EPA ANNOUNCES PROPOSED PLAN

STATE ROAD 114 GROUND WATER PLUME SUPERFUND SITE
HOCKLEY COUNTY, TEXAS **January 2008**

The purpose of this Proposed Plan is to:

- Identify the preferred remedial action alternative to address ground water and soil contamination at the State Road 114 Ground Water Plume Site;
- Describe the remedial alternatives evaluated for the ground water and soil in the Feasibility Study report;
- Provide summary results of the Remedial Investigation completed at the Site;
- Solicit public review and comment on the alternatives presented as well as on information contained in the Administrative Record file; and,
- Provide information on how the public can be involved in the remedy selection process for the State Road 114 Site.

In this Proposed Plan, the United States Environmental Protection Agency (EPA) presents summary information for the remedial alternatives to address ground water and soil contamination and the risks associated with the release of hazardous substances at the State Road 114 Site (Site). The EPA has conducted its activities in connection with the Site in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), 42 U.S.C. § 9601 et seq., and the National Oil and Hazardous Substance Contingency Plan (NCP), 40 C.F.R. Part 300.

The EPA is issuing this Proposed Plan in accordance with and as part of its public participation responsibilities under CERCLA §117(a), 42 U.S.C. § 9617(a) and 40 CFR §300.430(f)(2). The recommendations and alternatives set forth in this Proposed Plan are based on information and documents contained in the Administrative Record file for the Site.

The EPA Region 6 office is the lead agency for this Site. The Texas Commission on Environmental Quality (TCEQ) is the support agency and conducted the Remedial Investigation at the Site as well as provided technical support and review of the Feasibility Study through a cooperative agreement with EPA.

Community Participation

This Proposed Plan highlights information contained in the Administrative Record for the Site which includes the Remedial Investigation (RI) Report, Feasibility Study (FS) Report, the Human Health Risk Assessment (HHRA) Report, and other documents and reports used in preparing this Proposed Plan. The EPA encourages the public to review those documents to obtain more information about the Superfund activities that have been conducted at the Site. The EPA also encourages the public to participate in the decision-making process for the Site. The Administrative Record file is available at the following information repository locations:

Hockley County Memorial Library,
811 Austin Street
Levelland, TX 79336-4500
(806) 894-6750
Monday, Tuesday, Wednesday, and Friday – 9:00 am to 5:00 pm
Thursday – 9:00 am to 7:00 pm

Texas Commission on Environmental Quality
Building E, Records Management, First Floor
12100 Park 35 Circle
Austin, Texas 78753
(512) 239-2920
Monday - Friday - 8:00 am to 5:00 pm

Site Background

Site History

The Motor Fuels Corporation refinery (also known as Consumers Cooperative Refinery Association) was a former petroleum products refinery located approximately 1 mile west of the City of Levelland in Hockley County, Texas (Figure 1). The former refinery property consisted of approximately 64 acres, and is bordered to the north by State Highway 114, to the east and west by undeveloped land, and along the southern boundary by a railroad line. Refinery construction began in March 1939 for a 5,500 barrel/day production capacity of gasoline, tractor fuels, diesel, distillate products, and fuel oils. The refinery processed and refined crude oil for approximately 15 years from 1939 to 1954. The refinery was initially operated by the Motor Fuels Corporation (MFC); MFC was dissolved, however, in 1945, and the business was transferred to Consumers Cooperative Refinery Association (CCRA), also known as Levelland Consumers Cooperative Refinery Association. CCRA continued operations at the site until approximately 1954. The main refining facilities and tank storage area were dismantled or demolished after 1954. The former MFC refinery property was divided into various parcels of land and sold off in 1958. The Farmer's Co-Op Elevator Association was constructed prior to 1987 in the central and eastern portion of the site. There are several oil related service facilities that currently operate along State Highway 114.

Site Contamination

Wastes from the refinery processes were likely co-mingled with crude oil and petroleum products at or near the point of generation and within waste management areas. A 15-acre playa lake located west of the refinery operations was used as a disposal area for refining wastes (Figure 2). These wastes may have included off-specification batches of fuel, waste oil, brine water, and any other liquids. Between the playa and the refinery operations, there are five tar pits and a large excavated area that also received waste from the refinery operations as well as runoff from the adjacent refinery. The operating history of the refinery was such that wastewaters were routinely discharged into the playa, pits, or excavations, as well as likely spills throughout the refinery area. The wastewater discharges were also commingled with off-specification petroleum products, and petroleum laden wastewaters from the cleaning of process units and tanks. The playa lake, tar pits, and excavated area are all that remain of the former refinery. The playa lake basin has remained essentially undeveloped.

Ground water beneath the site is contaminated with volatile organic chemicals (VOCs) and metals. The contaminant plume is 1.2 miles long and extends about 0.7 mile beyond the edge of the eastern boundary of the former refinery (Figure 3). The principal contaminants in ground water at this site are benzene, 1,2-dichloroethane (1,2-DCA), arsenic, and manganese. The ultimate source of both the manganese and arsenic in groundwater is most likely the dissolution of aquifer materials (indicating reducing conditions), although the arsenic may also be related to the past refining operations. Potential sources of ongoing ground water contamination include a light non-aqueous phase liquid (LNAPL) containing petroleum products and waste material floating on the water table beneath the refinery; the soil matrix in the LNAPL smear zone; and, a benzene vapor plume in the unsaturated soils beneath the ground surface.

History of Federal and State Investigations

Ground water contamination suspected from refining wastes dumped into the playa basin was first investigated and documented by State agencies in 1990. The former refinery site was referred to the State Superfund program in 1992 after determining that enforcement remedies had been exhausted.

The EPA published a proposed rule on July 22, 1999 (64 FR 39886), to add the Site to the National Priorities List (NPL) of Superfund sites. The Site was added to the NPL in a final rule published on October 22, 1999 [Federal Register Listing (FRL-6462-1), Volume 64, Number 204, Pages 56966 - 56973]. The effective date of the amendment to the NCP listing the Site on the NPL was November 22, 1999.

The TCEQ completed the RI of the Site in 2005 under an EPA funded cooperative agreement. EPA completed the FS in 2007. The RI objectives were to determine the extent of the dissolved-phase contamination, characterize the centerline of the dissolved-phase plume, and determine the location of the source areas contributing to the dissolved-phase plume.

History of CERCLA Removal Actions

The EPA initiated a removal action to address the contamination of 17 privately owned wells in 1999. The primary contaminant of concern was 1,2-DCA, although elevated levels of other organic and heavy metal contaminants were identified in the wells. The

EPA and TCEQ agreed to partner on the response. The EPA provided initial installation of the water treatment units, after which the TCEQ provided the operation and maintenance of the units. The treatment units consist of granulated activated carbon (GAC) columns, a five micron pre-filter, and several sampling ports. In addition, wells with heavy metal contamination include an ion exchange unit. Since 1999, the TCEQ has installed an additional 14 filtration systems in response to continued contaminant migration and an expanded sampling effort at the Site.

Site Characteristics

Physical Characteristics

The Farmer's Co-Op Elevator Association occupies most of the former MFC refinery property. The current site features include offices, warehouses, and grain storage facilities. The former MFC refinery area is divided into three areas of concern (AOCs): AOC 1 consists of the former wastewater impoundments and playa located west of the refinery; AOC 2 consists of the west side tank farm and refinery; and, AOC 3 is the east side tank farm and refinery. AOC 1, west of the main refinery area, does not currently include any commercial/industrial activities. The land bordering the playa is open grassland and appears to be suitable for hunting activities around the playa. AOCs 2 and 3 are currently being used by the Farmer's Co-Op along with other businesses along State Highway 114. None of the former MFC refinery area is currently used for residential purposes. Agricultural, commercial/industrial, recreational, and residential areas are located within 1 mile of the site. The site is located wholly within what is known as the Levelland Oil Field. Oil production and injection wells are located on-site, and fuel pipelines traverse the site in a very high density, complicating site characterization activities.

Playa basins are naturally occurring depressions on the High Plains that act as the terminal point for surface water runoff. The majority of playas only hold water during and for some period after a significant rainfall event. As a result of their water-holding capacity in an otherwise semi-arid region, playas also support a diversity of flora and fauna, including migrating waterfowl. Playas also serve as major recharge foci for the Ogallala Aquifer.

Soil Contamination

The horizontal extent of the playa sludge (Figure 4) is estimated at 282,500 square feet (6.5 acres), and the thickness of the sludge in the playa varies from 32 to 56 inches, for an average of 44 inches (3.7 feet). The quantity of contaminated sludge material in the playa was estimated in excess of 38,700 cubic yards. Sludge was also encountered in the abandoned drum hot spot from 30 to 36 inches below ground surface. This lens of sludge material has an estimated horizontal extent of 19,800 square feet (0.45 acre) and an estimated volume of 950 cubic yards. The sludge is not a Resource Conservation and Recovery Act (RCRA) ignitable or characteristically hazardous waste.

An abandoned drum hotspot in AOC 1 (Figure 4) contains elevated copper and zinc in soils that exceed the TCEQ soil invertebrate benchmark values of 61 mg/kg and 120 mg/kg, respecively. The horizontal extent of the impacted soils is estimated at 16,300 square feet (0.37 acres) and the total soil volume is estimated at 3,600 cubic yards.

Site Hydrogeology

The vadose zone in the vicinity of the plume ranges in thickness from 140 to 150 feet, and contains fine-grained units of caliche, silt, and very fine-grained sand. The vadose zone is fairly uniform across the site; however, the degree of cementation varies vertically. In particular, the vadose zone contains a unit of well-cemented, fine- to medium grained sandstone that was consistently encountered at approximately 90 ft bgs and varies in thickness from about 5 to 15 feet. The saturated zone varies in thickness from approximately 40 to 90 feet, and consists of unconsolidated sands and gravels. The yellow clay unit is believed to be the base of the impacted portion of the Ogallala Aquifer because its fine-grained composition should minimize the potential for downward or upward leakage to or from the coarser-grained sediments that lie above the clay.

The Ogallala aquifer is generally an unconfined aquifer. In the Site area, there is little difference in hydraulic head or groundwater flow direction between the shallow and deeper wells. Based on the groundwater elevation contours, groundwater in both the upper and lower portions of the Ogallala Aquifer appears to be flowing in a N70°E direction. The magnitude of the gradient is approximately 0.004 foot per foot (20 feet per mile). The two aquifer tests performed at the Site resulted in the determination of hydraulic conductivities at the site on the order of 14 to 20 ft/d. Using a hydraulic conductivity of 14 to 20 ft/d, an effective porosity of 0.16, and a gradient of 0.004, a seepage velocity of roughly 130 to 185 feet per year (ft/yr) is calculated for the area.

Conceptual Site Model

AOC 1, located west of the refinery operations was used as a disposal area for refining wastes. These wastes may have included off-specification batches of fuel, waste oil, brine water, and any other liquids or wastes. The operating history of the refinery was such that wastewaters were routinely discharged into the playa, pits, or excavations, as well as likely spills throughout the refinery area. The wastewater discharges were also commingled with off-specification petroleum products, and petroleum laden wastewaters from the cleaning of process units and tanks.

Wastes from the refinery process were likely co-mingled with crude oil and gasoline at or near the point of generation and outside the waste management areas. Thus, waste materials known to have been spilled, dumped, or discharged into the waste management units and possibly into the refinery area have become intermixed with the spills of crude oil and petroleum products. Similar refinery wastes have been listed under the Resource Conservation and Recovery Act (RCRA) as hazardous waste number K052 (tank bottoms), K049 (slop tank contents), and F037 (primary separator sludge). In addition, spills or discarded product containing 1,2-DCA is listed under RCRA as U076. Since the waste materials disposed on the Site contain the same contaminants, in varying amounts, as the spilled petroleum products, specific origins of contaminants found in ground water cannot be distinguished. The attempt to reliably differentiate between specific sources of discrete areas of ground water contamination is made much more difficult by the time that has elapsed since the refinery ceased operations.

The chemical 1,2-DCA (also known as ethylene dichloride or EDC) was added to leaded gasoline as part of the antiknock mixture (motor mix) to prevent a build-up of lead oxides in the combustion chamber. Motor mix formulations have been designed so that during the combustion process, lead is scavenged by chloride ions to form more volatile and less corrosive compounds than lead oxides. As a result, 1,2-DCA or EDC is referred to as lead scavengers.

The primary release mechanisms leading to ground water contamination include waste discharges containing 1,2-DCA and benzene. These primary releases likely resulted in secondary contaminant sources, including contaminated soils and the LNAPL detected on the water table. Leaching to ground water is a secondary release mechanism from the secondary contaminant sources. The ultimate source of both the manganese and arsenic in groundwater is most probably the dissolution of aquifer materials (indicating reducing conditions), although the arsenic may also be related to the refining of condensate.

Groundwater contamination has been documented in the shallow and deep zones of the Ogallala Aquifer, resulting in an impact of both private and public water supply wells. Supply wells in this area typically contain screen intervals that span the entire saturated thickness of the Ogallala Aquifer. Potential exposure routes from ground water include ingestion, dermal contact, and inhalation, primarily associated with exposure to the ground water plume.

Ground Water Modeling Summary

The overall modeling approach for the SR 114 site is based on “telescopic grid refinement”, where a large, regional model is used to determine the boundary conditions for a local, more detailed model. This approach was selected because future water levels in Hockley County are expected to decline across much of the county due to sustained pumping for irrigated agriculture, and a regional model that simulates the future decline in water levels allows a consistent framework for the assignment of boundary conditions to a local (site) model in the vicinity of the plume. The Southern Ogallala GAM developed for the Texas Water Development Board (TWDB) was selected for application as the regional model. A much smaller and more detailed site model was developed and used to evaluate the potential for contamination of City supply wells, and estimate the location and pumping rates of remediation wells to accomplish specific objectives. The site model consists of a 6-square mile area that encompasses the full plume extent and a significant area of uncontaminated aquifer outside of the plume. If left unabated, the existing plume will likely migrate to City wells #10 and #21 within an estimated 10 to 15 years, with potential impacts to other supply wells further to the east.

Scope and Role of Response Action

This response action is the final site remedy and is intended to address fully the threats to human health and the environment posed by the conditions at this Site. The purpose of this response action is to implement a site-wide strategy for restoring the Ogallala aquifer to its beneficial use and preventing long-term exposure to contaminated ground water; reducing or eliminating the LNAPL as a principal threat waste; and, reducing the ecological risks posed by contaminated soils.

Summary of Site Risks

Chemicals of Concern

The chemicals of concern (COCs) in the ground water are arsenic, benzene, and 1,2-dichloroethane. COCs are chemicals that pose either a carcinogenic risk to human health greater than 1 in 1,000,000 (1×10^{-6}), have a noncarcinogenic hazard index (HI) greater than (>) 1, or are found in Site ground water at concentrations that exceed MCLs. The COCs in soil are copper and zinc. The COCs are metals that exceed the TCEQ soil invertebrate benchmark values.

Land and Ground Water Use Assumptions

Land use assumptions for the former refinery area include both commercial/industrial land use and potential future residential development. In addition, AOCs 1 and 2 contain a short-grass prairie habitat. The playa in AOC 1 also appears suitable for hunting activities.

The Ogallala aquifer is the principal water supply for Hockley County and a major aquifer in Texas. The current and potential future beneficial uses of the ground water in the Site area is expected to remain as a source for drinking water and agricultural supply. A significant number of residential and business wells are present along State Highway 114 within the Site area, along with a City of Levelland municipal well field immediately east of the ground water contaminant plume. The City of Levelland draws approximately 30 percent of its drinking water from the Ogallala Aquifer.

Populations and Exposure Pathways in Current and Future Risk Scenarios

Three populations (potential receptors) were evaluated for exposure to chemicals in ground water including current and future workers within the former refinery area; future residents within the former refinery area; and, current and future residents east of the former refinery area impacted by the ground water contaminant plume. All three populations were evaluated for exposure to chemicals in ground water through ingestion, inhalation, and dermal exposure routes. The ground water exposure was based on continued use of private water supply wells. Indoor air was not evaluated as a potential exposure route since the water table is greater than 100 feet below ground surface.

Three populations (potential receptors) were evaluated for exposure to chemicals in the soils and sludge including current and future workers within the former refinery area; future residents within the former refinery area; and, recreational visitors (hunters) and construction workers in AOC 1. All three populations were evaluated for exposure to chemicals in soils and sludge through ingestion, inhalation, and dermal exposure routes.

In the Baseline Human Health Risk Assessment, potential human health effects for these populations were estimated through the exposure pathways for individual COCs. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present and future land and ground water uses, and location of the Site. Exposure assessment is the determination or estimation of the magnitude, frequency, duration, and route of potential exposure.

Summary of the Human Health Risk Characterization

Site contaminants were assessed for carcinogenicity and for non-carcinogenic systemic toxicity. For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. These risks are probabilities that usually are expressed in scientific notation (e.g., 1 x 10^{-6}). An excess lifetime cancer of 1 x 10^{-6} indicates that an individual experiencing the Reasonable Maximum Exposure (RME) estimate has a 1 in a 1,000,000 chance of developing cancer as a result of site related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}. The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. A RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). A HQ less than 1 indicates that an individual's dose of a single contaminant is less than the RfD, and that toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect that same target organ (e.g., liver) or that act through the same mechanism within a medium or across all media to which a given individual may reasonably be exposed. An HI less than 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI greater than 1 indicates that site-related exposures may present a risk to human health.

Cancer risks and non-cancer hazards for the current/future commercial/industrial worker and current/future resident exposed to ground water were above the target levels. The ingestion and inhalation exposure pathway contributed the majority of the cancer and non-cancer hazard with benzene, 1,2-DCA, and arsenic as the primary risk drivers. The cumulative cancer risk for a current/future commercial/industrial worker ranged from 6.9 x 10^{-3} to 1.5 x 10^{-4}, and the hazard indices ranged from 2.2 to 38. The cumulative cancer risk for a current/future resident ranged from 6.9 x 10^{-3} to 1.5 x 10^{-4}, and the hazard indices ranged from 2.2 to 38. The carcinogenic and non-carcinogenic risks from exposure to benzene, 1,2-DCA, and arsenic in ground water exceed the EPA's acceptable risk range for all current and potential populations evaluated for this Site.

Summary of the Ecological Risk Characterization

The ecological risk assessment evaluated the exposure pathways and receptor populations for AOCs 1 and 3. The area is considered essentially one habitat (short grass prairie/playa), since the playa is essentially a terrestrial habitat during drought conditions or between rainfall events. However, the playa's ecological value is as an ephemeral wetland and a way point for migratory water fowl. Therefore, the playa was evaluated as a semi-aquatic habitat for water fowl. Potential risks to ecological communities at the Site were evaluated through ingestion of chemicals of potential concern in food, playa sludge, and soil.

Elevated concentrations of copper associated with the abandoned drum area in the southwest corner of AOC 1 resulted in HQs that exceeded the threshold of 1 for the herbivorous and omnivorous mammals; elevated concentrations of zinc resulted in HQs that exceeded the threshold of 1 for the herbivorous and omnivorous mammals and the herbivorous bird. Concentrations of polyaromatic hydrocarbons (PAHs) and metals within the playa sludge do not appear to present an excess risk to herbivorous and omnivorous water fowl. HQs for PAHs and metals were equivalent to or below the threshold of 1 for the herbivorous bird (Canada goose) and omnivorous bird (mallard duck). In order to maximize exposure to the playa sludge, the waterfowl were assumed to be year round residents at the site, even though the playa rarely contains water.

Summary

It is the Agency's current judgment that the Preferred Alternatives identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare from actual or threatened releases of hazardous substances into the environment.

Remedial Action Objectives and Goals

Ground Water

The expectations for contaminated ground water in the NCP and the site-specific conditions can be used to define the following remedial action objectives (RAOs) that the selected remedy should accomplish at the Site:

- Prevent human exposure to contaminated ground water above acceptable risk levels;
- Prevent or minimize further migration of the contaminant plume (plume containment);
- Prevent or minimize further migration of contaminants from source materials (such as LNAPL) to ground water (source control); and,
- Return ground waters to its expected beneficial uses wherever practicable (aquifer restoration).

The following preliminary remedial goals provide numerical criteria that can be used to measure the progress in meeting in the remedial action objectives for the cleanup:

- 1,2-dichloroethane: 5 µg/L [Maximum Contaminant Level (MCL) in drinking water under the Federal Safe Drinking Water Act]
- Benzene: 5 µg/L (MCL)
- Arsenic: 10 µg/L (MCL)
- Manganese: 1,100 µg/L [residential drinking water standard under TCEQ]

The ground water beneath the former refinery has a petroleum hydrocarbon layer (LNAPL) floating on the water table. The LNAPL layer is the result of contaminant migration from the surface. It contains high concentrations of benzene which is a component of petroleum products and refinery wastes including primary separator sludge (RCRA listed waste F037). Under current CERCLA authority, ground water contaminated with petroleum hydrocarbon product that is commingled with a CERCLA hazardous substance, pollutant or contaminant can be addressed by a remedial action.

Soil

The RAO for soil is based on the current ecological risks posed by the contaminated soils in AOC 1 within a short-grass prairie habitat. The RAO for soil is to prevent exposure of ecological receptors to site COCs above acceptable limits in the AOC 1 abandoned drum hot spot. The preliminary remedial goals for soil are 61 mg/kg for copper and 120 mg/kg for zinc [TCEQ soil invertebrate benchmark values].

Summary of Remedial Alternatives

Remedial alternatives were developed to address the remedial action objectives and remedial goals for the Site. The drinking water alternatives were developed to address the current and potential human exposure to contaminated ground water. The ground water alternatives were developed to address the source control, plume containment, and aquifer restoration objectives.

Drinking Water (DW) Alternatives

- DW-1: No Further Action/Maintain Filtration Systems
- DW-2: Water Supply Line (Preferred Alternative)

Alternative DW-1: No Further Action/Maintain Filtration Systems
Estimated Capital Cost: $0
Estimated Annual O&M Costs: $189,000
Estimated Total O&M Costs: $5,700,000 at 30 years
Estimated Present Worth (7%): $2,300,000 at 30 years
*Time Needed to Implement Remedy: 0 month*s

Alternative DW-1 represents the current conditions at the Site and the efforts by the TCEQ and the EPA to prevent exposure to contaminated ground water from private water supply wells. Currently, the TCEQ maintains the filtration systems installed on residential and commercial supply wells that remove either VOCs or metals, or a combination of both VOCs and metals, from the ground water. These systems are periodically monitored and maintained by the TCEQ throughout the year. In the absence of an alternate water supply, the TCEQ may continue maintenance of the filtration systems installed on private water supply wells impacted by Site contaminants exceeding Federal and State drinking water standards.

Alternative DW-2: Water Supply Line (Preferred Alternative)
Estimated Capital Cost: $750,000
Estimated Annual O&M Costs: $0
Estimated Total O&M Costs: $0
Estimated Present Worth (7%): NA
Time Needed to Implement Remedy: 6 - 12 months

Alternative DW-2 provides for installation of a water supply line from the City of Levelland along with the individual connections to homes and businesses with private water supply wells impacted by the Site contamination, or may be impacted within the near future. The monthly costs for water usage will be the responsibility of the resident or business at a rate set by the City of Levelland. The proposed service area is adjacent to the City of Levelland, north of State Highway 114, and bordering FM 1490. Commercial properties along State Highway 114 near the former Motor Fuels Refinery property are not currently within the proposed water service area due to the distance from the City of Levelland. Filtration systems may be maintained on those wells near the former refinery pending development of an alternative water supply for non-potable use. Filtration systems have also been installed on residential water supply wells impacted by elevated manganese and/or arsenic concentrations but are not considered to be within the Site ground water plume and are not within the proposed service area. The filtration systems will likely be removed from those supply wells on properties with access to the water supply line.

Ground Water (GW) Alternatives

- GW-1: No Action
- GW-2: Monitored Natural Attenuation
- GW-3: Hydraulic Containment
- GW-4: Soil Vapor Extraction and Aggressive Ground Water Extraction (Preferred Alternative)
- GW-5: Soil Vapor Extraction, In-Situ Bioremediation, and Ground Water Extraction

The ground water alternatives (with the exception of GW-1) include the following common remedial components.

- Institutional Controls: EPA will place institutional controls (ICs) on all properties affected by the ground water contamination following completion of the construction activities at the Site. The Texas Risk Reduction Program [(TRRP) 30 TAC §350.4(a)(47) and §350.111] requires the placement of institutional controls (e.g., deed notices or restrictive covenants) on affected property in different circumstances as part of completing a response action. Institutional controls are also created for response actions that will take greater than 15 years to complete [30 TAC §350.31(h)]. The ground water modeling completed for this Site has predicted that the remedial action will likely take longer than 15 years to achieve the remedial goals. The fundamental purpose of an IC at this Site is to provide a permanent notice to subsequent owners/operators of affected properties that chemicals of concern are present in the ground water beneath the property above the remedial goals. A copy of the TCEQ regulatory guidance is available in the Administrative Record as well as online at http://www.tceq.state.tx.us. Based on the Site location in Hockley County, the IC would consist of either a restrictive covenant or a deed notice.
  - Restrictive Covenant: an instrument filed in the real property records of the county where the affected property is located which ensures that the restrictions will be legally enforceable by the executive director when the person owning the property is the innocent landowner; the covenant can only be filed by the property owner and is binding on current and future owners and lessees even if they are "innocent owners or operators"; as beneficiaries of the document's restrictions, the TCEQ and the State of Texas can enforce the restrictions by means of a legal action in the courts.
  - Deed Notice: an instrument filed in the real property records of the county where the affected property is located that is intended to provide to owners, operators, prospective buyers and others notice and information regarding, but which does not, by itself, restrict use of the affected property; the TCEQ can enforce the restrictions against non-innocent owners and operators when there is a substantial change in circumstances [§350.35).
- Ground Water Monitoring: one of the performance measures for evaluation of the remedial alternatives is the collection of contaminant concentration data from the ground water monitoring network; additional monitoring wells will be required to effectively monitor remedy performance.
- Well Abandonment: all monitoring wells and extraction wells will be plugged and abandoned following completion of the cleanup activities.

- Five-Year Reviews: EPA will evaluate the protectiveness of the ongoing remedial action every 5-years and prepare a summary report documenting the findings; the 5-year review schedule is maintained by the EPA until the remedial objectives and goals have been achieved for the Site.
- Construction Schedule: the construction time for each alternative reflects only the time required to construct or implement the remedy and does not include the time required to design the remedy or procure contracts for construction.

Two ground water remediation scenarios were designed using the groundwater flow model combined with particle tracking to evaluate the migration of 1,2-DCA. The base-case scenario consists of four wells pumping a total of 178 gallons per minute (gpm) to capture the plume front, with four additional wells pumping a total of 67 gpm in zones with the highest 1,2-DCA concentrations. An aggressive remediation scenario was also developed using the base-case scenario as a starting point. The aggressive scenario includes 21 extraction wells placed throughout the 1,2-DCA plume pumping a total of 408 gpm. Median particle travel time in the aggressive scenario is approximately 6 years, compared to 9 years in the base-case scenario.

For alternatives GW-3, 4, and 5, three options were evaluated for the disposal of the treated ground water. For cost estimating purposes, option A was used to calculate the remedial action costs in alternatives GW-3, 4, and 5.

- Disposal option A: injection wells are used to return the treated ground water to the Ogallala aquifer; while four injection wells have been used to estimate costs for option A, the final number and location of the injection wells will be determined during the Remedial Design.
- Disposal option B: the treated ground water is delivered to the City of Levelland's water supply system via an estimated 2-mile pipeline from the Site treatment plant to the Lee Street well field intake point located at a City of Levelland park; additional monitoring requirements would be required for this option to ensure that the treated water produced by the treatment plant remains acceptable for reuse in the water supply system; the City of Levelland's water supply system is capable of receiving a maximum continuous inflow of 250 gallons per minute.
- Disposal option C: the treated ground water is delivered to the City of Levelland's waste water treatment plant, for future use as makeup water at the nearby ethanol plant. Delivery of the treated water would be through an estimated 6-mile pipeline from the Site treatment plant to the City wastewater treatment facility; while VOC concentrations would need to be below drinking water standards, the other parameters such as metals would not have to meet the same drinking water requirements prior to reuse.

Alternative GW-1: No Action
Estimated Capital Cost: $0
Estimated Total O&M Costs: $0
Time Needed to Implement Remedy: 0 months

Alternative GW-1 is the baseline condition against which other remedial alternatives are compared, as required by the NCP (NCP § 300.430 [e][6]). Alternative GW-1 does not include any active measures to prevent contaminant plume migration, restore ground water to its beneficial use, or reduce the contaminant source area. Passive remedial measures, such as ground water monitoring to evaluate plume migration and degradation, and institutional controls, are also excluded from this alternative.

Alternative GW-2: Monitored Natural Attenuation
Estimated Capital Cost: $0
Estimated Total O&M Costs: $9,700,000
Estimated Present Worth (7%): $3,500,000 at 30 years
Time Needed to Implement Remedy: 3 – 6 months

Natural attenuation in ground water is a combination of destructive and non-destructive mechanisms that reduce the mass, toxicity, mobility, volume, or concentration of contaminants over time without intervention. Biodegradation due to bacterial activity is the primary destructive mechanism for organic contaminants in the ground water. Dilution of the concentrations due to ground water recharge, or sorption of the contaminants onto the aquifer silts and clays, or volatilization of the VOCs from the water table are the principal non-destructive attenuation mechanisms. Biodegradation of benzene at a site will generally proceed until the bacteria have destroyed all of the available material. However, the rate of benzene transport in the ground water combined with the continued leaching of benzene from the LNAPL has exceeded the rate of destruction via biodegradation, resulting in the current large-scale benzene plume. The available field evidence also indicates that 1,2-DCA is more mobile than benzene, and is more resistant to biodegradation at this Site, resulting in a larger plume boundary. Arsenic and manganese within the benzene and 1,2-DCA plume are by-products of the organic contamination in the aquifer and would likely attenuate following destruction of the organic contaminants.

Long-term sampling of the monitoring wells would be performed on a semi-annual schedule to collect concentration data and natural attenuation indicator parameters. Since the contaminant plume would likely expand, an additional 40 wells would be installed periodically to assess migration over a 30-year period. Assuming the attenuation rate is insufficient to fully prevent further plume expansion, the plume can be expected to migrate along an east-southeast flow path that will impact the City of Levelland Lee Street well field and additional private water supply wells.

Alternative GW-3: Hydraulic Containment
Estimated Capital Cost: $3,300,000
Estimated Total O&M Costs: $33,900,000
Estimated Present Worth (7%): $18,100,000 for 27 years
Time Needed to Implement Remedy: 6 – 12 months

Ground water pump and treat systems are frequently designed to hydraulically control the movement of contaminated ground water in order to prevent continued expansion of the contaminant plume. Under Alternative GW-3, ground water extraction wells installed along the plume front are an effective technology to capture ground water flow and prevent contaminants from spreading. The cost estimate is based on the ground water modeling assessment that 4 extraction wells pumping at a combined rate of less than 180 gpm can achieve hydraulic containment of the plume front. The remaining RAOs of source control and aquifer restoration would be achieved through natural attenuation processes within the contained plume or through removal via the recovery wells. The hydraulic containment system would be operated for a period of 27 plus years without further remedial efforts to reduce the ground water concentrations and existing source area contribution. This estimated time frame is based on the expected time to recover a minimum of three-pore-volumes from the aquifer at the modeled extraction rate. The volume of ground water within a contamination plume is known as the pore volume, and is a measure that can be used to estimate the performance of the extraction system.

The basic components of a ground water extraction system (also known as a pump and treat system) include the extraction wells, above-ground treatment plant, treated water disposal system, ground water monitoring system, and process monitoring in the treatment plant. The extraction wells would pump water from the Ogallala aquifer and transfer the water through pipelines to a central treatment plant. The water would be treated to remove the VOCs via an air stripper with the vapors captured in a granular activated carbon (GAC) unit. Metals present in the water can be removed via ion exchange and filtration. The treatment plant can be located within or near the plume area with probable locations at the former Motor Fuels Refinery site or closer to the extraction wells and the plume front.

Alternative GW-4: Soil Vapor Extraction and Aggressive Ground Water Extraction (Preferred Alternative)
Estimated Capital Cost: $9,600,000
Estimated Total O&M Costs: $28,700,000
Estimated Present Worth (7%): $24,400,000 for 18 years
Time Needed to Implement Remedy: 6-12 months

Pump and treat technology designed for aquifer restoration generally combines hydraulic containment of the plume front with more aggressive manipulation of ground water flow via higher pumping rates to attain clean-up goals during a finite period. Ground water cleanup is typically much more difficult to achieve than hydraulic containment. Aquifer restoration requires that sufficient ground water be flushed through the contaminated zone to remove both existing dissolved contaminants and those that will continue to desorb from the aquifer material, dissolve from LNAPL, and/or diffuse from lower permeability zones (clays and silts in the aquifer). The affect of these processes combined with dilution in the flow field is monitored throughout the site to evaluate the progress of aquifer restoration. Ground water modeling has estimated that 21 extraction wells operating at a total flow rate of 408 gpm can achieve hydraulic containment of the plume front, and maximize the recovery of contaminants to achieve long-term aquifer restoration. The volume of ground water within a contamination plume is known as the pore volume, and is a measure that can be used to estimate the performance of the extraction system. The ground water extraction system would be operated for approximately 18 years based on the estimated time to recover three-pore-volumes at the predicted extraction rate.

Ground water restoration system design involves optimizing well locations, depths, and injection/extraction rates to maintain an effective hydraulic sweep through the contamination zone, minimize stagnation zones, flush pore volumes through the system, and contain contaminated ground water. Wells are installed in lines and other patterns to achieve these objectives. Figure 3 represents the initial well location design of the 21 extraction wells, as well as the benzene and 1,2-DCA plumes, as previously described. The extraction wells would pump water from the Ogallala aquifer and transfer the water through pipelines to a central treatment plant. The extracted ground water would be treated through a similar treatment plant described in Alternative 3. The treatment plant can be located within or near the plume area with probable locations at the former Motor Fuels Refinery site.

For sites where the contaminant source has been removed or contained, it may be possible to clean up the dissolved plume with pump and treat technology. Preventing or minimizing further migration of contaminants from source materials (such as LNAPL) would be achieved through the use of a soil vapor extraction system (SVE). Soil venting, SVE, and bioventing are terms commonly used to describe in-situ technologies in which gas flow is induced in unsaturated subsurface materials for the purpose of volatilizing or biodegrading organic chemicals. Air is extracted from a number of wells causing a pressure differential and subsequent advective gas flow. Soil venting is the primary method used in the U.S to remove VOCs from subsurface unsaturated media. Removal of VOCs is achieved by LNAPL evaporation, LNAPL dissolution, desorption, air-water partitioning, biodegradation, and abiotic degradation. The widespread use of venting is due to its above ground simplicity of operation and proven ability to remove contaminant mass inexpensively relative to competing technologies. SVE is a presumptive remedy for VOCs in soils along with the companion multi-phase extraction technology for VOCs in both soils and ground water.

Based on the size of the probable LNAPL area and the possibility that some locations will be inaccessible, the size of the SVE system is estimated to include 135 wells. Organic vapors generated by the SVE system would be piped to a centralized treatment plant and passed through the vapor treatment system before they are discharged to the atmosphere. The SVE system is anticipated to operate for approximately 3 years.

Alternative GW-5: Soil Vapor Extraction, In Situ Bioremediation, and Ground Water Extraction
Estimated Capital Cost: $11,000,000
Estimated Total O&M Costs: $29,600,000
Estimated Present Worth (7%): $26,700,000 for 18 years
Time Needed to Implement Remedy: 6 – 12 months

Further integrating the pump and treat system with SVE and enhanced bioremediation may improve the remedial performance of the combined system. The system integration would occur spatially and temporally (application of the technologies in series) within the LNAPL area. The initial operation would involve the use of a combined SVE and limited extraction well operation to reduce contaminant concentrations within the source (LNAPL) area. Upon completing the SVE system operations, injection wells would be used to deliver nutrients to the ground water to enhance bioremediation of the remaining benzene in the source area. The enhanced bioremediation may also remove some of the 1,2-DCA. The combined remedial system would be used to address the source area, plume containment, and long-term aquifer restoration.

The SVE system described in Alternative GW-4 is modified through completion of 26 SVE wells as dual extraction/injection wells. The in-situ bioremediation component relies on aerobic degradation of VOCs following the removal of the LNAPL with SVE. Degradation rates are accelerated through the injection of an oxygen-releasing amendment directly into the aquifer in the 26 dual extraction/injection wells.

For the remaining dissolved plume, an expanded hydraulic containment system would be in concurrent operation to prevent further plume migration and enhance contaminant reduction in the higher concentration areas. The ground water extraction system would consist of 8 wells operating for an estimated 18 years. Based on the ground water modeling results, this equates to a 2-pore-volume flush of the aquifer beneath the site at an extraction rate of 245 gpm. This lower flush volume estimate is based on the expected reduction in overall contaminant volume through enhanced biological activity. The extracted ground water would be treated through a similar treatment plant as described in Alternative 3. The treatment plant can be located within or near the plume area with probable locations at the former Motor Fuels Refinery site.

Soil (S) Alternatives
- S-1: No Action
- S-2: Excavation and Onsite Disposal (Preferred Alternative)

Only engineering controls were evaluated in the soil remedial alternatives since the contaminated soils were identified as a low-level threat waste that can be can be reliably contained and would present only a low risk in the event of release. Off-site disposal was not included in the remedial alternatives since any of the sludge/tar material encountered in the soil would require a manifest as a RCRA hazardous waste (e.g., hazardous waste number F037), which would incur the associated high total costs for treatment to comply with the Land Disposal Restrictions (40 CFR Part 268), transportation, and disposal at an approved RCRA disposal facility. Restrictive covenants or deed notices on portions of the property used for storage of the soils will offer a long-term control to prevent unintended exposure to the buried soils.

Alternative S-1: No Action
Estimated Capital Cost: $0
Estimated Annual O&M Costs: $0
Estimated Total O&M Costs: $0
Estimated Present Worth (7%): NA
*Time Needed to Implement Remedy: 0 month*s

As required by the NCP (NCP § 300.430 [e][6]), the alternatives for soil/sludge must include the No Action alternative. This is to be used as the baseline alternative against which the effectiveness of all other remedial alternatives are judged. Under this alternative, no remedial actions will be conducted to address contaminated soil in AOC 1. Soil contaminants will remain in place and will be subject to environmental influences. No institutional controls would be implemented for the soils and sludge.

Alternative S-2: Excavation and Onsite Disposal (Preferred Alternative)
Estimated Capital Cost: $200,000 - $300,000
Estimated Annual O&M Costs: $0
Estimated Total O&M Costs: $0
Estimated Present Worth (7%): NA
Time Needed to Implement Remedy: 3 months

Following completion of the site preparation activities, soil (approximately 3,600 cy) from the abandoned drum hot spot area in AOC 1 will be excavated and buried in an on-site pit and covered with clean soil. The pit can either be excavated adjacent to the drum hot spot or existing pits east of the playa can be used for the disposal area. The existing onsite pits are located in the former central and southeast impoundment areas. This soil will not be treated but will be placed at a depth greater than 5 feet below ground surface to prevent ecological exposure.

Evaluation of Alternatives

Nine criteria are used to evaluate the different remedial alternatives individually and against each other in order to select a remedy. The nine evaluation criteria are (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; 4) reduction of toxicity, mobility, or volume of contaminants through treatment; (5) short-term effectiveness; (6) implementability; (7) cost; (8) State/support agency acceptance; and (9) community acceptance. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below.

1. **Overall Protection of Human Health and the Environment** *addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.*

Drinking Water Alternatives: Alternatives DW-1 and DW-2, will both provide adequate protection of human health resulting from potential exposure to contaminated ground water. The primary advantage of Alternative DW-2 is through the elimination of the potential exposure pathway by providing a potable water supply system that has not impacted by the Site contaminants. Alternative DW-1 is dependent on treatment to completely prevent exposure to the site contaminants and is considered a safe alternative in the absence of an alternative water supply.

Ground Water Alternatives: Alternatives GW-1 and GW-2, No Action and MNA, would allow the existing contaminant plume to expand and potentially impact additional private and public water supply wells in portions of the uncontaminated Ogallala aquifer. The ground water modeling predicts a potential impact to a City of Levelland well field within 20 years. Alternative GW-1 is not considered protective of human health due to the absence of ground water monitoring to confirm the plume migration and the inability to identify potential exceedances in private and public water supply wells. Alternative GW-2 does achieve a level of protection through implementation of a sampling program at private and public water supply wells and a monitoring well network. However, Alternative GW-2 does not effectively control, reduce, or eliminate exposure pathways. Alternatives GW-3, GW-4, and GW-5 utilize engineering controls and treatment to control and eliminate exposure pathways. Hydraulic containment will prevent contamination of downgradient City wells and any additional private supply wells. Alternatives GW-4 and 5 are more likely to completely eliminate the exposure pathway through additional treatment components that will actively treat larger concurrent areas of the plume. SVE will remove continuing sources of ground water contamination, and ground water will be extracted and treated, or treated in-situ, until COC concentrations decrease to the cleanup standards. Successful implementation and operation of remedial alternatives GW-4 and GW-5 are expected to eliminate any unacceptable risks to human health. The depth to water precludes any potential discharge to surface water bodies, such as playas, so it is unlikely that contaminants in the ground water will pose any ecological risk, regardless of whether a response action is implemented at the Site.

Soil Alternatives: Alternative S-1 does not address the potential for direct contact with ecological receptors and is not considered protective of the environment. Alternative S-2 will reduce the potential ecological risks associated with the contaminants through burial below the potential depth of exposure.

2. **Compliance with Applicable or Relevant and Appropriate Requirements ("ARAR").** *Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and NCP § 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4), 42 U.S.C. § 9621(d)(4).*

Drinking Water Alternatives: The chemical-specific ARARs that apply to alternatives DW-1 and DW-2 are the Maximum Contaminant Levels (MCLs) under the National Primary Drinking Water Regulations (40 CFR Part 141), and State standards [30 TAC §290(F)]. Home treatment units will attain ARARs at the point of exposure to domestic ground water provided the treatment units are maintained and all aquifer users are identified. Drinking water supplied the City of Levelland eliminates the point of exposure for current residents dependent on private water supply wells. The City water supply system is subject to monitoring requirements for attainment of the MCLs under Federal and State regulations. There are no action- or location-specific ARARs for these remedial alternatives.

Ground Water Alternatives: Migration of the contaminant plume in the ground water has likely been ongoing for the last 50+ years, and significant decreases in the VOC concentrations are unlikely to occur within a reasonable time frame. Reduction of the contaminant concentrations under Alternatives GW-1 and GW-2 will likely take an equally long time to reach the chemical-specific ARARs based on the Maximum Contaminant Levels (MCLs) under the National Primary Drinking Water Regulations (40 CFR Part 141). As a result, the aquifer will not be returned to its beneficial use as expected in the NCP. No location- or action-specific ARARS are associated with alternatives GW-1 and GW-2.

Likewise, Alternatives GW 3 is expected to take 27+ years to achieve a significant concentration reduction and achieve the chemical-specific ARARs at the Site. Alternatives GW-4 and 5 are predicted to achieve significant concentration reduction across the Site with the possibility of achieving ARARs within all or a significant portion of the plume area. Alternatives GW-3, 4, and 5 will also have to comply with action-specific ARARs involving disposal of treatment residuals for the organic vapors. Extracted ground water will be treated using two separate technologies to attain discharge standards. Any residuals from treatment of organic vapors would be characterized and disposed as a hazardous waste.

Soil Alternatives: There are no chemical-, action-, or location-specific ARARs that apply to the remedial alternatives considered for the contaminated soils. Land Disposal Restrictions (40 CFR Part 268) which require that RCRA hazardous waste be properly disposed in a permitted facility is an action specific ARAR that does not apply to the contaminated soils, but would apply to any sludge from AOC 1 that is transported outside of the area of contamination.

3. **Long-term Effectiveness and Permanence** *refers to expected residual risk and the ability to maintain reliable protection of human health over time, once cleanup levels have been met.*

Drinking Water Alternatives: Home treatment units in Alternative DW-1 can provide long-term effectiveness through periodic maintenance and monitoring. However, this alternative does not provide a permanent solution to the problem. The use of these treatment units would be required until either active remediation or biodegradation and natural attenuation processes reduce contaminant levels below the remedial goals in the ground water. The time required for achieving the cleanup goals ranges from 18 to more than 30 years. A total of thirty-one home treatment units have been installed on the existing local wells, and are monitored and maintained by the TCEQ. Institutional controls will not be effective in preventing the installation of new wells in the aquifer. Alternative DW-2 provides long-term effectiveness and permanence in preventing exposure to ground water contaminants.

Ground Water Alternatives: The time required for natural biodegradation and attenuation to reduce contaminant levels below the cleanup goals is unknown in alternatives GW-1 and -2. The remediation rate for natural degradation and attenuation at the Site is difficult to predict as long as the LNAPL is present. It is almost certain that natural degradation and attenuation will not reduce the magnitude or residual risk within any reasonable period of time. Institutional controls will not be effective in preventing the installation of new wells in the aquifer. Alternative GW-2 does provide a basic level of long-term effectiveness through ground water monitoring to manage the risk of exposure for a few decades. Additional monitoring wells will likely be required under Alternative GW-2 to track the plume migration.

Alternative GW-3 is expected to provide a permanent solution after several decades of operation, provided the LNAPL plume decreases in size. This alternative will significantly mitigate risks and be effective in the long term. There will be potential for exposure to contaminated ground water from wells installed within the current extent of the plume until cleanup standards have been attained; however, monitoring will mitigate the potential for inadvertent exposure to contaminated ground water until cleanup standards are met. Hydraulic containment is expected to be able to control the plume and prevent further migration. Although ground water cleanup is not the goal of this alternative, contaminant concentrations are anticipated to decrease over time through the treatment of extracted ground water and the influx of clean ground water from outside the source area.

The combination of remedial technologies in Alternatives GW-4 and -5 are expected to be the most effective alternative in the long-term. These combinations offer the most permanent solution to the problem posed by the LNAPL and contaminated ground water. The remedial technologies combine to produce a substantial reduction if not elimination of LNAPL as a source of ground water contamination and also substantially reduce the level of contamination in ground water where concentrations are highest. These two alternatives may eliminate the residual risk from ground water exposure (subject to the qualification expressed in the discussion of the implementability of Alternative GW-5 which follows). Thus, these two alternatives will provide both long-term effectiveness and permanence.

Soil Alternatives: Alternative S-1 will not provide a permanent solution to the problem and will not be effective in the long term. This alternative does not achieve remedial action objectives and offers no mechanisms to control exposure or contact with contaminated soil. Alternative S-2 is expected to have minimal risk due to the depth of burial beneath clean soil and achieve a long-term permanence. Since the soil contaminants are not destroyed or disposed offsite, the alternative is not considered as permanent a solution.

4. **Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment** *refers to the anticipated performance of the treatment technologies that may be included as part of a remedy*.

Drinking Water Alternatives: Neither alternative is intended to reduce the toxicity, mobility or volume of the contaminants in the ground water through treatment. Alternative DW-1 treats the ground water at the point of exposure by reducing the volume of contaminants through adsorption in the carbon filters.

Ground Water Alternatives: Alternative GW-2 will achieve some reduction of toxicity, mobility, and volume through in-situ treatment by naturally occurring biological degradation and abiotic chemical degradation. However, the time frame for achieving the remedial action objectives and goals through these processes is expected to significantly exceed the time frame for active remedial measures. Alternatives GW-3, 4, and 5 all achieve reduction in mobility and volume through treatment of the extracted ground water. In addition, alternatives GW-4 and 5 achieve reduction in the volume of LNAPL through the use of soil vapor extraction systems. Toxicity, mobility, and volume of the contaminated ground water is reduced through vapor extraction and treatment of the benzene fraction within the NAPL. Alternative GW-5 achieves an additional reduction in the toxicity, mobility, and volume of the benzene in the ground water through in-situ treatment by enhanced biological degradation.

Soil Alternatives: Neither alternative achieves a reduction in the toxicity or volume of contaminants through treatment. Since the soil contaminants are considered a low-level threat waste, engineering controls (e.g., burial) are appropriate for the risks posed by the soil contamination.

5. **Short-term Effectiveness** *addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during implementation*.

Drinking Water Alternatives: Both alternatives are effective in the short-term with no anticipated adverse impacts to either workers or the community. Both alternatives would employ best practices to ensure worker safety during site related construction or maintenance activities.

Ground Water Alternatives: Alternative GW-2 is essentially a continuation of the existing sampling activities conducted during the Remedial Investigation/Feasibility Study phase and the filtration system monitoring performed by the TCEQ. Workers will be at risk of exposure to contaminated ground water during monitoring. However, these risks are controllable and can be mitigated by site-specific health and safety procedures. Risks to the community are considered low and Alternative GW-2 is effective in the short term. Alternative GW-3, 4, and 5 will subject the local community, site workers, and the environment to short-term risks during the construction phase. Construction traffic may increase the risk of vehicular accidents. However, adequate planning and compliance with safe work practices will mitigate these risks. Workers will face potential exposure to contaminated media during construction, operation, and maintenance. Compliance with a site-specific health and safety plan will mitigate these risks. Wastes produced by this alternative will include contaminated drill cuttings, contaminated water from well development and decontamination, and spent treatment media. Mobilization, installation and start-up of all the alternatives should be accomplished within one year.

Soil Alternatives: Alternative S-2 is a short-term remedial action that does not pose a risk to the environment during implementation. The presence of pipelines poses a potential risk to workers during the excavation that would be addressed as part of the Site health and safety plan.

6. **Implementability** *considers the technical and administrative feasibility of a remedy such as relative availability of goods and services and coordination with other governmental entities*.

Drinking Water Alternatives: Both alternatives have been implemented either at the Site or in the general area. Construction of the water supply lines under Alternative DW-2 will require the greater administrative effort during the design as well as obtaining the necessary permits for any road and railway crossings. Agreements will have to be implemented between EPA and the City of Levelland prior to the pipeline construction as well as between the City and the residents and businesses that will be connected to the water supply line. Mobilization, installation and start-up of Alternative DW-2 should be accomplished within one year. The use of filtration systems in DW-1 does not require a significant design effort but does require an ongoing administrative effort associated with contract management for the filter monitoring and maintenance. In addition, there is a significant effort to coordinate with current or future residents on reporting the sampling results and the installation of any new filter systems.

Ground Water Alternatives: Alternative GW-2 can be implemented but continued migration will increase the difficulty of future ground water sampling, monitoring well installation, and placement of effective institutional controls. This alternative would not preclude active remediation at a later date; however, future remediation of the contaminated aquifer is expected to increase in difficulty as the plume continues to expand in size. Alternatives GW-3, -4, and -5 can be implemented with existing technology and services. This alternative will involve standard construction practices common to the remediation industry. Technologies and services required to implement this remedy are anticipated to be available. Systems in this alternative are considered easy to operate. Procurement of access agreements to install extraction wells on private property will be a potential hurdle. Contaminated and treated water conveyance pipelines will cross public roads (including State Highway 114) below ground surface and necessary permits should be obtainable but may encounter a lengthy review process. The presence of existing underground petroleum pipelines are a potential hazard and will create additional health and safety issues during pipeline construction connecting the extraction and injection wells to the treatment system. In addition, the large number of wells required for the SVE and in-situ bioremediation may encounter these hazards requiring relocation or alteration of the designed well pattern. Mobilization, installation and start-up of all the alternatives should be accomplished within one year.

Soil Alternatives: Alternative S-2 does not pose any technical or administrative issues that would prevent implementation of the alternative.

7. **Cost** *includes estimated capital and operation and maintenance costs as well as present worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.*

Drinking Water Alternatives: Alternative DW-1 does not have capital costs but does incur an annual O&M cost of $189,000 to monitor and maintain the resident filtration systems. The total O&M cost for 30 years is $5,700,000 at a present value of $2,300,000. Alternative DW-2 has a capital cost of $750,000 for construction of the water supply line from the City of Levelland to the affected residences. There are no O&M charges for Alternative DW-2 since the water supply line will be turned over to the City following construction and the monthly water usage costs are borne by the residents.

Ground Water Alternatives: No costs are associated with Alternative GW-1. The total O&M costs associated with Alternative GW-2 is $9,700,000 at a present value of $3,500,000. Alternative GW-3 has a total capital cost of $3,300,000 and O&M costs of $33,900,000 at a present value of $18,100,000 for 27 years using disposal option A. Alternative GW-4 has a total capital cost of $9,600,000 and O&M costs of $28,700,000 at a present value of $24,400,000 for 18 years using disposal option A. Alternative GW-5 has a total capital cost of $11,000,00 and O&M costs of $29,600,000 at a present value of $26,700,000 for 18 years using disposal option A.

Soil Alternatives: No costs are associated with Alternative S-1. The total capital costs for Alternative S-2 are estimated at $200,000 to $300,000.

8. **State/Support Agency Acceptance** *considers whether the State agrees with U.S. EPA's analyses and recommendations of the RI/FS and the Proposed Plan.*

The TCEQ has been provided the opportunity to review the RI/FS reports and Proposed Plan and has indicated their support for the Preferred Alternatives DW-2, GW-4, and S-2

9. **Community Acceptance** *considers whether the local community agrees with U.S. EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.*

Community acceptance of the Preferred Alternatives will be evaluated after the public comment period ends and will be described in the ROD for the Site.

Summary of the Preferred Alternatives

Alternative DW-2, Water Supply Line, is the Preferred Alternative to address the remedial action objective of preventing human exposure to contaminated ground water above acceptable risk levels. This alternative is recommended because it will achieve a permanent risk reduction by eliminating the exposure pathway for residences and businesses that are dependent on private wells for their water supply. This alternative recognizes that remediation of the ground water is projected to last more than 10 years, thus eliminating the long-term costs associated with the frequent monitoring and maintenance of the individual filtration systems by the TCEQ. This alternative does not prevent current and future use of private water supply wells.

Alternative GW-4, Soil Vapor Extraction and Aggressive Ground Water Extraction, is the Preferred Alternative to address the remedial action objectives of source control, plume containment, and aquifer restoration. The Preferred Alternative represents an aggressive strategy to expedite contaminant removal through SVE and ground water extraction wells. This strategy is preferred to Alternative GW-5 due to uncertainty of the performance of the in-situ bioremediation system for 1,2-dichloroethane, and the appropriate sweep efficiency for the in-situ bioremediation amendments within the 30-acre source area.

Alternative S-2, Excavation and On-Site Disposal, is the Preferred Alternative to address soil contamination exceeding the soil benchmark values. Since the soil contamination is considered a low-level threat waste, the use of soil burial at the site is considered an appropriate engineering control. In addition, annual evaluations of the ecological criteria for the playa sludge and soils would be included as part of the Site annual O&M reports during the 10-year long-term remedial action period to ensure the site remains protective of potential ecological receptors.

The preferred remedial alternatives compose a site-wide cleanup strategy that is intended to address fully the threats to human health posed by the contaminated ground water and soil at this Site. The LNAPL is considered a principal threat waste and Alternative GW-4 does satisfy the statutory mandate for permanence and treatment to the maximum extent practicable. The preferred alternative can change in response to public comment or new information.

Based on information currently available, the EPA believes the Preferred Alternatives DW-2, GW-4, and S-2 meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The EPA expects the Preferred Alternatives to satisfy the following statutory requirements of CERCLA §121(b): 1) be protective of human health and the environment; 2) comply with ARARs (or justify a waiver); 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element.

For specific information about the State Road 114 Ground Water Plume Site or the Superfund process, please contact:

Vincent Malott, Remedial Project Manager
U.S. EPA Region 6
1445 Ross Avenue (6SF-RA)
Dallas, TX 75202
214-665-8313 or 1-800-533-3508 (toll-free)
malott.vincent@epa.gov

Inquires from the news media can be directed to Dave Bary, U.S. EPA Region 6 Press Office, at (214) 665-2208.

For specific information about the filtration systems installed on the private water supply wells or the State's participation in the Superfund process, please contact:

Diane Poteet
Texas Commission on Environmental Quality
Remediation Division (MC-143)
P.O. Box 13087
Austin, TX 78711-3087
512-239-2502
dpoteet@tceq.state.tx.us

Information Rpositories containing the RI/FS and other Site documents is located at:

Hockley County Memorial Library
811 Austin Street
Levelland, TX 79336
(806) 894-6750
Mon., Tue., Wed., and Fri. – 9:00 am to 5:00 pm
Thur. – 9:00 am to 7:00 pm

Texas Commission on Environmental Quality
Building E, Records Management, First Floor
12100 Park 35 Circle
Austin, Texas 78753
(512) 239-2920
Mon. - Fri. - 8:00 am to 5:00 pm

On the Web
On the internet, information about U.S. EPA and the Superfund Program can be found at:

U.S. EPA Headquarters: http://www.epa.gov
U.S. EPA Region 6: http://www.epa.gov/region6
U.S. EPA Region 6 Superfund Program: http://www.epa.gov/region6/superfund

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Call U.S. EPA at 1-800-533-3508 to receive a Spanish translation of this fact sheet.

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Para recibir una traducción en español de esta Hoja de Datos, comunicarse con la Agencia de Protección del Medio Ambiente de los EEUU (la EPA) al número de teléfono 1-800-533-3508.

Glossary

Administrative Record – All documents which the EPA considered or relied upon in selecting the response action at a Superfund site, culminating in the Record of Decision for a Remedial Action.

Applicable, Relevant, and Appropriate Requirements (ARARs) – Generally, any Federal, State, or local requirements or regulations that would apply to a remedial action if it were not being conducted under CERCLA, or that while not strictly applicable, are relevant in the sense that they regulate similar situations or actions and are appropriate to be followed in implementing a particular remedial action.

Baseline Human Health Risk Assessment – A formal risk assessment conducted as part of the RI according to EPA-prescribed procedures. The need for remedial action at a site is established in part on the results of the baseline risk assessment.

Chlorinated Solvents – An organic hydrocarbon in which chlorine atoms substitute for one or more hydrogen atoms in the compound's structure, for example, 1,2-dichloroethane. The substituted chlorine makes the compound less flammable than the non-substituted equivalent, but more toxic.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – Also known as Superfund. CERCLA is a Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act. Under CERCLA, the EPA can either pay for the site cleanup or take legal action to force parties responsible for site contamination to clean up the site or pay back the Federal government for the cost of the cleanup.

Enhanced Reductive Dechlorination (ERD) – ERD is a process that uses amendments such as vegetable oil, molasses, etc., in conjunction with native bacteria in the ground water to break-down chlorinated solvents by removing chlorine from the chlorinated solvent.

Feasibility Study (FS) – A detailed evaluation of alternatives for cleaning up a site.

Five-Year Reviews – A review generally required by statute or program policy when hazardous substances remain at a site above levels which permit unrestricted use and unlimited exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Reviews are performed five years after completion of the remedy construction at Superfund-financed sites, and are repeated every succeeding five years so long as future uses at a site remain restricted.

Ground Water – Water found beneath the ground surface that fills pores between soil, sand, and gravel particles to the point of saturation. When it occurs in a sufficient quantity and quality, ground water can be used as a water supply.

Hazard Index (HI) – In the baseline risk assessment, ration of the dose calculated for a receptor divided by the reference dose. When the HI exceeds 1.0, a health risk is assumed to exist.

Human Health Risk Assessment (HHRA) – Estimates the current and possible future risk if no action were taken to clean up a site. The EPA’s Superfund risk assessors determine how threatening a hazardous waste site is to human health and the environment. They seek to determine a safe level for each potentially dangerous contaminant present (e.g., a level at which ill health effects are unlikely and the probability of cancer is very small). Living near a Superfund site doesn’t automatically place a person at risk, that depends on the chemicals present and how a person is exposed to the chemical.

Institutional Controls (ICs) – Non-engineered instruments, such as administrative and/or legal controls, that help to minimize the potential for human exposure to contamination and/or protect the integrity of the remedy. ICs work by limiting land or ground water use and/or providing information that helps modify or guide a person’s action at a site. Some common examples include restrictive convenants, deed notices, or local ordinances.

Light Non-Aqueous Phase Liquids (LNAPL) – A LNAPL is an organic substance that is relatively insoluble in water and lighter than water. LNAPLs tend to float on the water table.

Maximum Contaminant Level (MCL) – MCLs are established under the Safe Drinking Water Act and are protective levels set for human exposure to a chemical in a drinking water source.

Micrograms per Liter (µg/L) - Is a measurement of concentration used to measure how many micrograms of a contaminant are present in one liter of water. One µg/L is equal to 0.001 milligrams per liter (mg/L).

Milligrams per Liter (mg/L) – Is a measurement of concentration used to measure how many milligrams of a contaminant are present in one liter of water. One mg/L is equal to 1000 micrograms per liter (µg/L).

Operable Unit (OU) - An operable unit is a discrete action that comprises an incremental step toward comprehensively addressing site contamination.

National Priorities List (NPL) – EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response.

Principal Threat Wastes - Those materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The ERA expects to use treatment when practical to address the principal threats posed by a site. The "principal threat" concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to ground water, surface water, or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material; however, organic liquids in a separate phase (e.g., LNAPL) may be viewed as source material.

Reasonable Maximum Exposure (RME) – The maximum exposure reasonably expected to occur in a population.

Reference Dose (RfD) - An estimate (with uncertainty spanning perhaps an order of magnitude or greater) of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of detrimental effects during a lifetime.

Remedial Investigation (RI) – The collection and assessment of data to determine the nature and extent of contamination at a site.

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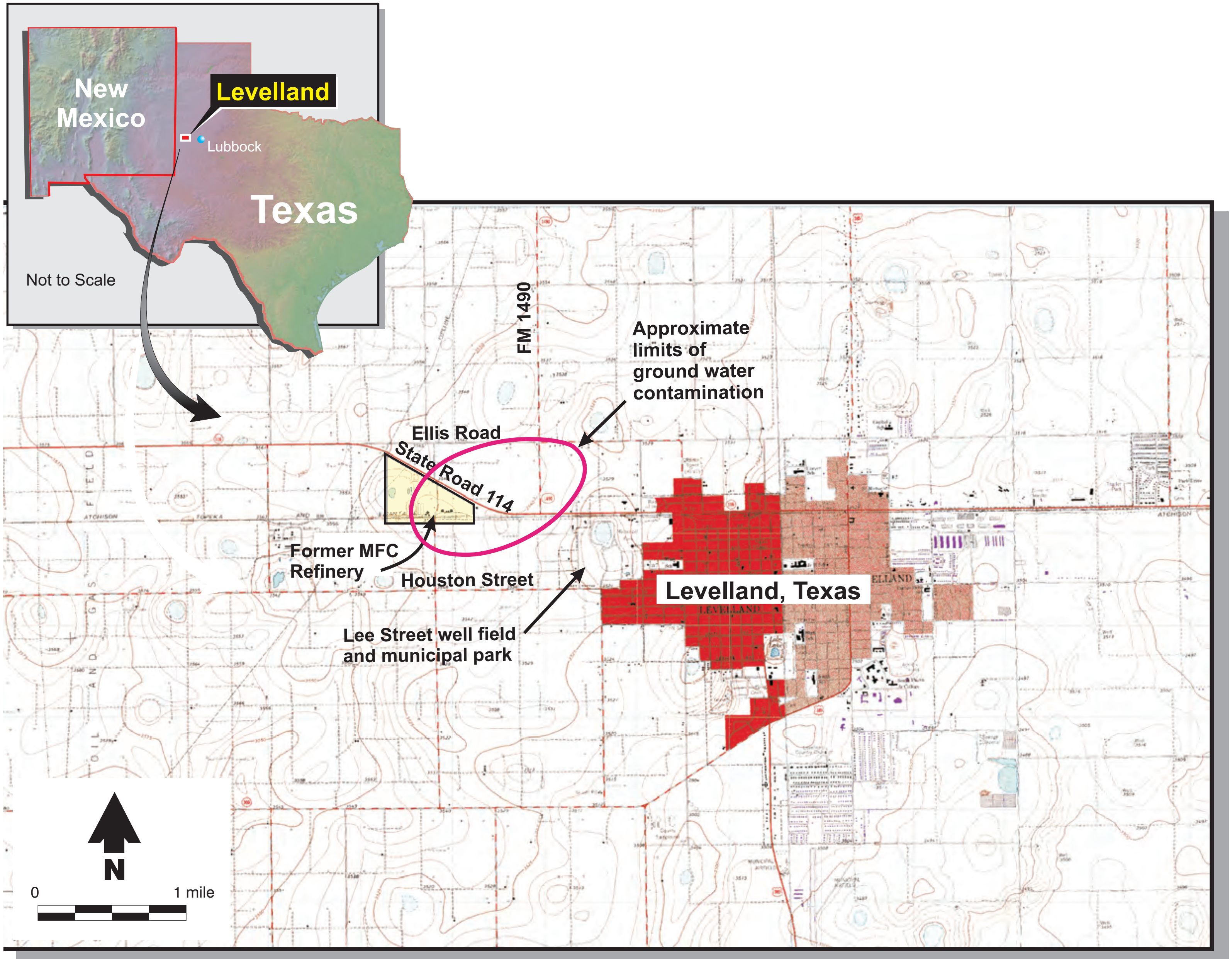

Source:
USGS 7.5 minute topographic map, Levelland West and East

STATE ROAD 114 GROUND WATER PLUME SUPERFUND SITE
Site Location

Figure 1

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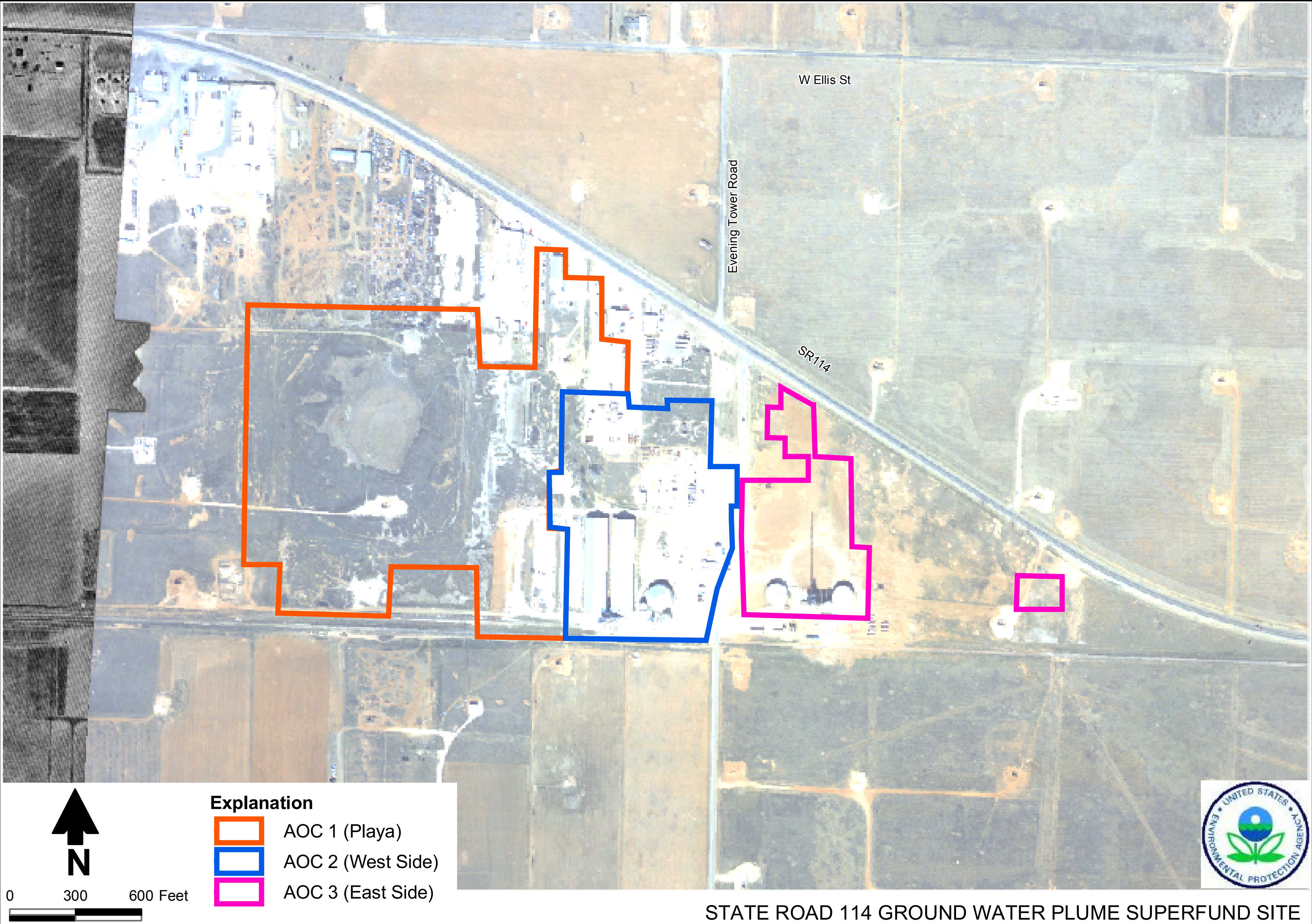

Figure 2

STATE ROAD 114 GROUND WATER PLUME SUPERFUND SITE

Former Motor Fuels Refinery AOCs

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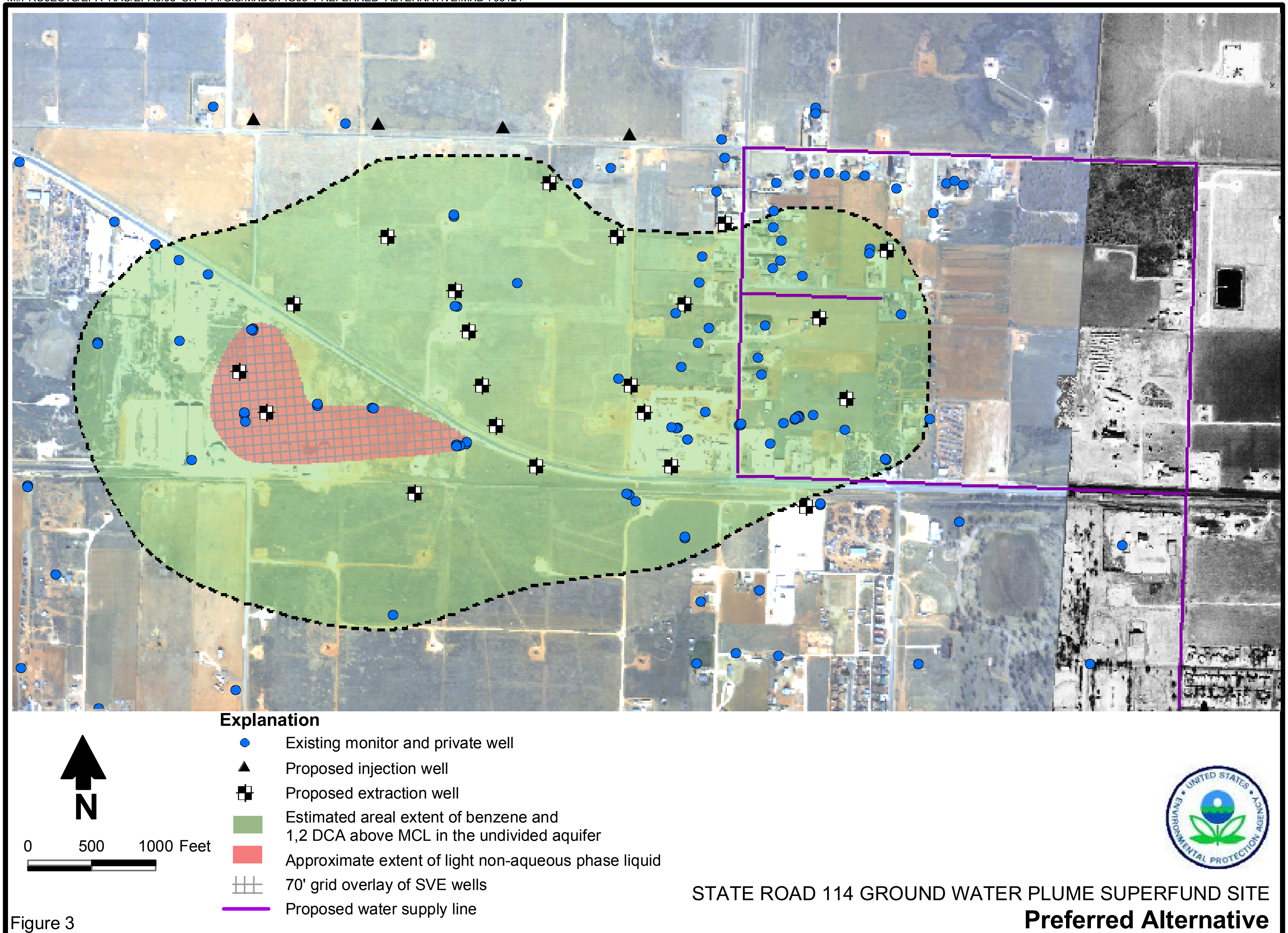
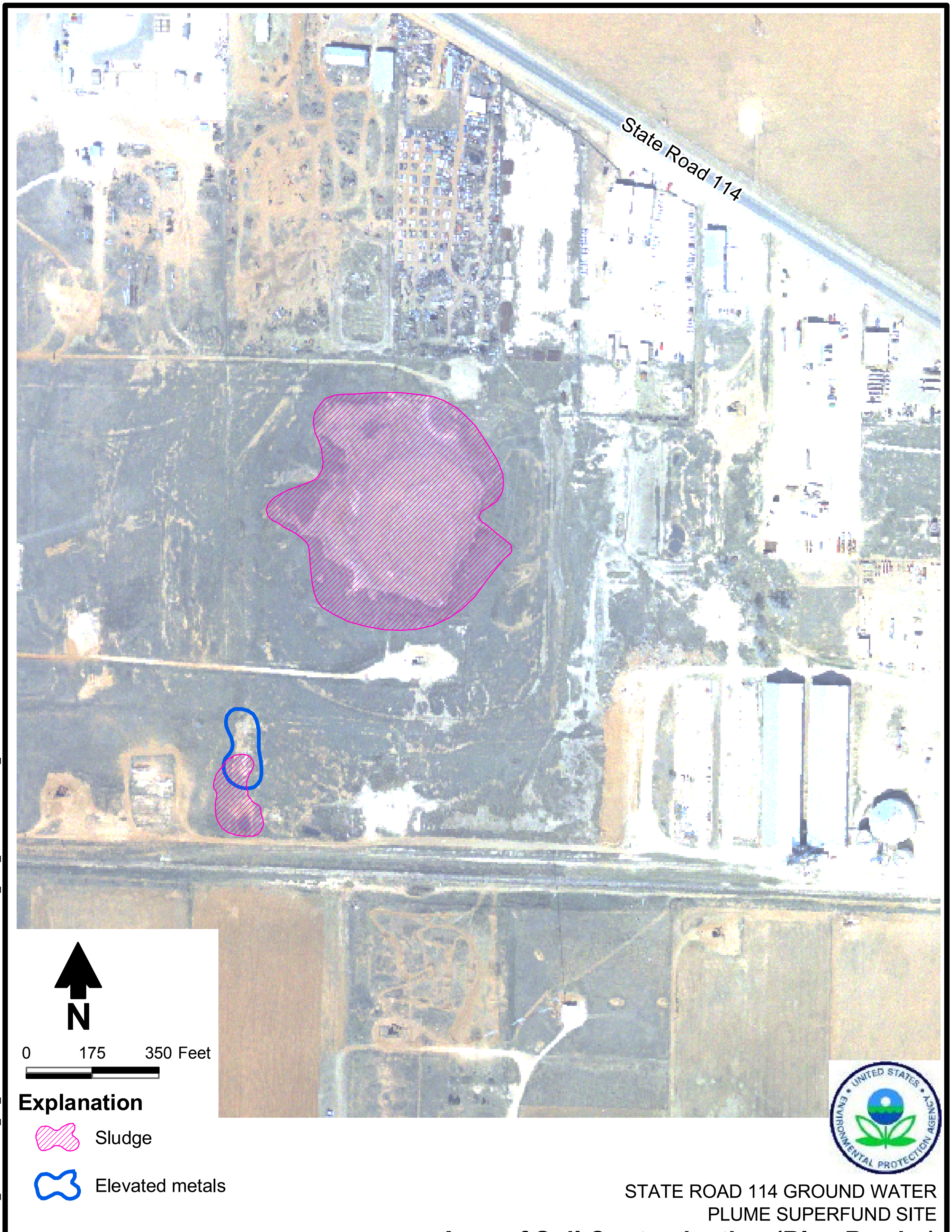


Figure 3

STATE ROAD 114 GROUND WATER PLUME SUPERFUND SITE

Preferred Alternative



STATE ROAD 114 GROUND WATER
PLUME SUPERFUND SITE

Area of Soil Contamination (Blue Border) and Sludge (Purple Border) in AOC 1

Figure 4

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