: 5 ft	Reference Code	Result: 14 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA							
Carbon tetrachloride	UG/KG			23	h5	45	h5	360	h5,h9
Chloroform	UG/KG			5		14		100	h5
Methylene chloride	UG/KG			ND		ND		34	h5,h9
Polynuclear Aromatic Hydrocarbons (PAHs)									
All PAHs	UG/KG			NA		ND		ND	
2-Methylnaphthalene	UG/KG	45	e5						
Fluoranthene	UG/KG	8.2	e5						
Phenanthrene	UG/KG	8.1	e5						
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

AUS-0A12-014	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-012	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
2-Methylnaphthalene	UG/KG	150	e5
Anthracene	UG/KG	9.4	e5
Benzo(a)anthracene	UG/KG	11	e5
Benzo(a)pyrene	UG/KG	12	e5
Benzo(b)fluoranthene	UG/KG	18	e5
Chrysene	UG/KG	24	e5
Fluoranthene	UG/KG	30	e5
Naphthalene	UG/KG	230	
Phenanthrene	UG/KG	30	e5
Pyrene	UG/KG	17	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-015	Units	Result: 0 - 6 in	Reference Code	Result: 1 ft	Reference Code	Result: 5 ft	Reference Code	Result: 11 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND				ND	
Acetone	UG/KG					33			
Polynuclear Aromatic Hydrocarbons (PAHs)									
All PAHs	UG/KG	ND		NA		ND		ND	
Explosives									
All Explosives	UG/KG			NA		ND		ND	
2,4,6-Trinitrotoluene (TNT)	UG/KG	930							
HMX	UG/KG	39000	e1						
RDX	UG/KG	17000							

AUS-0A12-016	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-013	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 3 ft	Reference Code	Result: 5 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA							
1,2-Dichloroethene (total)	UG/KG			ND		ND		6	
cis-1,2-Dichloroethene	UG/KG			ND		ND		6	
Tetrachloroethylene (PCE)	UG/KG			7	h5	2		ND	
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA				ND	
2,6-Dinitrotoluene	UG/KG	92	e1,h5,h9			ND			
2-Methylnaphthalene	UG/KG	470	e5			ND			
Benzo(a)anthracene	UG/KG	72	e5			ND			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	290	e5			60	e5		
Chrysene	UG/KG	86	e5			ND			
Di-n-butyl phthalate	UG/KG	940	e5			ND			
Dibenzofuran	UG/KG	130	e5			ND			
Fluoranthene	UG/KG	54	e5			ND			
Naphthalene	UG/KG	180				ND			
Phenanthrene	UG/KG	240	e5			ND			
Pyrene	UG/KG	170	e5			ND			
Explosives									
All Explosives	UG/KG			NA		ND		ND	
2,4-Dinitrotoluene	UG/KG	490	h5,h9						
HMX	UG/KG	2200							
RDX	UG/KG	6000							

AUS-0A12-017	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-003 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-004	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA			
Tetrachloroethylene (PCE)	UG/KG			10	h5
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-005 *Sediment*	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-008	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 3 ft	Reference Code	Result: 5 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA							
Chloroform	UG/KG			260	h5	11		3	
cis-1,2-Dichloroethene	UG/KG			490	h5,h9	320	h5	330	h5
Tetrachloroethylene (PCE)	UG/KG			2200	h5,h9	780	h5,h9	240	h5,h9
trans-1,2-Dichloroethene	UG/KG			ND		5		3	
Trichloroethylene (TCE)	UG/KG			51	h5	44	h5	32	h5
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA		ND			
2,4-Dinitrotoluene	UG/KG	130	h5,h9					ND	
2-Methylnaphthalene	UG/KG	290	e5					ND	
Anthracene	UG/KG	110	e5					ND	
Benzo(a)anthracene	UG/KG	290	e5,h5					ND	
Benzo(a)pyrene	UG/KG	370	e5,h1					ND	
Benzo(b)fluoranthene	UG/KG	330	e5,h5					48	e5
Benzo(g,h,i)perylene	UG/KG	330	e5					ND	
Benzo(k)fluoranthene	UG/KG	400	e5					ND	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	200	e5					ND	
Carbazole	UG/KG	58	e5,h5					ND	
Chrysene	UG/KG	440	e5					ND	
Di-n-butyl phthalate	UG/KG	1100	e5					410	e5
Dibenz(a,h)anthracene	UG/KG	84	e5,h5					ND	
Dibenzofuran	UG/KG	120	e5					ND	
Fluoranthene	UG/KG	460	e5					ND	
Indeno(1,2,3-c,d)pyrene	UG/KG	260	e5					ND	
N-Nitrosodiphenylamine	UG/KG	370	h5					ND	
Naphthalene	UG/KG	120						ND	
Phenanthrene	UG/KG	490	e5					ND	
Pyrene	UG/KG	440	e5					ND	
Explosives									
All Explosives	UG/KG			NA		ND		ND	
RDX	UG/KG	1600							

AUS-0A12-010	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 3 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)							
All PAHs	UG/KG			NA		ND	
2-Methylnaphthalene	UG/KG	200	e5				
Benzo(a)anthracene	UG/KG	9	e5				
Benzo(a)pyrene	UG/KG	15	e5				
Benzo(b)fluoranthene	UG/KG	28	e5				
Benzo(g,h,i)perylene	UG/KG	11	e5				
Benzo(k)fluoranthene	UG/KG	12	e5				
Chrysene	UG/KG	21	e5				
Fluoranthene	UG/KG	41	e5				
Indeno(1,2,3-c,d)pyrene	UG/KG	10	e5				
Phenanthrene	UG/KG	30	e5				
Pyrene	UG/KG	20	e5				
Explosives							
All Explosives	UG/KG	ND		NA		ND	
Dioxins							
2,3,7,8-TCDD	UG/KG	ND		ND		ND	

AUS-0A12-078	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-011	Units	Result: 3 ft	Reference Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	130	e5
Benzo(a)pyrene	UG/KG	310	e5,h1
Benzo(b)fluoranthene	UG/KG	180	e5
Benzo(g,h,i)perylene	UG/KG	2600	e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	9100	e1,e5
Chrysene	UG/KG	66	e5
Di-n-butyl phthalate	UG/KG	830	e5
Fluoranthene	UG/KG	52	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	480	e5
N-Nitrosodiphenylamine	UG/KG	110	h5
Naphthalene	UG/KG	49	
Phenanthrene	UG/KG	45	e5
Pyrene	UG/KG	130	e5
Explosives			
All Explosives	UG/KG	ND	

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12—AMMONIUM NITRATE PLANT

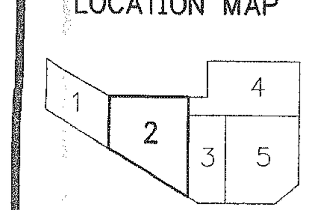
Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT—AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

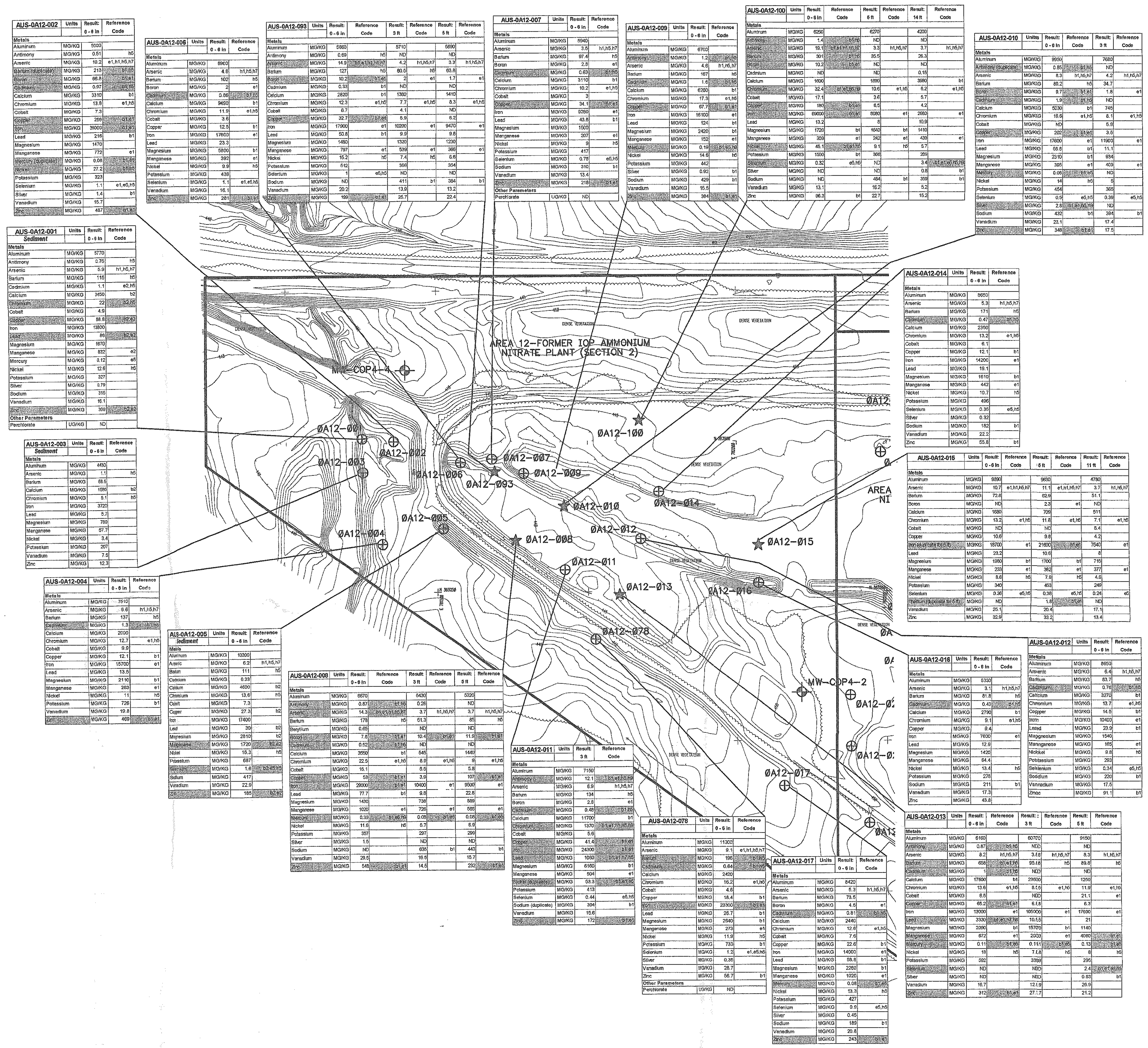
AUS—ØA12—Section 2—Sample Locations and Detections of Organic Compounds in Soils/Sediments

AREA 12—SECTION LOCATION MAP



Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-10
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS



LEGEND

⌖ MONITORING WELL LOCATION

⊕ HAND AUGER LOCATION

★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

100 0 100

SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

AREA 12—AMMONIUM NITRATE PLANT

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12-Section 2-Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

AREA 12-SECTION LOCATION MAP

1 2 3 4 5

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-11
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11x17\AUS-0A12(INORGANIC).DWG Last edited: AUG. 06, 01 @ 10:55 a.m. URS Corp.

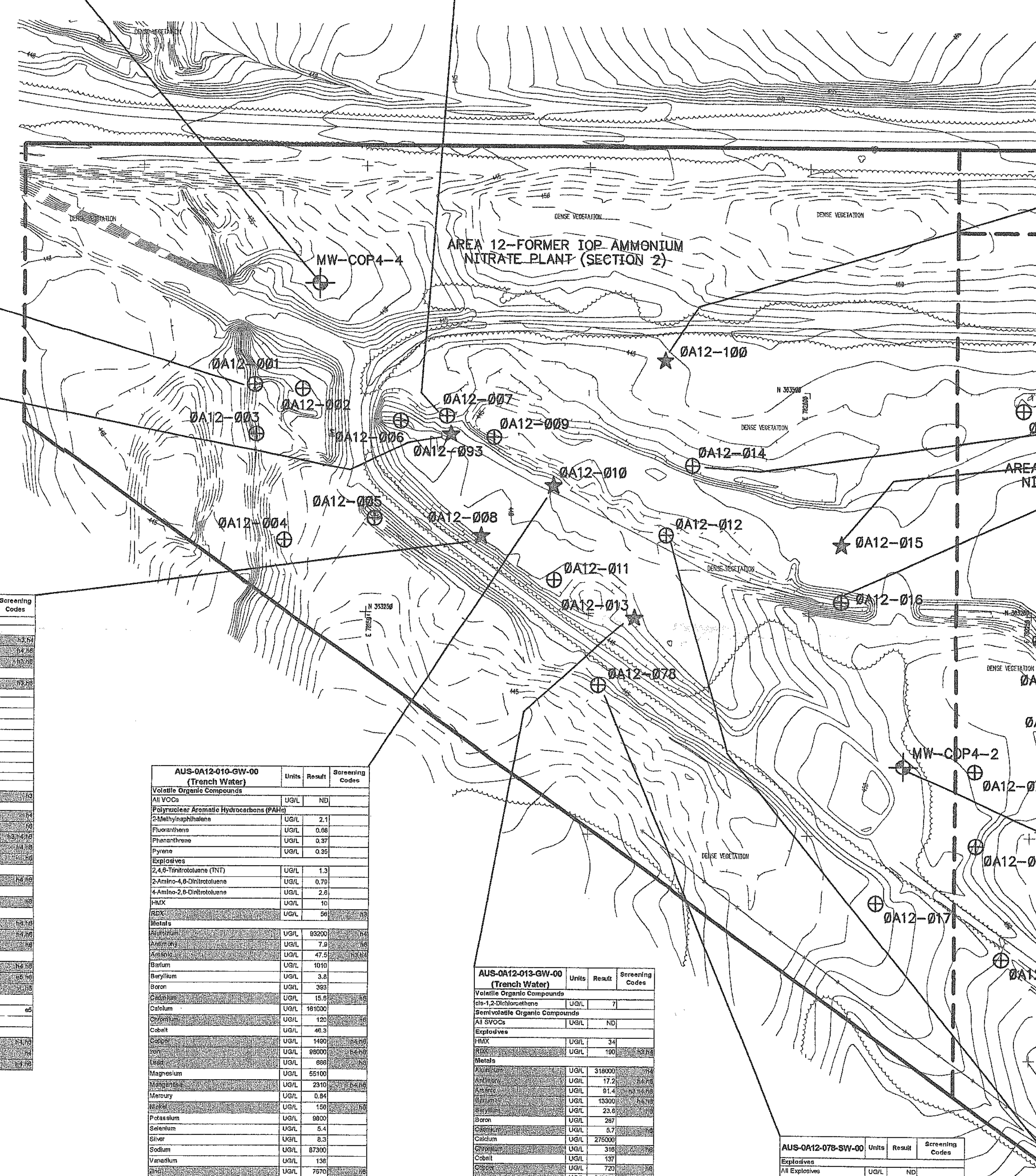
LEGEND

MONITORING WELL LOCATION

HAND AUGER LOCATION

TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-MW-COP4-4-GW	Units	Result	Screening Codes
Volatile Organic Compounds			
Tetrachloroethylene (PCE)	UG/L	0.7	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	339	
Barium	UG/L	35.4	
Calcium	UG/L	79000	
Iron	UG/L	302	
Magnesium	UG/L	81000	
Manganese	UG/L	166	h6
Nickel	UG/L	1.9	
Sodium	UG/L	338000	
Zinc	UG/L	2.8	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	490	
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	69.2	h4,h6
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.19	h4
Sulfate (as SO4)	UG/L	750000	h6
TDS	MG/L	1590	h6
TSS	MG/L	11.5	

AUS-0A12-007-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
HMX	UG/L	3.6	
RDX	UG/L	2.9	
Metals			
Aluminum	UG/L	856	b3,e3
Barium	UG/L	40.9	b3
Boron	UG/L	68.2	
Calcium	UG/L	59100	b3
Chromium	UG/L	0.98	
Iron	UG/L	948	b3
Lead	UG/L	1.1	
Magnesium	UG/L	26100	b3
Manganese	UG/L	73	
Potassium	UG/L	2270	b3
Sodium	UG/L	32600	b3
Zinc	UG/L	16.3	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	201	b3
Nitrogen, Ammonia (as N)	MG/L	0.75	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.3	b3
Sulfate (as SO4)	UG/L	160000	
TDS	MG/L	472	b3
TSS	MG/L	30	b3

AUS-0A12-001-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	0.8	
Tetrachloroethylene (PCE)	UG/L	22	
Trichloroethylene (TCE)	UG/L	1	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	7.9	
RDX	UG/L	25	
Metals			
Aluminum	UG/L	496	b3,e3
Barium	UG/L	60	b3
Boron	UG/L	59.1	
Calcium	UG/L	77300	b3
Iron	UG/L	664	b3
Magnesium	UG/L	39000	b3
Manganese	UG/L	46.6	
Mercury	UG/L	0.14	e5,h10
Potassium	UG/L	2710	b3
Sodium	UG/L	61200	b3
Zinc	UG/L	27.3	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.53	b3
Nitrogen, Nitrate-Nitrite	MG/L	2.1	b3
Perchlorate	UG/L	ND	

AUS-0A12-093-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	8	
Tetrachloroethylene (PCE)	UG/L	7	h3,h6
Trichloroethylene (TCE)	UG/L	5	h3
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
HMX	UG/L	3.4	
RDX	UG/L	4.3	h3
Metals			
Aluminum	UG/L	227000	h4
Antimony	UG/L	4.3	
Arsenic	UG/L	116	h3,h4,h6
Barium	UG/L	2050	h6
Beryllium	UG/L	13.3	h6
Boron	UG/L	262	
Cadmium	UG/L	4.7	
Calcium	UG/L	149000	
Chromium	UG/L	254	h6
Cobalt	UG/L	126	
Copper	UG/L	521	
Iron	UG/L	227000	h4,h6
Lead	UG/L	440	h6
Magnesium	UG/L	76000	
Manganese	UG/L	7520	h4,h6
Nickel	UG/L	267	h6
Potassium	UG/L	18500	
Selenium	UG/L	29.4	
Silver	UG/L	5.9	
Sodium	UG/L	66000	
Thallium	UG/L	2.7	h4,h6
Vanadium	UG/L	330	h4
Zinc	UG/L	3460	

AUS-0A12-008-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
2-Butanone (MEK)	UG/L	4	
Chloroform	UG/L	28	h3,h4
cis-1,2-Dichloroethene	UG/L	130	h4,h6
Tetrachloroethylene (PCE)	UG/L	54	h3,h6
trans-1,2-Dichloroethene	UG/L	1	
Trichloroethylene (TCE)	UG/L	6	h3,h6
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	1.1	
Chrysene	UG/L	1.8	
Di-n-butyl phthalate	UG/L	1.1	
Diethyl phthalate	UG/L	2	
Fluoranthene	UG/L	2.1	
Phenanthrene	UG/L	1.2	
Pyrene	UG/L	1.6	
Explosives			
HMX	UG/L	8	
RDX	UG/L	25	h3
Metals			
Aluminum	UG/L	500000	h4
Antimony	UG/L	8.7	h6
Arsenic	UG/L	142	h3,h4,h6
Barium	UG/L	6570	h4,h6
Beryllium	UG/L	22.3	h6
Boron	UG/L	896	
Cadmium	UG/L	20.5	h4,h6
Calcium	UG/L	236000	
Chromium	UG/L	736	h6
Cobalt	UG/L	302	
Copper	UG/L	5150	h4,h6
Iron	UG/L	417000	h4,h6
Lead	UG/L	2880	h6
Magnesium	UG/L	102000	
Manganese	UG/L	27400	h4,h6
Mercury	UG/L	4.1	e5,h6
Nickel	UG/L	515	h6
Potassium	UG/L	30800	
Selenium	UG/L	18.9	e5
Silver	UG/L	23.4	
Sodium	UG/L	137000	
Thallium	UG/L	3.2	h4,h6
Vanadium	UG/L	562	h4
Zinc	UG/L	58500	h4,h6

AUS-0A12-010-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
2-Methylnaphthalene	UG/L	2.1	
Fluoranthene	UG/L	0.68	
Phenanthrene	UG/L	0.37	
Pyrene	UG/L	0.35	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	1.3	
2-Amino-4,6-Dinitrotoluene	UG/L	0.79	
4-Amino-2,6-Dinitrotoluene	UG/L	2.6	
HMX	UG/L	10	
RDX	UG/L	56	h3
Metals			
Aluminum	UG/L	93200	h4
Antimony	UG/L	7.9	h6
Arsenic	UG/L	47.5	h3,h4
Barium	UG/L	1010	
Beryllium	UG/L	3.8	
Boron	UG/L	393	
Cadmium	UG/L	15.6	h6
Calcium	UG/L	161000	
Chromium	UG/L	120	h6
Cobalt	UG/L	46.3	
Copper	UG/L	1490	h4,h6
Iron	UG/L	98000	h4,h6
Lead	UG/L	666	h6
Magnesium	UG/L	55100	
Manganese	UG/L	2310	h4,h6
Mercury	UG/L	0.84	
Nickel	UG/L	156	h6
Potassium	UG/L	9800	
Selenium	UG/L	5.4	
Silver	UG/L	8.3	
Sodium	UG/L	87300	
Vanadium	UG/L	138	
Zinc	UG/L	7570	h6
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.38	
Nitrogen, Nitrate-Nitrite	MG/L	0.27	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	2.9	h4
Phosphorus, Total Orthophosphate (as P)	MG/L	5.6	

AUS-0A12-013-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	7	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	34	
RDX	UG/L	190	h3,h4
Metals			
Aluminum	UG/L	318000	h4
Antimony	UG/L	17.2	h4,h6
Arsenic	UG/L	91.4	h3,h4,h6
Barium	UG/L	13300	h4,h6
Beryllium	UG/L	23.6	h6
Boron	UG/L	287	
Cadmium	UG/L	5.7	h6
Calcium	UG/L	275000	
Chromium	UG/L	316	h6
Cobalt	UG/L	137	
Copper	UG/L	720	h6
Iron	UG/L	240000	h4,h6
Lead	UG/L	2660	h6
Magnesium	UG/L	137000	
Manganese	UG/L	9810	h4,h6
Mercury	UG/L	0.78	
Nickel	UG/L	354	h6
Potassium	UG/L	21500	
Selenium	UG/L	13.7	
Sodium	UG/L	82700	
Thallium	UG/L	1.8	
Vanadium	UG/L	333	h4
Zinc	UG/L	4080	

AUS-0A12-078-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	52000	b3,e3
Arsenic	UG/L	33.1	b3
Barium	UG/L	947	b3
Beryllium	UG/L	12.2	b3,e3
Boron	UG/L	398	
Calcium	UG/L	214000	b3,e3
Chromium	UG/L	47.9	b3
Cobalt	UG/L	73	b3,e3
Copper	UG/L	12.2	b3,e3,e4
Iron	UG/L	136000	b3,e3,e4,h10
Lead	UG/L	45.9	b3,e3,e4
Magnesium	UG/L	93900	b3,e3
Manganese	UG/L	4700	b3,e3,e4,h10
Nickel	UG/L	111	b3
Potassium	UG/L	15100	b3
Selenium	UG/L	5.9	b3,e5
Sodium	UG/L	76400	b3
Vanadium	UG/L	234	b3,e3
Zinc	UG/L	667	b3
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A12-100-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
1,2-Dichloroethane (EDC)	UG/L	39	h3,h4,h6
Carbon tetrachloride	UG/L	1200	h3,h4,h6
Chloroform	UG/L	630	h3,h4
Methylene chloride	UG/L	220	h3,h6
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
Nitrobenzene	UG/L	1	
RDX	UG/L	1.3	h3
Metals			
Aluminum	UG/L	106000	h4
Arsenic	UG/L	71.2	h3,h4,h6
Barium	UG/L	578	
Beryllium	UG/L	5.8	h6
Boron	UG/L	186	
Calcium	UG/L	80000	
Chromium	UG/L	137	h6
Cobalt	UG/L	103	
Copper	UG/L	84.9	
Iron	UG/L	193000	h4,h6
Lead	UG/L	73.9	h6
Magnesium	UG/L	81000	
Manganese	UG/L	3760	h4,h6
Mercury	UG/L	36.9	h6
Nickel	UG/L	201	h6
Potassium	UG/L	12500	
Selenium	UG/L	5	
Sodium	UG/L	167000	
Vanadium	UG/L	141	
Zinc	UG/L	539	

AUS-0A12-014-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2570	b3,e3
Barium	UG/L	74.5	b3
Beryllium	UG/L	0.13	
Calcium	UG/L	28300	b3
Cobalt	UG/L	4.9	e3
Iron	UG/L	5800	b3,e3,e4,h10
Magnesium	UG/L	11200	b3
Manganese	UG/L	676	b3
Nickel	UG/L	6.8	
Potassium	UG/L	3330	b3
Selenium	UG/L	2.1	e5
Sodium	UG/L	7180	b3
Zinc	UG/L	29.4	b3

AUS-0A12-015-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	3	h3
4-Amino-2,6-Dinitrotoluene	UG/L	0.62	
HMX	UG/L	54	
RDX	UG/L	890	h3,h4
Metals			
Aluminum	UG/L	33400	
Barium	UG/L	339	
Boron	UG/L	156	
Calcium	UG/L	97100	
Chromium	UG/L	31.8	
Cobalt	UG/L	31.3	
Copper	UG/L	30.7	
Iron	UG/L	39700	h4,h6
Lead	UG/L	45.5	h6
Magnesium	UG/L	55600	
Manganese	UG/L	8140	h4,h6
Nickel	UG/L	30.6	
Potassium	UG/L	3360	
Selenium	UG/L	6.5	
Sodium	UG/L	71700	
Vanadium	UG/L	52.4	
Zinc	UG/L	126	

AUS-0A12-016-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	2.9	
RDX	UG/L	0.64	
Metals			
Aluminum (duplicate)	UG/L	14400	b3,e3
Barium	UG/L	47.4	b3
Beryllium (duplicate)	UG/L	1.4	e3
Boron	UG/L	254	
Calcium	UG/L	91500	b3
Chromium (duplicate)	UG/L	13.3	b3
Cobalt (duplicate)	UG/L	19	e3
Copper (duplicate)	UG/L	16.9	b3,e3,e4
Iron	UG/L	1210	b3,e3,e4,h10
Lead (duplicate)	UG/L	17.1	b3
Magnesium	UG/L	40300	b3
Manganese (duplicate)	UG/L	2830	b3,e3,e4,h10
Nickel (duplicate)	UG/L	18.5	b3
Potassium	UG/L	2740	b3
Selenium (duplicate)	UG/L	3.8	b3,e5
Sodium	UG/L	22600	b3
Vanadium (duplicate)	UG/L	37.3	e3
Zinc	UG/L	16	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.45	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-0A12-MW-COP4-2-GW	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
RDX	UG/L	1.1	h3
Metals			
Barium	UG/L	33.4	
Boron	UG/L	224	
Calcium	UG/L	122000	
Magnesium	UG/L	80100	
Manganese	UG/L	78	
Potassium	UG/L	1220	
Sodium	UG/L	43100	
Zinc	UG/L	2.4	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A12-012-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
HMX	UG/L	0.99	
Metals			
Aluminum	UG/L	282	b3,e3
Antimony (duplicate)	UG/L	8.1	b3
Arsenic (duplicate)	UG/L	30.6	b3
Barium	UG/L	38.1	b3
Beryllium (duplicate)	UG/L	0.85	e3
Boron	UG/L	202	
Calcium	UG/L	74000	b3
Chromium (duplicate)	UG/L	4	
Cobalt (duplicate)	UG/L	9.3	e3
Copper	UG/L	135	b3,e3,e4
Iron	UG/L	478	b3
Magnesium	UG/L	34500	b3
Manganese	UG/L	102	
Nickel	UG/L	144	b3
Selenium (duplicate)	UG/L	31.3	b3,e5
Silver (duplicate)	UG/L	9	e3,e4,h10
Sodium	UG/L	22200	b3
Zinc	UG/L	79.8	b3
Other Parameters			
Sulfate (as SO4)	UG/L	120000	

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12–AMMONIUM NITRATE PLANT

AREA 12–SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

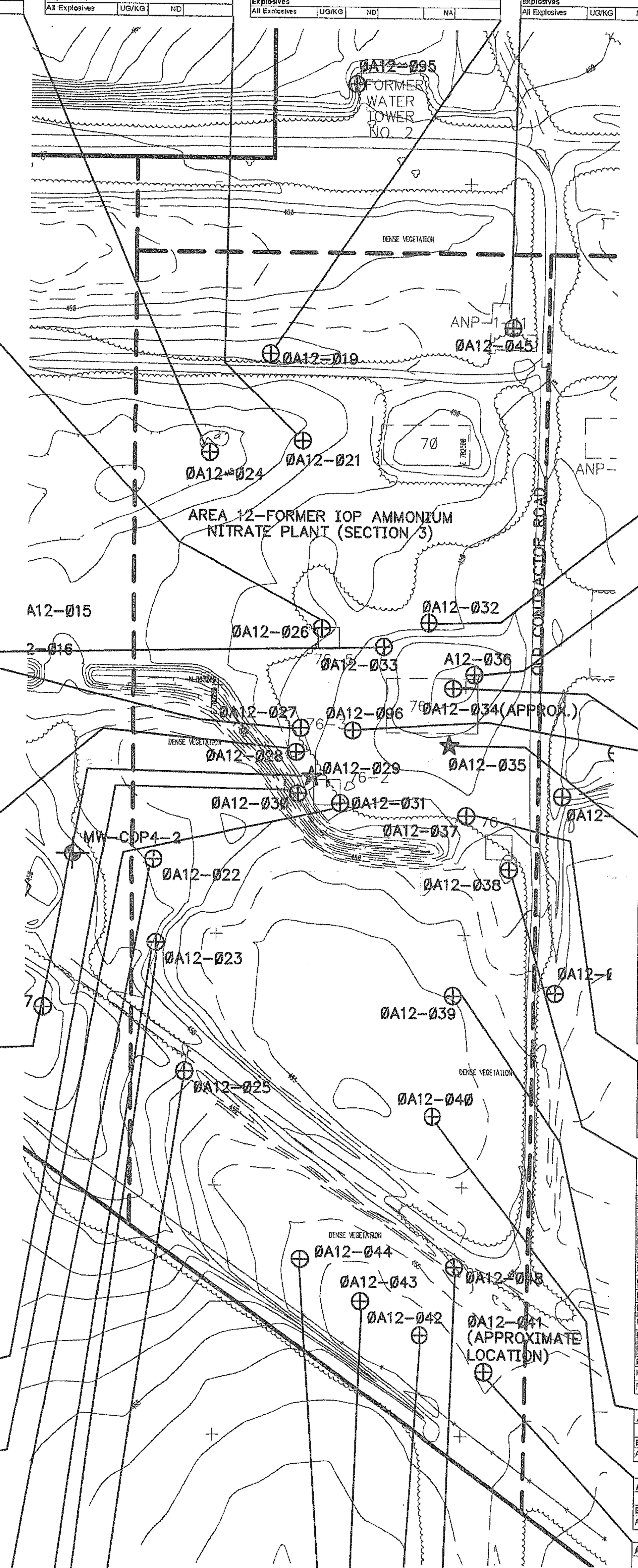
AUS–ØA12–Section 2–Sample Locations and Detections in Surface Water, Trench Water and Groundwater

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20–12
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA–SI REPORT–AUS OU\AUS–SAMPLE LOCATION 11x17\AUS–ØA12(WATER).DWG Last edited: AUG. 16, 01 @ 6:58 p.m. URS Corp.

AREA 12–AMMONIUM NITRATE PLANT



AUS-0A12-024	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	200	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-021	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-019	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-045	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-026	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	630	e5		
Anthracene	UG/KG	44	e5		
Benzo(a)anthracene	UG/KG	120	e5,h5		
Benzo(a)pyrene	UG/KG	99	e5		
Benzo(b)fluoranthene	UG/KG	91	e5		
Benzo(g,h,i)perylene	UG/KG	48	e5		
Benzo(k)fluoranthene	UG/KG	89	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	50	e5		
Chrysene	UG/KG	150	e5		
Di-n-butyl phthalate	UG/KG	45	e5		
Dibenzofuran	UG/KG	240	e5		
Fluoranthene	UG/KG	150	e5		
Naphthalene	UG/KG	230			
Phenanthrene	UG/KG	530	e5		
Pyrene	UG/KG	200	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-033	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	1100	e5		
Anthracene	UG/KG	59	e5		
Benzo(a)anthracene	UG/KG	140	e5,h5		
Benzo(a)pyrene	UG/KG	83	e5		
Benzo(b)fluoranthene	UG/KG	67	e5		
Benzo(g,h,i)perylene	UG/KG	43	e5		
Benzo(k)fluoranthene	UG/KG	77	e5		
Carbazole	UG/KG	45	e5,h5		
Chrysene	UG/KG	160	e5		
Di-n-butyl phthalate	UG/KG	41	e5		
Dibenzofuran	UG/KG	320	e5		
Fluoranthene	UG/KG	150	e5		
Naphthalene	UG/KG	510			
Phenanthrene	UG/KG	660	e5		
Pyrene	UG/KG	230	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-027	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	87	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	46	e5		
Phenanthrene	UG/KG	84	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-028	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Comppounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic (Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	580	e5		
Anthracene	UG/KG	53	e5		
Benzo(a)anthracene	UG/KG	90	e5,h5		
Chrysene	UG/KG	95	e5		
Dibenzofuran	UG/KG	230	e5		
Fluoranthene	UG/KG	94	e5		
Naphthalene	UG/KG	180			
Phenanthrene	UG/KG	430	e5		
Pyrene	UG/KG	120	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-029	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code	Result: 12 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA				ND	
2-Methylnaphthalene	UG/KG	970	e5			42	e5		
Acenaphthylene	UG/KG	49				ND			
Anthracene	UG/KG	100	e5			ND			
Benzo(a)anthracene	UG/KG	320	e5,h5			ND			
Benzo(a)pyrene	UG/KG	230	e5			ND			
Benzo(b)fluoranthene	UG/KG	200	e5			ND			
Benzo(k)fluoranthene	UG/KG	250	e5			ND			
Carbazole	UG/KG	67	e5,h5			ND			
Chrysene	UG/KG	330	e5			ND			
Dibenzofuran	UG/KG	310	e5			ND			
Fluoranthene	UG/KG	650	e5			ND			
Indeno(1,2,3-c,d)pyrene	UG/KG	94	e5			ND			
Naphthalene	UG/KG	320				ND			
Phenanthrene	UG/KG	820	e5			49	e5		
Pyrene	UG/KG	750	e5			ND			
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

AUS-0A12-030	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	410	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-031	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	90	e5		
Chrysene	UG/KG	41	e5		
Fluoranthene	UG/KG	50	e5		
Pentachlorophenol	UG/KG	1500	e5,h5,h9		
Pyrene	UG/KG	60	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-022	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
Benzo(a)pyrene	UG/KG	23	e5
Benzo(b)fluoranthene	UG/KG	25	e5
Benzo(g,h,i)perylene	UG/KG	20	e5
Chrysene	UG/KG	27	e5
Fluoranthene	UG/KG	24	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	12	e5
Phenanthrene	UG/KG	7.6	e5
Pyrene	UG/KG	22	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-023-DRUM	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/KG	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	56	e5

AUS-0A12-025	Units	Result: 0 - 6 in	Reference Code
Polynuclear Aromatic Hydrocarbons (PAHs)			
Fluoranthene	UG/KG	9.8	e5
Phenanthrene	UG/KG	9.4	e5

AUS-0A12-044	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-023	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	

AUS-0A12-043	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	59	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-042	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-048	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	110	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-032	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2-Methylnaphthalene	UG/KG	8900	e1,e5		
Acenaphthene	UG/KG	330	e5		
Anthracene	UG/KG	590	e5		
Benzo(a)anthracene	UG/KG	1100	e5,h5		
Benzo(a)pyrene	UG/KG	590	e5,h1,h5		
Benzo(b)fluoranthene	UG/KG	410	e5,h5		
Benzo(g,h,i)perylene	UG/KG	290	e5		
Benzo(k)fluoranthene	UG/KG	480	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	260	e5		
Carbazole	UG/KG	350	e5,h5		
Chrysene	UG/KG	1100	e5		
Di-n-butyl phthalate	UG/KG	210	e5		
Dibenz(a,h)anthracene	UG/KG	81	e5,h5		
Dibenzofuran	UG/KG	2800	e5		
Fluoranthene	UG/KG	780	e5		
Fluorene	UG/KG	270	e5		
Indeno(1,2,3-c,d)pyrene	UG/KG	160	e5		
Naphthalene	UG/KG	3900			
Phenanthrene	UG/KG	4800	e5		
Pyrene	UG/KG	1600	e5		
Explosives					
All Explosives	UG/KG			NA	
2,4,6-Trinitrotoluene (TNT)	UG/KG	1500			
4-Amino-2,6-Dinitrotoluene	UG/KG	4600			
4-Nitrotoluene (PNT)	UG/KG	6100			
HMX	UG/KG	7000			
RDX	UG/KG	3500			

AUS-0A12-036	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-034	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	ND		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG			500	e5
Explosives					
All Explosives	UG/KG	ND		ND	
Dioxins					
2,3,7,8-TCDD	UG/KG	ND		ND	

AUS-0A12-096	Units	Result: 0 - 6 in	Reference Code
Polychlorinated Biphenyls (PCB)			
PCB-1254	UG/KG	28	e5
PCB-1260	UG/KG	21	e5

AUS-0A12-035	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code	Result: 13 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA		ND		ND	
2-Methylnaphthalene	UG/KG	130	e5						
Benzo(a)anthracene	UG/KG	42	e5						
Chrysene	UG/KG	52	e5						
Dibenzofuran	UG/KG	44	e5						
Fluoranthene	UG/KG	41	e5						
Naphthalene	UG/KG	45							
Phenanthrene	UG/KG	120	e5						
Pyrene	UG/KG	64	e5						
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

AUS-0A12-037	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-038	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	440	e5
Benzo(a)anthracene	UG/KG	150	e5,h5
Benzo(a)pyrene	UG/KG	79	e5
Benzo(b)fluoranthene	UG/KG	68	e5
Benzo(k)fluoranthene	UG/KG	64	e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	53	e5
Chrysene	UG/KG	170	e5
Dibenzofuran	UG/KG	220	e5
Fluoranthene	UG/KG	190	e5
Naphthalene	UG/KG	120	
Phenanthrene	UG/KG	680	e5
Pyrene	UG/KG	220	e5
Explosives			
HMX	UG/KG	2300	
RDX	UG/KG	4900	

AUS-0A12-039	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-040	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-041	Units	Result: 2 ft	Reference Code
Volatile Organic Compounds			
All VOCs	UG/KG	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

LEGEND

- ⌖ MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

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SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12–SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

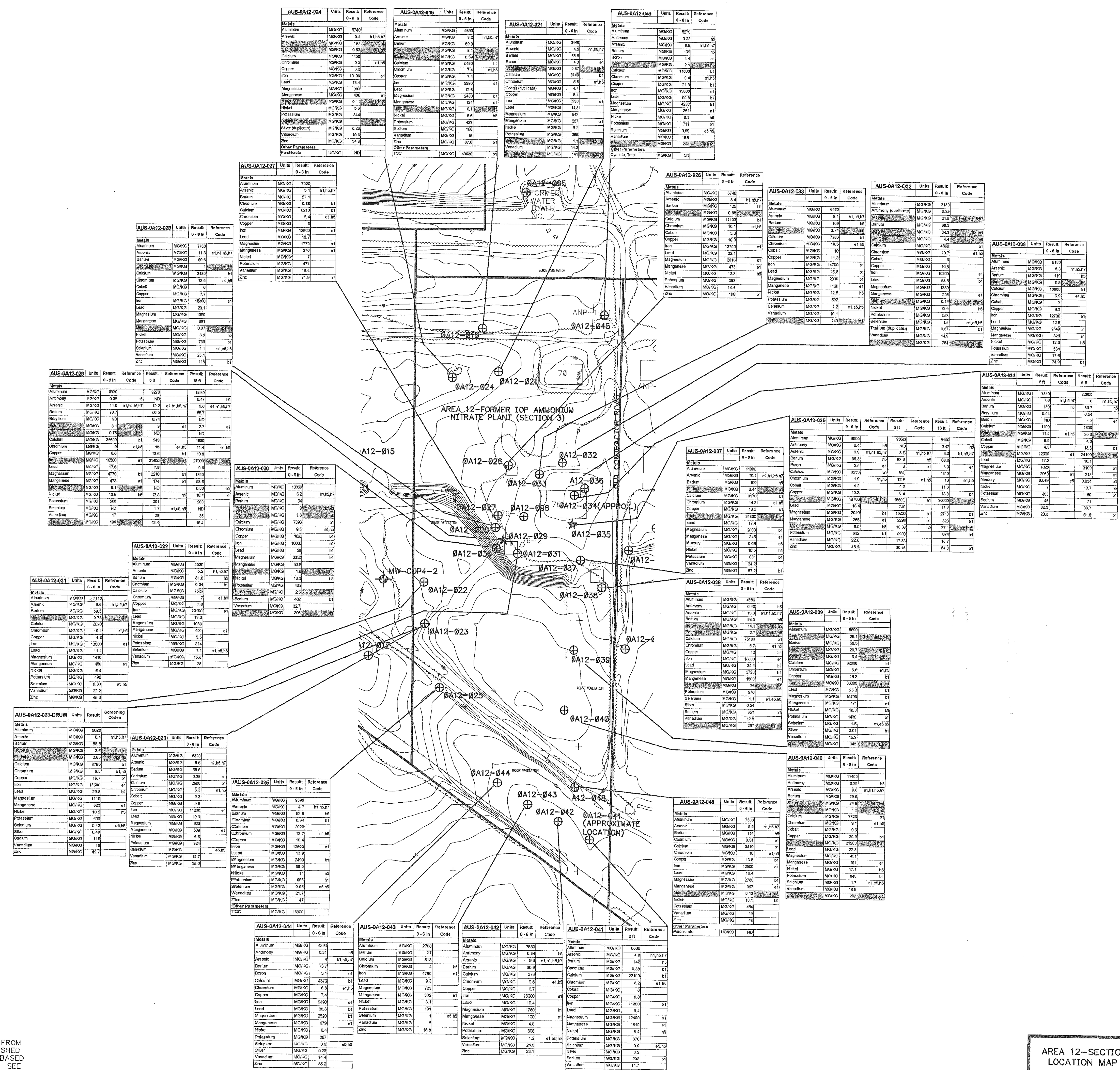
PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–ØA12–Section 3–Sample Locations and Detections of Organic Compounds in Soils/Drums

Date: 12/27/ØØ	Project Number: 2320ØØØØ26.ØØ	Figure Number: 2Ø–13
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\23200000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11&12\AUS-0A12(ORGANIC).DWG Last edited: AUG. 30, 01 @ 09:11 a.m. URS Corp.



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - carcinogenic	h1
USEPA Region IX Industrial Soil PRG - noncarcinogenic	h2
USEPA Region IX Tap Water PRG - carcinogenic	h3
USEPA Region IX Tap Water PRG - noncarcinogenic	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

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SCALE FEET

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–ØA12–Section 3–Sample Locations and Detections of Inorganic Compounds in Soils/Drums

AREA 12–SECTION LOCATION MAP

1 2 3 4 5

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20–14
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15–3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

AREA 12–AMMONIUM NITRATE PLANT

LEGEND

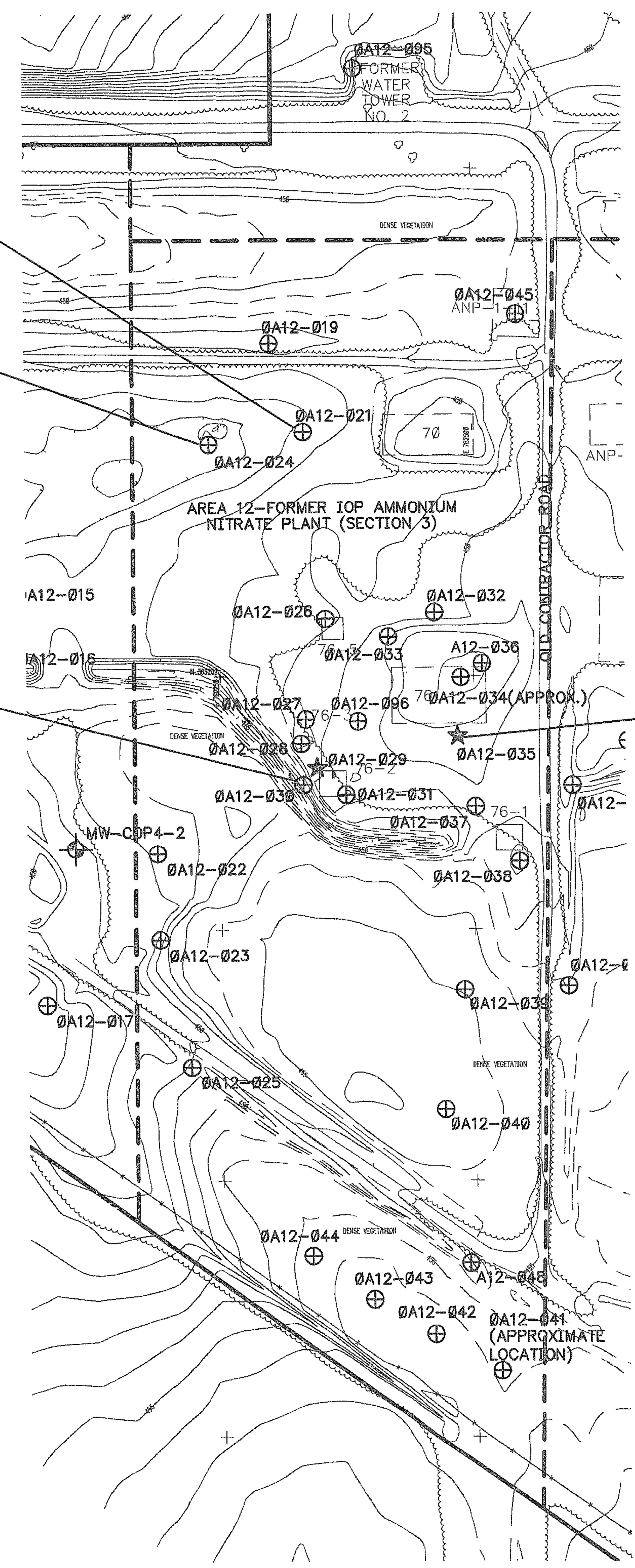
- MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-021-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	11300	b3,e3
Barium	UG/L	192	b3
Beryllium	UG/L	0.41	
Boron	UG/L	207	
Calcium	UG/L	74600	b3
Chromium	UG/L	11.1	b3
Cobalt	UG/L	8.5	e3
Copper	UG/L	12.1	b3,e3,e4
Iron	UG/L	11000	b3,e3,e4,h10
Lead	UG/L	12.6	b3
Magnesium	UG/L	27200	b3
Manganese	UG/L	924	b3
Nickel	UG/L	11.3	b3
Potassium	UG/L	3760	b3
Selenium	UG/L	3.5	b3,e5
Sodium	UG/L	12400	b3
Vanadium	UG/L	24.6	e3
Zinc	UG/L	106	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.64	b3
Nitrogen, Nitrate-Nitrite (duplicate)	MG/L	0.071	b3

AUS-0A12-024-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	1.5	e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	125	e3
Antimony	UG/L	1.6	
Barium	UG/L	108	b3
Calcium	UG/L	47600	b3
Copper	UG/L	6.3	
Iron	UG/L	1570	b3,e3,e4,h10
Magnesium	UG/L	16500	b3
Manganese	UG/L	319	
Potassium	UG/L	4000	b3
Selenium	UG/L	2.1	e5
Sodium	UG/L	10600	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	176	b3
Nitrogen, Ammonia (as N)	MG/L	0.25	
Nitrogen, Nitrate-Nitrite	MG/L	0.21	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	14000	
TDS	MG/L	250	b3
TSS	MG/L	80	b3

AUS-0A12-030-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	5.8	
RDX	UG/L	1.4	
Metals			
Aluminum	UG/L	138	e3
Barium	UG/L	87.8	b3
Boron	UG/L	603	
Calcium	UG/L	161000	b3,e3
Cobalt	UG/L	4	e3
Copper	UG/L	3.7	
Iron	UG/L	5620	b3,e3,e4,h10
Magnesium	UG/L	78700	b3
Manganese	UG/L	311	
Potassium	UG/L	3750	b3
Selenium	UG/L	2	e5
Sodium	UG/L	54100	b3
Zinc	UG/L	30.1	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.35	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.063	b3
Sulfate (as SO4)	UG/L	590000	h10
TDS	MG/L	1140	b3,h10



AUS-0A12-035-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	22	h3,h4
HMX	UG/L	30	
RDX	UG/L	44	h3
Metals			
Aluminum	UG/L	115000	h4
Arsenic	UG/L	49	h3,h4
Barium	UG/L	1180	
Beryllium	UG/L	6.3	h6
Boron	UG/L	149	
Calcium	UG/L	71300	
Chromium	UG/L	144	h6
Cobalt	UG/L	86	
Copper	UG/L	62.8	
Iron	UG/L	158000	h4,h6
Lead	UG/L	68.4	h6
Magnesium	UG/L	45100	
Manganese	UG/L	5240	h4,h6
Nickel	UG/L	177	h6
Potassium	UG/L	9360	
Selenium	UG/L	2.7	
Sodium	UG/L	46400	
Vanadium	UG/L	152	
Zinc	UG/L	429	
Other Parameters			
Phosphorus, Total (as P)	MG/L	2.2	h4
Phosphorus, Total Orthophosphate (as P)	MG/L	1.5	

N

100 0 100
SCALE FEET

NOTES:

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2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12-AMMONIUM NITRATE PLANT

AREA 12-SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12-Section 3-Sample Locations and Detections in Surface Water and Trench Water

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-15
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11&12\AUS-ØA12(WATER).DWG Last edited: AUG. 16, 01 @ 6:58 p.m. URS Corp.

AUS-0A12-W01	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 17 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Semivolatile Organic Compounds							
All SVOCs	UG/KG			NA			
2-Methylnaphthalene	UG/KG	880	e5			ND	
Anthracene	UG/KG	56	e5			ND	
Benzo(a)anthracene	UG/KG	85	e5,h6			ND	
Benzo(a)pyrene	UG/KG	73	e5			ND	
Benzo(b)fluoranthene	UG/KG	74	e5			ND	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	190	e5			180	e5
Chrysene	UG/KG	85	e5			ND	
Di-n-butyl phthalate	UG/KG	240	e5			ND	
Dibenzofuran	UG/KG	230	e5			ND	
Fluoranthene	UG/KG	95	e5			ND	
Naphthalene	UG/KG	410				ND	
Phenanthrene	UG/KG	380	e5			ND	
Pyrene	UG/KG	140	e5			ND	
Explosives							
All Explosives	UG/KG	ND		NA		ND	

AUS-0A12-086	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	1100	e1,e5		
Di-n-butyl phthalate	UG/KG	49	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-085	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	53	e5		
Di-n-butyl phthalate	UG/KG	550	e5		
N-Nitrosodiphenylamine	UG/KG	130	h5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-087	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG	ND		NA	

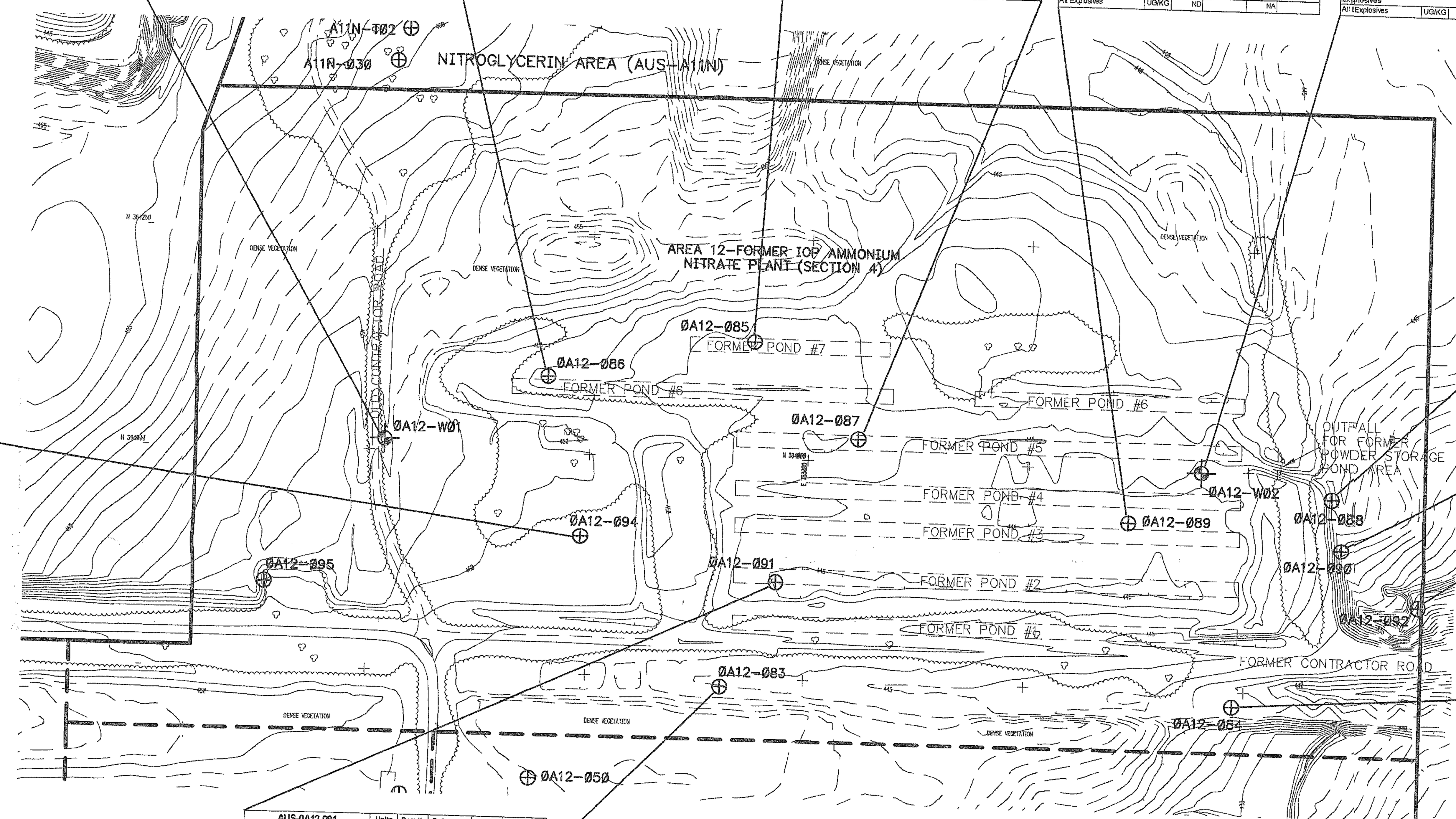
AUS-0A12-089	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
Benzo(b)fluoranthene	UG/KG	65	e5		
Benzo(k)fluoranthene	UG/KG	76	e5		
Chrysene	UG/KG	55	e5		
Di-n-butyl phthalate	UG/KG	84	e5		
Pyrene	UG/KG	42	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-W02	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code	Result: 20 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA		ND		ND	
Di-n-butyl phthalate	UG/KG	130	e5						
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

LEGEND

- MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-094	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA			
Acetone (duplicate)	UG/KG			72	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2,4-Dinitrotoluene (duplicate)	UG/KG	48	h5,h9		
2-Methylnaphthalene	UG/KG	89	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	92	e5		
Di-n-butyl phthalate	UG/KG	51	e5		
Dibenzofuran	UG/KG	57	e5		
Phenanthrene	UG/KG	89	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-088	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG			NA	
RDX	UG/KG	640			

AUS-0A12-090	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	48	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-092	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-084	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-091	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	68	e5		
Di-n-butyl phthalate	UG/KG	60	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-083	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	48	e5
Explosives			
All Explosives	UG/KG	ND	

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100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12—AMMONIUM NITRATE PLANT

AREA 12—SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT—AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS—0A12—Section 4—Sample Locations and Detections of Organic Compounds in Soils

Date: 12/27/00	Project Number: 23200000026.00	Figure Number: 20—16
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

LEGEND

⊕ MONITORING WELL LOCATION

⊕ HAND AUGER LOCATION

★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
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USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-086	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	6600	
Arsenic	MG/KG	6	h1,h5,h7
Barium	MG/KG	63.9	
Boron	MG/KG	2.3	e1
Cadmium	MG/KG	0.29	b1
Calcium	MG/KG	2580	b1
Chromium	MG/KG	9.4	e1,h5
Copper	MG/KG	7.2	
Iron	MG/KG	13000	e1
Lead	MG/KG	10.8	
Magnesium	MG/KG	1360	
Manganese	MG/KG	391	e1
Nickel	MG/KG	7.3	h5
Potassium	MG/KG	616	
Selenium	MG/KG	0.79	e5,h5
Vanadium	MG/KG	18.1	
Zinc	MG/KG	31.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-085	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	4060	
Barium	MG/KG	47.2	
Cadmium	MG/KG	0.31	b1
Calcium	MG/KG	23100	b1
Chromium	MG/KG	6.7	e1,h5
Copper	MG/KG	6.2	
Iron	MG/KG	10400	e1
Lead	MG/KG	9.4	
Magnesium	MG/KG	1210	
Manganese	MG/KG	234	e1
Nickel	MG/KG	7	
Potassium	MG/KG	674	b1
Selenium (duplicate)	MG/KG	0.61	e5,h5
Vanadium	MG/KG	10	
Zinc	MG/KG	33.1	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-087	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	6340	
Arsenic	MG/KG	5.3	h1,h5,h7
Barium	MG/KG	58.7	
Boron	MG/KG	2.8	e1
Cadmium	MG/KG	0.28	b1
Calcium	MG/KG	5190	b1
Chromium	MG/KG	9.1	e1,h5
Copper	MG/KG	8.6	
Iron	MG/KG	16300	e1
Lead	MG/KG	10.7	
Magnesium	MG/KG	1360	
Manganese	MG/KG	324	e1
Nickel	MG/KG	9.7	h5
Potassium	MG/KG	602	
Selenium	MG/KG	0.87	e5,h5
Vanadium	MG/KG	15.3	
Zinc	MG/KG	30.5	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-089	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	5840	
Barium	MG/KG	65.1	
Boron	MG/KG	1.8	e1
Cadmium	MG/KG	0.31	b1
Calcium	MG/KG	7750	b1
Chromium	MG/KG	8.7	e1,h5
Copper	MG/KG	6.3	
Iron	MG/KG	10100	e1
Lead	MG/KG	9.8	
Magnesium	MG/KG	2150	b1
Manganese	MG/KG	252	e1
Nickel	MG/KG	8.4	h5
Potassium	MG/KG	717	b1
Selenium	MG/KG	0.52	e5,h5
Vanadium	MG/KG	13.9	
Zinc	MG/KG	35.8	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-W02	Units	Result: 0 - 6 In	Refference Code	Result: 5 ft	Reference Code	Result: 20 ft	Reference Code
Metals							
Aluminum	MG/KG	8850		7960		6430	
Arsenic	MG/KG	6.5	h1,h5,h7	8.7	h1,h5,h7	1.1	h5
Barium	MG/KG	110	h5	77.1		42.2	
Beryllium	MG/KG	0.5		ND		ND	
Boron (duplicate for 0-6 In)	MG/KG	5.6	b1,e1	2.6	e1	ND	
Calcium	MG/KG	16000	b1	589		2710	b1
Chromium	MG/KG	11.7	e1,h5	13.3	e1,h5	12.3	e1,h5
Cobalt	MG/KG	7.3		6.7		5.6	
Copper	MG/KG	8.4		14.9	b1	9.5	
Iron	MG/KG	15200	e1	20700	b1,e1	8600	e1
Lead	MG/KG	12.5		11.7		10.9	
Magnesium	MG/KG	3050	b1	2160	b1	2080	b1
Manganese	MG/KG	588	e1	417	e1	78.4	
Mercury	MG/KG	ND		ND		0.061	b1,e5
Nickel	MG/KG	12.4	h5	14.5	h5	18	h5
Potassium	MG/KG	561		570		530	
Selenium	MG/KG	1	e5,h5	ND		ND	
Sodium (duplicate)	MG/KG	463	b1	ND		ND	
Vanadium	MG/KG	19.7		21.2		12.6	
Zinc	MG/KG	38		46.3		50.4	
Other Parameters							
All Other Parameters	UG/KG	ND		ND		ND	
Perchlorate	UG/KG	ND		ND		ND	

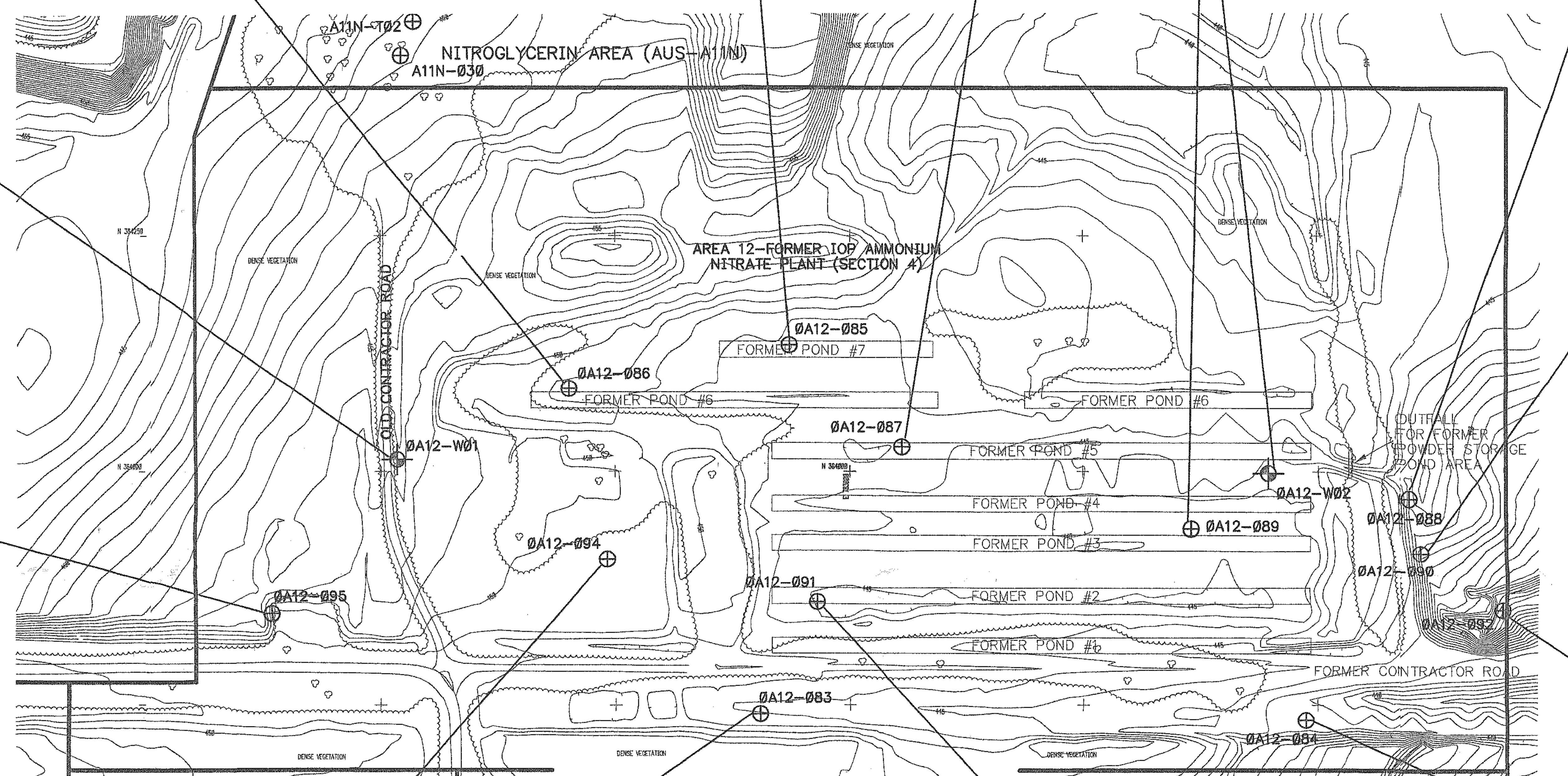
AUS-0A12-W01	Units	Result: 0 - 6 In	Reference Code	Result: 17 ft	Reference Code
Metals					
Aluminum	MG/KG	3920		7470	
Arsenic	MG/KG	3.1	h1,h5,h7	4.3	h1,h5,h7
Barium	MG/KG	45.8		73.5	
Beryllium	MG/KG	0.49		0.68	
Boron	MG/KG	16.6	b1,e1	ND	
Cadmium	MG/KG	1.1	b1,h5	0.25	b1
Calcium	MG/KG	13000	b1	17200	b1
Chromium	MG/KG	5.9	e1,h5	14.6	e1,h5
Copper	MG/KG	5.8		12.3	b1
Iron	MG/KG	8750	e1	17900	e1
Lead	MG/KG	76.7	b1	9.7	
Magnesium	MG/KG	5550	b1	2790	b1
Manganese	MG/KG	523	e1	342	e1
Nickel	MG/KG	5.7		19.8	b1,h5
Potassium	MG/KG	423		671	b1
Selenium	MG/KG	0.84	e5,h5	0.42	e5,h5
Silver	MG/KG	ND		0.19	
Sodium	MG/KG	ND		450	b1
Thallium	MG/KG	ND		0.24	
Vanadium	MG/KG	11.7		16.1	
Zinc	MG/KG	124	b1,e1	46.8	
Other Parameters					
All Other Parameters	UG/KG	ND		NA	
Perchlorate	UG/KG	ND			

AUS-0A12-095	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	7880	
Arsenic	MG/KG	6	h1,h5,h7
Barium	MG/KG	132	h5
Cadmium	MG/KG	0.33	b1
Calcium	MG/KG	829	
Chromium	MG/KG	10.8	e1,h5
Copper	MG/KG	10.5	
Iron	MG/KG	14200	e1
Lead	MG/KG	12.7	
Magnesium	MG/KG	1910	b1
Manganese	MG/KG	154	e1
Nickel	MG/KG	7.7	h5
Potassium	MG/KG	465	
Sodium	MG/KG	599	b1
Vanadium	MG/KG	18.1	
Zinc	MG/KG	36.3	

AUS-0A12-088	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	7420	
Arsenic	MG/KG	6.2	h1,h5,h7
Barium	MG/KG	118	h5
Boron	MG/KG	1.9	e1
Cadmium	MG/KG	0.28	b1
Calcium	MG/KG	2520	b1
Chromium	MG/KG	12.9	e1,h5
Cobalt	MG/KG	8	
Copper	MG/KG	9.8	
Iron	MG/KG	16400	e1
Lead	MG/KG	9.6	
Magnesium	MG/KG	1860	b1
Manganese	MG/KG	358	e1
Nickel	MG/KG	11.6	h5
Potassium	MG/KG	556	
Selenium	MG/KG	0.81	e5,h5
Vanadium	MG/KG	20.9	
Zinc	MG/KG	35.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-090	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	6900	
Arsenic	MG/KG	6	h1,h5,h7
Barium	MG/KG	82.8	h5
Boron	MG/KG	3	e1
Cadmium	MG/KG	0.32	b1
Calcium	MG/KG	9770	b1
Chromium	MG/KG	11.4	e1,h5
Cobalt	MG/KG	6.7	
Copper	MG/KG	9.1	
Iron	MG/KG	15000	e1
Lead	MG/KG	10.6	
Magnesium	MG/KG	2630	b1
Manganese	MG/KG	485	e1
Nickel	MG/KG	8.9	h5
Potassium	MG/KG	500	
Selenium	MG/KG	1.2	e1,e5,h5
Vanadium	MG/KG	21	
Zinc	MG/KG	36.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-092	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	7940	
Arsenic	MG/KG	14.4	b1,e1,h1,h5,h7
Barium	MG/KG	84.4	h5
Boron	MG/KG	4	e1
Cadmium	MG/KG	0.76	b1,h5
Calcium	MG/KG	44500	b1
Chromium	MG/KG	14.5	e1,h5
Cobalt	MG/KG	8.8	
Copper	MG/KG	8.3	
Iron	MG/KG	25200	b1,e1
Lead	MG/KG	18.3	
Magnesium	MG/KG	24100	b1
Manganese	MG/KG	1020	e1
Nickel	MG/KG	9.1	h5
Potassium	MG/KG	534	
Selenium	MG/KG	0.96	e5,h5
Vanadium	MG/KG	31.6	
Zinc	MG/KG	49.7	



AUS-0A12-094	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	4900	
Arsenic	MG/KG	4.5	h1,h5,h7
Barium	MG/KG	75.8	
Boron	MG/KG	3	e1
Cadmium	MG/KG	0.74	b1,h5
Calcium	MG/KG	16300	b1
Chromium	MG/KG	5.9	e1,h5
Cobalt	MG/KG	7.1	
Copper	MG/KG	5.7	
Iron	MG/KG	9860	e1
Lead	MG/KG	28.7	b1
Magnesium	MG/KG	9080	b1
Manganese	MG/KG	1340	e1
Nickel	MG/KG	6.9	
Potassium	MG/KG	295	
Selenium	MG/KG	1	e5,h5
Vanadium	MG/KG	16.6	
Zinc	MG/KG	215	b1,e1

AUS-0A12-083	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	6900	
Arsenic	MG/KG	7.1	h1,h5,h7
Barium	MG/KG	166	h5
Cadmium	MG/KG	0.32	b1
Calcium	MG/KG	2440	
Chromium	MG/KG	11.6	e1,h5
Cobalt	MG/KG	11.2	
Copper	MG/KG	10.6	
Iron	MG/KG	16000	e1
Lead	MG/KG	12.7	
Magnesium	MG/KG	2150	b1
Manganese	MG/KG	541	e1
Nickel	MG/KG	14.6	h5
Potassium	MG/KG	425	
Vanadium	MG/KG	21	
Zinc	MG/KG	39.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-091	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	6850	
Arsenic	MG/KG	4.8	h1,h5,h7
Barium	MG/KG	68.1	
Boron	MG/KG	1.8	e1
Cadmium	MG/KG	0.29	b1
Calcium	MG/KG	4380	b1
Chromium	MG/KG	10.3	e1,h5
Copper	MG/KG	8.2	
Iron	MG/KG	13900	e1
Lead	MG/KG	10.9	
Magnesium	MG/KG	2330	b1
Manganese	MG/KG	478	e1
Nickel	MG/KG	8.4	h5
Potassium	MG/KG	555	
Selenium	MG/KG	0.63	e5,h5
Vanadium	MG/KG	18	
Zinc	MG/KG	31.8	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-084	Units	Result: 0 - 6 In	Reference Code
Metals			
Aluminum	MG/KG	6480	
Arsenic	MG/KG	4.9	h1,h5,h7
Barium	MG/KG	115	h5
Cadmium	MG/KG	0.3	b1
Calcium	MG/KG	16800	b1
Chromium	MG/KG	9.6	e1,h5
Cobalt	MG/KG	6.2	
Copper	MG/KG	7.5	
Iron	MG/KG	12300	e1
Lead	MG/KG	9.8	
Magnesium	MG/KG	10000	b1
Manganese	MG/KG	430	e1
Nickel	MG/KG	9.5	h5
Potassium	MG/KG	506	
Vanadium	MG/KG	18.7	
Zinc	MG/KG	33.3	
Other Parameters			
Perchlorate	UG/KG	ND	

N

100 0 100

SCALE FEET

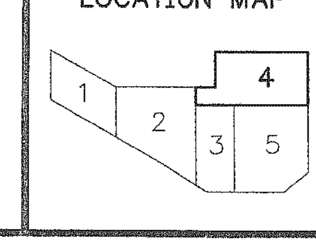
NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

AREA 12—AMMONIUM NITRATE PLANT

AREA 12-SECTION LOCATION MAP



Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12-Section 4-Sample Locations and Detections of Inorganic Compounds in Soils

Date: 12/27/00	Project Number: 23200000026.00	Figure Number: 20-17
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

LEGEND

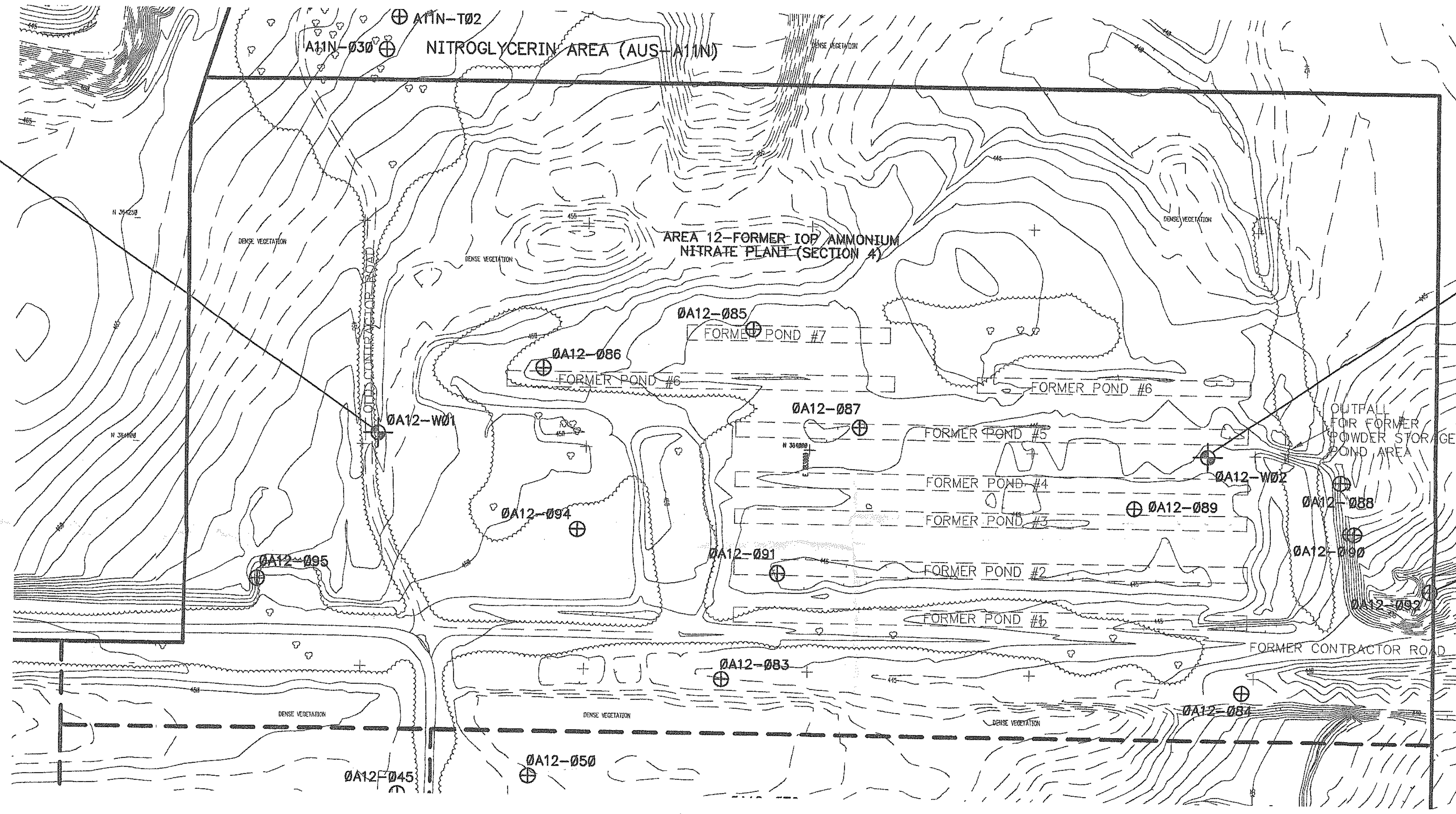
⌖ MONITORING WELL LOCATION

⊕ HAND AUGER LOCATION

★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	132000	h4
Arsenic	UG/L	76.2	h3,h4,h6
Barium	UG/L	1650	
Beryllium	UG/L	12.8	h6
Calcium	UG/L	85200	
Chromium	UG/L	216	h6
Cobalt	UG/L	132	
Copper	UG/L	184	
Iron	UG/L	298000	h4,h6
Lead	UG/L	119	h6
Magnesium	UG/L	78300	
Manganese	UG/L	7310	h4,h6
Mercury	UG/L	0.32	
Nickel	UG/L	280	h6
Potassium	UG/L	7850	
Selenium	UG/L	8.2	
Sodium	UG/L	194000	
Vanadium	UG/L	270	h4
Zinc	UG/L	644	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	496	
Nitrogen, Ammonia (as N)	MG/L	0.15	
Nitrogen, Nitrate-Nitrite	MG/L	0.086	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.82	h4
Sulfate (as SO4)	UG/L	260000	
TDS	MG/L	888	
TSS	MG/L	770	



AUS-0A12-W02-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Chloromethane	UG/L	0.7	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	368	
Barium	UG/L	59.7	
Calcium	UG/L	74500	
Chromium	UG/L	34.1	
Iron	UG/L	394	
Magnesium	UG/L	37100	
Manganese	UG/L	47.2	
Nickel	UG/L	2.3	
Potassium	UG/L	752	
Sodium	UG/L	20800	
Zinc	UG/L	2.8	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A12-092-SW-00	Units	Result	Screening Codes
Explosives			
2,4-Dinitrotoluene	UG/L	0.38	
2,6-Dinitrotoluene	UG/L	2.1	
2-Nitrotoluene (ONT)	UG/L	1.4	
Metals			
Aluminum	UG/L	460	b3,e3
Barium	UG/L	63.7	b3
Boron	UG/L	470	
Calcium	UG/L	153000	b3,e3
Iron	UG/L	560	b3
Magnesium	UG/L	107000	b3,e3
Manganese	UG/L	56.9	
Selenium	UG/L	3.4	b3,e5
Sodium	UG/L	114000	b3
Zinc	UG/L	28.2	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.24	
Nitrogen, Nitrate-Nitrite	MG/L	35.9	b3

N

100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12—AMMONIUM NITRATE PLANT

AREA 12—SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

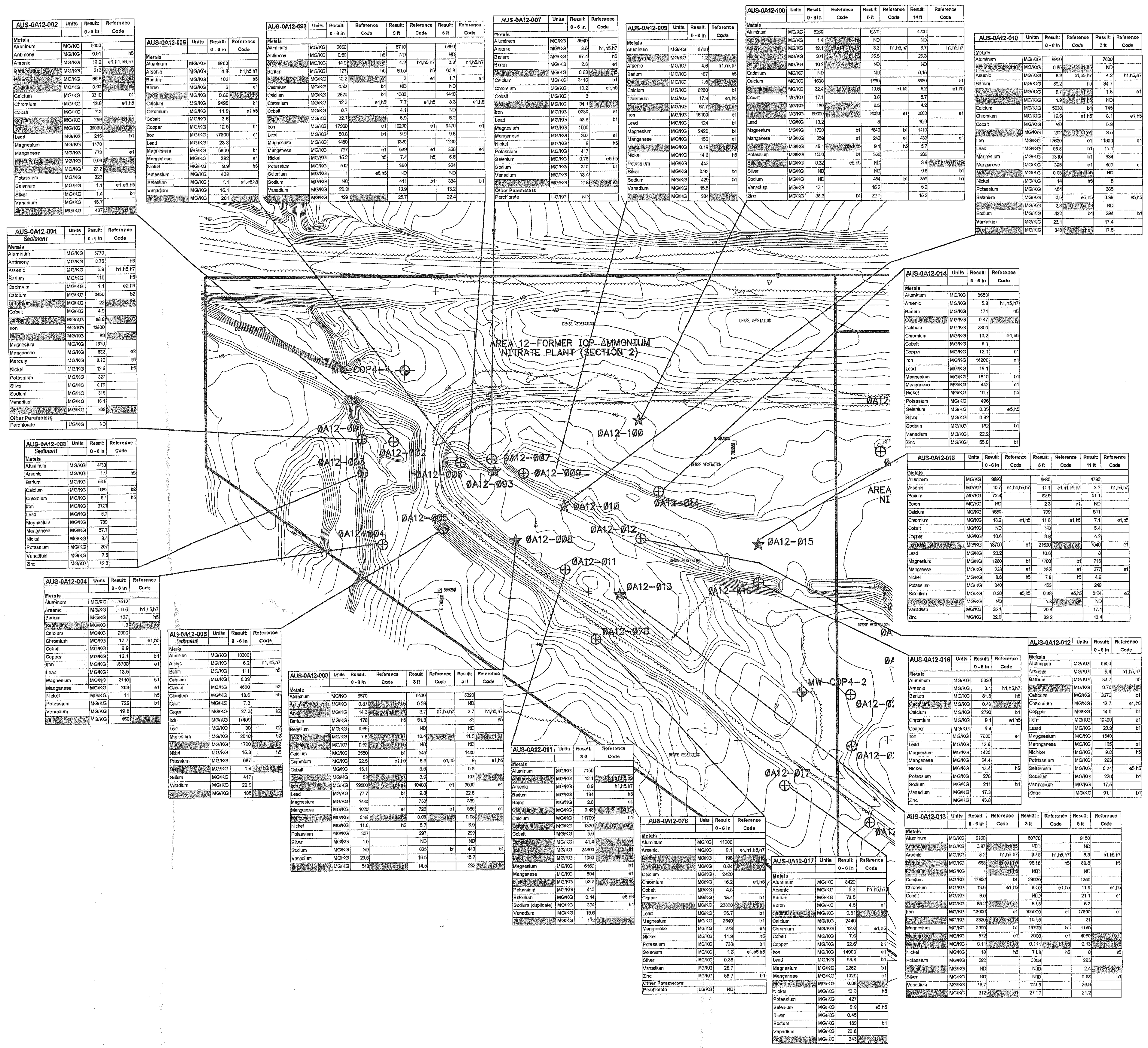
PA/SI REPORT—AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS—0A12—Section 4—Sample Locations and Detections in Surface Water and Groundwater

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20—18
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11&12\AUS-0A12(WATER).DWG Last edited: AUG. 16, 01 @ 6:58 p.m. URS Corp.



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

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2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

AREA 12—AMMONIUM NITRATE PLANT

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12-Section 2-Sample Locations and Detections of Inorganic Compounds in Soils/Sediments

AREA 12-SECTION LOCATION MAP

1 2 3 4 5

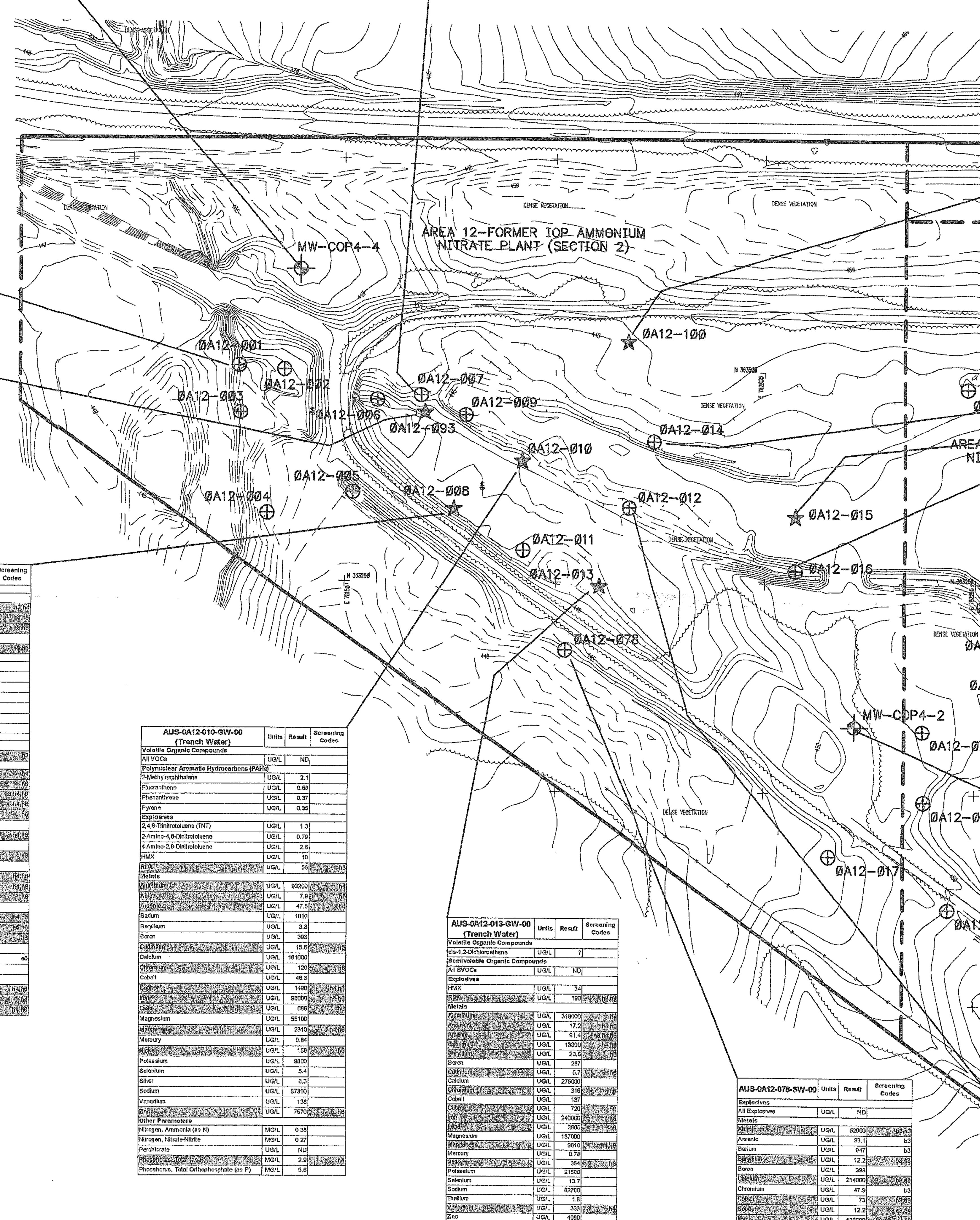
Date: 12/27/ØØ	Project Number: 2320000026.00	Figure Number: 20-11
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-MW-COP4-4-GW	Units	Result	Screening Codes
Volatile Organic Compounds			
Tetrachloroethylene (PCE)	UG/L	0.7	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	339	
Barium	UG/L	35.4	
Calcium	UG/L	79000	
Iron	UG/L	302	
Magnesium	UG/L	81000	
Manganese	UG/L	166	h6
Nickel	UG/L	1.9	
Sodium	UG/L	338000	
Zinc	UG/L	2.8	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	490	
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	69.2	h4,h6
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.19	h4
Sulfate (as SO4)	UG/L	750000	h6
TDS	MG/L	1590	h6
TSS	MG/L	11.5	

AUS-0A12-007-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
HMX	UG/L	3.6	
RDX	UG/L	2.8	
Metals			
Aluminum	UG/L	856	b3,e3
Barium	UG/L	40.9	b3
Boron	UG/L	68.2	
Calcium	UG/L	59100	b3
Chromium	UG/L	0.98	
Iron	UG/L	948	b3
Lead	UG/L	1.1	
Magnesium	UG/L	26100	b3
Manganese	UG/L	73	
Potassium	UG/L	2270	b3
Sodium	UG/L	32600	b3
Zinc	UG/L	16.3	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	201	b3
Nitrogen, Ammonia (as N)	MG/L	0.75	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.3	b3
Sulfate (as SO4)	UG/L	160000	
TDS	MG/L	472	b3
TSS	MG/L	30	b3

AUS-0A12-100-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
1,2-Dichloroethane (EDC)	UG/L	39	h3,h4,h6
Carbon tetrachloride	UG/L	1200	h3,h4,h6
Chloroform	UG/L	630	h3,h4
Methylene chloride	UG/L	220	h3,h6
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
Nitrobenzene	UG/L	1	
RDX	UG/L	1.3	h3
Metals			
Aluminum	UG/L	109000	h4
Arsenic	UG/L	71.2	h3,h4,h6
Barium	UG/L	578	
Beryllium	UG/L	5.8	h6
Boron	UG/L	186	
Calcium	UG/L	80000	
Chromium	UG/L	137	h6
Cobalt	UG/L	103	
Copper	UG/L	84.9	
Iron	UG/L	193000	h4,h6
Lead	UG/L	73.9	h6
Magnesium	UG/L	81000	
Manganese	UG/L	3760	h4,h6
Mercury	UG/L	36.9	h6
Nickel	UG/L	201	h6
Potassium	UG/L	12500	
Selenium	UG/L	5	
Sodium	UG/L	167000	
Vanadium	UG/L	141	
Zinc	UG/L	539	

AUS-0A12-001-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	0.8	
Tetrachloroethylene (PCE)	UG/L	22	
Trichloroethylene (TCE)	UG/L	1	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	7.9	
RDX	UG/L	25	
Metals			
Aluminum	UG/L	496	b3,e3
Barium	UG/L	60	b3
Boron	UG/L	59.1	
Calcium	UG/L	77300	b3
Iron	UG/L	664	b3
Magnesium	UG/L	39000	b3
Manganese	UG/L	46.6	
Mercury	UG/L	0.14	e5,h10
Potassium	UG/L	2710	b3
Sodium	UG/L	61200	b3
Zinc	UG/L	27.3	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.53	b3
Nitrogen, Nitrate-Nitrite	MG/L	2.1	b3
Perchlorate	UG/L	ND	

AUS-0A12-014-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	2570	b3,e3
Barium	UG/L	74.5	b3
Beryllium	UG/L	0.13	
Calcium	UG/L	28300	b3
Cobalt	UG/L	4.9	e3
Iron	UG/L	5800	b3,e3,e4,h10
Magnesium	UG/L	11200	b3
Manganese	UG/L	676	b3
Nickel	UG/L	6.8	
Potassium	UG/L	3330	b3
Selenium	UG/L	2.1	e5
Sodium	UG/L	7190	b3
Zinc	UG/L	29.4	b3

AUS-0A12-093-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	8	
Tetrachloroethylene (PCE)	UG/L	7	h3,h6
Trichloroethylene (TCE)	UG/L	5	h3
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
HMX	UG/L	3.4	
RDX	UG/L	4.3	h3
Metals			
Aluminum	UG/L	227000	h4
Antimony	UG/L	4.3	
Arsenic	UG/L	116	h3,h4,h6
Barium	UG/L	2050	h6
Beryllium	UG/L	13.3	h6
Boron	UG/L	262	
Cadmium	UG/L	4.7	
Calcium	UG/L	149000	
Chromium	UG/L	254	h6
Cobalt	UG/L	126	
Copper	UG/L	521	
Iron	UG/L	227000	h4,h6
Lead	UG/L	440	h6
Magnesium	UG/L	76000	
Manganese	UG/L	7520	h4,h6
Nickel	UG/L	267	h6
Potassium	UG/L	18500	
Selenium	UG/L	29.4	
Silver	UG/L	5.9	
Sodium	UG/L	66000	
Thallium	UG/L	2.7	h4,h6
Vanadium	UG/L	330	h4
Zinc	UG/L	3460	

AUS-0A12-015-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	3	h3
4-Amino-2,6-Dinitrotoluene	UG/L	0.62	
HMX	UG/L	54	
RDX	UG/L	890	h3,h4
Metals			
Aluminum	UG/L	33400	
Barium	UG/L	339	
Boron	UG/L	156	
Calcium	UG/L	97100	
Chromium	UG/L	31.8	
Cobalt	UG/L	31.3	
Copper	UG/L	30.7	
Iron	UG/L	39700	h4,h6
Lead	UG/L	45.5	h6
Magnesium	UG/L	55600	
Manganese	UG/L	8140	h4,h6
Nickel	UG/L	30.6	
Potassium	UG/L	3360	
Selenium	UG/L	6.5	
Sodium	UG/L	71700	
Vanadium	UG/L	52.4	
Zinc	UG/L	125	

AUS-0A12-016-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	2.9	
RDX	UG/L	0.64	
Metals			
Aluminum (duplicate)	UG/L	14400	b3,e3
Barium	UG/L	47.4	b3
Beryllium (duplicate)	UG/L	1.4	e3
Boron	UG/L	254	
Calcium	UG/L	91500	b3
Chromium (duplicate)	UG/L	13.3	b3
Cobalt (duplicate)	UG/L	19	e3
Copper (duplicate)	UG/L	16.9	b3,e3,e4
Iron	UG/L	1210	b3,e3,e4,h10
Lead (duplicate)	UG/L	17.1	b3
Magnesium	UG/L	40300	b3
Manganese (duplicate)	UG/L	2830	b3,e3,e4,h10
Nickel (duplicate)	UG/L	18.5	b3
Potassium	UG/L	2740	b3
Selenium (duplicate)	UG/L	3.8	b3,e5
Sodium	UG/L	22600	b3
Vanadium (duplicate)	UG/L	37.3	e3
Zinc	UG/L	16	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.45	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-0A12-005-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
2-Butanone (MEK)	UG/L	4	
Chloroform	UG/L	28	h3,h4
cis-1,2-Dichloroethene	UG/L	130	h4,h6
Tetrachloroethylene (PCE)	UG/L	54	h3,h6
trans-1,2-Dichloroethene	UG/L	1	
Trichloroethylene (TCE)	UG/L	6	h3,h6
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	1.1	
Chrysene	UG/L	1.8	
Di-n-butyl phthalate	UG/L	1.1	
Diethyl phthalate	UG/L	2	
Fluoranthene	UG/L	2.1	
Phenanthrene	UG/L	1.2	
Pyrene	UG/L	1.6	
Explosives			
HMX	UG/L	8	
RDX	UG/L	25	h3
Metals			
Aluminum	UG/L	500000	h4
Antimony	UG/L	8.7	h6
Arsenic	UG/L	142	h3,h4,h6
Barium	UG/L	6570	h4,h6
Beryllium	UG/L	22.3	h6
Boron	UG/L	896	
Cadmium	UG/L	20.5	h4,h6
Calcium	UG/L	236000	
Chromium	UG/L	736	h6
Cobalt	UG/L	302	
Copper	UG/L	5150	h4,h6
Iron	UG/L	417000	h4,h6
Lead	UG/L	2860	h6
Magnesium	UG/L	102000	
Manganese	UG/L	27400	h4,h6
Mercury	UG/L	4.1	e5,h6
Nickel	UG/L	515	h6
Potassium	UG/L	30800	
Selenium	UG/L	18.9	e5
Silver	UG/L	23.4	
Sodium	UG/L	137000	
Thallium	UG/L	3.2	h4,h6
Vanadium	UG/L	562	h4
Zinc	UG/L	58500	h4,h6

AUS-0A12-010-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
2-Methylnaphthalene	UG/L	2.1	
Fluoranthene	UG/L	0.68	
Phenanthrene	UG/L	0.37	
Pyrene	UG/L	0.35	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	1.3	
2-Amino-4,6-Dinitrotoluene	UG/L	0.79	
4-Amino-2,6-Dinitrotoluene	UG/L	2.6	
HMX	UG/L	10	
RDX	UG/L	56	h3
Metals			
Aluminum	UG/L	93200	h4
Antimony	UG/L	7.9	h6
Arsenic	UG/L	47.5	h3,h4
Barium	UG/L	1010	
Beryllium	UG/L	3.8	
Boron	UG/L	393	
Cadmium	UG/L	15.6	h6
Calcium	UG/L	161000	
Chromium	UG/L	120	h6
Cobalt	UG/L	46.3	
Copper	UG/L	1490	h4,h6
Iron	UG/L	96000	h4,h6
Lead	UG/L	666	h6
Magnesium	UG/L	55100	
Manganese	UG/L	2310	h4,h6
Mercury	UG/L	0.84	
Nickel	UG/L	156	h6
Potassium	UG/L	9800	
Selenium	UG/L	5.4	
Silver	UG/L	8.3	
Sodium	UG/L	87300	
Vanadium	UG/L	136	
Zinc	UG/L	7570	h6
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.38	
Nitrogen, Nitrate-Nitrite	MG/L	0.27	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	2.9	h4
Phosphorus, Total Orthophosphate (as P)	MG/L	5.6	

AUS-0A12-MW-COP4-2-GW	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
RDX	UG/L	1.1	h3
Metals			
Barium	UG/L	33.4	
Boron	UG/L	224	
Calcium	UG/L	122000	
Magnesium	UG/L	80100	
Manganese	UG/L	78	
Potassium	UG/L	1220	
Sodium	UG/L	43100	
Zinc	UG/L	2.4	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A12-013-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
cis-1,2-Dichloroethene	UG/L	7	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	34	
RDX	UG/L	190	h3,h4
Metals			
Aluminum	UG/L	318000	h4
Antimony	UG/L	17.2	h4,h6
Arsenic	UG/L	91.4	h3,h4,h6
Barium	UG/L	13300	h4,h6
Beryllium	UG/L	23.6	h6
Boron	UG/L	287	
Cadmium	UG/L	5.7	h6
Calcium	UG/L	275000	
Chromium	UG/L	316	h6
Cobalt	UG/L	137	
Copper	UG/L	720	h6
Iron	UG/L	240000	h4,h6
Lead	UG/L	2660	h6
Magnesium	UG/L	137000	
Manganese	UG/L	9810	h4,h6
Mercury	UG/L	0.78	
Nickel	UG/L	354	h6
Potassium	UG/L	21500	
Selenium	UG/L	13.7	
Sodium	UG/L	82700	
Thallium	UG/L	1.8	
Vanadium	UG/L	333	h4
Zinc	UG/L	4080	

AUS-0A12-078-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	52000	b3,e3
Arsenic	UG/L	33.1	b3
Barium	UG/L	947	b3
Beryllium	UG/L	12.2	b3,e3
Boron	UG/L	398	
Calcium	UG/L	214000	b3,e3
Chromium	UG/L	47.9	b3
Cobalt	UG/L	73	b3,e3
Copper	UG/L	12.2	b3,e3,e4
Iron	UG/L	136000	b3,e3,e4,h10
Lead	UG/L	45.9	b3,e3,e4
Magnesium	UG/L	93900	b3,e3
Manganese	UG/L	4700	b3,e3,e4,h10
Nickel	UG/L	111	b3
Potassium	UG/L	15100	b3
Selenium	UG/L	5.9	b3,e5
Sodium	UG/L	76400	b3
Vanadium	UG/L	234	b3,e3
Zinc	UG/L	667	b3
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A12-012-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Polynuclear Aromatic Hydrocarbons (PAHs)			
All PAHs	UG/L	ND	
Explosives			
HMX	UG/L	0.99	
Metals			
Aluminum	UG/L	282	b3,e3
Antimony (duplicate)	UG/L	8.1	b3
Arsenic (duplicate)	UG/L	30.8	b3
Barium	UG/L	38.1	b3
Beryllium (duplicate)	UG/L	0.85	e3
Boron	UG/L	202	
Calcium	UG/L	74000	b3
Chromium (duplicate)	UG/L	4	
Cobalt (duplicate)	UG/L	9.3	e3
Copper	UG/L	135	b3,e3,e4
Iron	UG/L	478	b3
Magnesium	UG/L	34500	b3
Manganese	UG/L	102	
Nickel	UG/L	144	b3
Selenium (duplicate)	UG/L	31.3	b3,e5
Silver (duplicate)	UG/L	9	e3,e4,h10
Sodium	UG/L	22200	b3
Zinc	UG/L	79.8	b3
Other Parameters			
Sulfate (as SO4)	UG/L	120000	

N

100 0 100

SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12—AMMONIUM NITRATE PLANT

AREA 12—SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

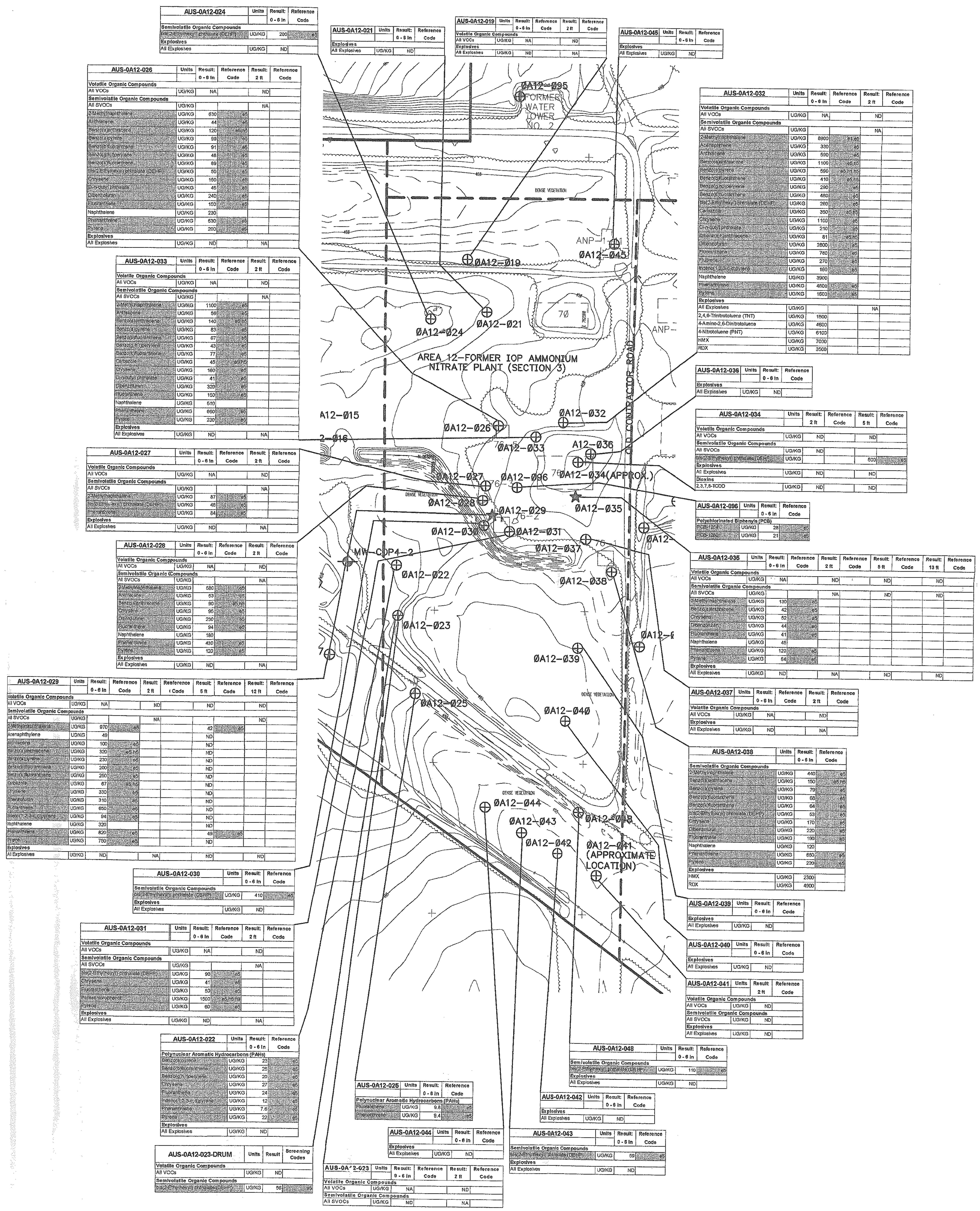
AUS-ØA12-Section 2-Sample Locations and Detections in Surface Water, Trench Water and Groundwater

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-12
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11x17\AUS-ØA12(WATER).DWG Last edited: AUG. 16, 01 @ 6:58 p.m. URS Corp.

AREA 12–AMMONIUM NITRATE PLANT



LEGEND

- MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

N

100 0 100
SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2ØØØ. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15–3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

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File: E:\2320000026.00\PA–SI REPORT–AUS OU\AUS–SAMPLE LOCATION 11&12\AUS–0A12(ORGANIC).DWG Last edited: AUG. 30, 01 @ 09:11 a.m. URS Corp.

Revision No.	Description	Date	By	App.

REVISIONS

AREA 12–SECTION LOCATION MAP

1 2 3 4 5

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–ØA12–Section 3–Sample Locations and Detections of Organic Compounds in Soils/Drums

Date: 12/27/ØØ	Project Number: 232ØØØØØ26.ØØ	Figure Number: 2Ø–13
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

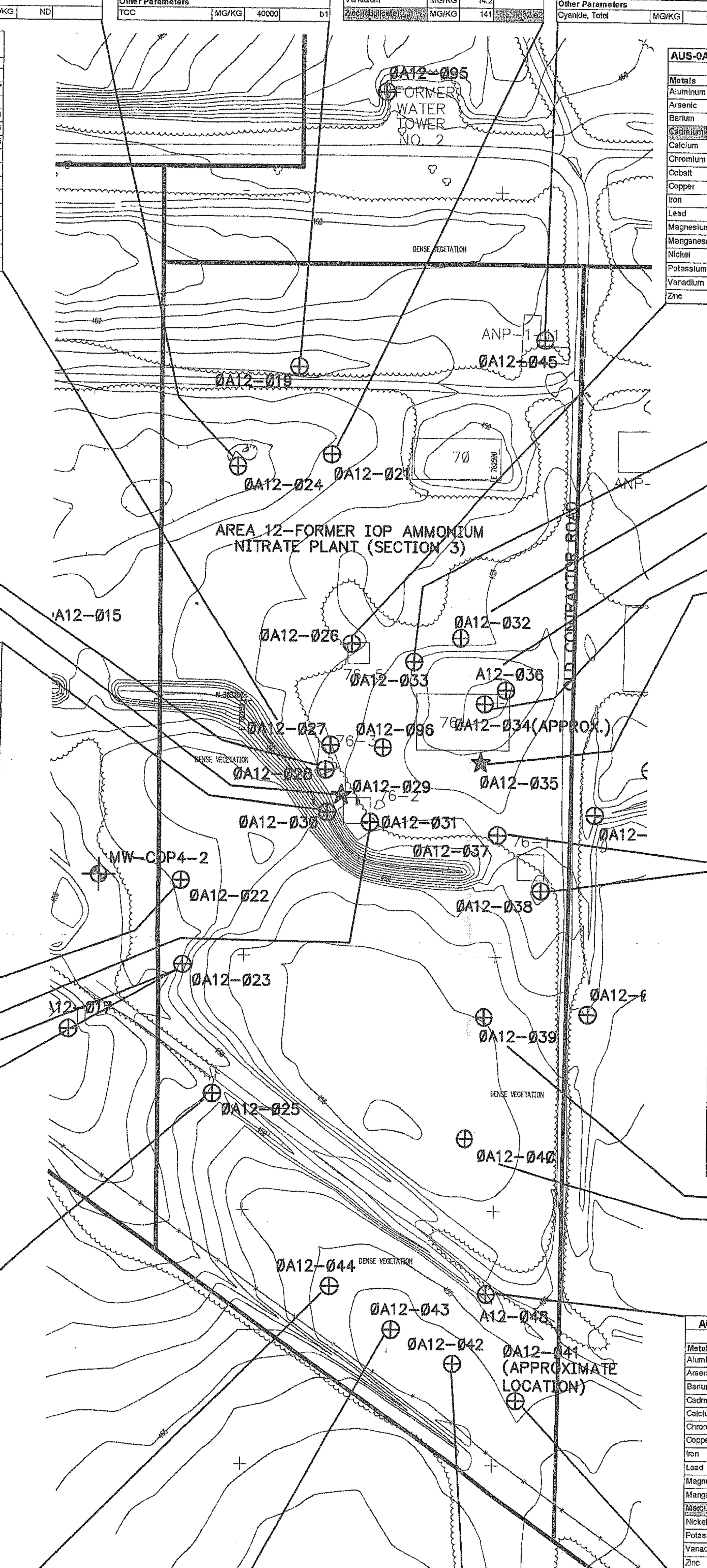
LEGEND

⌖ MONITORING WELL LOCATION

⊕ HAND AUGER LOCATION

★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-024	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5740	
Arsenic	MG/KG	3.4	h1,h5,h7
Barium	MG/KG	197	b1,h5
Cadmium	MG/KG	0.53	b1,h5
Calcium	MG/KG	1450	
Chromium	MG/KG	9.3	e1,h5
Copper	MG/KG	6.2	
Iron	MG/KG	10100	e1
Lead	MG/KG	13.4	
Magnesium	MG/KG	983	
Manganese	MG/KG	436	e1
Mercury	MG/KG	0.11	b1,e5
Nickel	MG/KG	5.6	
Potassium	MG/KG	344	
Selenium (duplicate)	MG/KG	1	b2,e5,h5
Silver (duplicate)	MG/KG	0.23	
Vanadium	MG/KG	19.6	
Zinc	MG/KG	34.3	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-019	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5390	
Arsenic	MG/KG	3.2	h1,h5,h7
Barium	MG/KG	59.3	
Boron	MG/KG	8.1	b1,e1
Cadmium	MG/KG	0.59	b1,h5
Calcium	MG/KG	5490	b1
Chromium	MG/KG	7.4	e1,h5
Copper	MG/KG	7.4	
Iron	MG/KG	9990	e1
Lead	MG/KG	12.6	
Magnesium	MG/KG	2430	b1
Manganese	MG/KG	124	e1
Mercury	MG/KG	0.1	b1,e5
Nickel	MG/KG	8.6	h5
Potassium	MG/KG	423	
Sodium	MG/KG	168	
Vanadium	MG/KG	15	
Zinc	MG/KG	67.6	b1
Other Parameters			
TOC	MG/KG	40000	b1

AUS-0A12-021	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	3440	
Arsenic	MG/KG	4.5	h1,h5,h7
Barium	MG/KG	65.6	
Boron	MG/KG	4.3	e1
Cadmium	MG/KG	0.87	b1,h5
Calcium	MG/KG	3140	b1
Chromium	MG/KG	6.8	e1,h5
Cobalt (duplicate)	MG/KG	4.4	
Copper	MG/KG	8.4	
Iron	MG/KG	8930	e1
Lead	MG/KG	14.8	
Magnesium	MG/KG	842	
Manganese	MG/KG	257	e1
Nickel	MG/KG	6.2	
Potassium	MG/KG	265	
Selenium (duplicate)	MG/KG	1.1	b2,h5
Vanadium	MG/KG	14.2	
Zinc (duplicate)	MG/KG	141	b2,e2

AUS-0A12-045	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5270	
Antimony	MG/KG	0.38	h5
Arsenic	MG/KG	6.9	h1,h5,h7
Barium	MG/KG	109	h5
Boron	MG/KG	4.4	e1
Cadmium	MG/KG	2.1	b1,h5
Calcium	MG/KG	11000	b1
Chromium	MG/KG	9.4	e1,h5
Copper	MG/KG	21.3	b1
Iron	MG/KG	13800	e1
Lead	MG/KG	50.8	b1
Magnesium	MG/KG	4230	b1
Manganese	MG/KG	361	e1
Nickel	MG/KG	8.3	h5
Potassium	MG/KG	711	b1
Selenium	MG/KG	0.89	e5,h5
Vanadium	MG/KG	16.6	
Zinc	MG/KG	263	b1,e1
Other Parameters			
Cyanide, Total	MG/KG	ND	

AUS-0A12-027	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7020	
Arsenic	MG/KG	5.1	h1,h5,h7
Barium	MG/KG	57.1	
Cadmium	MG/KG	0.38	b1
Calcium	MG/KG	6210	b1
Chromium	MG/KG	8.4	e1,h5
Copper	MG/KG	6	
Iron	MG/KG	12800	e1
Lead	MG/KG	10.7	
Magnesium	MG/KG	1770	b1
Manganese	MG/KG	270	e1
Nickel	MG/KG	7	
Potassium	MG/KG	471	
Vanadium	MG/KG	19.8	
Zinc	MG/KG	71.9	b1

AUS-0A12-028	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7160	
Arsenic	MG/KG	11.8	e1,h1,h5,h7
Barium	MG/KG	69.6	
Cadmium	MG/KG	1	b1,h5
Calcium	MG/KG	3480	b1
Chromium	MG/KG	12.6	e1,h5
Cobalt	MG/KG	6	
Copper	MG/KG	7.7	
Iron	MG/KG	15300	e1
Lead	MG/KG	23.1	
Magnesium	MG/KG	1350	
Manganese	MG/KG	691	e1
Mercury	MG/KG	0.07	b1,e5
Nickel	MG/KG	8.9	h5
Potassium	MG/KG	766	b1
Selenium	MG/KG	1.1	e1,e5,h5
Vanadium	MG/KG	25.1	
Zinc	MG/KG	118	b1

AUS-0A12-026	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5740	
Arsenic	MG/KG	8.4	h1,h5,h7
Barium	MG/KG	125	h5
Cadmium	MG/KG	0.88	b1,h5
Calcium	MG/KG	11100	b1
Chromium	MG/KG	10.1	e1,h5
Cobalt	MG/KG	5.8	
Copper	MG/KG	10.9	
Iron	MG/KG	13700	e1
Lead	MG/KG	22.1	
Magnesium	MG/KG	2810	b1
Manganese	MG/KG	473	e1
Nickel	MG/KG	12.3	h5
Potassium	MG/KG	592	
Vanadium	MG/KG	18.4	
Zinc	MG/KG	106	b1

AUS-0A12-033	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6460	
Arsenic	MG/KG	8.1	h1,h5,h7
Barium	MG/KG	159	h5
Cadmium	MG/KG	0.74	b1,h5
Calcium	MG/KG	7380	b1
Chromium	MG/KG	10.5	e1,h5
Cobalt	MG/KG	10	
Copper	MG/KG	11.3	
Iron	MG/KG	14700	e1
Lead	MG/KG	26.8	b1
Magnesium	MG/KG	2030	b1
Manganese	MG/KG	1160	e1
Nickel	MG/KG	12.5	h5
Potassium	MG/KG	592	
Selenium	MG/KG	1.2	e1,e5,h5
Vanadium	MG/KG	19.1	
Zinc	MG/KG	149	b1,e1

AUS-0A12-032	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	2130	
Antimony (duplicate)	MG/KG	0.29	
Arsenic	MG/KG	21.9	b1,e1,h1,h5,h7
Barium	MG/KG	68.3	
Boron	MG/KG	34.3	b1,e1
Cadmium	MG/KG	4.4	b1,h5,h9
Calcium	MG/KG	4860	b1
Chromium	MG/KG	10.7	e1,h5
Cobalt	MG/KG	9	
Copper	MG/KG	10.8	
Iron	MG/KG	15900	e1
Lead	MG/KG	63.5	b1
Magnesium	MG/KG	1330	
Manganese	MG/KG	205	e1
Mercury	MG/KG	0.16	b1,e5,h9
Nickel	MG/KG	12.5	h5
Potassium	MG/KG	583	
Selenium	MG/KG	1.8	e1,e5,h5
Thallium (duplicate)	MG/KG	0.67	b1
Vanadium	MG/KG	14.9	
Zinc	MG/KG	754	b1,e1,h5

AUS-0A12-036	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6180	
Arsenic	MG/KG	5.3	h1,h5,h7
Barium	MG/KG	119	h5
Cadmium	MG/KG	0.5	b1,h5
Calcium	MG/KG	10800	b1
Chromium	MG/KG	9.9	e1,h5
Cobalt	MG/KG	7	
Copper	MG/KG	9.3	
Iron	MG/KG	12700	e1
Lead	MG/KG	12.8	
Magnesium	MG/KG	2540	b1
Manganese	MG/KG	325	e1
Nickel	MG/KG	12.8	h5
Potassium	MG/KG	534	
Vanadium	MG/KG	17.6	
Zinc	MG/KG	74.9	b1

AUS-0A12-029	Units	Result: 0 - 6 in	Reference Code	Result: 6 ft	Reference Code	Result: 12 ft	Reference Code
Metals							
Aluminum	MG/KG	6930		9270		5580	
Antimony	MG/KG	0.38	h5	ND		0.47	h5
Arsenic	MG/KG	11.5	e1,h1,h5,h7	12.2	e1,h1,h5,h7	9.6	e1,h1,h5,h7
Barium	MG/KG	70.7		56.5		55.7	
Beryllium	MG/KG	ND		0.74		ND	
Boron	MG/KG	8.1	b1,e1	3	e1	2.7	e1
Cadmium	MG/KG	0.78	b1,h5	ND		ND	
Calcium	MG/KG	36600	b1	943		1600	
Chromium	MG/KG	9	e1,h5	15	e1,h5	11.4	e1,h5
Copper	MG/KG	8.6		13.6	b1	10.8	
Iron	MG/KG	16500	e1	21400	b1,e1	27000	b1,e1
Lead	MG/KG	17.6		7.9		9.6	
Magnesium	MG/KG	4770	b1	2210	b1	1340	
Manganese	MG/KG	473	e1	174	e1	93.6	
Mercury	MG/KG	0.1	b1,e5	ND		0.06	e5
Nickel	MG/KG	10.6	h5	12.8	h5	16.4	h5
Potassium	MG/KG	568		391		260	
Selenium	MG/KG	ND		1.7	e1,e5,h5	ND	
Vanadium	MG/KG	17		28		35	
Zinc	MG/KG	196	b1,e1	42.4		18.4	

AUS-0A12-030	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	13300	
Arsenic	MG/KG	6.2	h1,h5,h7
Barium	MG/KG	34	
Boron	MG/KG	9	b1,e1
Cadmium	MG/KG	1.8	b1,h5
Calcium	MG/KG	7390	b1
Chromium	MG/KG	9.5	e1,h5
Copper	MG/KG	16.6	b1
Iron	MG/KG	10000	e1
Lead	MG/KG	28	b1
Magnesium	MG/KG	2350	b1
Manganese	MG/KG	53.8	
Mercury	MG/KG	1.6	b1,e5,h9
Nickel	MG/KG	16.3	h5
Potassium	MG/KG	405	
Selenium	MG/KG	2.5	b1,e1,e5,h5,h9
Sodium	MG/KG	482	b1
Vanadium	MG/KG	22.7	
Zinc	MG/KG	306	b1,e1

AUS-0A12-022	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4530	
Arsenic	MG/KG	5.2	h1,h5,h7
Barium	MG/KG	81.8	h5
Cadmium	MG/KG	0.34	b1
Calcium	MG/KG	1520	
Chromium	MG/KG	7	e1,h5
Copper	MG/KG	7.6	
Iron	MG/KG	10100	e1
Lead	MG/KG	13.3	
Magnesium	MG/KG	1080	
Manganese	MG/KG	401	e1
Nickel	MG/KG	5.5	
Potassium	MG/KG	314	
Selenium	MG/KG	1.1	e1,e5,h5
Vanadium	MG/KG	16.8	
Zinc	MG/KG	28	

AUS-0A12-031	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7110	
Arsenic	MG/KG	6.6	h1,h5,h7
Barium	MG/KG	59.5	
Cadmium	MG/KG	0.78	b1,h5
Calcium	MG/KG	2020	
Chromium	MG/KG	10.1	e1,h5
Copper	MG/KG	4.8	
Iron	MG/KG	13600	e1
Lead	MG/KG	11.4	
Magnesium	MG/KG	1410	
Manganese	MG/KG	450	e1
Nickel	MG/KG	6.4	
Potassium	MG/KG	495	
Selenium	MG/KG	0.83	e5,h5
Vanadium	MG/KG	22.2	
Zinc	MG/KG	45.3	

AUS-0A12-023-DRUM	Units	Result	Screening Codes
Metals			
Aluminum	MG/KG	5020	
Arsenic	MG/KG	6.4	h1,h5,h7
Barium	MG/KG	55.5	
Boron	MG/KG	3.6	e1
Cadmium	MG/KG	0.63	b1,h5
Calcium	MG/KG	3790	b1
Chromium	MG/KG	9.5	e1,h5
Copper	MG/KG	16.7	b1
Iron	MG/KG	15600	e1
Lead	MG/KG	29.8	b1
Magnesium	MG/KG	1110	
Manganese	MG/KG	623	e1
Nickel	MG/KG	10.9	h5
Potassium	MG/KG	509	
Selenium	MG/KG	0.42	e5,h5
Silver	MG/KG	0.49	
Sodium	MG/KG	116	
Vanadium	MG/KG	18	
Zinc	MG/KG	49.7	

AUS-0A12-023	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5320	
Arsenic	MG/KG	6.6	h1,h5,h7
Barium	MG/KG	55.5	
Cadmium	MG/KG	0.38	b1
Calcium	MG/KG	2690	b1
Chromium	MG/KG	8.3	e1,h5
Cobalt	MG/KG	5.3	
Copper	MG/KG	9.5	
Iron	MG/KG	11200	e1
Lead	MG/KG	19.9	
Magnesium	MG/KG	923	
Manganese	MG/KG	539	e1
Nickel	MG/KG	6.5	
Potassium	MG/KG	324	
Selenium	MG/KG	1	e5,h5
Vanadium	MG/KG	18.7	
Zinc	MG/KG	38.6	

AUS-0A12-025	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	9590	
Arsenic	MG/KG	4.7	h1,h5,h7
Barium	MG/KG	92.8	h5
Cadmium	MG/KG	0.34	b1
Calcium	MG/KG	2020	
Chromium	MG/KG	12.7	e1,h5
Copper	MG/KG	10.4	
Iron	MG/KG	13600	e1
Lead	MG/KG	13.9	
Magnesium	MG/KG	2490	b1
Manganese	MG/KG	86.9	
Nickel	MG/KG	11	h5
Potassium	MG/KG	666	b1
Selenium	MG/KG	0.96	e5,h5
Vanadium	MG/KG	21.7	
Zinc	MG/KG	47	
Other Parameters			
TOC	MG/KG	15900	

AUS-0A12-034	Units	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Metals					
Aluminum	MG/KG	7840		22900	
Arsenic	MG/KG	7.6	h1,h5,h7	6	h1,h5,h7
Barium	MG/KG	130	h5	85.7	h5
Beryllium	MG/KG	0.44		0.54	
Boron	MG/KG	ND		1.3	e1
Calcium	MG/KG	1100		1350	
Chromium	MG/KG	11.4	e1,h5	25.3	b1,e1,h5
Cobalt	MG/KG	9.9		4.8	
Copper	MG/KG	4.3		13.6	b1
Iron	MG/KG	12900	e1	24100	b1,e1
Lead	MG/KG	17.2		10.1	
Magnesium	MG/KG	1020		3100	b1
Manganese	MG/KG	2060	e1	218	e1
Mercury	MG/KG	0.019	e5	0.034	e5
Nickel	MG/KG	7		13.7	h5
Potassium	MG/KG	463		1180	b1
Sodium	MG/KG	45		71	
Vanadium	MG/KG	32.3		39.7	
Zinc	MG/KG	20.3		51.6	b1

AUS-0A12-035	Units	Result: 0 - 6 in	Reference Code	Result: 6 ft	Reference Code	Result: 13 ft	Reference Code
Metals							
Aluminum	MG/KG	9500		9650		8160	
Antimony	MG/KG	0.4	h5	ND		0.47	h5
Arsenic	MG/KG	9.9	e1,h1,h5,h7	3.6	h1,h5,h7	8.3	h1,h5,h7
Barium	MG/KG	95.3	h5	83.7	h5	68.8	
Boron	MG/KG	2.5	e1	3	e1	3.9	e1
Calcium	MG/KG	3250	b1	580		1810	
Chromium	MG/KG	11.9	e1,h5	12.8	e1,h5	16	e1,h5
Cobalt	MG/KG	4.2		4.2		11.6	
Copper	MG/KG	10.2		8.9		13.8	b1
Iron	MG/KG	19700	b1,e1	15600	e1	30000	b1,e1
Lead	MG/KG	18.4		7.9		11.3	
Magnesium	MG/KG	2040	b1	16200	b1	2710	b1
Manganese	MG/KG	266	e1	2299	e1	323	e1
Nickel	MG/KG	8.5	h5	10.33	h5	27.1	b1,h5
Potassium	MG/KG	632	b1	5000		674	b1
Vanadium	MG/KG	22.6		17.33		18.7	
Zinc	MG/KG	46.6		30.88		54.3	b1

AUS-0A12-037	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	11800	
Arsenic	MG/KG	10.1	e1,h1,h5,h7
Barium	MG/KG	100	h5
Cadmium	MG/KG	0.44	b1,h5
Calcium	MG/KG	3170	b1
Chromium	MG/KG	14.3	e1,h5
Copper	MG/KG	13.3	b1
Iron	MG/KG	21300	b1,e1
Lead	MG/KG	17.4	
Magnesium	MG/KG	2000	b1
Manganese	MG/KG	345	e1
Mercury	MG/KG	0.06	e5
Nickel	MG/KG	10.6	h5
Potassium	MG/KG	631	b1
Vanadium	MG/KG	24.2	
Zinc	MG/KG	57.2	b1

AUS-0A12-038	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4880	
Antimony	MG/KG	0.46	h5
Arsenic	MG/KG	13.3	e1,h1,h5,h7
Barium	MG/KG	93.5	h5
Boron	MG/KG	14.3	b1,e1
Cadmium	MG/KG	2.7	b1,h5
Calcium	MG/KG	75100	b1
Chromium	MG/KG	6.7	e1,h5
Copper	MG/KG	12	b1
Iron	MG/KG	18600	e1
Lead	MG/KG	34.4	b1
Magnesium	MG/KG	3730	b1
Manganese	MG/KG	1500	e1
Nickel	MG/KG	26	b1,h5
Potassium	MG/KG	576	
Selenium	MG/KG	1.1	e1,e5,h5
Silver	MG/KG	0.24	
Sodium	MG/KG	351	b1
Vanadium	MG/KG	12.8	
Zinc	MG/KG	267	b1,e1

AUS-0A12-039	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5590	
Arsenic	MG/KG	26.1	b1,e1,h1,h5,h7
Barium	MG/KG	58.5	
Boron	MG/KG	20.7	b1,e1
Cadmium	MG/KG	3.4	b1,h5
Calcium	MG/KG	32000	b1
Chromium	MG/KG	6.6	e1,h5
Copper	MG/KG	16.3	b1
Iron	MG/KG	36300	b1,e1
Lead	MG/KG	26.3	b1
Magnesium	MG/KG	15700	b1
Manganese	MG/KG	471	e1
Nickel	MG/KG	18.3	h5
Potassium	MG/KG	1430	b1
Selenium	MG/KG	1.6	e1,e5,h5
Silver	MG/KG	0.61	b1
Vanadium	MG/KG	15.9	
Zinc	MG/KG	345	b1,e1

AUS-0A12-040	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	11400	
Antimony	MG/KG	0.39	h5
Arsenic	MG/KG	9.6	e1,h1,h5,h7
Barium	MG/KG	29.9	
Boron	MG/KG	34.8	b1,e1
Cadmium	MG/KG	1.2	b1,h5
Calcium	MG/KG	7320	b1
Chromium	MG/KG	9.1	e1,h5
Cobalt	MG/KG	9.6	
Copper	MG/KG	20.9	b1
Iron	MG/KG	21900	b1,e1
Lead	MG/KG	22.3	
Magnesium	MG/KG	451	
Manganese	MG/KG	191	e1
Nickel	MG/KG	17.1	h5
Potassium	MG/KG	845	b1
Selenium	MG/KG	1.7	e1,e5,h5
Vanadium	MG/KG	18.9	
Zinc	MG/KG	203	b1,e1

AUS-0A12-048	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7530	
Arsenic	MG/KG	5.5	h1,h5,h7
Barium	MG/KG	114	h5
Cadmium	MG/KG	0.31	b1
Calcium	MG/KG	3410	b1
Chromium	MG/KG	10	e1,h5
Copper	MG/KG	13.8	b1
Iron	MG/KG	12500	e1
Lead	MG/KG	13.4	
Magnesium	MG/KG	2700	b1
Manganese	MG/KG	397	e1
Mercury	MG/KG	0.13	b1,e5
Nickel	MG/KG	10.1	h5
Potassium	MG/KG	454	
Vanadium	MG/KG	19	
Zinc	MG/KG	43	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-044	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4390	
Antimony	MG/KG	0.31	h5
Arsenic	MG/KG	4	h1,h5,h7
Barium	MG/KG	73.7	
Boron	MG/KG	3.1	e1
Calcium	MG/KG	4370	b1
Chromium	MG/KG	6.6	e1,h5
Copper	MG/KG	7.4	
Iron	MG/KG	9490	e1
Lead	MG/KG	38.8	b1
Magnesium	MG/KG	2520	b1
Manganese	MG/KG	679	e1
Nickel	MG/KG	6.4	
Potassium	MG/KG	367	
Selenium	MG/KG	0.9	e5,h5
Silver	MG/KG	0.23	
Vanadium	MG/KG	14.4	
Zinc	MG/KG	35.2	

AUS-0A12-043	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	2700	
Barium	MG/KG	37	
Calcium	MG/KG	818	
Chromium	MG/KG	4	h5
Iron	MG/KG	4780	e1
Lead	MG/KG	9.3	
Magnesium	MG/KG	723	
Manganese	MG/KG	302	e1
Nickel	MG/KG	3.1	
Potassium	MG/KG	191	
Selenium	MG/KG	1	e5,h5
Vanadium	MG/KG	8	
Zinc	MG/KG	15.8	

AUS-0A12-042	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7880	
Antimony	MG/KG	0.34	h5
Arsenic	MG/KG	9.6	e1,h1,h5,h7
Barium	MG/KG	30.9	
Calcium	MG/KG	378	
Chromium	MG/KG	9.6	e1,h5
Copper	MG/KG	6.7	
Iron	MG/KG	15200	e1
Lead	MG/KG	10.4	
Magnesium	MG/KG	1760	b1
Manganese	MG/KG	120	e1
Nickel	MG/KG	4.8	
Potassium	MG/KG	308	
Selenium	MG/KG	1.2	e1,e5,h5
Vanadium	MG/KG	24.8	
Zinc	MG/KG	23.1	

AUS-0A12-041	Units	Result: 2 ft	Reference Code
Metals			
Aluminum	MG/KG	6060	
Arsenic	MG/KG	4.8	h1,h5,h7
Barium	MG/KG	142	h5
Cadmium	MG/KG	0.39	b1
Calcium	MG/KG	22100	b1
Chromium	MG/KG	8.2	e1,h5
Cobalt	MG/KG	6	
Copper	MG/KG	6.8	
Iron	MG/KG	11300	e1
Lead	MG/KG	9.4	
Magnesium	MG/KG	12400	b1
Manganese	MG/KG	1810	e1
Nickel	MG/KG	8.4	h5
Potassium	MG/KG	370	
Selenium	MG/KG	0.9	e5,h5
Silver	MG/KG	0.2	
Sodium	MG/KG	202	b1
Vanadium	MG/KG	14.7	
Zinc	MG/KG	30.8	

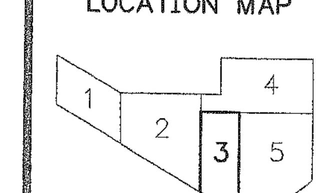
NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

AREA 12—AMMONIUM NITRATE PLANT

AREA 12—SECTION LOCATION MAP



Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT—AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS—ØA12—Section 3—Sample Locations and Detections of Inorganic Compounds in Soils/Drums

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-14
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11x17\AUS-0A12(INORGANIC).DWG Last edited: AUG. 06, 01 @ 10:55 a.m. URS Corp.

LEGEND

- MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

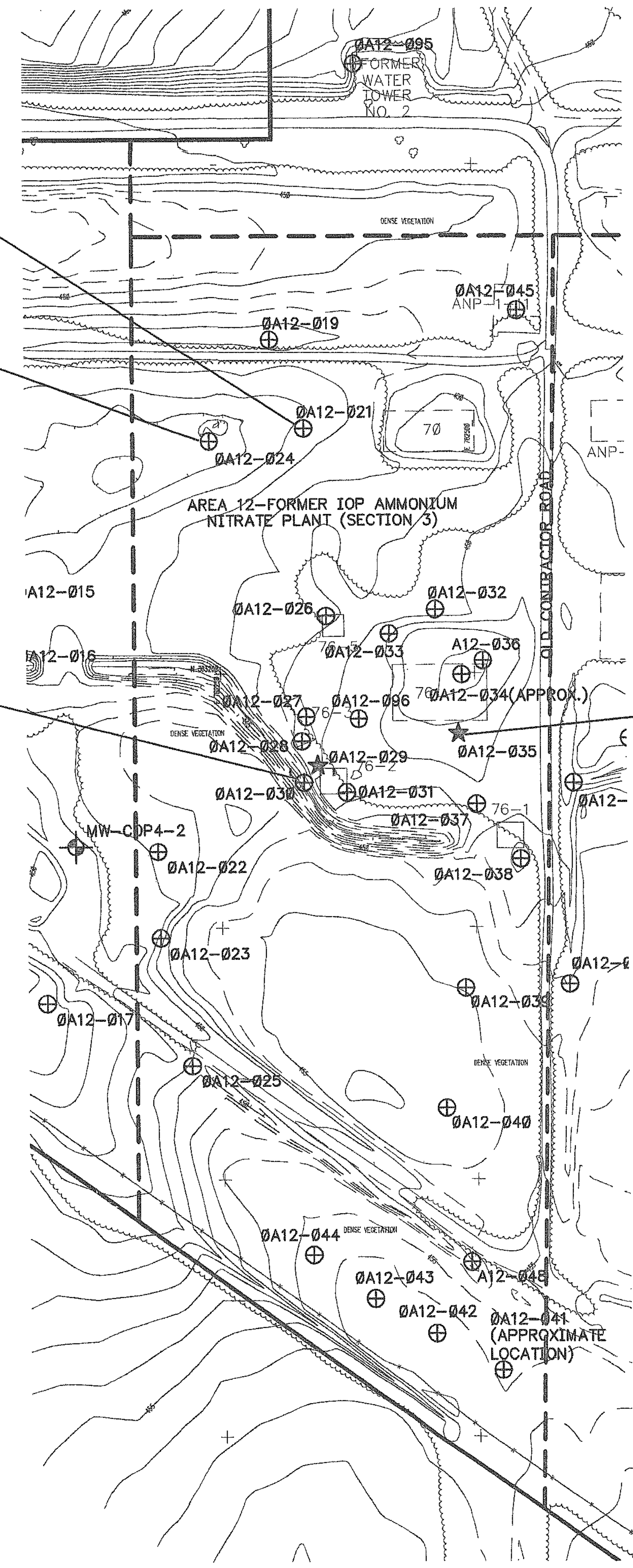
Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-021-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	11300	b3,e3
Barium	UG/L	182	b3
Beryllium	UG/L	0.41	
Boron	UG/L	207	
Calcium	UG/L	74600	b3
Chromium	UG/L	11.1	b3
Cobalt	UG/L	8.5	e3
Copper	UG/L	12.1	b3,e3,e4
Iron	UG/L	11000	b3,e3,e4,h10
Lead	UG/L	12.5	b3
Magnesium	UG/L	27200	b3
Manganese	UG/L	924	b3
Nickel	UG/L	11.3	b3
Potassium	UG/L	3760	b3
Selenium	UG/L	3.5	b3,e5
Sodium	UG/L	12400	b3
Vanadium	UG/L	24.6	e3
Zinc	UG/L	106	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.64	b3
Nitrogen, Nitrate-Nitrite (duplicate)	MG/L	0.071	b3

AUS-0A12-024-SW-00	Units	Result	Screening Codes
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate (DEHP)	UG/L	1.5	e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	125	e3
Antimony	UG/L	1.8	
Barium	UG/L	108	b3
Calcium	UG/L	47600	b3
Copper	UG/L	6.3	
Iron	UG/L	1570	b3,e3,e4,h10
Magnesium	UG/L	16500	b3
Manganese	UG/L	319	
Potassium	UG/L	4000	b3
Selenium	UG/L	2.1	e5
Sodium	UG/L	10600	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	176	b3
Nitrogen, Ammonia (as N)	MG/L	0.25	
Nitrogen, Nitrate-Nitrite	MG/L	0.21	b3
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	14000	
TDS	MG/L	250	b3
TSS	MG/L	80	b3

AUS-0A12-030-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
HMX	UG/L	5.8	
RDX	UG/L	1.4	
Metals			
Aluminum	UG/L	138	e3
Barium	UG/L	87.8	b3
Boron	UG/L	603	
Calcium	UG/L	161000	b3,e3
Cobalt	UG/L	4	e3
Copper	UG/L	3.7	
Iron	UG/L	5620	b3,e3,e4,h10
Magnesium	UG/L	78700	b3
Manganese	UG/L	311	
Potassium	UG/L	3750	b3
Selenium	UG/L	2	e5
Sodium	UG/L	54100	b3
Zinc	UG/L	30.1	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.35	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.063	b3
Sulfate (as SO4)	UG/L	590000	h10
TDS	MG/L	1140	b3,h10

AUS-0A12-035-GW-00 (Trench Water)	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
2,4,6-Trinitrotoluene (TNT)	UG/L	22	h3,h4
HMX	UG/L	30	
RDX	UG/L	44	h3
Metals			
Aluminum	UG/L	115000	h4
Arsenic	UG/L	49	h3,h4
Barium	UG/L	1180	
Beryllium	UG/L	8.3	h6
Boron	UG/L	149	
Calcium	UG/L	71300	
Chromium	UG/L	144	h6
Cobalt	UG/L	86	
Copper	UG/L	62.8	
Iron	UG/L	158000	h4,h6
Lead	UG/L	68.4	h6
Magnesium	UG/L	45100	
Manganese	UG/L	5240	h4,h6
Nickel	UG/L	177	h6
Potassium	UG/L	8360	
Selenium	UG/L	2.7	
Sodium	UG/L	46400	
Vanadium	UG/L	152	
Zinc	UG/L	429	
Other Parameters			
Phosphorus, Total (as P)	MG/L	2.2	h4
Phosphorus, Total Orthophosphate (as P)	MG/L	1.5	



NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12-AMMONIUM NITRATE PLANT

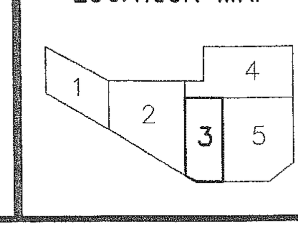
Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12-Section 3-Sample Locations and Detections in Surface Water and Trench Water

AREA 12-SECTION LOCATION MAP



Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-15
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

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LEGEND

MONITORING WELL LOCATION

HAND AUGER LOCATION

TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-W01	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 17 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Semivolatile Organic Compounds							
All SVOCs	UG/KG			NA			
2-Methylnaphthalene	UG/KG	880	e5			ND	
Anthracene	UG/KG	56	e5			ND	
Benzo(a)anthracene	UG/KG	85	e5,h5			ND	
Benzo(a)pyrene	UG/KG	73	e5			ND	
Benzo(b)fluoranthene	UG/KG	74	e5			ND	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	190	e5			180	e5
Chrysene	UG/KG	85	e5			ND	
Di-n-butyl phthalate	UG/KG	240	e5			ND	
Dibenzofuran	UG/KG	230	e5			ND	
Fluoranthene	UG/KG	95	e5			ND	
Naphthalene	UG/KG	410				ND	
Phenanthrene	UG/KG	380	e5			ND	
Pyrene	UG/KG	140	e5			ND	
Explosives							
All Explosives	UG/KG	ND		NA		ND	

AUS-0A12-086	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	1100	e1,e5		
Di-n-butyl phthalate	UG/KG	49	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-085	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	53	e5		
Di-n-butyl phthalate	UG/KG	550	e5		
N-Nitrosodiphenylamine	UG/KG	130	h5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-087	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-089	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
Benzo(b)fluoranthene	UG/KG	65	e5		
Benzo(k)fluoranthene	UG/KG	76	e5		
Chrysene	UG/KG	55	e5		
Di-n-butyl phthalate	UG/KG	84	e5		
Pyrene	UG/KG	42	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-W02	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code	Result: 20 ft	Reference Code
Volatile Organic Compounds									
All VOCs	UG/KG	NA		ND		ND		ND	
Semivolatile Organic Compounds									
All SVOCs	UG/KG			NA		ND		ND	
Di-n-butyl phthalate	UG/KG	130	e5						
Explosives									
All Explosives	UG/KG	ND		NA		ND		ND	

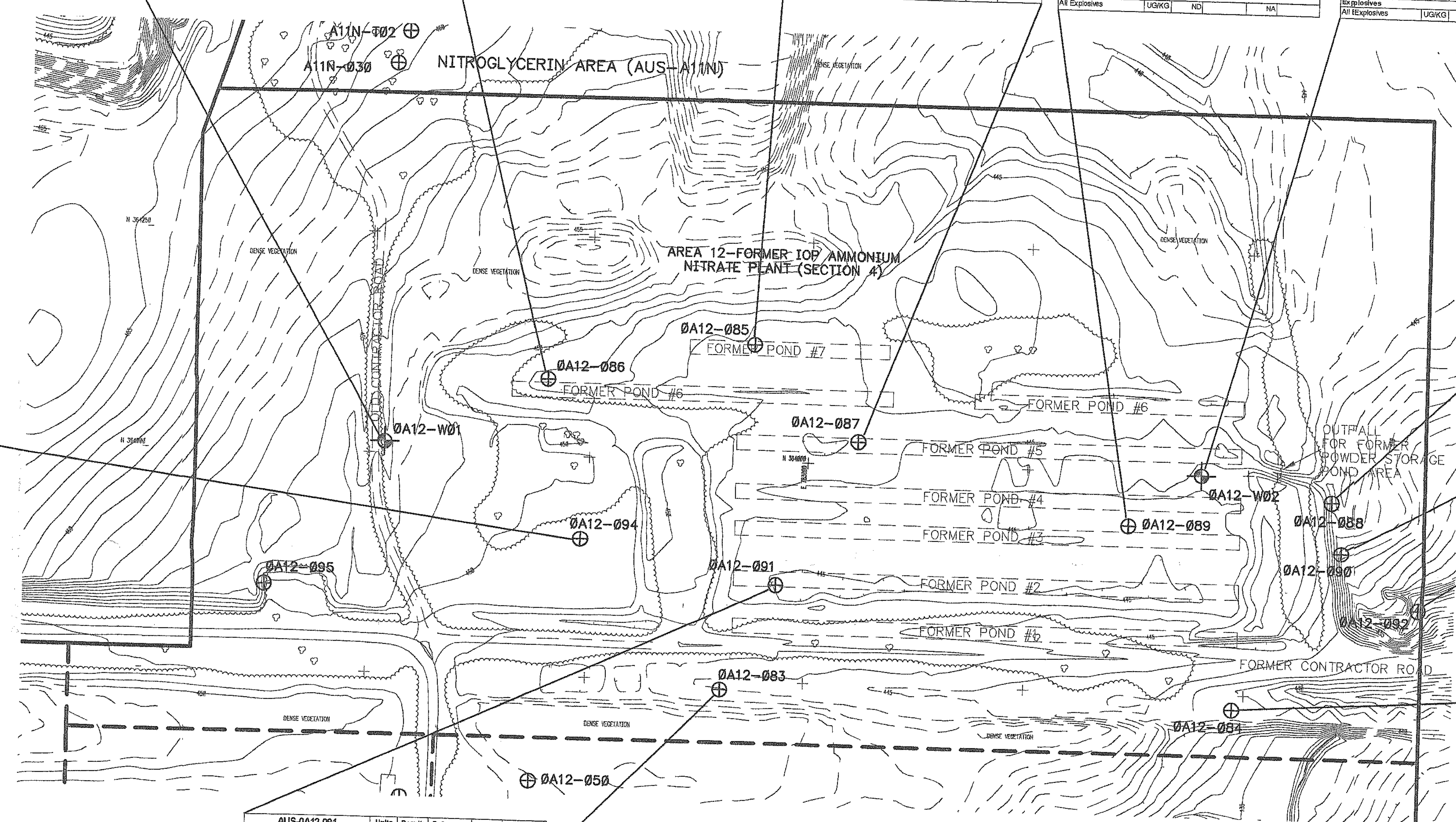
AUS-0A12-094	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA			
Acetone (duplicate)	UG/KG			72	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2,4-Dinitrotoluene (duplicate)	UG/KG	48	h5,h9		
2-Methylnaphthalene	UG/KG	89	e5		
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	92	e5		
Di-n-butyl phthalate	UG/KG	51	e5		
Dibenzofuran	UG/KG	57	e5		
Phenanthrene	UG/KG	89	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-088	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Explosives					
All Explosives	UG/KG			NA	
RDX	UG/KG	640			

AUS-0A12-090	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	48	e5
Explosives			
All Explosives	UG/KG	ND	

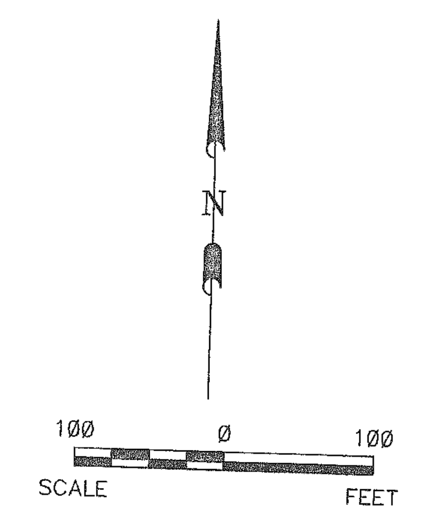
AUS-0A12-092	Units	Result: 0 - 6 in	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A12-084	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	



AUS-0A12-091	Units	Result: 0 - 6 in	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	68	e5		
Di-n-butyl phthalate	UG/KG	60	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A12-083	Units	Result: 0 - 6 in	Reference Code
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	48	e5
Explosives			
All Explosives	UG/KG	ND	



NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12—AMMONIUM NITRATE PLANT

AREA 12—SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT—AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS—ØA12—Section 4—Sample Locations and Detections of Organic Compounds in Soils

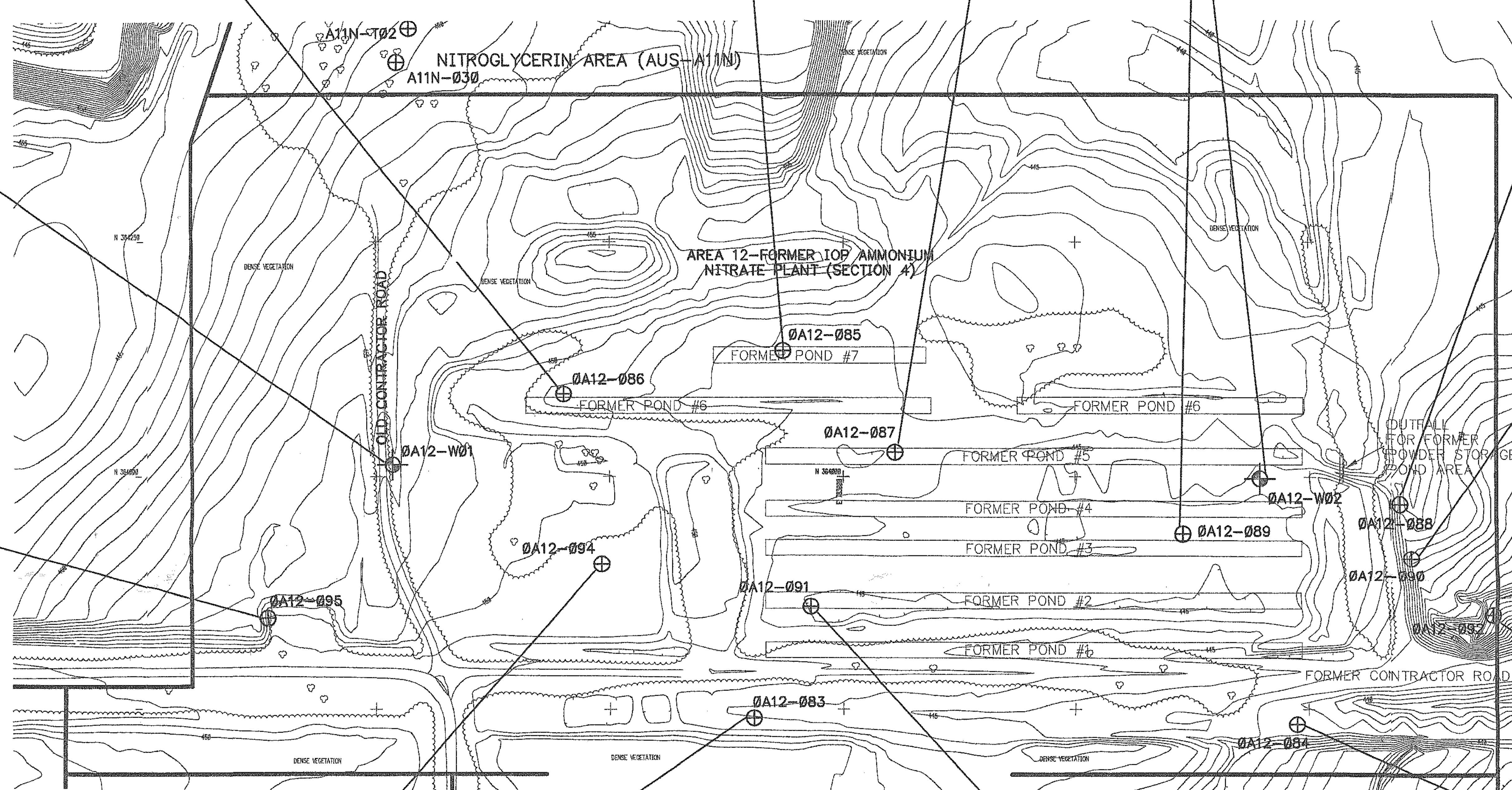
Date: 12/27/00	Project Number: 23200000026.00	Figure Number: 20—16
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

URS

LEGEND

- MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10



AUS-0A12-086	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6600	
Arsenic	MG/KG	5	h1,h5,h7
Barium	MG/KG	63.9	
Boron	MG/KG	2.3	e1
Cadmium	MG/KG	0.29	b1
Calcium	MG/KG	2580	b1
Chromium	MG/KG	9.4	e1,h5
Copper	MG/KG	7.2	
Iron	MG/KG	13000	e1
Lead	MG/KG	10.8	
Magnesium	MG/KG	1360	
Manganese	MG/KG	391	e1
Nickel	MG/KG	7.3	h5
Potassium	MG/KG	616	
Selenium	MG/KG	0.79	e5,h5
Vanadium	MG/KG	18.1	
Zinc	MG/KG	31.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-085	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4060	
Barium	MG/KG	47.2	
Cadmium	MG/KG	0.31	b1
Calcium	MG/KG	23100	b1
Chromium	MG/KG	6.7	e1,h5
Copper	MG/KG	6.2	
Iron	MG/KG	10400	e1
Lead	MG/KG	9.4	
Magnesium	MG/KG	1210	
Manganese	MG/KG	234	e1
Nickel	MG/KG	7	
Potassium	MG/KG	674	b1
Selenium (duplicate)	MG/KG	0.61	e5,h5
Vanadium	MG/KG	10	
Zinc	MG/KG	33.1	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-087	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6340	
Arsenic	MG/KG	5.3	h1,h5,h7
Barium	MG/KG	58.7	
Boron	MG/KG	2.8	e1
Cadmium	MG/KG	0.28	b1
Calcium	MG/KG	5190	b1
Chromium	MG/KG	9.1	e1,h5
Copper	MG/KG	8.6	
Iron	MG/KG	16300	e1
Lead	MG/KG	10.7	
Magnesium	MG/KG	1360	
Manganese	MG/KG	324	e1
Nickel	MG/KG	9.7	h5
Potassium	MG/KG	602	
Selenium	MG/KG	0.87	e5,h5
Vanadium	MG/KG	15.3	
Zinc	MG/KG	30.5	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-089	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5840	
Barium	MG/KG	65.1	
Boron	MG/KG	1.8	e1
Cadmium	MG/KG	0.31	b1
Calcium	MG/KG	7750	b1
Chromium	MG/KG	8.7	e1,h5
Copper	MG/KG	6.3	
Iron	MG/KG	10100	e1
Lead	MG/KG	9.8	
Magnesium	MG/KG	2150	b1
Manganese	MG/KG	252	e1
Nickel	MG/KG	8.4	h5
Potassium	MG/KG	717	b1
Selenium	MG/KG	0.52	e5,h5
Vanadium	MG/KG	13.9	
Zinc	MG/KG	35.8	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-W02	Units	Result: 0 - 6 in	Refference Code	Result: 5 ft	Reference Code	Result: 20 ft	Reference Code
Metals							
Aluminum	MG/KG	8850		7960		6430	
Arsenic	MG/KG	6.5	h1,h5,h7	8.7	h1,h5,h7	1.1	h5
Barium	MG/KG	110	h5	77.1		42.2	
Beryllium	MG/KG	0.5		ND		ND	
Boron (duplicate for 0-6 in)	MG/KG	5.6	b1,e1	2.6	e1	ND	
Calcium	MG/KG	16000	b1	589		2710	b1
Chromium	MG/KG	11.7	e1,h5	13.3	e1,h5	12.3	e1,h5
Cobalt	MG/KG	7.3		6.7		5.6	
Copper	MG/KG	8.4		14.9	b1	9.5	
Iron	MG/KG	15200	e1	20700	b1,e1	8600	e1
Lead	MG/KG	12.5		11.7		10.9	
Magnesium	MG/KG	3050	b1	2160	b1	2080	b1
Manganese	MG/KG	588	e1	417	e1	78.4	
Mercury	MG/KG	ND		ND		0.061	b1,e5
Nickel	MG/KG	12.4	h5	14.5	h5	18	h5
Potassium	MG/KG	561		570		530	
Selenium	MG/KG	1	e5,h5	ND		ND	
Sodium (duplicate)	MG/KG	463	b1	ND		ND	
Vanadium	MG/KG	19.7		21.2		12.6	
Zinc	MG/KG	38		46.3		50.4	
Other Parameters							
All Other Parameters	UG/KG	ND		ND		ND	
Perchlorate	UG/KG	ND		ND		ND	

AUS-0A12-W01	Units	Result: 0 - 6 in	Reference Code	Result: 17 ft	Reference Code
Metals					
Aluminum	MG/KG	3920		7470	
Arsenic	MG/KG	3.1	h1,h5,h7	4.3	h1,h5,h7
Barium	MG/KG	45.8		73.5	
Beryllium	MG/KG	0.49		0.68	
Boron	MG/KG	16.6	b1,e1	ND	
Cadmium	MG/KG	1.1	b1,h5	0.25	b1
Calcium	MG/KG	13000	b1	17200	b1
Chromium	MG/KG	5.9	e1,h5	14.6	e1,h5
Copper	MG/KG	5.8		12.3	b1
Iron	MG/KG	8750	e1	17900	e1
Lead	MG/KG	76.7	b1	9.7	
Magnesium	MG/KG	5550	b1	2790	b1
Manganese	MG/KG	523	e1	342	e1
Nickel	MG/KG	5.7		19.8	b1,h5
Potassium	MG/KG	423		671	b1
Selenium	MG/KG	0.84	e5,h5	0.42	e5,h5
Silver	MG/KG	ND		0.19	
Sodium	MG/KG	ND		450	b1
Thallium	MG/KG	ND		0.24	
Vanadium	MG/KG	11.7		16.1	
Zinc	MG/KG	124	b1,e1	46.8	
Other Parameters					
All Other Parameters	UG/KG	ND		NA	
Perchlorate	UG/KG	ND			

AUS-0A12-095	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7880	
Arsenic	MG/KG	6	h1,h5,h7
Barium	MG/KG	132	h5
Cadmium	MG/KG	0.33	b1
Calcium	MG/KG	829	
Chromium	MG/KG	10.8	e1,h5
Copper	MG/KG	10.5	
Iron	MG/KG	14200	e1
Lead	MG/KG	12.7	
Magnesium	MG/KG	1910	b1
Manganese	MG/KG	154	e1
Nickel	MG/KG	7.7	h5
Potassium	MG/KG	465	
Sodium	MG/KG	599	b1
Vanadium	MG/KG	18.1	
Zinc	MG/KG	36.3	

AUS-0A12-088	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7420	
Arsenic	MG/KG	6.2	h1,h5,h7
Barium	MG/KG	118	h5
Boron	MG/KG	1.9	e1
Cadmium	MG/KG	0.28	b1
Calcium	MG/KG	2520	b1
Chromium	MG/KG	12.9	e1,h5
Cobalt	MG/KG	8	
Copper	MG/KG	9.8	
Iron	MG/KG	16400	e1
Lead	MG/KG	9.6	
Magnesium	MG/KG	1860	b1
Manganese	MG/KG	358	e1
Nickel	MG/KG	11.6	h5
Potassium	MG/KG	556	
Selenium	MG/KG	0.81	e5,h5
Vanadium	MG/KG	20.9	
Zinc	MG/KG	35.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-090	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6900	
Arsenic	MG/KG	6	h1,h5,h7
Barium	MG/KG	82.8	h5
Boron	MG/KG	3	e1
Cadmium	MG/KG	0.32	b1
Calcium	MG/KG	9770	b1
Chromium	MG/KG	11.4	e1,h5
Cobalt	MG/KG	6.7	
Copper	MG/KG	9.1	
Iron	MG/KG	15000	e1
Lead	MG/KG	10.6	
Magnesium	MG/KG	2630	b1
Manganese	MG/KG	485	e1
Nickel	MG/KG	8.9	h5
Potassium	MG/KG	500	
Selenium	MG/KG	1.2	e1,e5,h5
Vanadium	MG/KG	21	
Zinc	MG/KG	36.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-092	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7940	
Arsenic	MG/KG	14.4	b1,e1,h1,h5,h7
Barium	MG/KG	84.4	h5
Boron	MG/KG	4	e1
Cadmium	MG/KG	0.76	b1,h5
Calcium	MG/KG	44500	b1
Chromium	MG/KG	14.5	e1,h5
Cobalt	MG/KG	8.8	
Copper	MG/KG	8.3	
Iron	MG/KG	25200	b1,e1
Lead	MG/KG	18.3	
Magnesium	MG/KG	24100	b1
Manganese	MG/KG	1020	e1
Nickel	MG/KG	9.1	h5
Potassium	MG/KG	534	
Selenium	MG/KG	0.96	e5,h5
Vanadium	MG/KG	31.6	
Zinc	MG/KG	49.7	

AUS-0A12-094	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4900	
Arsenic	MG/KG	4.5	h1,h5,h7
Barium	MG/KG	75.8	
Boron	MG/KG	3	e1
Cadmium	MG/KG	0.74	b1,h5
Calcium	MG/KG	16300	b1
Chromium	MG/KG	5.9	e1,h5
Cobalt	MG/KG	7.1	
Copper	MG/KG	5.7	
Iron	MG/KG	9860	e1
Lead	MG/KG	28.7	b1
Magnesium	MG/KG	9080	b1
Manganese	MG/KG	1340	e1
Nickel	MG/KG	6.9	
Potassium	MG/KG	295	
Selenium	MG/KG	1	e5,h5
Vanadium	MG/KG	16.6	
Zinc	MG/KG	215	b1,e1

AUS-0A12-083	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6900	
Arsenic	MG/KG	7.1	h1,h5,h7
Barium	MG/KG	166	h5
Cadmium	MG/KG	0.32	b1
Calcium	MG/KG	2440	
Chromium	MG/KG	11.6	e1,h5
Cobalt	MG/KG	11.2	
Copper	MG/KG	10.6	
Iron	MG/KG	16000	e1
Lead	MG/KG	12.7	
Magnesium	MG/KG	2150	b1
Manganese	MG/KG	541	e1
Nickel	MG/KG	14.6	h5
Potassium	MG/KG	425	
Vanadium	MG/KG	21	
Zinc	MG/KG	39.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-091	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6850	
Arsenic	MG/KG	4.8	h1,h5,h7
Barium	MG/KG	68.1	
Boron	MG/KG	1.8	e1
Cadmium	MG/KG	0.29	b1
Calcium	MG/KG	4380	b1
Chromium	MG/KG	10.3	e1,h5
Copper	MG/KG	8.2	
Iron	MG/KG	13900	e1
Lead	MG/KG	10.9	
Magnesium	MG/KG	2330	b1
Manganese	MG/KG	478	e1
Nickel	MG/KG	8.4	h5
Potassium	MG/KG	555	
Selenium	MG/KG	0.63	e5,h5
Vanadium	MG/KG	18	
Zinc	MG/KG	31.8	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A12-084	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6480	
Arsenic	MG/KG	4.9	h1,h5,h7
Barium	MG/KG	115	h5
Cadmium	MG/KG	0.3	b1
Calcium	MG/KG	16800	b1
Chromium	MG/KG	9.6	e1,h5
Cobalt	MG/KG	6.2	
Copper	MG/KG	7.5	
Iron	MG/KG	12300	e1
Lead	MG/KG	9.8	
Magnesium	MG/KG	10000	b1
Manganese	MG/KG	430	e1
Nickel	MG/KG	9.5	h5
Potassium	MG/KG	506	
Vanadium	MG/KG	18.7	
Zinc	MG/KG	33.3	
Other Parameters			
Perchlorate	UG/KG	ND	

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SCALE FEET

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

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AREA 12–AMMONIUM NITRATE PLANT

AREA 12–SECTION LOCATION MAP

1 2 3 4 5

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS–0A12–Section 4–Sample Locations and Detections of Inorganic Compounds in Soils

Date: 12/27/00	Project Number: 23200000026.00	Figure Number: 20–17
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

URS

LEGEND

- MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
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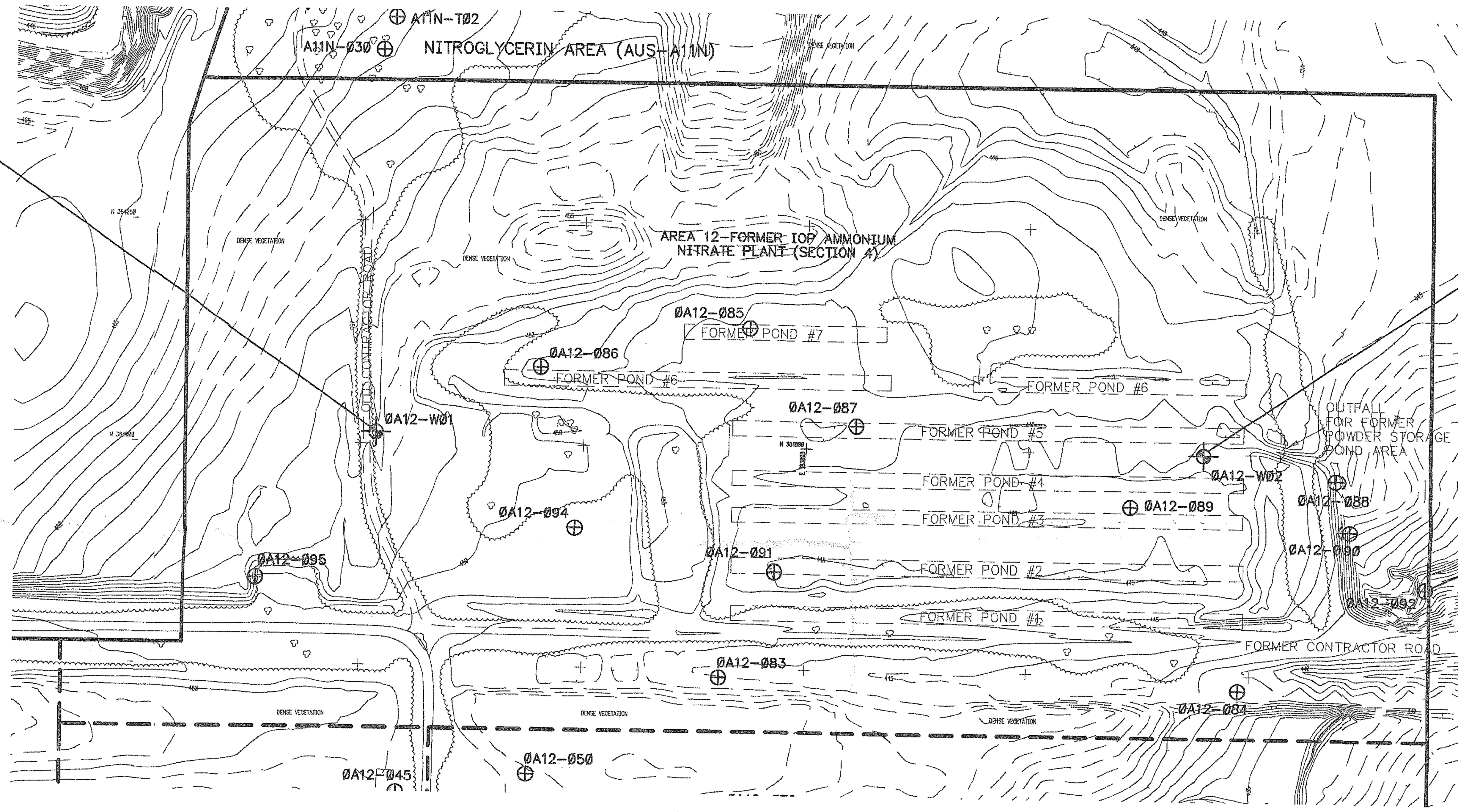
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	132000	h4
Arsenic	UG/L	76.2	h3,h4,h6
Barium	UG/L	1660	
Beryllium	UG/L	12.8	h6
Calcium	UG/L	65200	
Chromium	UG/L	216	h6
Cobalt	UG/L	132	
Copper	UG/L	184	
Iron	UG/L	298000	h4,h6
Lead	UG/L	119	h6
Magnesium	UG/L	76300	
Manganese	UG/L	7310	h4,h6
Mercury	UG/L	0.32	
Nickel	UG/L	290	h6
Potassium	UG/L	7850	
Selenium	UG/L	6.2	
Sodium	UG/L	194000	
Vanadium	UG/L	270	h4
Zinc	UG/L	644	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	496	
Nitrogen, Ammonia (as N)	MG/L	0.15	
Nitrogen, Nitrate-Nitrite	MG/L	0.086	
Perchlorate	UG/L	ND	
Phosphorus, Total (as P)	MG/L	0.82	h4
Sulfate (as SO4)	UG/L	260000	
TDS	MG/L	888	
TSS	MG/L	770	

AUS-0A12-W02-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Chloromethane	UG/L	0.7	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	368	
Barium	UG/L	59.7	
Calcium	UG/L	74500	
Chromium	UG/L	34.1	
Iron	UG/L	394	
Magnesium	UG/L	37100	
Manganese	UG/L	47.2	
Nickel	UG/L	2.3	
Potassium	UG/L	752	
Sodium	UG/L	20800	
Zinc	UG/L	2.8	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A12-092-SW-00	Units	Result	Screening Codes
Explosives			
2,4-Dinitrotoluene	UG/L	0.38	
2,6-Dinitrotoluene	UG/L	2.1	
2-Nitrotoluene (ONT)	UG/L	1.4	
Metals			
Aluminum	UG/L	460	b3,e3
Barium	UG/L	63.7	b3
Boron	UG/L	470	
Calcium	UG/L	153000	b3,e3
Iron	UG/L	560	b3
Magnesium	UG/L	107000	b3,e3
Manganese	UG/L	56.8	
Selenium	UG/L	3.4	b3,e5
Sodium	UG/L	114000	b3
Zinc	UG/L	28.2	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.24	
Nitrogen, Nitrate-Nitrite	MG/L	35.9	b3



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NOTES:

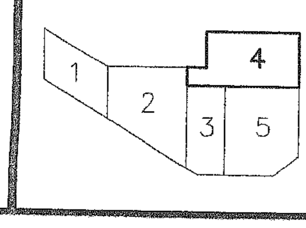
1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12–AMMONIUM NITRATE PLANT

AREA 12–SECTION LOCATION MAP



Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT–AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12–Section 4–Sample Locations and Detections in Surface Water and Groundwater

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-18
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

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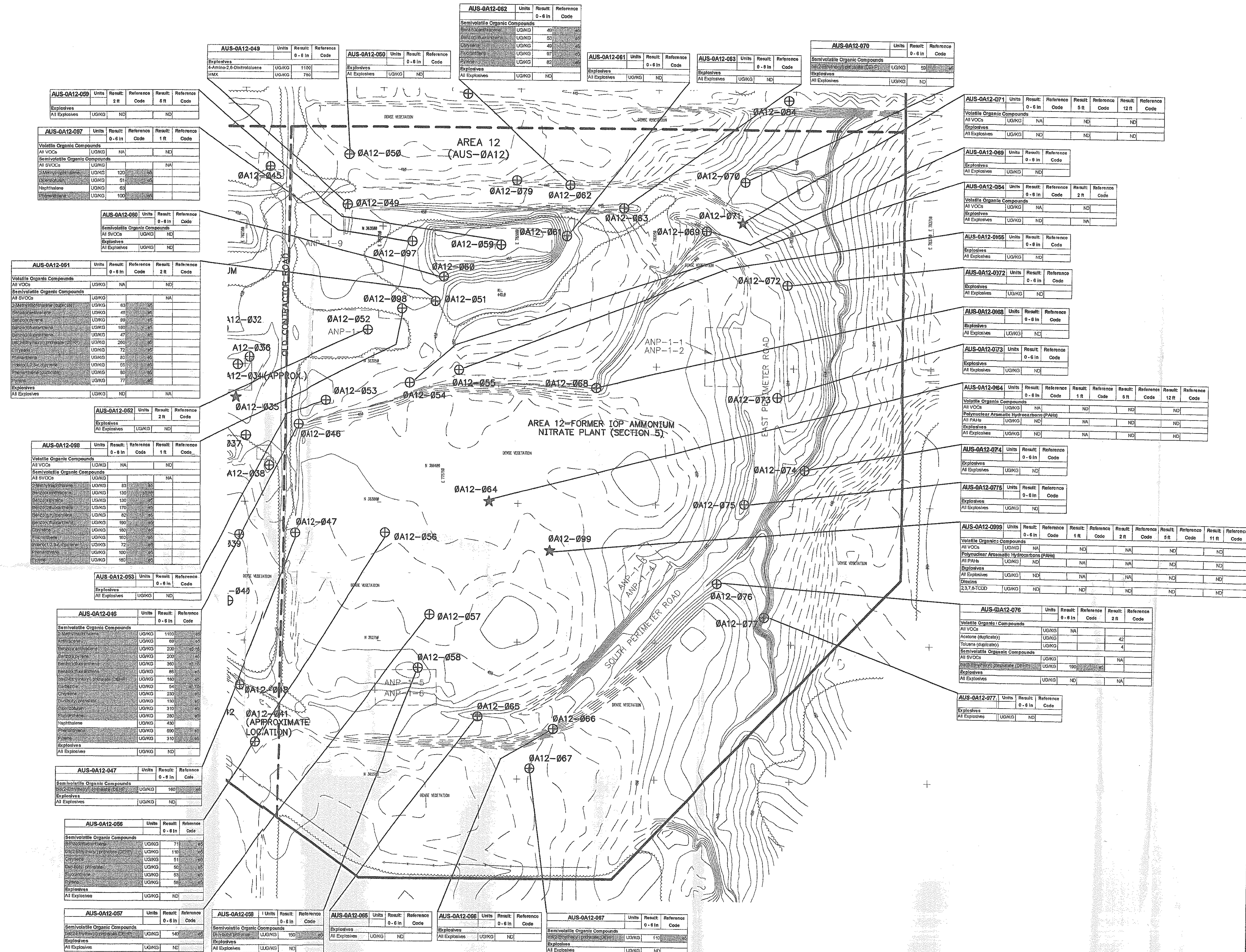
File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11&12\AUS-0A12(WATER).DWG Last edited: AUG. 16, 01 @ 6:58 p.m. URS Corp.



LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

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3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AREA 12-AMMONIUM NITRATE PLANT

Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-ØA12-Section 5-Sample Locations and Detections of Organic Compounds in Soils

AREA 12-SECTION LOCATION MAP

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-19
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

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File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-SAMPLE LOCATION 11\A12\AUS-ØA12(ORGANIC).DWG Last edited: AUG. 30, 01 @ 09:11 a.m. URS Corp.

LEGEND

- ⌖ MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT. DASHED OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES BASED ON DRAWINGS PREPARED BY FORMER TENANTS (U.S. POWDER/OLIN). SEE FIGURE 15-3 FOR EXPLANATION OF FORMER STRUCTURES. NOTE THAT U.S. POWDER BUILDING NUMBERS ARE USED TO DESIGNATE ALL STRUCTURES EXCEPT THOSE USED EXCLUSIVELY BY OLIN, WHICH HAVE OLIN BUILDING NUMBERS.

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AREA 12—AMMONIUM NITRATE PLANT

AREA 12—SECTION LOCATION MAP

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Revision No.	Description	Date	By	App.

REVISIONS

PA/SI REPORT—AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS—0A12—Section 5—Sample Locations and Detections of Inorganic Compounds in Soils

Date: 12/27/00	Project Number: 23200000026.00	Figure Number: 20—20
Drawn by: DJD	Design by: MM	Checked by: MCH/CMW

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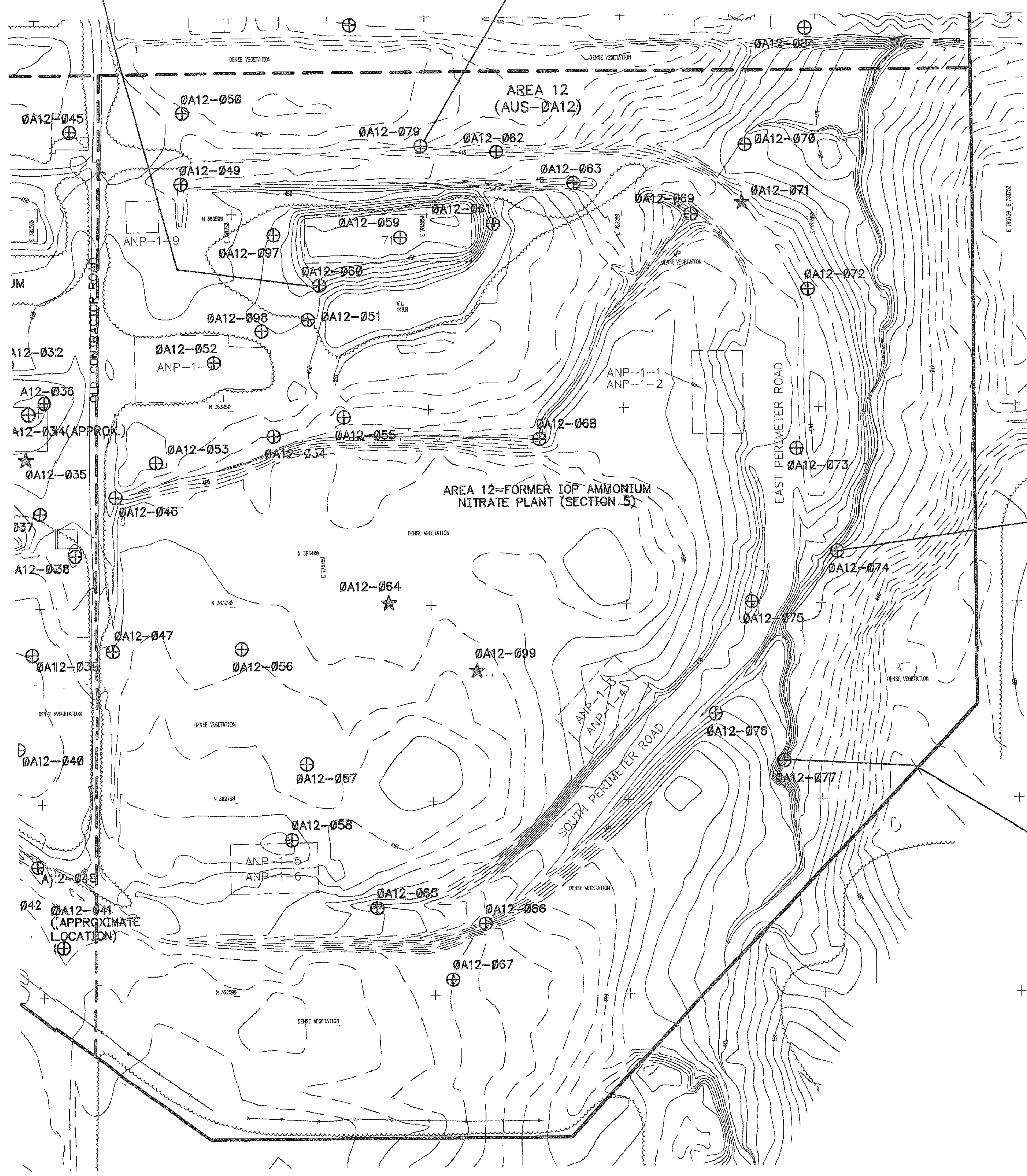
LEGEND

- ⌖ MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ★ TEST PIT LOCATION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0A12-060-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/L	1.1	e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	411	b3,e3
Barium	UG/L	54.7	b3
Calcium	UG/L	6670	
Copper	UG/L	4.1	
Iron	UG/L	1290	b3,e3,e4,h10
Magnesium	UG/L	4620	b3
Manganese	UG/L	282	
Sodium	UG/L	2380	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	31.8	b3
Nitrogen, Ammonia (as N)	MG/L	0.59	b3
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
Sulfate (as SO4)	UG/L	9600	
TDS	MG/L	52	
TSS	MG/L	169	b3

AUS-0A12-079-SW-00	Units	Result	Screening Codes
Explosives			
HMX	UG/L	1.2	
RDX	UG/L	2.9	
Metals			
Aluminum	UG/L	191	e3
Barium	UG/L	39.1	b3
Calcium	UG/L	76700	b3
Chromium	UG/L	19.6	b3
Copper	UG/L	15.8	b3,e3,e4
Iron	UG/L	369	b3
Magnesium	UG/L	16000	b3
Manganese	UG/L	61.2	
Nickel	UG/L	21	b3
Sodium	UG/L	13600	b3
Zinc	UG/L	16.6	



AUS-0A12-074-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	3340	b3,e3
Antimony	UG/L	1.3	
Barium	UG/L	101	b3
Boron	UG/L	331	
Calcium	UG/L	103000	b3
Chromium	UG/L	4	
Cobalt	UG/L	6.8	e3
Iron	UG/L	4780	b3,e3,e4,h10
Magnesium	UG/L	63800	b3
Manganese	UG/L	657	b3
Nickel	UG/L	7.6	
Selenium	UG/L	3.9	b3,e5
Sodium	UG/L	68200	b3
Zinc	UG/L	36.9	b3
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	0.51	b3
Nitrogen, Nitrate-Nitrite	MG/L	15.9	b3

AUS-0A12-077-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	10000	b3,e3
Barium	UG/L	173	b3
Beryllium	UG/L	1.3	e3
Boron	UG/L	364	
Calcium	UG/L	103000	b3
Chromium	UG/L	9.8	
Cobalt	UG/L	16.6	e3
Copper	UG/L	47	b3,e3,e4
Iron	UG/L	9660	b3,e3,e4,h10
Lead	UG/L	15.3	b3
Magnesium	UG/L	64100	b3
Manganese	UG/L	2630	b3,e3,e4,h10
Nickel	UG/L	50.3	b3
Potassium	UG/L	3400	b3
Sodium	UG/L	73500	b3
Vanadium	UG/L	30.9	e3
Zinc	UG/L	72.2	b3

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Revision No.	Description	Date	By	App.

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PA/SI REPORT-AUS OU
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MARION, ILLINOIS

AUS-ØA12-Section 5-Sample Locations and Detections in Surface Water

Date: 12/27/00	Project Number: 2320000026.00	Figure Number: 20-21
Drawn by: DJD	Design by: MAM	Checked by: MCH/CMW

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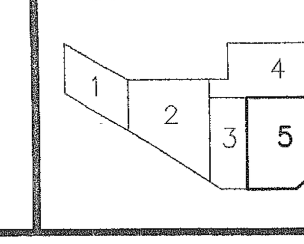
AREA 12-SECTION LOCATION MAP



NOTES:

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AREA 12-AMMONIUM NITRATE PLANT

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