APPENDIX E

Confined Disposal Facility Conceptual Design Report

ERDC/EL SR-08-XX

Environmental Laboratory

US Army Corps
of Engineers®
Engineer Research and
Development Center

Conceptual CDF Design for Inner Harbor Navigation Canal Lock Replacement Project

Environmental Processes and Engineering Division,
Environmental Laboratory

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Conceptual CDF Design for Inner Harbor Navigation Canal Lock Replacement Project

Environmental Processes and Engineering Division

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Final report

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Preface

Approximately 3 million cubic yards of sediment will be dredged in conjunction with the construction of a new navigation lock in the Industrial Harbor Navigation Canal, New Orleans, LA. A confined disposal facility (CDF) may be needed to contain dredged material requiring upland disposal. This report describes the development of a conceptual level CDF design for the project. The Environmental Laboratory (EL) of the U.S. Army Engineer Research and Development Center (ERDC) conducted this work, supported by U.S. Army Corps of Engineers Districts Detroit, Huntington and Pittsburgh. The U.S. Army Corps of Engineers (USACE) New Orleans funded ERDC under Customer Order Number W42HEM80450267. Project manager for the IHNC Lock Replacement Project is Larry Poindexter, New Orleans District.

This report was written by Dr. Trudy J. Estes, Michael G. Channell and Dr. Paul R. Schroeder, Environmental Engineering Branch (EEB), Environmental Processes and Engineering Division (EPED), EL, ERDC. Cost estimates for construction and operation of the CDF were prepared by Donald A. Whitmore, USACE, Huntington District. In-situ dredging volume estimates were developed by Darin H. White and Michael E. Rist, USACE, Huntington District. Preliminary dike profile was developed by Francisco Martinez-Rodriquez and Richard J. Varuso, USACE, New Orleans District. Internal review was provided by the IHNC project development team (PDT) members, including Richard E. Boe and Eric Glisch, USACE, New Orleans District and Dr. Eric Webb, GSR Corporation, Baton Rouge, LA. Independent Technical Review (ITR) members were William D. Merte and Patrick J. Olk, USACE, Detroit District, and Paula G. Boren and Robert J. Burstynowicz (ITR Facilitator), USACE, Pittsburgh District.

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COL Richard B. Jenkins was Commander of ERDC. Dr. James R. Houston was Director.

1 Executive Summary

The Industrial Harbor Navigation Canal (IHNC) and lock is located in the southeastern portion of Louisiana, within the city limits of New Orleans. The lock is a key component of the navigation system in this region, connecting the Mississippi River, the Gulf Intracoastal Waterway (GIWW), the Mississippi River-Gulf Outlet (MRGO) and Lake Pontchartrain. The existing lock was constructed in 1923 and is functionally obsolete, impeding efficient movement of traffic through the lock and limiting the vessel draft that can be accommodated.

Planning efforts for a new lock are presently underway. Under the National Environmental Policy Act (NEPA), the Army Corps of Engineers is required to prepare an Environmental Impact Statement (EIS) documenting activities and environmental impacts associated with the lock construction project. Two construction alternatives are being considered, cast-in-place (CIP) and float-in-place (FIP). A different volume of sediment will be dredged in conjunction with each of these alternatives, and will require either temporary or permanent disposal, depending upon the character of the sediment and the disposal or beneficial use alternatives available. Six disposal alternatives are being considered for the material dredged from the IHNC:

- Open water disposal in the designated Mississippi River disposal site.
- Beneficial use to restore degraded wetland areas in the proposed mitigation site.
- Backfill for the lock construction.
- Upland disposal.
- Landfill disposal.
- Some combination of the above alternatives

Confined disposal facilities (CDFs) are customarily used by the Corps for upland disposal of dredged material. A conceptual level design was prepared for each construction alternative under consideration and, in each case, two scenarios were considered:

- All dredged material will be placed in the CDF (Alternative 1).
- Only material needed for construction fill and material unsuitable for open water disposal will be placed in the CDF (Alternative 2).

The design was developed based on available information. Some follow on studies will be required to resolve areas of uncertainty. Based upon the preliminary analysis, however, we determined the following:

- An estimated 2.22 million cubic yards of in-situ sediment will need to be dredged for the float-in-place construction alternative, and an estimated 3.44 million cubic yards for the cast-in-place alternative.
- Total site area required to accommodate storage area and dikes was estimated to range from approximately 266 to 500 acres. The maximum available area encompassed by the MRGO disposal site was estimated to be approximately 452 acres in two parcels, sufficient to accommodate all but one alternative. Boundary information is conflicting however, and ownership of the site is still being researched. The area that will ultimately be available for use is still unknown.
- A dike constructed to a +15 ft crest elevation will match the specified interim reconstructed height of the adjacent flood control levee. To fully address community concerns regarding potential material losses from the CDF, however, further analysis should be done to establish appropriate setbacks from the flood control levee and need for measures to protect the CDF in the event of levee failure. In addition, potential for overtopping of the dikes in the event of catastrophic flooding in the area should be quantified, and this information utilized in establishing minimum dike height requirements from a hurricane protection perspective.
- Based on the preliminary geotechnical evaluation, a 17-ft high dike (measured from grade) will require a total base width of 306.5 ft around the entire perimeter of the CDF (assuming a 7-ft wide crest and 3 on 1 interior slope). For this configuration, a minimum setback from Bayou Bienvenue of 295 ft, measured from the centerline of the dike crest, will be required.
- Some on-site material may be suitable for dike construction, but high volume losses are expected due to the organic character and water content of the surficial soils. The proximity of the water table is also expected to limit depth of excavation for borrow. Site sampling and material testing will be required to determine whether borrow materials can be obtained from the site and to characterize foundation materials that will be supporting the dikes.
- Impacts of the dike loading on seepage and foundation materials underlying the flood control levee should be evaluated, as well as any real potential for failure of the CDF dikes to affect the flood control levee. Runoff between the north dike and the flood control levee will require management to promote drainage away from the area and prevent excessive ponding. This issue requires further study to assess potential impacts on dike and levee structures.
- A preliminary evaluation of impacts associated with contaminant transport from the facility indicates that mixing zones will be required to achieve dilution of dissolved contaminants in effluent and runoff. Limited effluent treatment may be required to reduce dilution requirements when some areas are dredged. Exposures associated with volatilization and leachate pathways are not expected to be unacceptable. The plant and animal pathways are not considered to be

a relevant contaminant pathway for the CDF due to salinity of the material and management planned to prevent establishment of vegetation.

- Of the four alternatives considered, the least cost alternative appears to be CIP Alternative 2 (combined open water and limited upland disposal). Although FIP Alternative 2 requires the smallest average storage area, for this alternative ponding area requirements are greater than storage area requirements. If dike heights cannot be proportionately reduced, which is inconsistent with the conservative hurricane protection requirements assumed here, potential cost savings are largely negated.
- Acreage potentially restorable as wetlands was estimated to range between 113 acres and 201 acres for FIP and between 219 acres and 389 acres for CIP, if beneficial use of suitable dredged material is employed.

Results of the conceptual CDF design effort are summarized in this report. Findings of this report will be incorporated in the EIS required under NEPA for the IHNC lock replacement project.

2 Introduction

The IHNC is located in the southeastern portion of Louisiana, within the city limits of New Orleans. This channel connects the Mississippi River, the Gulf Intracoastal Waterway (GIWW), the Mississippi River-Gulf Outlet (MRGO) and Lake Pontchartrain, and serves the Port of New Orleans (Figure 1). A lock is required to navigate between the Mississippi River and Lake Pontchartrain. However, the existing lock was constructed in 1923 and is functionally obsolete. Vessels navigating the lock sometimes encounter long delays due to competing traffic. Vessel draft that can be accommodated is limited.

A new lock was proposed to improve traffic handling capability and accommodate deep draft vessels. A study was authorized in 1956, with construction authorized in 1998 (*http://www.mvn.usace.army.mil/pd/projectsList/home.asp?projectID=107&directoryFilePath=ProjectData*). Two construction alternatives are being considered: float-in-place and cast-in-place. These alternatives differ with respect to dredging volumes required and the sequence and timing of the construction. In both cases, the bulk of the dredging will occur prior to lock construction and the remainder after. Some of the dredged material must be stockpiled for use as backfill once lock construction is completed. This material will require temporary upland disposal.

With some limitations, the remainder of the material could be disposed of in the Mississippi River open water disposal site or used beneficially at the mitigation site. However, materials demonstrating benthic toxicity to freshwater organisms cannot be disposed in the Mississippi River disposal site. Similarly, materials demonstrating benthic toxicity to marine organisms cannot be placed in an aquatic marine location without suitable containment. Materials being placed in the CDF that are unsuitable for either freshwater or marine open water placement will be stored in a cell separate from materials demonstrating no benthic toxicity in either environment. This will permit more comprehensive evaluation of suitability and containment required for beneficial use of materials with placement restrictions.

The purpose of this effort is to develop a conceptual level design for the CDF for inclusion in the EIS. The design must consider construction staging and differing dredging and disposal volumes for the two construction alternatives. The effort encompasses the following tasks:

1. Development of a dredging and disposal/placement plan.
2. Suitability evaluation of the proposed disposal site (MRGO disposal site).

3. Determination of storage volume requirements and dike geometry.
4. Containment facility features and operation.
5. Evaluation of availability and suitability of construction materials.
6. Consideration of hurricane protection requirements.
7. Consideration of potential contaminant impacts.
8. Consideration of all applicable federal, state and local regulations.
9. Development of preliminary cost estimates.
10. Consideration of beneficial use potential

3 Approach and Findings

3.1 Development of a Dredging and Disposal/Placement Plan

3.1.1 Approach

Presently, hydraulic dredging is planned for all stages of the IHNC lock construction project. Annual dredging volumes were estimated by correlating areas scheduled to be dredged during each construction phase (USACE 2007a) to dredged material management units (DMMUs) defined as part of the associated sediment characterization effort (Figure 2, USACE 2007b). Results of recent bathymetric surveys and sediment corings were used to estimate sediment volume scheduled for dredging in each DMMU, and to discriminate between native and non-native material volumes in each location.

Two disposal scenarios were then considered in order to estimate volumes of material that would be disposed in the CDF:

- Maximum possible volume: 100 percent of dredged material would be disposed in the CDF.
- Expected volume: material demonstrating freshwater, or freshwater and marine benthic toxicity, plus a requisite volume of material suitable for fill, would be placed in separate cells in the CDF, with the remainder of the dredged material going to open water disposal in the Mississippi River disposal site.

Other scenarios are being considered, including direct hydraulic placement of suitable material at the mitigation site and landfilling of materials unsuitable for open water disposal or beneficial use. Feasibility of landfilling unsuitable materials is being evaluated by others. Information is being gathered by the District to further evaluate feasibility of hydraulic placement at the mitigation site. The two scenarios evaluated here were considered to represent the worst case alternative in terms of area impacted by the CDF, and the most likely alternative if open water disposal is also utilized. In truth, various permutations of these alternatives may be possible, and could be considered as part of an optimization analysis, but were beyond the scope of this study.

Suitability for open water disposal in the Mississippi River disposal site was first determined for each DMMU based on results of benthic toxicity testing and anticipated water column impacts. Benthic toxicity was evaluated in testing conducted as part of the 404 analysis required for the dredging permit, and reported in Weston (2008 in preparation). Material demonstrating no benthic toxicity to freshwater organisms was considered suitable for open water disposal, subject to evaluation of associated water column impacts. Water column impacts were evaluated by comparing State and federal freshwater water quality criteria for toxicity to elutriate concentrations from the standard elutriate test after considering mixing, also conducted in conjunction with the 404 analysis. Where concentrations exceeded applicable criteria, the dilution required was calculated by taking into account background concentrations. Attainable dilution was modeled using STFATE (Johnson 1990) and CDFATE (Chase 1994), and mixing zone dimensions calculated. Tabular summaries of elutriate concentrations and mixing zone dilutions will be reported in the preliminary mixing zone analysis in preparation (ERDC 2008 in preparation).

Suitability for construction fill was also based on results of the benthic toxicity testing. Material not demonstrating benthic toxicity (marine or freshwater) was assumed to be suitable for use as construction fill. Geotechnical suitability of the dredged material for construction fill was not evaluated, and remains to be determined. Manner of placement and potential water column impacts associated with in-water placement as fill also require further consideration. For the purposes of this analysis, however, construction fill is assumed to be placed after dewatering in the CDF, which will minimize dilution requirements.

Material demonstrating benthic toxicity to marine organisms was assumed to be unsuitable for placement at the mitigation site and unsuitable for construction fill (both the mitigation site and the lock construction site are marine environments). This assumption was consistent with establishing the maximum anticipated volume of dredged material requiring placement in the CDF. With proper controls, one or both beneficial use placements may be possible without unacceptable adverse environmental effects. Further evaluation of material and placement conditions and controls will be required to make this determination however.

3.1.2 Findings

Estimated dredging volumes associated with each DMMU, or with specific horizontal or vertical sections of each DMMU, are summarized in Table 1 (Dredging and Disposal Plan). Also indicated is freshwater and marine placement suitability based on benthic toxicity, planned placement (upland or open water), and expected year of dredging.

Table 1 reflects the following assumed dredging sequence and timeline:

- DMMUs 6 and 7, Year 1 (north bypass channel).
- DMMUs 3, 4 and 5, Years 2 and 3 (new lock excavation).
- DMMUs 1 and 2, Years 6 or 7 (north channel excavation).
- DMMU 8 (Sites 1-3), Year 7 (south channel excavation).

- DMMU 9 (Sites 2 & 4) and all DMMU 10, Year 7 (south channel bypass excavation).
- DMMU 9 (Sites 1 & 3) Year 11 (lock demolition, river excavation to St. Claude).
- DMMU 11 (Not scheduled to be dredged).

Where open water disposal can be utilized, it was assumed that all required fill and clean cover material would be obtained from dredging of DMMUs 6 and 7. Approximately 403,587 cy fill are required for float-in-place, and 651,028 cy for cast-in-place (USACE 2007a). An allowance of 50,000 cy over and above estimated requirements for lock fill (USACE 2007a) was included for future covering of the disposal cell in the CDF. If material from the disposal cell is determined to be suitable for placement as fill, fill and cover volumes can be reduced proportionately. Fill and cover volumes may need to be increased, however, to compensate for volume losses occurring due to consolidation of the material. After consolidation testing has been completed, material shrinkage should be evaluated and placement volumes adjusted accordingly.

All other dredged material suitable for open water disposal (an estimated 1,397,550 cy for float-in-place, and 2,306,378 cy for cast-in-place) would be disposed in the Mississippi River open water disposal site (Table 1). Dredged materials unsuitable for freshwater disposal would be placed in the permanent disposal cell of the CDF (approximately 316,800 cy for float-in-place, and 439,300 for cast-in-place).

The letter report (USACE 2007a) assumed 70,000 cy of fill would be obtained during dredging of the south bypass channel and placed directly as backfill at the new lock. However, if hydraulic dredging is used, a large ponding area is required to achieve clarification. It may be possible to place the material hydraulically if it is predominantly sandy. Allowable dredging rate and clarification area needed would require further analysis. Finer materials would need to be mechanical dredged and placed or dewatered in a CDF and then placed mechanically. We therefore assumed that all necessary fill should be stockpiled and dewatered in the CDF prior to placement as fill. Obtaining fill from the areas dredged first (DMMUs 6 and 7) will allow a maximum amount of time for dewatering, and will facilitate rehandling and transport of the material when it is needed for fill.

In the unlikely event that open water disposal could not be utilized, it was assumed that all material suitable for both freshwater and marine placement would be placed in the fill cell (an estimated 1,033,750 cy for float-in-place, and 1,955,800 cy for cast-in-place), and the remainder would be placed in the permanent disposal cell (1,143,700 float-in-place cy, 440,900 cy cast-in-place).

Total annual dredging and disposal volumes were developed based on these assumptions and used in sizing the CDF.

3.2 Suitability Evaluation of the Proposed Disposal Site (MRGO Disposal Site)

3.2.1. Approach

Site suitability determinations involve consideration of a number of factors, including but not necessarily limited to:

- Adequacy of site area.
- Previous and existing uses.
- Adjacent land uses.
- Topography.
- Chemical and physical character of the on-site soils/fill.
- Access.
- Availability of utilities.
- Easements and existing structures.
- Ownership.
- Habitat value.
- Future site use.

Because the adequacy of available area can only be determined once area requirements are known, these evaluations are conducted concurrently. There is of necessity some redundancy between this section and the following section (Section 3.3 Determination of storage volume requirements and dike geometry). Available site area was estimated using measurements taken from aerial photographs and coordinates provided by the New Orleans District (Figures 3 and 4).

Historical photographs of the site were obtained from District files, and a site visit was made to obtain information regarding existing conditions and adjacent land uses. Information regarding access and utility easements was gathered from multiple sources, including the Orleans Levee District, the New Orleans Sewer and Water Board (NOS&WB), MVN Real Estate division and various reports. Habitat value of the site is being evaluated by others in MVN.

3.2.2 Findings

The acreage encompassed by this site is somewhat indeterminate as the boundaries and acreage assumed in various reports and evaluations (Washington Group International 2000 and Figures 3, 4 and 5), historical photographs (Figures 6-10), and existing dike locations obtained from satellite images (Figure 5), are not in agreement. In addition, ownership of the site is still being researched, so the area that will ultimately be available for use is still unknown. Maximum available area for construction of a CDF was estimated based on coordinates provided by MVN delineating the approximate north line of the facility (from Figure 4), the existing dike transect on the west side, Bayou Bienvenue on the south, and the approximate location of the sewage line easement. Roughly 264 acres are available on the west side of the site and 188 acres on the east side. According to Figure 3, containment dikes originally took in some acreage further east of this area as well. Maximum estimated available area was platted as part of conceptual layouts developed in the following section, and attached as Appendix A (Figure A5). With one exception, the estimated available area is sufficient to construct a CDF of the requisite size. Area requirements are more fully discussed in the following section.

The area was previously used as a dredged material disposal area in 1958 and 1959, as evidenced by historical photos provided by MVN (Figures 6-10). Dikes remaining on the site can be visualized in aerial and satellite views (Figures 3 and 5), and were evident during the site visit (Figure 11). The site is presently rather heavily overgrown (Figures 11 and 12) and there are fairly large ditches of unknown depth bisecting the site adjacent to the dikes. These can also been seen in the satellite views of the site. The site will require substantial preparation for construction of a CDF and wet conditions in some areas may present additional problems for heavy equipment.

The proposed disposal site is flanked on the north by a flood control levee (Figures 13 and 14) and the GIWW. To the west is a salvage yard operation (Figures 15-19), to the south Bayou Bienvenue, and more open land extends eastward to Paris Road (Figure 3). The proposed use of the site as a dredged material disposal area is therefore not considered to be incompatible with present land uses in the immediate area.

Topography of the MRGO disposal site was evaluated based on a Light Detection and Ranging (LIDAR) figure provided by MVN (Figure 20, from FEMA LIDAR 1999, referenced to NAVD88 (2004.65) and observations made during the site visit (January 2008). Based on the LIDAR figure, ground surface elevation in the west half of the site ranges from approximately 3.9 ft to 5.2 ft above the reference elevation. Surface elevation in the east half of the site ranges from approximately 2.8 ft to 4.1 ft above the reference elevation.

An on-site sampling effort is planned to obtain information regarding the chemical and physical character of the on-site fill and foundation materials. Some information regarding foundation materials in the area was obtained from old soil borings taken along the MRGO transect (Figures 21-23), and more recently within the MRGO disposal site along a transect parallel to and approximately 100 feet south of the flood control levee (Washington Group International, Inc 2000). Arsenic concentrations on the MRGO disposal site were evaluated in response to concerns regarding levels of arsenic in IHNC lock replacement project materials and potential implications with respect to disposal of these materials. Arsenic concentrations were measured in the top five feet of material sampled in the MRGO disposal site. This soil horizon was reportedly considered representative of agriculturally impacted soils regionally, and provided appropriate background levels for comparison to samples from the Oak Tree Grove area adjacent to the existing lock. Conclusions of that sampling effort were:

- From 0 to approximately 20 in below ground surface (bgs) soils consisted of dry, hard, organic silty clays containing root and shell fragments.
- From 20 to 60 in bgs, soils consisted of interbedded clays, silty clays and very fine grained silty sands containing shell fragments.
- The groundwater table in the MRGO disposal site was observed at a depth of approximately 4 ft bgs along this transect.
- Arsenic concentrations in the 30 MRGO disposal site samples ranged from 2.8 mg/kg to 7.8 mg/kg.
- Arsenic concentrations in the 20 Oak Tree Grove samples ranged from 1.0 mg/kg to 9.3 mg/kg.

Inquiries were made with MVN Real Estate division to determine where streets may have been platted through the area and where utility easements exist, in order to guide the layout of the proposed facility. MVN confirmed with the NOS&WB that an active 54-in sewer main bisects the site, running roughly north to south along a 50-ft wide easement (Figure 24). This is the only pipeline thought to be present on the site, but information available was rather dated and MVN is working to provide further confirmation on this question.

No other indication of utilities or pipelines is visible in aerial photographs of the site, nor were they observed during the initial site visit by ERDC. MVN Relocation made a second site visit to verify utilities locations and found no other facilities in the vicinity of the 54" sewer force main and the proposed disposal site. They noted pipeline protection was in place over the sewer force main where it crosses the access berm road (Figure 25). Far to the east of the proposed disposal site, there is a 10" Louis Drayfus NGL liquids pipeline. The pipeline is located at the floodgate just before the Paris Road bridge, at the levee and floodwall transition. This pipeline reportedly crosses over the levee. A 24" Entergy gas line passes through the floodwall just east of the Louis Drayfus line. Where these lines intersect the access and berm road, pipeline protection is also in place. Table 8 contains latitude and longitude readings for these utility lines, taken by Relocation with a handheld GPS unit. Electricity is also presumed to be available from somewhere near the salvage yard to the west or near the sewage treatment plant to the south. Entergy was contacted regarding estimated distances to hookup, but that information could not be obtained without a site visit by Entergy.

Present access to the MRGO disposal site is via the flood control levee bordering the GIWW on the north side of the site (Figures 13 and 14). According to MVN personnel, the flood control levees are designed for HS20-44 loading on the crown and berm of the levee and present the most feasible route to the site. (HS20-44 specifies concentrated and uniform lane loads allowable.) The levee also appears to be currently trafficked by trucks in conjunction with the operation of a nearby salvage yard (Figure 17). The Orleans Levee Board was contacted to determine whether access to the site via the flood control levee would be permitted to maintain the facility and to truck fill out of the site in later years. They referred us back to MVN Real Estate division. At the time of this report, long-term access to the site via the levee and load limitations could not be confirmed. Access to the site via the levee was recently granted to MVN by the Orleans Levee Board for purposes of conducting field sampling (Personal communication Deanna Walker MVN March 14, 2008). There appear to have been streets platted through the area, as indicated in street plat in Figure 4 provided by MVN Real Estate division. They may provide other avenues for access to the site if needed, but would require clearing and construction. For the purposes of this effort, it is assumed that access would continue via the flood control levee, subject to formal approval by the appropriate authorities.

The MVN Real Estate division is working actively to resolve questions pertaining to ownership and access. At the time of this effort, these efforts were ongoing. For the conceptual design, the assumption was made that the necessary area would ultimately be available for use.

Because the site has been unused for an extended period, and the area has reverted to a more natural state, the value of the site as habitat is being evaluated by MVN and USFW. A determination regarding habitat mitigation requirements will be made by these agencies based on the results of their evaluation. Improving the disposal area to create higher quality habitat is one option being considered for use of the site after project completion.

3.3 Determination of Storage Volume Requirements and Dike Geometry

3.3.1 Approach

The principal objectives of the preliminary CDF design effort were to estimate storage volume required to contain the dredged sediments and provide sufficient ponding volume for management of water produced during dredging. The SETTLE model[1] was used to estimate disposal volumes and ponding requirements for the hydraulically disposed sediment. The model requires the following input parameters:

- Grain size, specific gravity, and solids concentration of the in-situ sediments.
- Column settling test data.
- Annual dredging volumes.
- Size and type of dredge (hydraulic or mechanical).
- Approximate available site area and geometry.
- CDF design constraints.

Grain size, in-situ solids concentration and specific gravity were determined as part of the settling test procedures conducted on 20 sediment composites from each of the dredged material management units (DMMUs) (Weston 2008 in preparation).

Dredging rate was estimated based on the following assumptions:

- 24-in hydraulic cutterhead dredge.
- 20 hr/day, 7 day/wk active dredging operation (unconstrained).[2]

Available site area was estimated using measurements taken from aerial photographs and coordinates provided by the New Orleans District, as reported in the previous section. Hydraulic efficiency was calculated for assumed CDF configurations using DYCON.

The above information was input to the SETTLE model to estimate ponding and storage volume requirements for the CDF. The SETTLE model calculates the volume of the dredged sediment at the time of disposal. Because large volumes of water are entrained during hydraulic dredging, this volume is substantially larger than the in-situ volume. Initial settling occurs relatively rapidly however, and within a few hours to a few days a comparatively clear supernatant forms above the settled solids. This supernatant is then typically discharged from the facility as effluent. The sediment continues to consolidate, with the result that some storage volume is recovered over time. In the absence of fixed ring and self weight consolidation test data, consolidation behavior was extrapolated in SETTLE by extending the project period. This provided a rough approximation of the volume occupied by the material after approximately 1 year. (More rigorous estimation of expected consolidation can be accomplished with the use of the PSDDF[1]

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[1] *http://el.erdc.usace.army.mil/products.cfm?Topic=model&Type=drgmat*

[2] Unconstrained operations could be performed around the clock, weather permitting, and are assumed not to be limited by environmental or regulatory constraints, or by local ordinances (consistent with similar assumptions in the Letter Report (USACE 2007a).

model, and is recommended for design level efforts. PSDDF requires data from fixed ring and self weight consolidation tests. For purposes of conceptual design, the method utilized provides a conservative estimate of storage volume required.) Generally, where multiple composites were tested in a single DMMU, worst case column settling results (lowest zone settling velocity or highest percent fines) were used in the SETTLE analysis. All SETTLE model input parameters are summarized in Table 2, and input files (*.sei) were included in the electronic documentation accompanying this report.

Effluent discharged from the CDF must meet applicable water quality criteria within an approved mixing zone. Dilution required for chemical constituents to meet WQC was estimated based on maximum and average effluent elutriate concentrations. The comprehensive mixing zone analysis is in preparation. Evaluation of potential contaminant impacts is further discussed in Section 3.7. Effluent total suspended solids (TSS) are in part a function of CDF configuration, and TSS limitations are considered in conjunction with the facility design. Sufficient ponding area and hydraulic retention time are required to achieve clarification and to reduce TSS adequately for discharge. A TSS criteria was extrapolated from the TSS/turbidity relationships developed in the column settling tests (Weston 2008 in preparation) and the applicable LADEQ turbidity criteria for estuarine lakes, bays, bayous and canals (State of Louisiana Title 33 Part IX Subpart I Chapter 11 § 1113 Criteria 9.b.ii), which is 50 nephelometric turbidity units (NTUs).

3.3.2 Findings

Drawings of the site location, preliminary CDF configurations and available area were prepared in AutoCAD (Appendix A, Figures A1-A6). It is important to emphasize that these figures are conceptual in nature and may require some adjustment to optimize dredged material management objectives, to achieve clarification and to reduce effluent TSS adequately. These issues are discussed further in this section. Based on the limited site information available, MVN geotechnical division developed a preliminary perimeter dike profile for the MRGO disposal facility (Figure A6). The design assumes a grade elevation of -2 ft, and specifies an overall dike width of 306.5 ft, a total height of 17 ft above grade (+15 elevation), and a 7 ft crest width. Interior dike slopes specified were 3 horizontal to 1 vertical. The exterior slope specified varies with different sections of the toe. A minimum setback of 295 ft from Bayou Bienvenue was specified (measured from the center line of the dike crest). (The dike section developed by MVN specifies a crest elevation of +15 ft, assuming a grade elevation of -2 ft. However, grade elevation at the MRGO disposal site varies. A constant crest elevation would yield varying dike heights, requiring the interior to be excavated to provide a uniform interior depth. For the purposes of estimating storage area requirements, a constant interior dike height of 17 ft was assumed. If this is not achievable, cell areas calculated in this section will need to be adjusted to reflect the varying cell depth resulting from the site topography.)

It was assumed that the facility would be constructed with one fill cell and one disposal cell, in order to separate materials demonstrating benthic toxicity from those demonstrating no toxicity. Where cells can be constructed on the same side of the site, a simple dike profile was assumed for the interior dike (Figure A6). All dike construction requirements will require verification once more site information is available. It may be necessary to pond water on one side of the interior dike while disposal is taking place in the other, or to place small lifts in each cell up to the point that the interior dike can support anticipated loads without further stabilization. If this proves infeasible, a profile similar to that of the perimeter dike may be required.

As stated in the previous section, maximum available area for construction of a CDF was estimated based on coordinates provided by MVN delineating the approximate north line of the facility (Figure 4), the existing dike transect on the west side, Bayou Bienvenue on the south, and the approximate location of the sewage line easement. Roughly 264 acres are available on the west side of the site and 188 acres on the east side (Figure A5).

Estimated cumulative disposal volumes and placement depths are summarized by year in Tables 3-6 for each construction and disposal alternative considered. Due to time constraints, the storage area analysis took place concurrently with development of site layouts that could be accommodated within available site area. A simplified rectangular geometry was assumed for the purposes of determining total site area requirements and dike perimeters, summarized in Table 7. Given the uncertainty regarding available area, this was deemed a reasonable simplification. Total area and dike perimeter reported in Table 7 do take into account the width of the dike as reflected in the profile developed by MVN.

Generally, sediment storage requirements determine minimum interior area. The large volume of sediment to be placed in Year 1 for all alternatives largely drives the size of the fill cell, for example. Where settling properties of the sediment are poor or hydraulic efficiency of the cell is low however, required ponding area may govern (see Table 7). This is the case for both cells for FIP Alternative 2, for the fill cell in FIP Alternative 1, and the disposal cell in CIP Alternative 2. With the exception of FIP Alternative 2, the difference between available ponding area (as determined by storage volume requirements and dike geometry) and required ponding area is approximately 3 acres. Unless the area is expanded, no clarification will occur. Because the areas involved here are small, it should be possible to expand the cells and provide the additional area required. Further, the ponding area requirements may be overestimated somewhat, since they are a function of what we assume to be the "active area". Active area is related to our assumptions regarding hydraulic efficiency. Improvements in hydraulic efficiency would therefore have the indirect effect of increasing the active area and reducing ponding area requirements. Changes in cell geometry, placement of a baffle to increase flow path from dredge discharge to weir, or filling simultaneously from two separate locations (thus eliminating dead zones), are all methods by which hydraulic efficiency can be increased.

For FIP Alternative 2, the ponding area requirements exceed available ponding by approximately 34 acres. In this case the size of the cell must be increased in order to achieve clarification. Because what is needed is more ponding area rather than increased storage volume, increasing the area of the cell without reducing dike height would result in excess storage capacity and unnecessary construction cost. Reduction of the dike heights would be a logical alternative, except for the concern regarding potential for overtopping in the event of flooding. Lower dike heights would likely reduce the dike profile required, however, which would have the effect of reducing the total area required for the CDF. Given the cumulative impact of these uncertainties on the cell design, a layout and cost estimate was not prepared for this alternative. Further evaluation of the actual risk of erosion and overtopping associated with a lower dike height, and requirements for construction of a lower dike will be required if FIP Alternative 2 is to be carried through subsequent analysis. This alternative does present an opportunity for significant cost savings if the questions related to hurricane protection can be favorably resolved.

Plan views illustrate possible cell configurations that could be constructed within the available area (Figures A2 – A4). In one case, the required area exceeds the estimated available area (Figure A2, CIP Alternative 1 fill cell). In several cases, the area occupied by the dike is approximately equal to or greater than the storage area provided. Selected site configuration will be influenced by a number of factors however, including dike profile, land availability, and setback requirements from the flood control levee, sewer line, and Bayou Bienvenue. Some iteration will be required to optimize the CDF design once engineering and site constraints have been more definitively determined.

Based on the TSS and turbidity relationships developed in the column testing (Weston 2008 in preparation), TSS equaled from .82 to 1.64 times the measured turbidity, with an average value of 1.3 times the turbidity. Assuming a turbidity criterion of 50 NTU, allowable TSS would then range from 41 to 80 mg/l, with an average allowable value of approximately 65 mg/l.

Predicted effluent TSS ranged from 19 to 443 mg/l, for configurations in which minimum ponding requirements were met (Table 7). Background TSS for Bayou Bienvenue, Mitigation Site and Mississippi River were 13.2 mg/l, 30.8 mg/l, and 14.8 mg/l respectively (Weston 2008 in preparation). At the time of this report, background turbidity and TSS in the GIWW was not known. However, background TSS in DMMU 1, the DMMU nearest the GIWW, was 4.0 mg/l. The State of LA water quality standards do allow for exceedances of background concentrations where background exceeds the applicability turbidity standards. It is not clear if a mixing zone is allowed for TSS. It appears that this may be considered on a case by case basis, in consideration of potential impacts within the mixing zone, as described in LAC 33:IX.1115.C.5. If a mixing zone is not allowed, it appears likely that measures will be required to reduce TSS and turbidity before discharge when certain areas of the IHNC are dredged. As previously mentioned, flocculants could be employed intermittently as needed, and have been demonstrated to be effective for TSS reduction in effluents (Schroeder et al 1983; Bailey et al. 2006). Increased retention time, which can be achieved by increasing hydraulic efficiency and/or cell area, are the other available TSS reduction measures.

3.4 CDF Features and Operation

3.4.1 Approach

Major facility features typically include dikes, access roads, fencing and discharge structures. As previously mentioned, a preliminary dike design was developed by MVN Geotechnical Division based on available information. Total area and dike perimeter were calculated in AutoCAD® for assumed CDF configurations, and were reported in the previous section. Weir lengths required for effluent release were determined using SETTLE. Pumping requirements were estimated based on dredge discharge rate, percent solids, and annual dredging duration calculated with SETTLE. Available guidance for typical site operations was summarized and is included as an addendum to this report (Appendix B).

3.4.2 Findings

Tentative configurations for the conceptual design were developed and described in the previous section, and Appendix A. With one possible exception, it is envisioned that the cells will be laid out as two separate structures in order to avoid the 50 ft sewer main easement (shown in Figure 24) and fit within the available area. Dike heights and cell areas required to meet storage requirements were summarized in Table 7. A comprehensive engineering analysis of foundation strength and available construction materials will be required in order to develop a final dike design. The footprint occupied by the dike will be a function of the final dike design and setback requirements from the flood control levee, sewer main and Bayou Bienvenue, all of which remain to be determined.

Construction guidance for the dikes, including number of lifts, compaction, grading, and other considerations, can be found in the Corps guide specifications for embankment construction (Section 02332) (Personal communication Francisco Martinez-Rodriguez, MVN, April 8, 2008).

Management activities are required during and following the dredging operation. Anticipated post-construction management activities include surface water management, monitoring, sediment dewatering, vegetation control, and material recovery for beneficial use. Future material recovery activities were considered in developing the CDF design and planning management activities, but were not evaluated as part of this study.

Surface water management involves the controlled and monitored release of water produced during dredging and resulting from precipitation on the site. Effluent is a high volume flow generated during the period of dredging. As sediment settles within the CDF, the clarified supernatant is collected and discharged. Weir structures are frequently used for controlled discharge of effluent and runoff. Box weirs are one type of discharge structure that could be used here. An example is pictured in Figure 26.

The rate at which effluent and runoff is discharged varies depending upon dredge production rate, ponding capacity of the site, dewatering objectives for the sediment and receiving water capacity in terms of both flow and ability to provide dilution for contaminants. There are two possible receiving waters in this case, Bayou Bienvenue and the GIWW. Flow rate in Bayou Bienvenue is thought to be very low and intermittent, and dilution capacity is therefore expected to be correspondingly low. Flow rate and dilution capacity in the GIWW are believed to be much higher. Given these site specific conditions, there are three possible alternatives for management of effluent and runoff:

- Pump out to the GIWW at a rate corresponding to production.
- Gradual gravity drainage to Bayou Bienvenue through multiple discharge points.
- Treatment in conjunction with one of the above discharge schemes.

To discharge effluent at the rate that it is produced by a 24-inch dredge operating 20 hours per day, the weir length needed (assuming a 2-foot withdrawal depth and zone settling) is estimated to be 54 feet. Because effluent flows are thought to be comparable to the flow in Bayou Bienvenue, it was envisioned that effluent would need to be pumped over the flood control levee to the GIWW where dilution capacity is higher. High capacity pumps and lengthy discharge piping would be needed during dredging periods. Estimated pumping rates and durations required are summarized in Tables 9-12. Actual pumping durations will be somewhat less than estimated given that some percentage of the water discharged to the site will not be recoverable during the disposal operation (it will remain in storage with the sediment as porewater). The main discharge weirs would be located to maximize the distance from dredge discharge points in order to prevent short circuiting and improve clarification of effluent (Figures A2-A4).

Runoff flows will be much smaller than effluent flows, and will occur intermittently. It may be feasible to release runoff to Bayou Bienvenue gradually, in order to minimize water quality impacts. Additional piping could be incorporated along the south side of the facility to distribute the runoff discharge along the length of the bayou (depicted in Figure A7). Another alternative would be to discharge runoff to the wetland area to the west of the disposal site, where flows would dissipate and enter the bayou all along the perimeter of the wetland. This would provide an opportunity for further SS and contaminant reduction as well, possibly eliminating the need for the other management measures previously discussed.

Additional climate and stream flow information is needed before effluent and runoff management alternatives can be definitively evaluated, however. Dilution requirements for both effluent and runoff (preliminary, subject to completion of the runoff testing) are discussed in Section 3.7 Consideration of Potential Contaminant Impacts. Pump out of runoff to the GIWW could also be employed if gravity flow to Bayou Bienvenue proves infeasible.

Disposal sites tend to be colonized with opportunistic vegetation relatively quickly. In order to maintain the facility in optimum condition for multiple year placements of dredged material and to facilitate recovery of dredged material, some type of vegetation control may be needed. Where clarification area is marginal, as is the case with several of the preliminary cell configurations, vegetation control is especially important to maximize the “active area” of the pond. (Area requirements are discussed in more detail in Section 3.3. Determination of storage volume requirements and dike geometry).

The following recommendations for vegetation control were provided by Richard A Price, ERDC (Personal communication, March 5, 2008). “Most effective would be tillage once the material is sufficiently dewatered, application of herbicide, or a combination of both. One could also cover the material with a fabric but this may be difficult to keep in place. A glyphosate herbicide such as AquaMaster can be applied as soon as vegetation appears, will provide complete control without adverse environmental effects, and is approved for aquatic application. Glyphosate generally works better with a surfactant but must be carefully selected due to the potential migration to surface water. The surfactants and adjuvants normally added to herbicides to increase their effectiveness are more toxic than glyphosate. There are other herbicides that will essentially kill the soil to prevent plant establishment for a year but these may not be as environmentally acceptable. A vegetation management plan will need to be developed once more is known about the consolidation rate of the dredged material and the site specific species requiring control.” In addition, the exterior slopes of the dikes should be seeded with some type of self-sustaining groundcover or grass to stabilize them and prevent erosion. Periodic reseeding may be required if it fails to establish uniformly or is damaged due to site activities or storm events.

Active dewatering management is expected to be needed in order to encourage rapid consolidation and desiccation of the dredged material and facilitate recovery for use as fill. Construction of the facility with a dewatering trench located around the perimeter inside of the dikes will provide some passive dewatering. Surface trenching and regular weir management to minimize standing water following disposal is most important. For purposes of cost estimating, it was assumed for this analysis that perimeter dragline trenching and weir management would be done in the first year following placement of material in a cell. Once a crust of 4-6 in forms, surface trenching would be employed. A rotary trencher equipped with a low ground pressure chassis is typical. Trenches will be placed 100-200 ft on center, running parallel to each other, and connecting to the perimeter trench. Trenches would be periodically deepened as the crust depth increases.

Access to the CDF was assumed to be via the flood control levee on the north, as previously discussed. It was envisioned that some type of earthen ramp would be required to enable trucks to get up and down the side of the levee, both to maintain the CDF and ultimately to recover fill materials from it. Permission to access the CDF using the flood control levee and to construct an access ramp against the levee will need to be obtained from the appropriate authorities. A comprehensive engineering analysis will also be required to develop construction specifications. Similar ramps will be needed on the side of the CDF to enable workers to maintain the site and operate the pumps and weirs. It was envisioned that the dikes would be thickened at the top of each ramp, and in the corners of the CDFs, to provide an adequate area for turning vehicles around on the dike.

Further consideration should be given to potential impacts of constructing a dike in relatively close proximity to the flood control levee. One issue is the potential for rainfall to accumulate between the two dikes, given the relatively flat topography and the proximity of the structures. Provisions will be needed to ensure adequate drainage of this area through grading and water control structures. For the purposes of this evaluation, construction of drainage ditches along the north side and down to the bayou on either side of each cell was assumed. Because of the length of the structures and the relatively flat terrain, establishing a slope sufficient to achieve drainage may be difficult however. The other issue of concern is the potential impact of the dike loading on the foundation underlying the flood control levee. This is not anticipated to be problematic with sufficient space between the structures (personal communication Landris Lee March 19, 2008), but the necessary clearance should be quantified as part of the engineering analysis supporting dike design and construction.

Because the site is somewhat remote, no permanent fencing was considered necessary. Silt fences will be required to control TSS in the runoff from the site during site preparation and dike construction, and while grass is being established on the dike slopes. Some type of secure pump housings will be required to protect them from the elements and from vandalism, however, as well as small concrete pads to support the pumps. Electricity will need to be brought to the site to support operation of the pumps, or diesel or gasoline powered pumps could be utilized. When pumping is not required, it is likely that power requirements could be met with portable equipment during periods of construction and maintenance.

3.5 Evaluation of Availability and Suitability of Construction Materials

3.5.1 Approach

MVN is presently soliciting candidate sites for borrow material to support levee reconstruction in the area. Over 100 million cubic yards of material is estimated to be needed for this effort (*http://www.mvn.usace.army.mil/HPS/borrow_pits_home.htm*). The office in charge of this effort was contacted to ascertain whether there was a central repository of borrow areas in reasonable proximity to the IHNC, and what types and volumes of material might be available for dike construction.

In addition, the amount of borrow material potentially available on the proposed disposal site was estimated from LIDAR data and estimates of water table depth based on borings taken along the facility on the north side (Washington Group International, Inc 2000).

3.5.2 Findings

Locating borrow material for projects other then levee reconstruction is not part of the MVN borrow team's mission, and they were unable to provide any information regarding existing borrow sites that might be utilized. Given the urgent need for material to reconstruct flood control levees, however, construction of the confined disposal facility is likely to be considered to be a lower priority and it is questionable whether off-site materials would be available. It is possible that material considered unsuitable for construction of flood control levees could be utilized for construction of the CDF dikes, and that possibility should be explored further.

Although the volume of borrow above the water table on-site was initially thought to be sufficient to construct the dikes, the preliminary design developed by MVN will require much larger volumes of borrow material than originally anticipated. In addition, reportedly large volume losses should be expected due to the organic character of the surficial materials and the high water content, even in materials above the water table.

If the volume of on-site borrow is insufficient, it may be possible to construct the dikes to an interim height with on-site material and raise them later with dredged material. However, the proposed dredging plan assumes all the fill will be stockpiled in the first year or two of dredging, which may preclude staged construction. Staged construction staging or foundation stabilization measures might be considered in order to strengthen the foundation, possibly reducing the width of the dikes necessary and the volume of borrow required. Stabilization is typically expensive, however.

For the purposes of the conceptual design, it was assumed that sufficient suitable material was available on-site to construct the dikes to their full height. Further evaluation to determine the suitability of on-site materials for dike construction will be required. Results of the planned on-site sampling effort should provide information to support the engineering evaluation, although additional geotechnical testing may also be required. Coordination is recommended to assure all data requirements for environmental and geotechnical evaluations are met by the sampling effort. If materials must be brought in from outside the immediate area, this could have a significant impact on construction costs.

3.6 Consideration of Hurricane Protection Requirements

3.6.1 Approach

Various documents were reviewed to obtain information regarding historical flood levels in the area of the MRGO disposal area, including flooding occurring during Hurricane Katrina. Information regarding predicted flood levels and flood control levee heights in the area of the disposal site was obtained from the MVN Hurricane Protection System website (*http://www.mvn.usace.army.mil/hps/*). Inquiries were also made within MVN to clarify available information.

3.6.2 Findings

In a letter filed by the Tulane Environmental Law Clinic with the U.S. District Court, Eastern District of Louisiana, concern was expressed regarding the kind of storm events a confined disposal facility constructed at the MRGO disposal site would withstand (Tulane Environmental Law Clinic 2006). An attachment to that letter (Kohl, Figure 2) indicates locations where the flood control levee along the MRGO/GIWW failed during Hurricane Katrina in 2005. Based on this figure there were two locations on the north bank of the MRGO/GIWW, opposite the proposed location of the CDF, that suffered storm induced failures during Hurricane Katrina. There were no failures indicated along the portion of the levee paralleling and immediately adjacent to the proposed CDF, but there were failures further to the east that the letter indicates resulted in flooding throughout the area, including the location of the proposed CDF.

The MRGO disposal area appears to lie largely within the area defined as Sub-Basin C (Inside of Levee-Protected Areas) in Orleans Parish, Louisiana. In FEMA flood recovery guidance outlining **advisory** base flood elevations (BFE) for this area, (*http://www.fema.gov/pdf/hazard/flood/recoverydata/orleans_parish04-12-06.pdf*).

FEMA recommends the following (in part):

- “New construction and substantially damaged homes and businesses within a designated FEMA floodplain should be elevated to either the Base Flood Elevation (BFE) shown on the current effective Flood Insurance Rate Map (FIRM) or at least 3 feet above the highest adjacent existing ground elevation at the building site, whichever is higher.”

Also taken from the FEMA flood recovery reference cited above:

- “For the Parish Advisory BFE (ABFE) inside levees, this Guidance is similar to NFIP rules for areas protected by levees being restored to provide 1-percent-annual-chance base flood protection. Should the requirements needed for application of these rules fail to materialize, flood elevations in this area would be based on a “without levee” scenario and could exceed elevations of 8 feet (west and south of Mississippi River) or 13 to 15 feet (east and north of Mississippi River) referenced to the National Geodetic Vertical Datum of 1929 (NGVD29).”
- “In addition to the recent USACE storm surge modeling, FEMA has also developed these recommendations based on the height and integrity of the levee system expected to be in place by September 2007.”

In a project fact sheet on the Inner Harbor Navigation Canal released in 2006 by the US Army Corps of Engineers Hurricane Protection Office, it was reported that as part of the U.S. Army Corps of Engineers commitment to upgrade the storm flood protection infrastructure to a 100-year protection level, improvements were made to the Inner Harbor Navigation Canal levee wall. Reportedly, in some locations walls were raised to the previously authorized elevation, and are now built to an elevation of 15 feet, about 2 feet higher than pre-Katrina conditions.

The Corps of Engineers release of new risk maps for the New Orleans area was announced in a news release from the Office of the Federal Coordinator of Gulf Coast Rebuilding and the US Army Corps of Engineers, dated August 22, 2007. In it, the agencies cite the Federal Emergency Management Agency (FEMA) definition of one-hundred year flood protection: "One-hundred year flood protection is defined by the Federal Emergency Management Agency (FEMA) as the flood elevation that has a 1 percent chance of flooding in any given year. The 100-year level of flood protection is a standard used by most Federal and state agencies, including FEMA's National Flood Insurance Program (NFIP)."

Predicted flood levels with a 1 percent annual probability of occurrence in the area of the MRGO disposal area were found in US Army Corps of Engineer depth maps available on-line at *http://www.mvn.usace.army.mil/hps/Presentations/Final%20R&R%20maps. pps#256*, 1, Slide 1, released March 10, 2008. The maps indicate predicted flood levels throughout the New Orleans area assuming 0 percent, 50 percent and 100 percent pumping capacity. Figure 27 was copied (unmodified) from the slide presentation by Dr. Ed Link, Director, Interagency Performance Evaluation Task Force (IPET) (*http://www.mvn.usace.army.mil/hps/risk_depth_map.html*). This slide indicates that prior to Hurricane Katrina, flood levels in the area of the MRGO disposal area could exceed 8 ft for all pumping capacities. As of June 1, 2007, this depth was reduced in some regions of the disposal to area to less than 6 ft, and from 6 to 8 ft over the remainder of the site.

The flood risk map released for Bayou Bienvenue (Figure 28) appears to indicate that with a 100 year level of protection in place, no flooding is predicted in the MRGO disposal site location (*http://www.mvn.usace.army.mil/hps/pdf/100Yr_Maps_pdf/SB2_100yr.pdf*). A contract was awarded in June of 2007 by the U.S. Army Corps of Engineers for Project LPV-142 (Figure 29) Interim Measure - South Side of GIWW (*http://www.mvn.usace.army.mil/hps/hps_contract_info.html*). The work is described as follows (taken from the above web site March 19, 2008):

> *"Raise low areas in the levee along the GIWW between Paris Road and the IHNC to elevation 15'. Orleans Parish. Construction is ongoing. Memphis District is performing the work. During construction crews degraded approximately 250' and encountered sand layers. Inspection trenches indicate the sand layer extends*

> *for approximately 4300' of existing levee. Memphis District is currently working from Sta. 78+00 to 81+00. Scheduled completion is April 08."*

We have not found documentation of the proposed final height of this levee, but infer from documentation pertaining to reconstruction of levees along the IHNC (previously discussed) and the FEMA flood recovery guidance previously cited, that 15 ft may correspond to a previously authorized levee height rather than the 100 year protection level. This remains to be confirmed. Levee reconstruction work was in progress during the site visit in January 2008 (Figure 13).

For the purposes of developing a conceptual design, it was felt that a conservative assumption would be to assume that the dikes of the CDF would be constructed to the same elevation as the adjacent flood control levee. Based on the predicted flood levels as of June 1, 2007 (previously cited), a 17 ft dike would provide approximately seven to nine feet of height above the maximum anticipated flood level in this area (eight feet appears to be the maximum predicted flood level in the MRGO disposal area based on the flood risk maps, but resolution of the maps is ± 2 ft). Because ground surface elevation varies, excavation would be required to maintain a crest elevation of +15 ft around the perimeter of the facility and a consistent interior dike height of 17 ft (to meet storage volume requirements). Alternatively, a constant crest elevation could be maintained and interior dike height allowed to vary with ground surface, but total area would need to be adjusted to reflect the impact on total storage volume.

Two concerns have been raised by the community regarding stability of the CDF (Tulane Environmental Law Clinic 2006):

- Potential for overtopping of the dikes in the event of flooding around the CDF.
- Erosion of the CDF dikes as a result of failure of the adjacent flood control levee.

Because the CDF will be located within the newly reconstructed levee system, flooding around the CDF is not a condition that would be expected under normal conditions. However, because flooding has occurred in this area previously as a result of levee failure, the conservative approach would be to model the potential for overtopping in the event of widespread flooding. This was beyond the scope of this effort, but should be done to definitively resolve the question and to better quantify the hurricane protection requirements. Similarly, modeling of the potential impacts of high velocity flows resulting from levee failure would help in determining what protection the CDF may require. Armoring of the exterior dikes so located as to be vulnerable to levee failure is a consideration. Armoring was not recommended by MVN Geotechnical Division, however, other than possibly in the location of any proposed weirs, given that the CDF is not intended to serve a flood protection function. MVN did specify that the dikes should be located an adequate distance from the existing hurricane protection levees so that the levees themselves would not be compromised by any instability of the CDF dikes. It should be noted that other than during active dredging and disposal periods, when surficial layers of sediment will be fluidized and the surface of the CDF ponded, the dredged material within the CDF will exist in a relatively high percent solids condition. Also, the preliminary dike profile is substantial, which would serve as a barrier to impacting water currents. It is anticipated that these two factors would limit the area within the CDF that could potentially be lost as a result of scour. Further modeling should be done to quantify potential for material losses, and assess potential for adverse environmental associated with loss of sediment from the CDF. These considerations are further discussed in the next section.

3.7 Consideration of Potential Contaminant Impacts

3.7.1 Approach

A partitioning analysis is customarily done as part of the 404 analysis for dredged material disposal at an existing CDF. In a partitioning analysis, the degree and magnitude of contaminant release through relevant pathways is estimated based on equilibrium partitioning of contaminant between sediment and water, with the dissolved contaminant being the most mobile phase. Pathways normally considered for upland disposal include (Figure 30):

- Volatilization.
- Leachate.
- Effluent and runoff.
- Plant and animal uptake.

When a new facility is being constructed, information regarding the physical and chemical character of the on-site materials is normally also obtained. Where there will be a return flow from the CDF to a surface water body, receiving water quality and flow rates must also be known in order to estimate attainable dilution of effluent and runoff. Information regarding foundation materials and depth to groundwater is necessary to estimate attenuation of leachate. To estimate dilution attainable within an underlying aquifer, information regarding groundwater flow rate and quality is needed.

In this case, existing data was somewhat limited. A sampling effort is planned by MVN for the disposal site, but had not been completed at the time of this report. Old borings from the transect of the adjacent flood control levee were available and thought to reasonably represent foundation materials within the MRGO disposal site. Water quality in the GIWW was estimated based on samples taken from DMMU1, the DMMU in closest proximity, for which recent analytical data was available. Water quality was evaluated in Bayou Bienvenue and the Mitigation Site in the recent sampling effort, but little documentation exists with respect to general bathymetry, water depth or flow. Some qualitative information was obtained from MVN staff familiar with these water bodies.

A limited mixing zone analysis was conducted based on average and maximum effluent elutriate concentrations for all DMMUs. Dilution required to meet marine acute and chronic water quality criteria for effluent and runoff flows was determined and compared to dilution achievable in the GIWW and Bayou Bienvenue. A preliminary evaluation of the leachate pathway was conducted based on available information regarding foundation materials. More rigorous evaluation can be conducted once the results of the site sampling effort are available. Similarly, a preliminary evaluation regarding contaminant releases by the runoff pathway was also conducted. For the unoxidized case (runoff occurring before surface material has dried), effluent provides a conservative estimate of runoff quality. For the oxidized case (runoff occurring after surface material has dried), metals are more mobile and results of the simplified laboratory runoff procedure (SLRP) analysis will be required to more definitively evaluate this pathway. These tests were still underway at the time of this report, and will be reported in Weston (2008 in preparation). Volatilization potential was evaluated based on contaminant partitioning. The plant and animal uptake pathway was not considered a relevant pathway for the CDF due to salinity of the material and planned vegetation control site management.

3.7.2 Findings

Effluent and Runoff

Effluent dilution requirements were calculated using applicable chronic criteria due to the extended duration of dredging and effluent discharges. Dilution was calculated for GIWW and for Bayou Bienvenue as receiving waters, taking into account estimated and measured contaminant concentrations in each water body, respectively. The dilution ratio (volume receiving water required per unit volume effluent) is given by the following equation:

$$D = \frac{\left(C_{Effluent} - C_{WQC}\right)}{\left(C_{WQC} - C_{Background}\right)}$$

where

C_{WQC} = applicable water quality criteria concentration (µg/l).
$C_{Effluent}$ = modified elutriate contaminant concentration (µg/l).
$C_{Background}$= receiving water contaminant concentration (µg/l).

Where background concentrations exceed water quality criteria, dilution was calculated to 110 percent of background. Where background concentrations exceed effluent concentrations, no dilution can be achieved (negative values result, implying the effluent is diluting the receiving water).

Salinity of overlying water was observed to vary from approximately 3 ppt to over 15 ppt in sediment samples taken for column settling tests (Weston 2008 in preparation). In order to obtain a conservative estimate of dilution requirements, Federal water quality criteria were therefore compared to both marine and brackish State of Louisiana water quality standards. The lowest of these three values was used to calculate necessary dilutions. For a few constituents no federal or State criteria was available. In these cases, EPA Region 4 water quality screening values for hazardous waste sites were used, if available. Two modified elutriate values were utilized in calculating dilution ratios, maximum measured value (for all DMMUs) for each chemical constituent, and the geometric mean for all DMMUs. The geometric mean is considered a better measure of the central tendency of the data than the arithmetic mean when the dataset is skewed, with a few very high concentrations. When the data set is reasonably symmetrical, the geometric mean and arithmetic mean produce similar values.

Tables 13 and 14 summarize the non-zero dilution ratios obtained for geometric mean and maximum elutriate concentrations, respectively. Only three constituents require dilution based on the geometric mean (Table 13), and for both receiving waters the dilution ratio was no greater than six:

- Tributyltin.
- Dieldrin.
- Total PCBs.

There were 22 constituents requiring dilution based on the maximum reported elutriate concentrations (Table 14). Of these, only three require a dilution ratio greater than 100 for either receiving water:

- Tributyltin.
- Dieldrin.
- Total PCBs.

Maximum tributyltin concentration (6.7 µg/l) was measured in sample 04000004WTWAMD (DMMU 4, sample location 4, see nomenclature in Weston (2008) in preparation, requiring a dilution of 3105 in Bayou Bienvenue and 3180 in the GIWW. Next highest concentration (1.7 µg/l) was measured in sample 04000005WTWAMD (DMMU4, sample location 5), which would require a dilution of approximately 780 in Bayou Bienvenue and 799 in the GIWW. The remaining 11 samples with measurable values of tributyltin were an order of magnitude lower, requiring a dilution of 138 in Bayou Bienvenue and 142 in the GIWW.

The maximum value of gamma-Chlordane (0.066 µg/l) was measured in sample 07000002WTWAMD (DMMU 7, sample location 2) and requires a dilution of 81 for Bayou Bienvenue and 19 for the GIWW. Five samples had concentrations ranging between 0.011 µg/l and 0.018 µg/l, requiring a maximum dilution of 14 in Bayou Bienvenue and 4 in the GIWW. The remaining 15 samples with measurable values of gamma-Chlordane were an order of magnitude lower.

The maximum total PCBs concentration (2.2 µg/l) was measured in sample 07000002WTWAMD, requiring a dilution of 547 in Bayou Bienvenue and 404 in the GIWW. There were 25 additional samples with PCBs concentrations sufficient to require dilution. Dilution could be achieved for all of these with a minimum dilution of 97 in Bayou Bienvenue and 65 in the GIWW.

The dilution requirements for runoff discharges should be much less than that required for the effluent pathway (based on application of acute toxicity standards due to the short-term and intermittent nature of the runoff discharges as opposed to the application of the chronic toxicity standards for the effluent discharges) and will be determined by the SLRP testing. In addition, the quality of the runoff discharges are expected to be better than the effluent due to lower suspended solids concentrations forming the runoff than the solids concentrations in the influent dredged material slurry forming the effluent. Dilution requirements for runoff were estimated based on comparison of measured effluent concentrations to applicable acute aquatic life criteria. As for the effluent dilutions, the most conservative of federal marine and State marine and brackish acute aquatic life criteria was applied in calculating dilutions. For a few constituents no federal or State criteria was available. In these cases, EPA Region 4 water quality screening values for hazardous waste sites were used, if available.

No exceedances of water quality criteria were predicted for estimated mean runoff concentrations (modeled using effluent geometric mean concentrations compared to acute aquatic life criteria). Table 15 summarizes the non-zero dilution ratios obtained for estimated maximum estimated runoff concentrations (modeled using effluent maximum concentrations compared to acute aquatic life criteria). There were seven compounds requiring dilution based on maximum estimated runoff concentrations:

- Copper.
- Tributyltin.
- Cyanide.
- 4,4'-DDD.
- Endosulfan II.
- PCBs Aroclor 1260.
- Total PCBs.

Maximum copper concentration was 25.3 µg/l, measured in sample 1000C3&4LTWAMD, requiring a dilution ratio of 17.6 in Bayou Bienvenue and 59.3 in the GIWW. However, total suspended solids concentration in this sample was three orders of magnitude higher than any other sample (40,000 mg/l as compared to the geometric mean value of 4.33 mg/l). Reported elutriate concentrations therefore reflect total concentrations rather than dissolved concentrations for this sample. Actual dilution requirements are expected to be much lower for dilution of dissolved concentrations, and can be determined with reanalysis of this sample.

Maximum tributyltin concentration was 6.7 µg/l, measured in sample 04000004WTWAMD, requiring a dilution ratio of 15.8 in Bayou Bienvenue and 15.7 in the GIWW.

Maximum cyanide concentration was 6.6 µg/l, measured in sample 06000006LTWAMD, requiring a dilution ratio of 2.2 in both receiving waters.

Maximum 4,4'-DDD concentration was 0.140 µg/l, measured in sample 07000002WTWAMD, requiring a dilution ratio of 3.8 in both receiving waters.

Maximum endosulfan II concentration was 0.039 µg/l, measured in sample 07000002WTWAMD, requiring a dilution ratio of 0.33 in Bayou Bienvenue and 0.20 in the GIWW.

Maximum PCB Aroclor 1260 concentration was 1.6 µg/l, measured in sample 07000002WTWAMD, requiring a dilution of 0.53 µg/l in both receiving waters.

Maximum total PCBs concentration was 2.2 µg/l, measured in sample 07000002WTWAMD, requiring a dilution ratio of 0.10 in both receiving waters.

The maximum dilution ratio required for Bayou Bienvenue as receiving water was 17.6, and for the GIWW was 59.3. This is believed to be an overestimate of maximum actual dilution requirements due to high TSS in the sample concerned (copper concentrations in sample 1000C3&4LTWAMD). Further, if dredged materials from other DMMUs are placed in the CDF after the dredged material from DMMUs 4 and 7, the runoff quality would be much improved and likely require a dilution ratio no greater than approximately 4. Again, the actual dilution needs will be determined by the SLRP testing.

Preliminary Mixing Zone Analysis – GIWW

Although data for the GIWW was limited, and the GIWW was not sampled or analyzed as part of the IHNC characterization effort, sufficient information regarding channel geometry and flow rate was available to estimate mixing zone dimensions necessary to achieve required dilutions. Currents on the GIWW and Mississippi River-Gulf Outlet (MR-GO) are affected by tidal action and freshwater inflows. Reportedly, the mean annual velocity in the channel is about 0.6 fps, but may exceed 2 fps on ebb or flood tides. During periods of low inflows into the lake, July through November, surface ebb and bottom velocities average about 0.8 and 1.7 fps, respectively. Both may exceed 2 fps. Based on a mean annual velocity of 0.6 fps, and an estimated cross sectional area of 2661 m^3, average flow in the GIWW was estimated to be approximately 17,000 cfs.

Mixing zone requirements are set forth in Louisiana State Environmental Regulatory Code Part IX, Subpart 1, Chapter 11, §1115C. According to this section, aquatic life criteria apply within the mixing zone, and human health criteria apply only below the point of discharge after complete mixing. Mixing zones are exempted from general and numerical criteria as specified in LAC 33:IX.1113, except as required in paragraph C.5 of this Section. Paragraph C.5 provides narrative criteria pertaining to floating material, substances in concentrations that will produce undesirable or nuisance aquatic life, and materials in concentrations causing acute toxicity to aquatic life. Numerical acute criteria or other acute quantitative limits for toxic substances are applied within the mixing zone, in a zone of initial dilution (ZID) to protect against acute toxicity. Waters outside of the mixing zone must meet all standards for the particular body of water, which requires meeting chronic aquatic life criteria for toxic substances at the edge of the mixing zone. The 7Q10 is specified, limiting 7-day average concentration exceedances (of chronic aquatic life criteria) to no more than once every 10 years. Chloride, sulfate and total dissolved solids criteria are to be met below the point of discharge after complete mixing (based on harmonic mean flow of the receiving water body), but these were not analyzed in the IHNC elutriate.

Limits of mixing zones may include, but are not limited to, linear distances from point source discharges, surface area involvement and volume of receiving water. Nearby mixing zones must be taken into consideration such that overlapping mixing zones do not impair any designated water use in the receiving water body when the water body is considered as a whole. There are no known point source discharges in this reach of the GIWW and it is therefore believed that there are no mixing zones that would overlap with the CDF mixing zone. The only drinking water intake that could be found is located on the Mississippi River, between mile markers 93 and 83, located at 29° 55' 31.046"N, 89° 57' 34.925"W, and serving St. Bernard Parish waterworks (Personal communication Jesse Means, State of Louisiana, April 2, 2008). This intake which will not be impacted by effluent and runoff discharges to the GIWW or Bayou Bienvenue.

The GIWW would be classified as a Category 3 water body (tidal channel with flow greater than 100 cubic feet per second (cfs). For such a water body, the zone of initial dilution (within which acute criteria may be exceeded) is restricted to 10 cfs or 1/30 of the flow, whichever is greater. In this case, the average flow in the GIWW was estimated to be approximately 17,000 cfs. The zone of initial dilution would be restricted to 1/30 of the cross sectional area. Similarly, the mixing zone is restricted to 100 cfs or 1/3 of the flow, whichever is greater. The allowable mixing zone would therefore be restricted to 1/3 of the cross sectional area of the GIWW.

The basis for the mixing zone analysis will be more fully described in ERDC (2008 in preparation). The outcome of the mixing zone analysis is summarized here. Mixing zone curves generated from CDFATE (Chase 1994) results (Figures 31-33) reflect attainable dilution as a function of distance from the discharge point. Figure 34 illustrates the attainable dilution in the GIWW as a function of cross sectional area. The maximum attainable dilution ratio in compliance with these restrictions is approximately 120.

Effluent Dilution in the GIWW - Based on dilution estimates and the mixing zone curves generated with CDFATE (a model for dredged material discharges based on EPA's CORMIX system for mixing zone determinations), adequate dilution will be attainable within the mixing zone for all constituents except tributyltin and total PCBs. Effluent treatment will be required when dredging areas of the IHNC with elevated concentrations of these compounds (as defined by dilution requirements). It is anticipated that simple broadcasting of activated carbon around the weir of the CDF will be effective in reducing effluent concentrations of these compounds sufficiently to permit discharge. The use of activated carbon to reduce volatile emissions from ponded water in a CDF has been evaluated for another project involving contaminated sediments. Bench testing will be required to establish dosage and contact time requirements to meet treatment objectives for the IHNC effluent.

Runoff Dilution in the GIWW – Based on estimated runoff concentrations and available mixing in the GIWW, adequate dilution will be attainable within the mixing zone for all constituents, without treatment.

Preliminary Mixing Zone Analysis – Bayou Bienvenue

Flow in Bayou Bienvenue - Data regarding geometry and flow rate in Bayou Bienvenue was insufficient to permit modeling of a mixing zone, as was done for the GIWW. Bayou Bienvenue is sufficiently small in depth and width and the flow rate is sufficiently low that discharge from the CDF would fully envelop and mix with the entire flow of Bayou Bienvenue within a couple hundred feet of the discharge. As such, modeling is not needed and the dilution achieved is simply a ratio of the flow of Bayou Bienvenue and the CDF discharge. Flow rate within Bayou Bienvenue was estimated based on available information and appears to be quite limited, a function of tidal exchange, surface runoff, and stormwater pumping.

Stormwater pumping varies from 20 to 50 cfs on an annual basis with a characteristic average annual discharge rate to 33 cfs (National Marine Fisheries Service 1999). Pumping typically occurs no more than a few days per month and may average about 2 days per month. During these periods of pumping the flow rate may average 500 cfs with instantaneous rates of more than 1000 cfs.

The drainage area is about 2780 acres (National Marine Fisheries Service 1999). The mean annual rainfall is about 50 inches and the mean annual runoff would be about 30 inches. This would yield an average annual discharge rate of 10 cfs and would average about 120 cfs on days when runoff occurs, assuming about 30 runoff events per year.

The tidal flow is diurnal with an average tidal range of 1 ft (Appendix B, Page B-3, Section B.1.9, USACE 1997). Assuming a channel width of 130 ft and channel length of 20,000 ft, the average daily tidal exchange rate is 60 cfs.

The flow rate in Bayou Bienvenue would typically be about 70 cfs, but the flow rate would be much greater (perhaps 600 cfs) following large precipitation rates (10 to 20 days per year).

Effluent Dilution in Bayou Bienvenue - At a flow rate of 70 cfs, the dilution available for effluent discharged at a rate of 47 cfs into Bayou Bienvenue is 1.5 parts background flow to 1 part effluent (1.5:1). This dilution is inadequate to meet water quality criteria for the effluent pathway without treatment.

Runoff Dilution in Bayou Bienvenue - Runoff from the CDF would be discharged at a rate up to 1 inch per day from the interior area of the CDF. The interior areas of the disposal cells range from about 35 to 120 acres. Therefore, the runoff discharge rate from the CDF ranges up to 1.5 to 5 cfs. During these days, the flow rate in Bayou Bienvenue would range from about 150 cfs to 500 cfs, depending on stormwater pumping. As such, the dilution available for runoff discharges into Bayou Bienvenue would range from 30:1 to 100:1 or greater, assuming the entire width and depth of the bayou are enveloped in the mixing zone. This is adequate to meet dilution requirements for runoff without treatment.

Bayou Bienvenue would be classified as a Category 4 water body (tidal channel with flow less than 100 cubic feet per second) in Louisiana State Environmental Regulatory Code Part IX, Subpart 1, Chapter 11, §1115C. For Category 4 water bodies, the zone of initial dilution is restricted to 1/10 of the average flow over one tidal cycle (effectively, 1/10 of the cross sectional area), and the mixing zone is permitted to encompass the entire cross sectional area and flow.

Leachate Pathway

The leachate pathway was examined using the screening protocols from the USACE Upland Testing Manual (USACE 2003). Conservative default partitioning coefficients and chemical specific constants were used along the worst-case inputs for bulk sediment concentrations (DMMUs 4 and 7) and operational and design conditions (largest CDF footprint). Since the leachate will have a salinity of 5 to 15 ppt and the leachate will be transported to either Bayou Bienvenue or the MRGO (both estuarine water bodies), the chronic marine water quality criteria were selected as the screening criteria. A number of constituents were predicted to have pore water concentrations that exceed the screening criteria. However, none of the constituents was predicted to pass through the foundation soil to any laterally transmissive layer at concentrations above the screening criteria in 10,000 years.

Volatilization Pathway

The volatilization pathway was examined using the screening protocols from the USACE Upland Testing Manual (USACE 2003). Conservative default partitioning coefficients and chemical specific constants were used along the worst-case inputs for bulk sediment concentrations (DMMUs 4 and 7) and operational and design conditions (largest CDF footprint). Ammonia is the only constituent that is predicted to produce significant volatile emissions, but the ammonia emissions do not pose a health risk.

3.8 Consideration of All Applicable Federal, State and Local Regulations

3.8.1 Approach

Two issues were considered here, requirements for dredged material disposal and requirements for CDF construction. Dredged material disposal is regulated under Section 404 of the Clean Water Act. States may elect to regulate dredged material as solid waste if contaminants are present above certain thresholds or if biological effects based testing indicates that significant disposal site management would be required to avoid adverse ecological impacts. However, dredged material disposal activities regulated under a CWA permit are normally considered to be exempted from the Subtitle C (hazardous waste) provisions of RCRA as long as there is a return flow.

ERDC researchers and MVN personnel were contacted to ascertain where information might be obtained with respect to environmental windows, which could potentially limit dredging and open water placement of dredged material, and noise control, which could potentially limit dredging, CDF construction, maintenance and material excavation activities. Environmental requirements pertaining to land development activities were researched on the LA DEQ website.

3.8.2 Findings

Historically, dredged material disposal in the New Orleans District has been regulated under Section 404 of the Clean Water Act. The environmental evaluations stipulated for upland disposal in US Army Corps of Engineers guidance (US Army Corps of Engineers 2003) are designed to satisfy the requirements of 404, and these have been the basis for the characterization and testing done for the lock replacement project. The UTM outlines a tiered approach to dredged material evaluation that considers the potential impacts associated with contaminants present in the dredged material. This approach can loosely be summarized as:

- Tier I Reason to Believe.
- Tier II Screening Level Evaluations.
- Tier III Effects Based Testing.
- Tier IV Risk Assessment.

The sediment characterization and the partitioning analysis conducted as part of this effort are considered Tier II screens. The toxicity testing, elutriate tests, and other physical testing conducted on sediments from the IHNC are Tier III screens. Tier IV, formal risk assessment, is generally employed only when a definitive determination regarding the effects of disposal cannot be made with Tier I through Tier III evaluations.

Some results from the completed testing have been used to facilitate decision-making for the conceptual CDF design and disposal plan. These evaluations take into account the requirements of Section 404, but will not be discussed in detail in this report. A separate report (Weston in preparation 2008) will provide a comprehensive summary of all testing done in conjunction with the 404 analysis.

The following was extracted from a paper prepared by Palermo and Wilson (2000), regarding the RCRA Subtitle C exclusion for dredged material.

> *“The applicability of RCRA requirements to dredged material disposal activities (especially upland CDFs) has previously been a confusing issue for both the Corps and EPA. EPA has recently issued the Hazardous Waste Identification Rule*[1] *which reduces the confusion to a large degree and eliminates the potential for dual regulation of highly contaminated dredged material as hazardous waste. Under the new rule, dredged material disposal activities regulated under an MPRSA or CWA permit are exempted from the Subtitle C (hazardous waste) provisions of RCRA. This approach is intended to avoid duplication with other Federal Statutes as provided for under RCRA Section 1006, and recognizes that management of highly contaminated dredged material according to Corps/EPA guidelines meets or exceeds the hazardous waste disposal criteria. Open water placements regulated under MPRSA or the CWA are clearly covered by this exemption. A key technical point related to this exemption is the "trigger" for CWA regulation at CDFs. Under the CWA, the runoff or return flow from a contained land or water disposal area (CDF) to waters of the U.S. is specifically identified as a dredged material discharge. If such a discharge occurs from a site, the activity is regulated under the CWA, and evaluation of potential impacts to groundwater, air, and other pathways can be addressed as a part of the CWA administrative process. But, if there is no return flow to waters of the U.S., the activity may be subject to RCRA Subtitle C regulation. This "trigger" differentiates placement in a CDF intended as a contained disposal area from sites essentially established as landfills. For example, most CDF disposal operations are performed by pipeline dredges resulting in vast volumes of water that must be managed. Thus, placement of materials dredged from waterways directly into contained sites would almost always have a requirement for return flow to waters of the U.S. This would include placement of materials directly from the water body into*

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[1] The proposed rule was issued on April 29, 1996, Volume 61, Number 83, pages 18779-18864. The final rule was issued on November 30, 1998, Volume 63, Number 229, pages 65874-65947, with an effective date of June 1, 1999.

> *temporary rehandling sites prior to additional treatment or management."*

There appears to be no clearinghouse on environmental windows, largely because each District handles them differently (Personal communication Doug Clarke, ERDC, January 25, 2008). According to MVN, it should be safe to assume no dredging windows for the IHNC Lock project. The only species that could remotely cause an issue (both with respect to dredging and with respect to beneficial use placement at the mitigation site) is gulf sturgeon. That is considered highly unlikely (Personal communication Richard Boe, MVN January 29, 2008). There are no dredging windows for the IHNC because it is not part of the critical habitat in Louisiana for Gulf sturgeon (Personal communication Elizabeth Behrens, MVN January 25, 2008). Further, when the recent maintenance dredging was done in the IHNC below the lock, there appeared to be no agency concern regarding Gulf sturgeon because they are rarely found that far up in the channel.

Operational constraints cited in the Letter Report (USACE 2007a) specified that pile driving and heavy truck hauling would be limited to 10 hours of daylight each day. It is expected that general construction activities and dredging will be allowed to take place around-the-clock, however, and this was assumed for the purposes of this report. Having been addressed in the Letter Report (USACE 2007a), further investigation of potential operational constraints was not recommended by MVN.

The following guidance for general contractors engaged in "small and large construction activities, demolition and land clearing" was found on LDEQ's web site (*http://www.deq.louisiana.gov/portal/tabid/1811/Default.aspx*) and appears to be generally applicable to expected construction, maintenance and reclamation activities at the site:

> *"Air quality regulations require the control of fugitive emissions including dust kicked up by trucks and other equipment, and from equipment such as generators or compressors. Demolition of asbestos-containing equipment or structures must follow the asbestos regulations. Water quality regulations require the operator to obtain a storm water permit for small and large construction activities. Open burning of construction debris is forbidden. Construction debris should be disposed of at an approved landfill."*

The following information relevant to CDF construction was also found on the LDEQ website (*http://nonpoint.deq.louisiana.gov/wqa/default.htm*). The site defines nonpoint source pollution as "a type of water pollution that is not generated from a discrete conveyance, such as a discharge pipe, but is generated during rainfall events" and identifies major construction activities such as development of industrial areas, as a nonpoint source. The major pollutant associated with these activities is sediment (SS in runoff), but other pollutants such as fuel, oil, pesticides and other compounds associated with construction may also be of concern and require management. The State of Louisiana requires owners of construction activities which disturb more than one acre to develop and implement construction site erosion control and storm water management plans (*http://www.stormwaterauthority.org/regulatory_data/state.aspx?id=139*). Silt fences are typically employed to control loss of suspended solids in runoff from construction sites. With proper management, other contaminants are not expected to be problematic during site construction, but may be designated in the storm water permit at the State's discretion.

Under the 2007 Endangered Species Listing – Fish and Wildlife Service MOU also provides for Fish and Wildlife review of Louisiana Pollution Discharge Elimination System (LPDES) permits. (The LPDES administers National Pollution Discharge Elimination System (NPDES) permits to construction sites larger than one acre, many industrial sites, and all designated Municipal Separate Storm Sewer Systems. Numerical stormwater treatment requirements reportedly are "not in place at the state level, but Louisiana requires that stormwater be treated to the maximum extent practicable." (*http://www.stormwaterauthority.org/regulatory_data/state.aspx?id=139*)

Additional local permits may be required for construction of the CDF. Local permit requirements will be evaluated by MVN prior to construction of the CDF.

3.9 Development of Preliminary Cost Estimates

3.9.1 Approach

Planning level cost estimates were developed for construction and operation of the CDF, based on alternatives developed for each construction alternative under consideration (cast-in-place versus float-in-place, as further described in USACE 2007a). These estimates include costs for site preparation, CDF construction, effluent and runoff management, dewatering and vegetation control. Recovery of material for construction fill was not part of this evaluation.

Material volumes required for dike construction were estimated based on the preliminary profile developed by MVN and a simplified rectangular geometry of the required storage area calculated with SETTLE. Pumping rate and annual number of pumping days were also calculated based on dredging duration estimated using SETTLE. An operating plan was developed for the CDF, outlining assumed frequency and extent of dewatering operations and vegetation control.

3.9.2 Findings

A detailed description of the cost estimating assumptions is included as Appendix C of this report. Supporting calculations were included in the electronic documentation accompanying this report. Costs were estimated for only three of the four construction/disposal alternative combinations:

- CIP Alternatives 1 and 2.
- FIP Alternative 1.

Costs were not estimated for FIP Alternative 2 because there are significant differences between average storage area requirements and ponding requirements in this case. The implications of this were that to provide adequate ponding area for clarification while maintaining a dike height consistent with the other alternatives and the hurricane protection rationale, the facility would be significantly overbuilt for the storage capacity required. However, if it should be determined that the risk of flooding and overtopping of the facility were negligible and/or that a lower dike would provide adequate protection from overtopping, significant cost savings are potentially achievable with FIP Alternative 2.

The alternatives array is summarized in Appendix C Table 1. The MII Reports and Pivot Table Summary are also attached in Appendix C and included in the electronic documentation accompanying this report. CIP Alternative 2 was the lowest cost alternative, for both 20 percent and 60 percent contingencies (Table 16), followed by FIP Alternative 1 and CIP Alternative 1, respectively. Costs were reflected as a range to reflect the uncertainties of the design assumptions. Factors contributing to the uncertainty of the costs estimates were:

- Uncertainty regarding how much on-site material will be suitable for dike construction.
- Dike layout has not been finalized and site sampling to characterize foundation materials has not been completed.
- Dike length and profile that will be required is preliminary and subject to further modification.
- Regional availability of materials for dike construction is uncertain given the present high demand for borrow material for flood control levees in New Orleans.

As further information becomes available and engineering design analyses are completed, the estimates can be refined and the contingencies will be reduced.

3.10 Evaluation of Beneficial Use Potential

3.10.1 Approach

Information regarding bottom surface elevations and water depths in the area south of the MRGO disposal site was obtained from Hartman Engineering Inc. (2001), a study conducted to evaluate the feasibility of constructing terraces and vegetative plantings in this area. The maximum open water area potentially restorable was estimated based on average water depths and volume of available dredged material potentially suitable for beneficial use placement in a marine environment.

3.10.2 Findings

The following procedure was taken from Hartman Engineering Inc. (2001). The open water south and east of the MRGO disposal site was divided into four areas (A, B, C, and D). The proposed mitigation site for the IHNC lock construction project is located in Area A, which reportedly has a bottom elevation of +1/2 to – 1-1/2 ft (NAVD88). Based on sediment core samples taken from Area B, potential consolidation of sediments on which terraces were to be constructed was estimated to be approximately two to two and one-half feet. Maximum average monthly water elevation in Area B was estimated based on readings obtained over the period 1975 to 1992 from US Army Corps of Engineers gauge 76020 Bayou Bienvenue, located at the Paris Road Bridge. Wave heights were calculated using the following relationship, taken from the Federal Emergency Management Agency (FEMA) Coastal Construction Manual (Hartman Engineering Inc. (2001):

$$d/h = 1.28$$

where

d = depth of water (ft).
h = maximum wave height (ft).

In Hartman Engineering Inc. (2001), the elevation of a terrace required to sustain cordgrass (inundation not exceeding 1 inch to 1 ft, 4 to 6 days at a time) was calculated for Area B by adding ½ the projected wave height to the average maximum water depth. A maximum average water elevation of +1.64 ft (NGVD 29) was estimated based on the Paris Road gauge readings (These readings did not capture tidal variations because they were taken at 0800 every day and therefore may not reflect actual maximum water levels. Also, there is a difference between reference elevations NAVD88 and NGVD 29 of approximately 0.2 ft. Because the difference is small, the authors made no adjustment to bottom surface elevations (reported relative to NAVD88) or water surface elevations (reported relative to NAVD88). Bottom surface elevation in Area B was estimated to be approximately -2.5 ft, giving a wave height of 3.23 ft. Adding one half of the wave height to the maximum water elevation yields a required terrace elevation of +3.75 ft.

Assuming the same water elevation, the procedure was applied to estimate depth of fill required to restore surface elevations in Area A to a comparable level. Wave height was calculated as a function of bottom surface elevation as follows:

$$h = \frac{W - x}{1.28}$$

where

W = water surface elevation = 1.64 (ft).
h = wave height (ft).
x = bottom surface elevation (ft).

Target fill depth was then estimated by adding ½ the wave height to the assumed water surface elevation to obtain the target surface elevation (as was done for Area B), then subtracting the bottom surface elevation and adding 2 ft to allow for consolidation:

$$d_{fill} = 1.64 + 0.5\left(\frac{W - x}{1.28}\right) - x + 2 = 4.28 - 1.39x$$

Assuming the volume of the material after initial consolidation and desiccation has taken place (V_{fill}) is approximately 1.5 times that of the in-situ sediment ($V_{in\text{-}situ}$), the area that could be restored was estimated as follows:

$$A = \frac{V_{fill}}{d_{fill}} = \frac{1.5\,V_{in-situ}}{4.28 - 1.39x}$$

Available volume of suitable dredged material was estimated for each construction alternative by deducting the construction fill volume required from the total dredging volume, along with the volume of material unsuitable for placement in the marine environment (see Table 1 dredging plan summary). Values obtained were:

- FIP 773,863 cubic yards or 479.7 acre-ft.
- CIP 1,499,472 cubic yards or 929.4 acre-ft.

Varying the bottom elevation (x) from -1.5 ft to +0.5 ft produces the following range of recoverable areas, also illustrated in Figure 35:

- FIP 113 acres to 201 acres or 145 acres for an average bottom elevation of -0.5 ft and average fill depth of approximately 5.0 ft.
- CIP 219 acres to 389 acres or 280 acres for an average bottom elevation of -0.5 ft and average fill depth of approximately 5.0 ft.

For hydraulic placement of dredged material in the wetland area, ponded area required for clarification must be taken into consideration, just as it was for upland placement. Depending upon effluent suspended solids restrictions, provision also must be made for adequate ponding depth and freeboard. In order to minimize the height of any structures utilized to provide containment, material will need to be placed in multiple lifts. The bulk of the dredging is scheduled for the first year of the project however. This requirement may effectively limit the area that can be restored if the material is to be placed directly from the dredge. If the material is to be placed mechanically after dewatering, this could be done over a period of time and the maximum area restored.

Structures that might be used to contain the material in the water are sand filled geotubes, cabled and anchored hay bales, sheet piles, a cable reinforced silt fence wall, or a rubble mound; however, the allowable depth of fill behind some of these structures is less than the desired depth of fill. Other options may also be available. Containment should not be needed for mechanical placement as dispersion of the material is not a concern, although erosion protection may be required. Dewatered material could be placed using long-arm excavators working from mats or a barge, progressing from the shallow to the deep end of the placement area. The geometry of the placement site should be optimized based on considerations of containment requirements, depth, hydraulic efficiency, environmental factors and cost.

4 Conclusions

4.1 Dredging and Disposal Volumes

Estimated dredging volumes were established based on construction schedules outlined in the letter report and results of recent sediment sampling and characterization efforts. Total in-situ dredging volume estimated for each alternative was:

- CIP 3,396,700 in-situ cy.
- FIP 2,177,450 in-situ cy.

Suitability of dredged material for open water disposal, wetland mitigation and construction fill was evaluated based on benthic toxicity. (Geotechnical requirements of materials for construction fill and wetlands restoration was not evaluated.) Estimated volumes of material suitable for open water disposal were:

- FIP 1,397,550 cy.
- CIP 2,306,378 cy.

Estimated volumes of material suitable for wetland mitigation were:

- FIP 773,863 cubic yards (or 479.7 acre-ft).
- CIP 1,499,472 cubic yards (or 929.4 acre-ft).

Hydraulic placement of fill during dredging, as specified in the Letter Report (USACE 2007a) for a portion of the fill volume, was considered infeasible due to the large ponding area required for clarification. It was therefore assumed that all construction fill would be stockpiled in the CDF, dewatered, and excavated for later placement at the lock construction site. Estimated volumes of construction fill required and dredged material suitable (based on benthic toxicity) are:

- FIP 353,587 cy (USACE 2007a) plus a 50,000 cy allowance for clean cover materials (1,033,750 cy suitable).
- CIP 601,028 cy (USACE 2007a) plus a 50,000 cy allowance for clean cover materials (1,955,800 cy suitable).

4.2 Site Suitability

There is some uncertainty regarding the acreage available for construction of a CDF, both because information regarding site boundaries is conflicting, and because ownership is still being investigated. Based on coordinates provided by MVN, existing dike locations, and the perimeter defined by Bayou Bienvenue, approximately 264 acres appears to be available on the west side of the site and 188 acres on the east side. This is sufficient to meet area requirements area for all disposal alternatives but CIP Alternative 1.

Estimated total site area requirements are:

- CIP Alternative 1 506 acres (301 acres west parcel, 124 acres east parcel).
- CIP Alternative 2 266 acres (149 acres west parcel, 90 acres east parcel).
- FIP Alternative 1 372 acres (184 acres west parcel, 171 acres east parcel).
- FIP Alternative 2 >200 acres (this alternative was eliminated due to conflicting storage volume and ponding area requirements).

The only developed access to the site at present is the flood control levee. Other ingress and egress points may be possible, but will require clearing and road construction. Permission to utilize the levee for construction, maintenance and material recovery activities will be required.

The site itself is heavily overgrown and will require substantial preparation prior to construction. A determination regarding habitat value of the site and potential mitigation requirements had not been completed at of the time of this report.

Surrounding land uses include a salvage yard to the west and undeveloped land to the east. The GIWW borders on the north and open water to the south. Construction of a CDF on the site is not considered to be incompatible with existing land uses.

4.3 CDF Features, Operation and Management

CDF storage requirements were estimated using the SETTLE model, assuming a 24-inch hydraulic dredge, operating 20 hours per day, 7 days per week. The CDF was designed with two separate cells, one to contain fill material (fill cell) and the other to contain materials evidencing either freshwater or benthic toxicity (disposal cell). A minimum average ponded area of 100 acres will be required in all cells in order to achieve clarification of the dredge discharge. In all but one case (FIP 2), storage area requirements were greater than ponding area requirements. Estimated average storage area requirements are:

- CIP Alternative 1 1614 acre-ft disposal cell, 2567 acre-ft fill cell.
- CIP Alternative 2 512 acre-ft disposal cell, 1083 acre-ft fill cell.
- FIP Alternative 1 1318 acre-ft disposal cell, 1421 acre-ft fill cell.
- FIP Alternative 2 373 acre-ft disposal cell, 803 acre-ft fill cell.

An estimated discharge weir length of 54 ft will be required. Predicted effluent TSS ranges from 19 to 443 mg/l where ponding requirements were met. A mixing zone or site management to improve hydraulic efficiency is expected to be required to comply with applicable TSS/turbidity criteria when some areas are dredged. Native and freshwater materials demonstrated slow settling characteristics (Weston 2008 in preparation).

Vegetation control and active dewatering, through surface water management and perimeter and cross trenching, will be required to facilitate dewatering of dredged material so that it can be recovered as fill. Vegetation control will also be important to prevent short-circuiting in the disposal cells since available ponding area (required for clarification) is marginal in some cases.

Drainage ditches will be required between the flood control levee and the CDF dikes to prevent undesirable pooling of runoff in this area. Setback requirements from the levee, from the sewage main and from the water line of Bayou Bienvenue remain to be confirmed. Surface water management will be required during construction to prevent unacceptable releases of TSS and other contaminants to adjacent water bodies.

We assumed that an appropriate level of hurricane protection would be achieved if the dikes were constructed to the same level as the adjacent flood control levee (+15 ft). However, actual risk of flooding in this area may not be significant once new hurricane protection measures are in place, and lower dikes may provide sufficient protection. Resolution of this question will require further analysis.

4.4 Evaluation of Beneficial Use Potential

The maximum wetland area potentially restorable with available and suitable dredged material was estimated for the different lock construction alternatives to be:

- FIP 113 acres to 201 acres (145 acres assuming an average bottom elevation of -0.5 ft in the mitigation site and average fill depth of approximately 5.0 ft).
- CIP 219 acres to 389 acres (280 acres assuming an average bottom elevation of -0.5 ft in the mitigation site and average fill depth of approximately 5.0 ft.

4.5 Consideration of Potential Contaminant Impacts

Dissolved contaminant concentrations predicted in effluent and runoff exceed water quality criteria in some cases. Three constituents require dilution based on mean elutriate concentrations (geometric mean):

- Tributyltin.
- Dieldrin.
- Total PCBs.

Twenty-two constituents require dilution based on maximum elutriate concentrations. The same three constituents require dilutions greater than 100 for either Bayou Bienvenue or the GIWW as receiving water.

No exceedances of water quality criteria were predicted for mean estimated runoff concentrations. Seven constituents require dilution based on maximum estimated runoff concentrations, with a maximum dilution ratio of 17.6 in Bayou Bienvenue and 59.3 in the GIWW:

- Copper.
- Tributyltin.
- Cyanide.
- 4,4'-DDD.
- Endosulfan II.
- PCBs Aroclor 1260.
- Total PCBs.

Flow in Bayou Bienvenue is insufficient to achieve estimated dilution requirements for effluent, but may be sufficient for runoff if the entire cross section is utilized as a mixing zone and runoff is discharged gradually or during municipal stormwater pumping. Effluent will have to be pumped over the flood control levee to the GIWW for discharge. Estimated effluent dilution requirements can be met for most contaminants within an acceptable mixing zone in the GIWW. Effluent treatment is expected to be required, however, for constituents requiring a dilution ratio in excess of 120. Carbon broadcasting around the discharge weir is expected to be the most feasible method of reducing contaminant concentrations in effluent when the principal source areas are dredged.

Leachate and volatilization releases are not predicted to be unacceptable. The plant and animal uptake pathways are not considered to be relevant to the CDF due to the salinity of the material and planned vegetation control.

4.6 Regulations

It is anticipated that disposal of dredged material will be regulated under Section 404 of the Clean Water Act, as is customary. There appear to be no environmental windows that will limit either dredging or dredged material disposal activities for the proposed locations. Heavy truck hauling is expected to be constrained to 10 hours of daylight each day, as per requirements set for in the Letter Report (USACE 2007a). Stormwater management will be required under requirements set forth in the LPDES, to prevent unacceptable releases of TSS. Management to prevent release of other construction related contaminants such as fuel oil and fugitive dust may also be required. Local construction permits may also be needed but these requirements have not been determined at this time.

4.7 Cost Estimates

Cost estimates were prepared for CIP 1 and 2 and FIP 1. Costs for FIP 2 were not prepared due to the design conflicts encountered with that alternative. CIP 2 represents the least cost alternative evaluated, with combined construction, operating and maintenance cost ranging from $23,153,315 (20 percent contingency) to $30,871,086 (60 percent contingency). Next least cost alternative was FIP 1, $29,019,960 (20 percent contingency) to $38,693,279 (60 percent contingency) and CIP1, $33,616,307 (20 percent contingency) to $44,821,743 (60 percent contingency).

5 Recommendations

Available site area and access uncertainties must be resolved before the CDF design can be finalized. Further site characterization will be required in order to assess suitability of on-site materials for dike construction, to characterize foundation properties for the purposes of dike design, to establish limits of excavation, to evaluate constructability and to confirm assumptions of leachate attenuation estimates. Coordination of sampling and testing efforts for environmental and geotechnical data needs is recommended. Data requirements for the following engineering analysis need to be established and data collected to:

- Engineer the dikes.
- Determine setback requirements from flood control levee, Bayou Bienvenue and sewer force main.
- Evaluate armoring requirements to protect CDF dikes in the event of levee failure.
- Refine hurricane protection requirements, by quantifying the actual risk of flooding and overtopping of the CDF dikes.
- Quantify potential for material losses from the CDF, and evaluate potential environmental impacts based on available plant and animal uptake data.

Availability of regional borrow material, type and quantity of material, and cost to obtain and transport must be investigated further.

Reconsideration of FIP Alternative 2 is recommended following more quantitative evaluation of flood risk in the area of the CDF. If dike heights can be reduced without unacceptably compromising hurricane protection, cost savings may be achieved with this alternative.

Additional receiving water data for Bayou Bienvenue and the GIWW is needed to definitively evaluate attainable dilution of effluent and runoff. Average flow rates, channel characteristics and water quality data are needed. Bench testing is recommended to establish appropriate carbon dosages and contact time for effluent treatment.

Bottom surface elevation, sediment/foundation characterization, water quality, water surface elevation and tidal variation of the proposed mitigation area is needed in order to refine estimates of restorable wetland area using dredged material as fill.

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Figure 1. Location map.

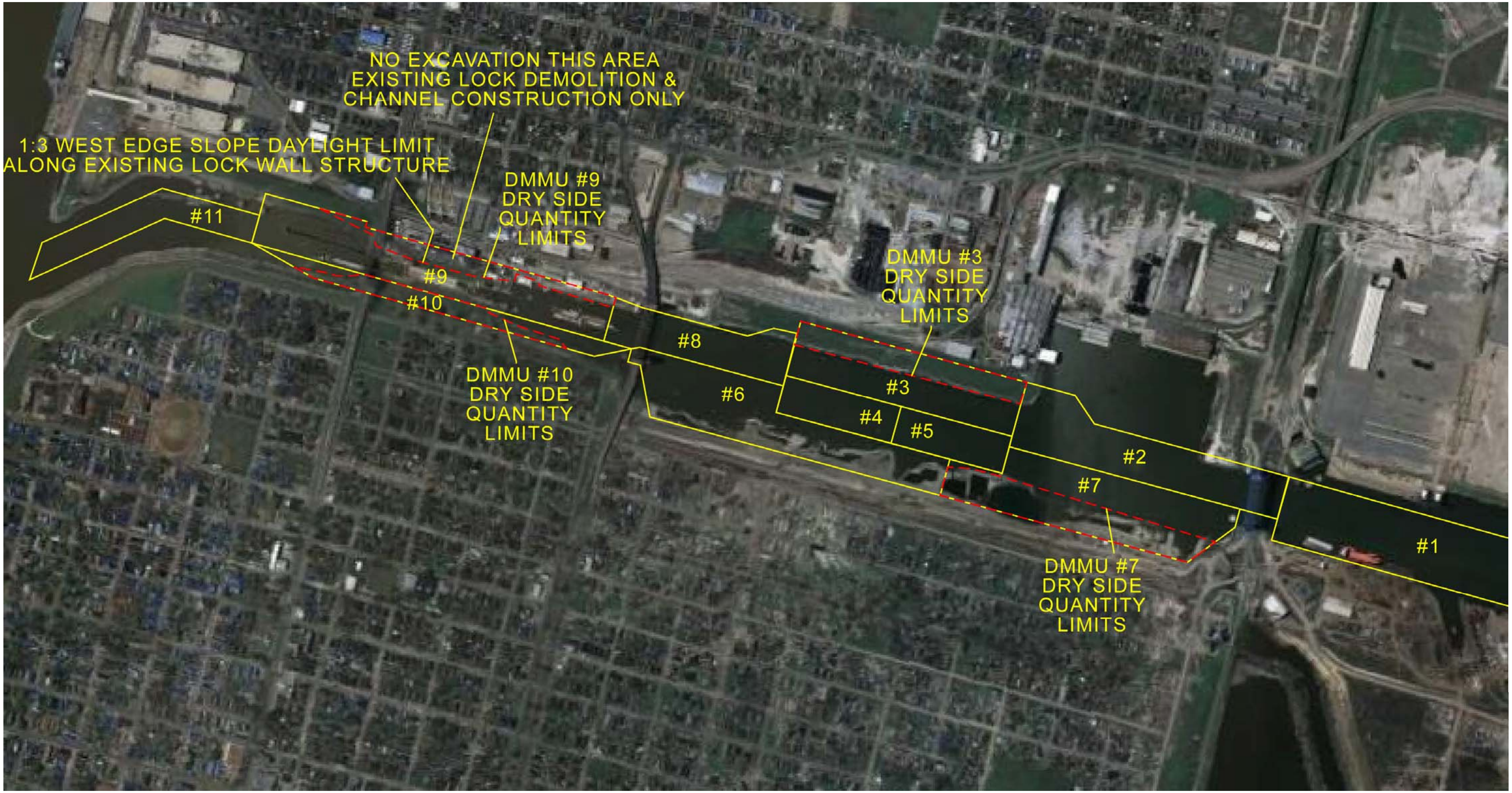

Figure 2. DMMU locations and divisions assumed for dredged material volume estimating purposes.

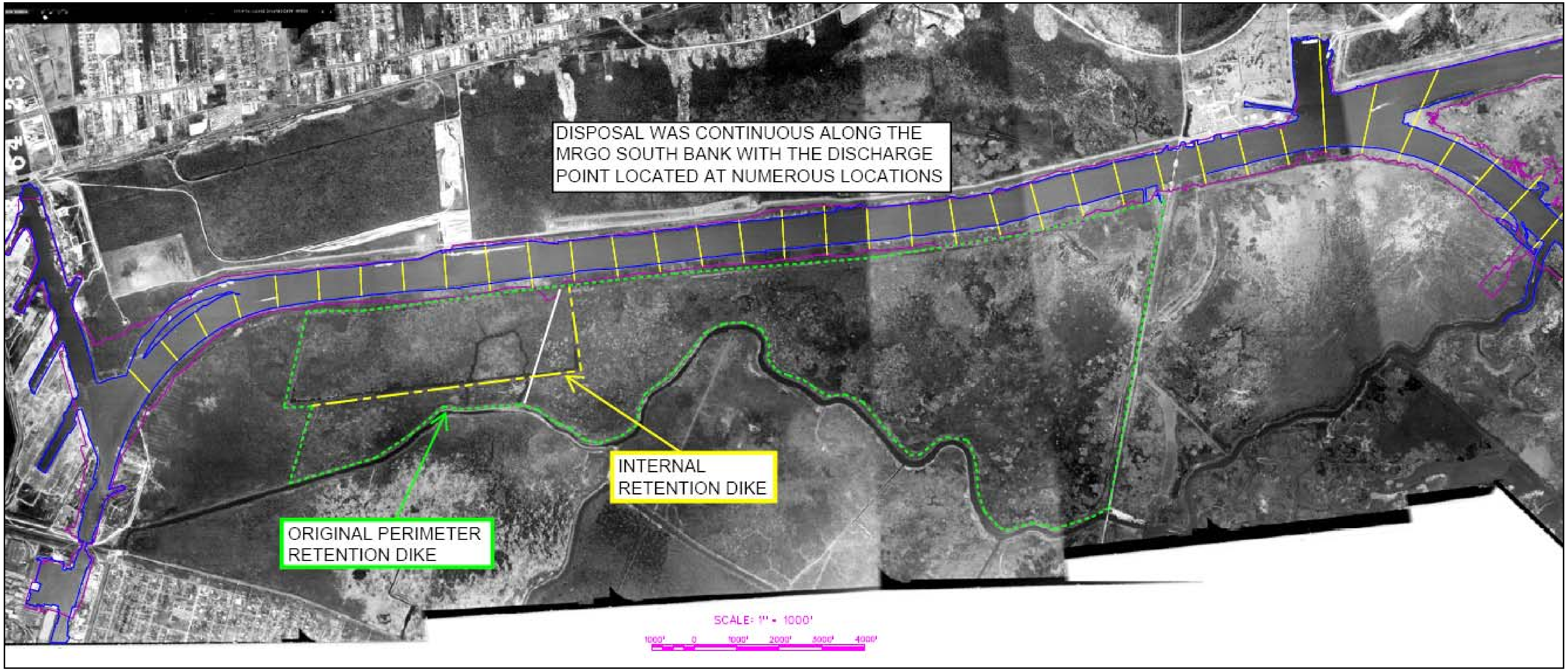

Figure 3. Existing perimeter of the MRGO disposal area.

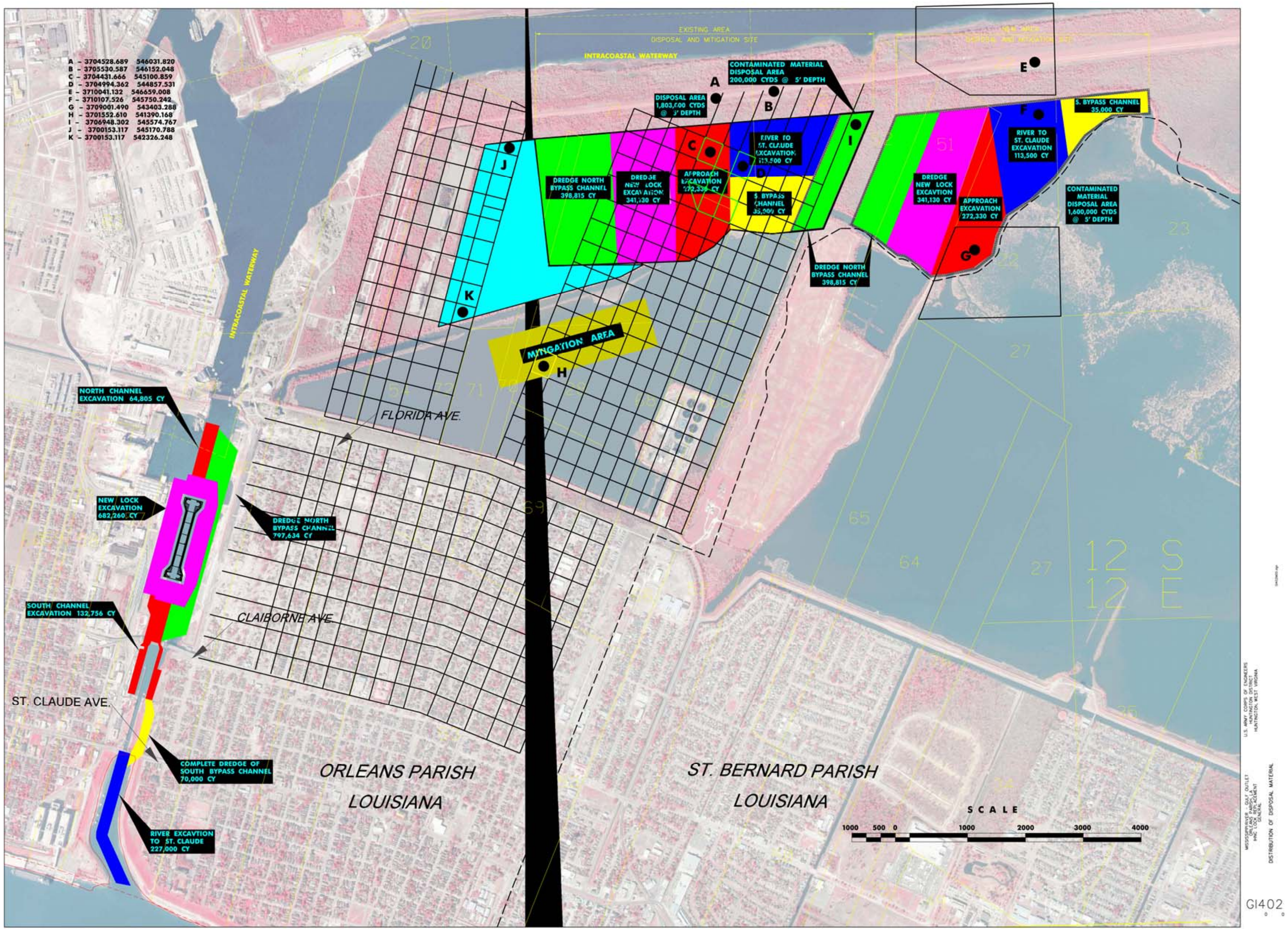

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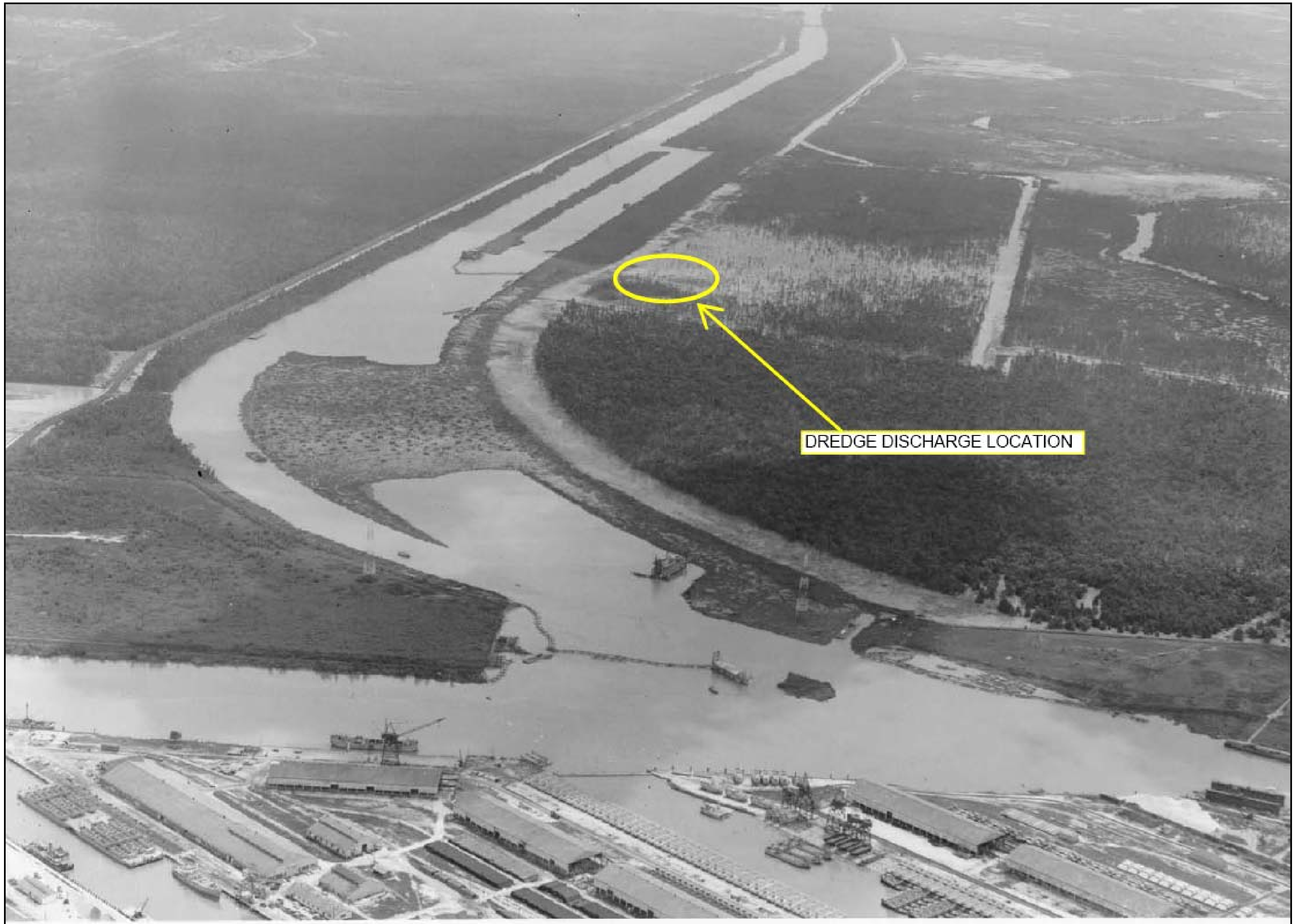
EXHIBIT FIP-36

Figure 4. Street plat for MRGO disposal area and vicinity.

Figure 5. Satellite view of MRGO disposal site (Google Earth).



DREDGE DISCHARGE LOCATION

9 JULY 1958

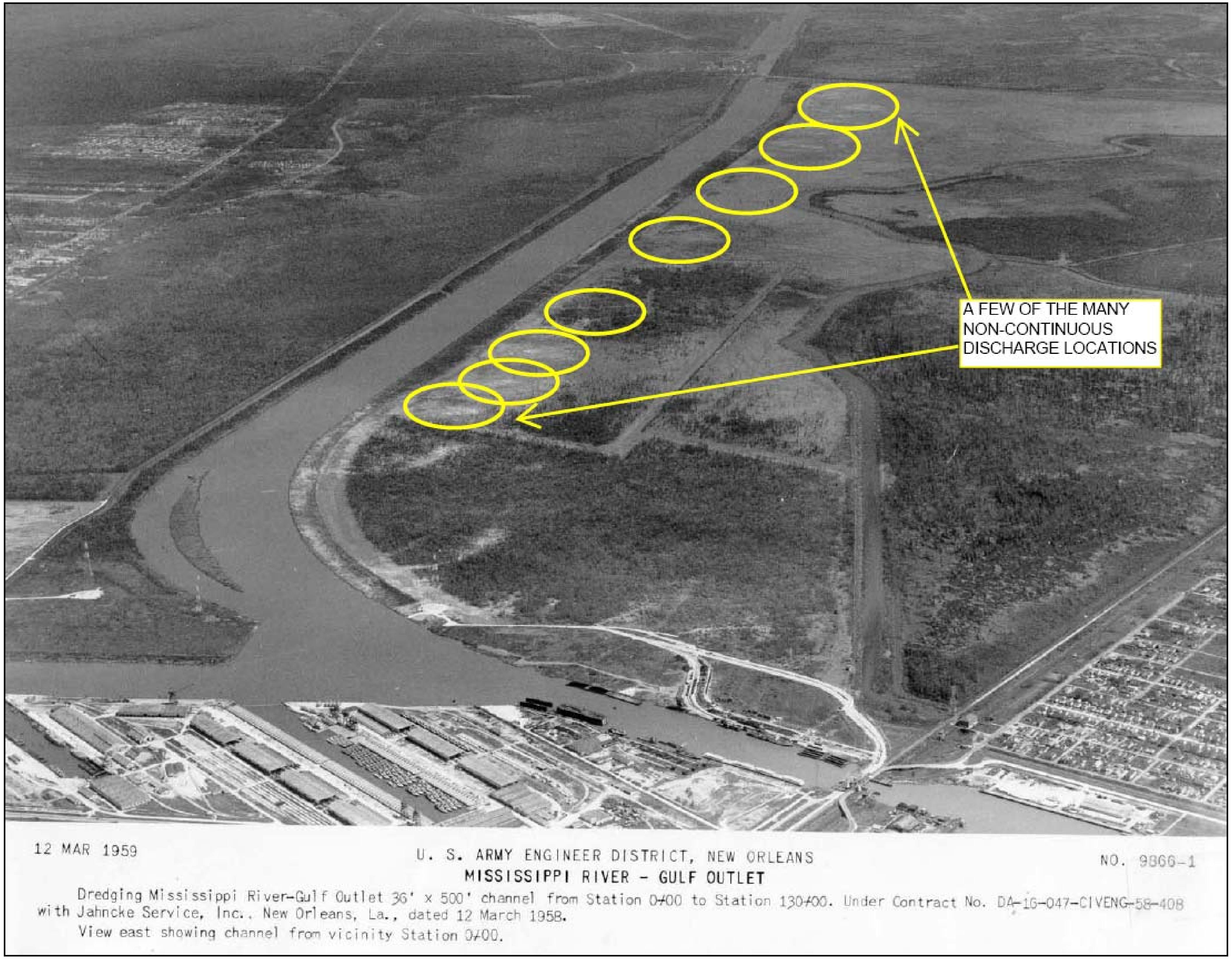
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS

NO. 9773-1

MISSISSIPPI RIVER - GULF OUTLET

Dredging Mississippi River-Gulf Outlet 36' x 500' channel from Station 0+00 to Station 130+00. Under contract No. DA-16-047-CIVENG-58-408 with Jahncke Service, Inc., New Orleans, La., dated 12 March 1958.

Figure 6. Historical photo – discharge to the MRGO disposal site during dredging of the Mississippi River Gulf Outlet 1958.



A FEW OF THE MANY NON-CONTINUOUS DISCHARGE LOCATIONS

12 MAR 1959

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS

NO. 9866-1

MISSISSIPPI RIVER - GULF OUTLET

Dredging Mississippi River-Gulf Outlet 36' x 500' channel from Station 0+00 to Station 130+00. Under Contract No. DA-16-047-CIVENG-58-408 with Jahncke Service, Inc., New Orleans, La., dated 12 March 1958.

View east showing channel from vicinity Station 0+00.

Figure 7. Historical photo - discharge locations to the MRGO disposal area during dredging of the MRGO 1959.

Figure 8. Historical photo – MRGO disposal area 1960.

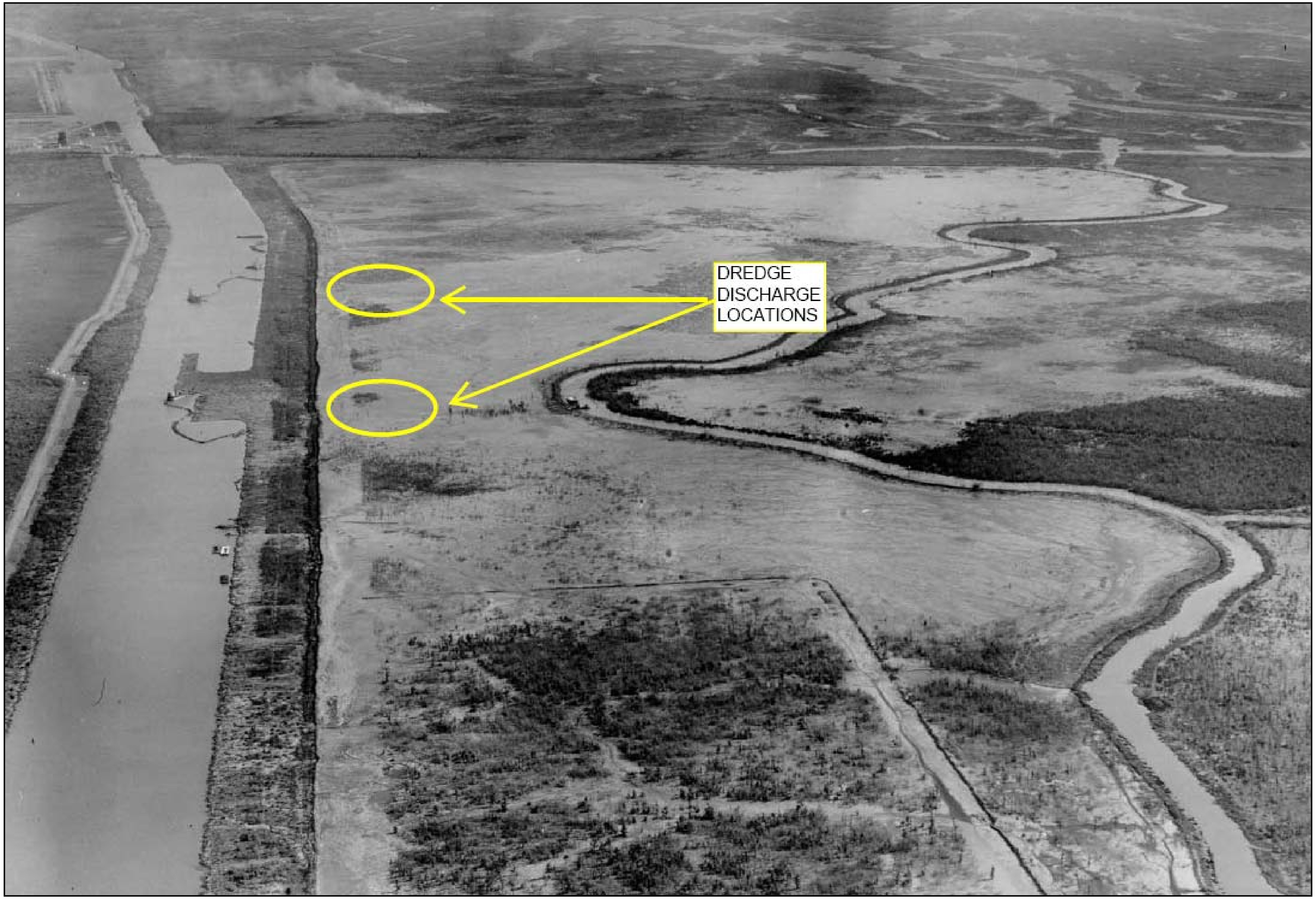


Figure 9. Historical photo – Disposal to the MRGO disposal area during dredging of the MRGO 1959.

Figure 10. Historical photo – southern boundary of the MRGO disposal site and Bayou Bienvenue 1959.

Figure 11. Existing dike structure MRGO disposal site January 2008.

Figure 12. MRGO Site overgrowth and ditch paralleling dike.

Figure 13. Flood control levee north of MRGO disposal area, presently under reconstruction. MRGO disposal area lies to the right of the photo with the north boundary running parallel to the levee.

Figure 14. Existing flood control levee access to MRGO disposal site, looking west. Northwest corner of disposal site lies to the left, out of view of the camera. Florida Avenue Bridge in the distance.

Figure 15. Part of salvage operation west of MRGO disposal site. Florida Avenue Bridge in the background.

Figure 16. Part of salvage yard operation west of MRGO disposal site.

Figure 17. Truck crossing levee in vicinity of salvage yard operation.

Figure 18. Looking south toward soft materials mound, part of salvage operation west of MRGO disposal site.

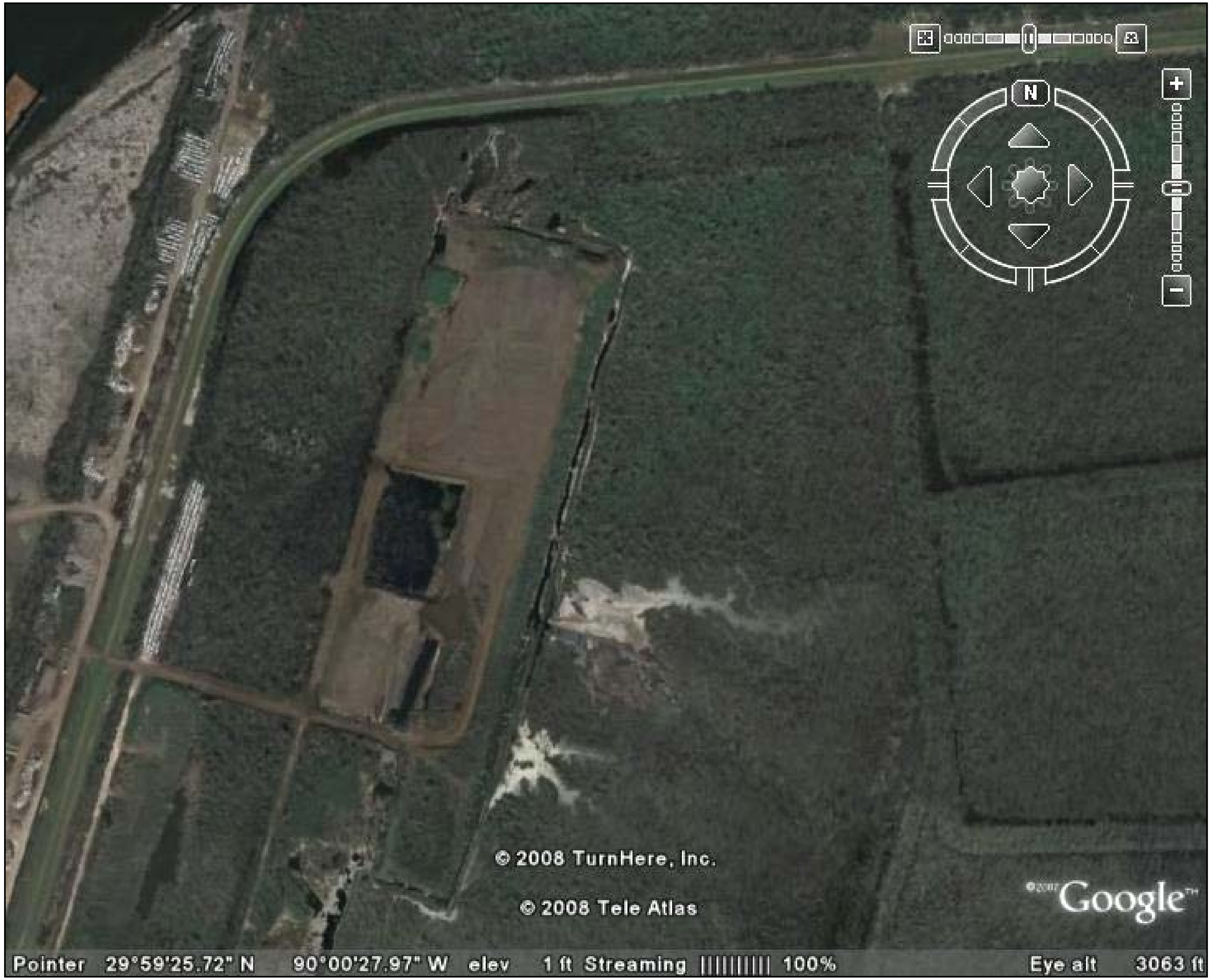


Figure 19. Satellite view of soft materials pile from salvage operation, west boundaries of MRGO disposal site visible to right.

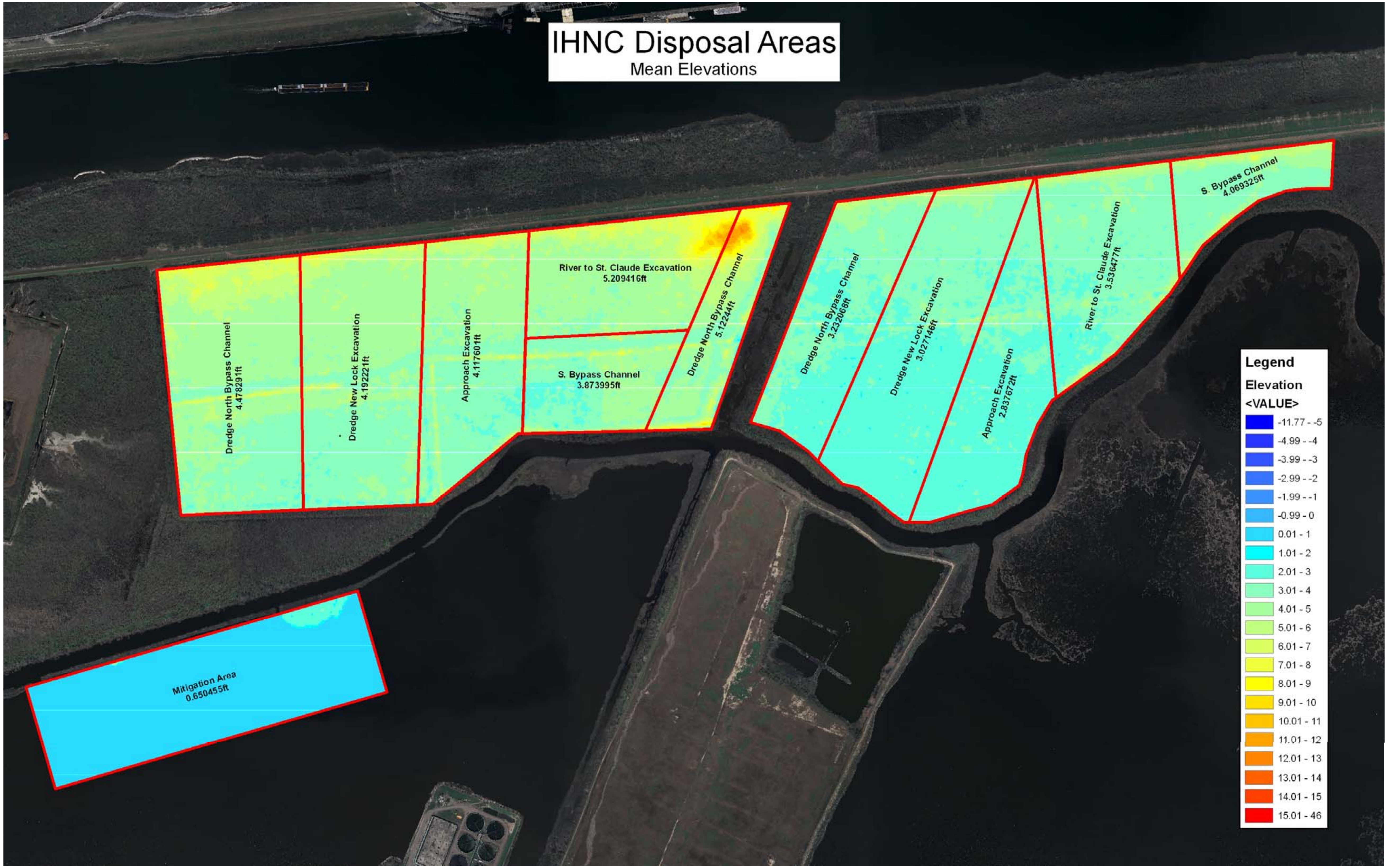


Figure 20. LIDAR data for MRGO disposal.

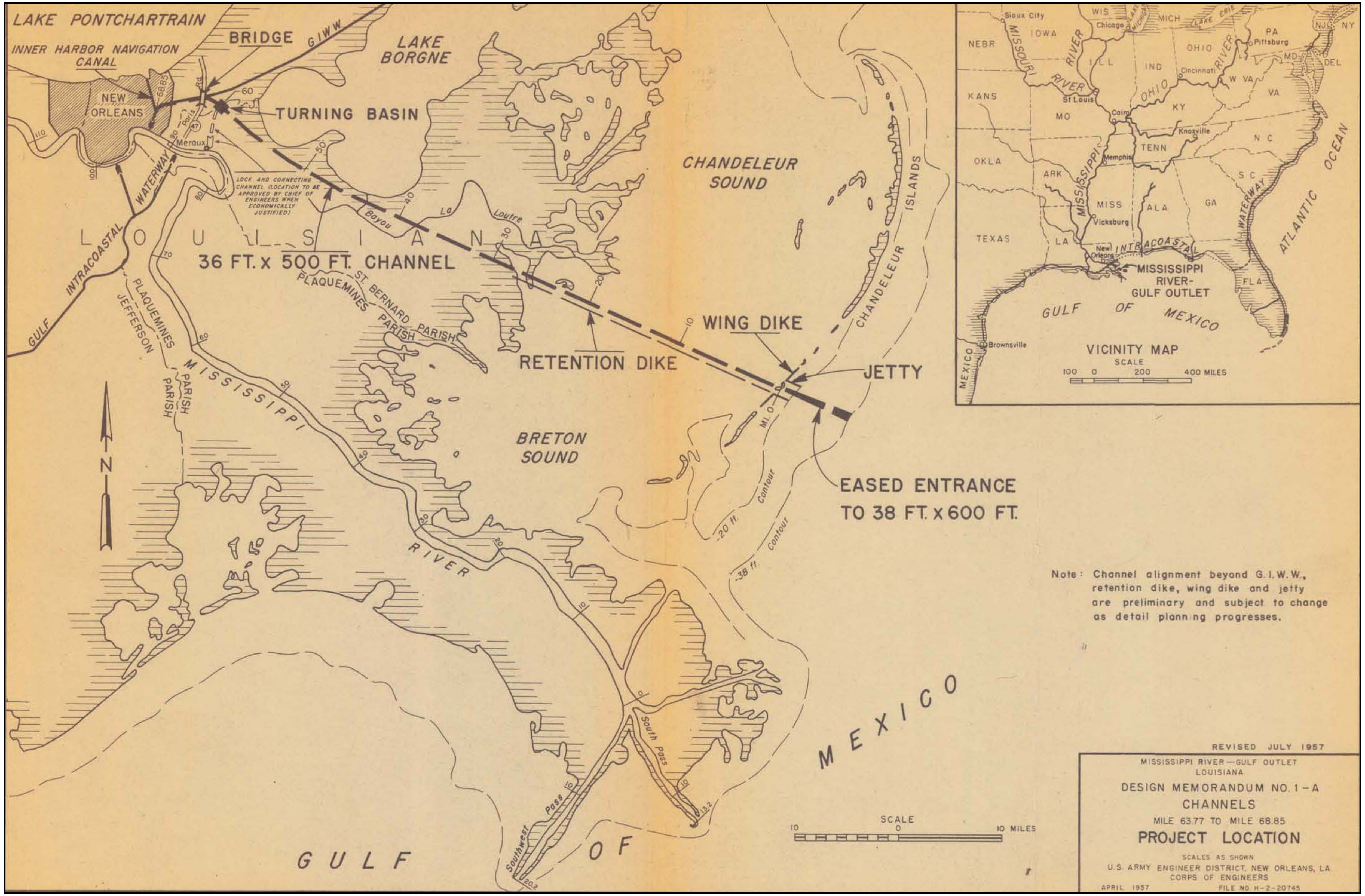


Figure 21. Historical location map for soil borings along MRGO channel transect.

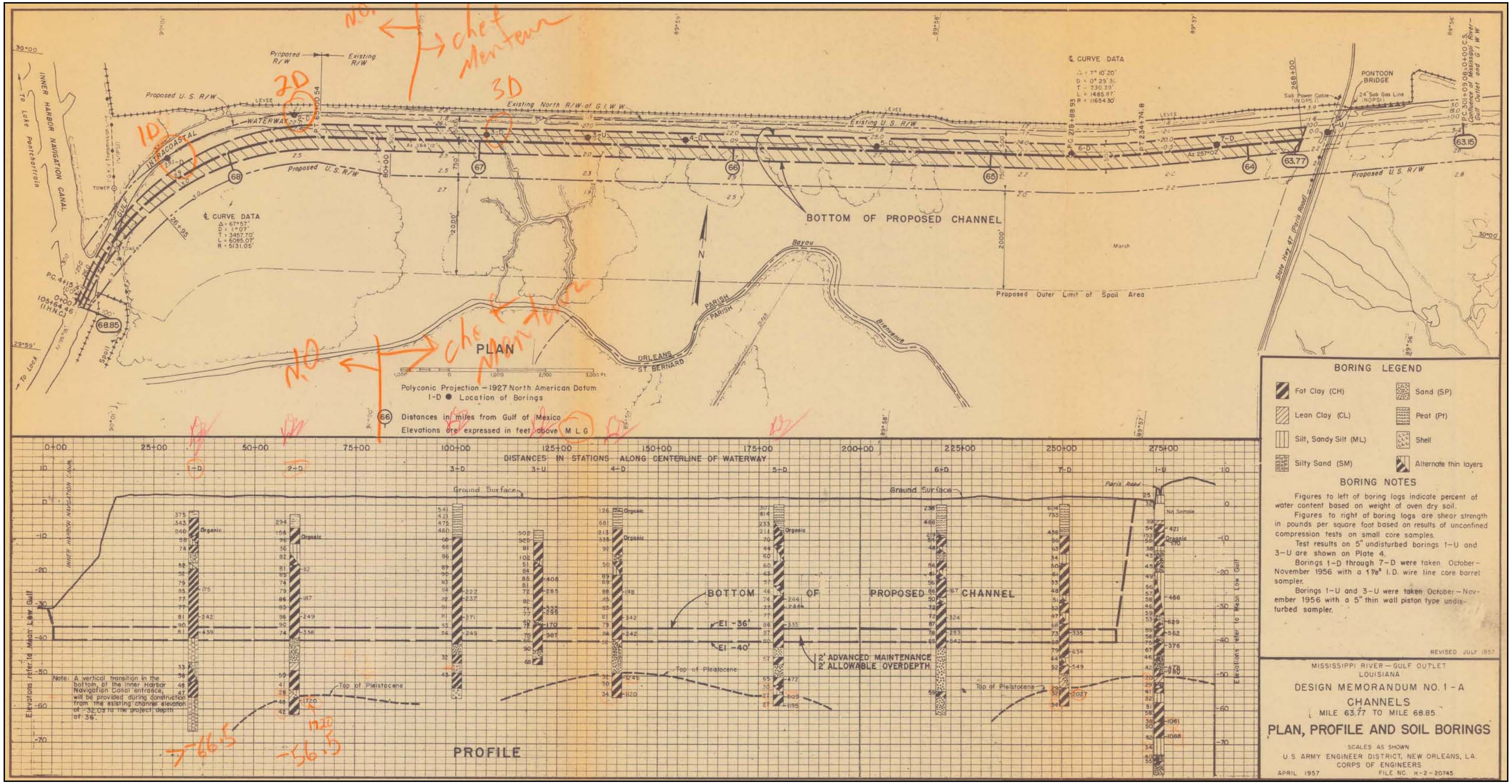


Figure 22. Historical soil borings along MRGO channel transect.

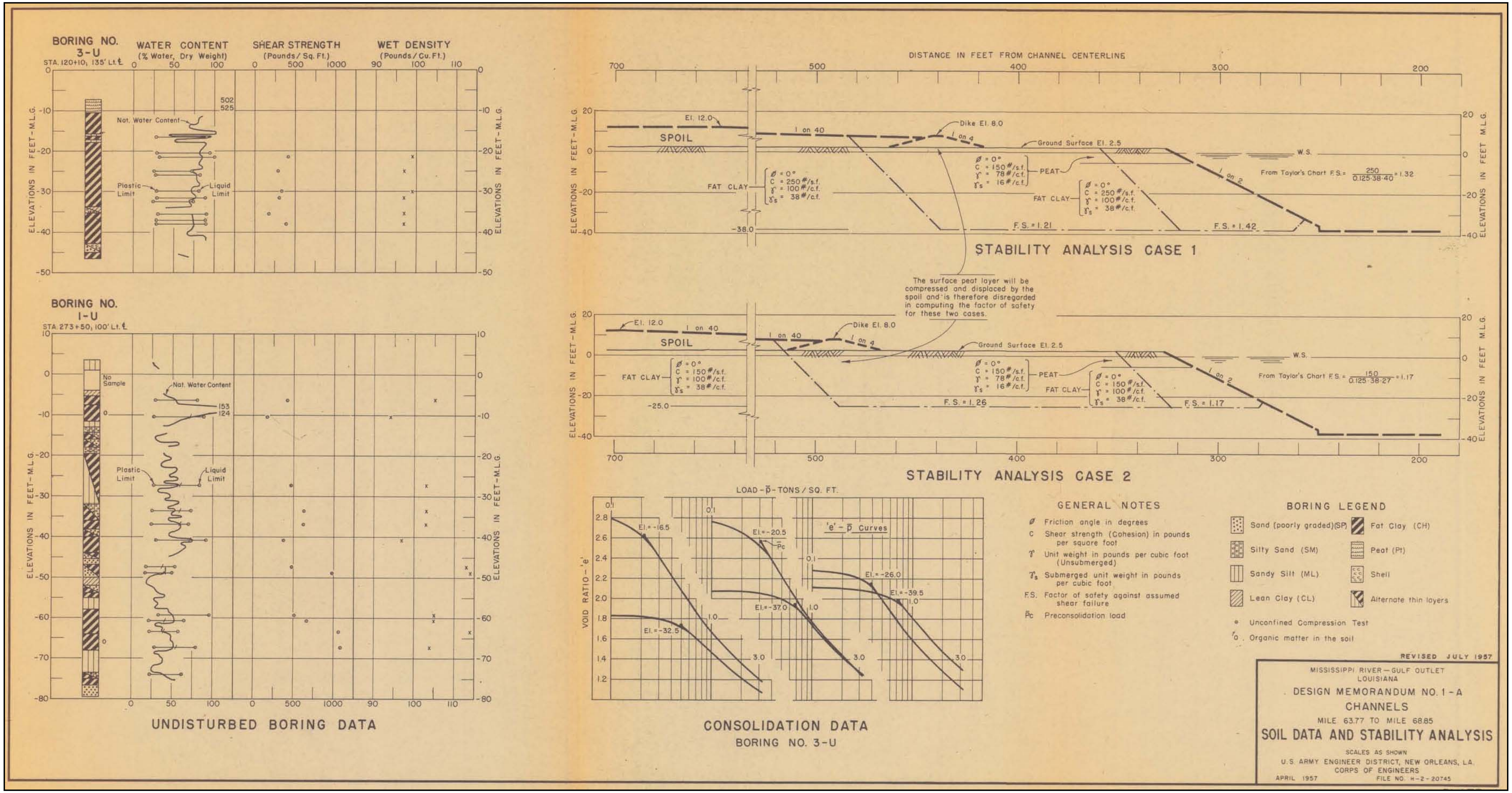


Figure 23. Historical soil data and stability analysis from MRGO channel transect soil investigation.

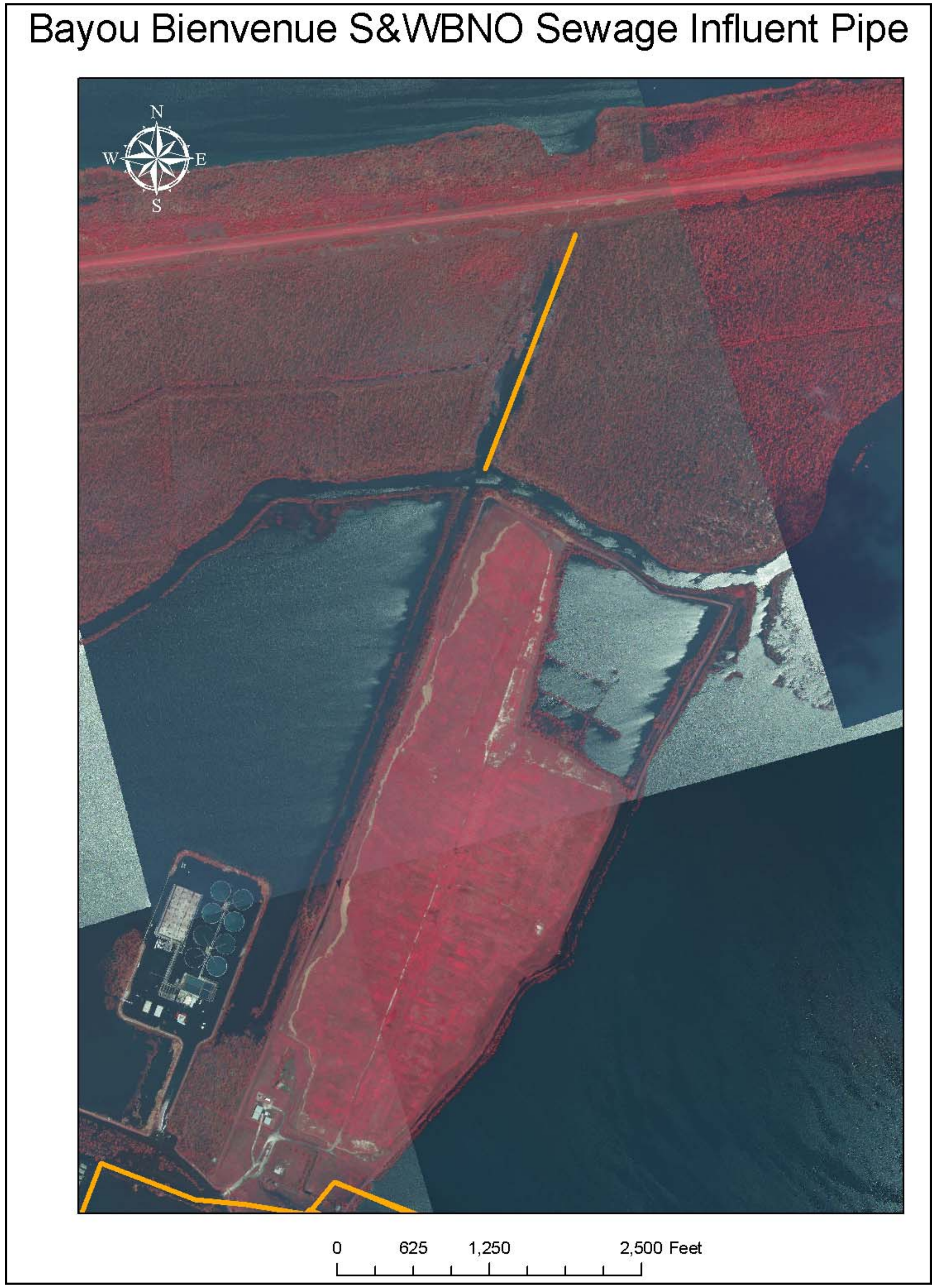
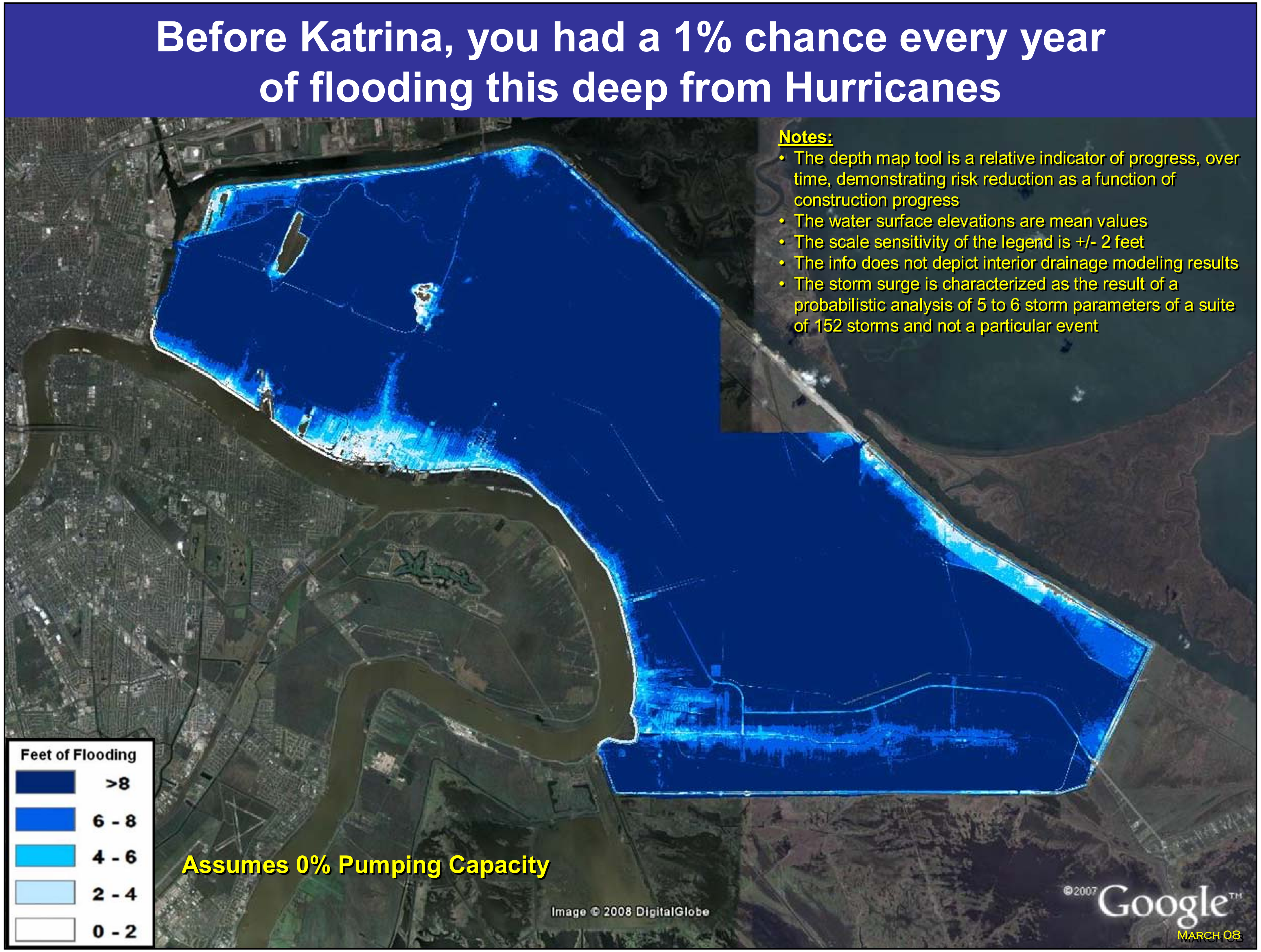


Figure 24. 54 in sewer force main easement (in yellow, bisecting MRGO disposal site cell locations).

Figure 25. Pipeline Protection Structures.

Figure 26. Box weir structure.



Before Katrina, you had a 1% chance every year of flooding this deep from Hurricanes

Notes:

- The depth map tool is a relative indicator of progress, over time, demonstrating risk reduction as a function of construction progress
- The water surface elevations are mean values
- The scale sensitivity of the legend is +/- 2 feet
- The info does not depict interior drainage modeling results
- The storm surge is characterized as the result of a probabilistic analysis of 5 to 6 storm parameters of a suite of 152 storms and not a particular event

Assumes 0% Pumping Capacity

Figure 27. Probabilistic flood levels prior to Hurricane Katrina (copied unmodified from the slide presentation by Dr. Ed Link, Director, Interagency Performance Evaluation Task Force (IPET) posted on-line at *http://www.mvn.usace.army.mil/hps/risk_depth_map.htm*).

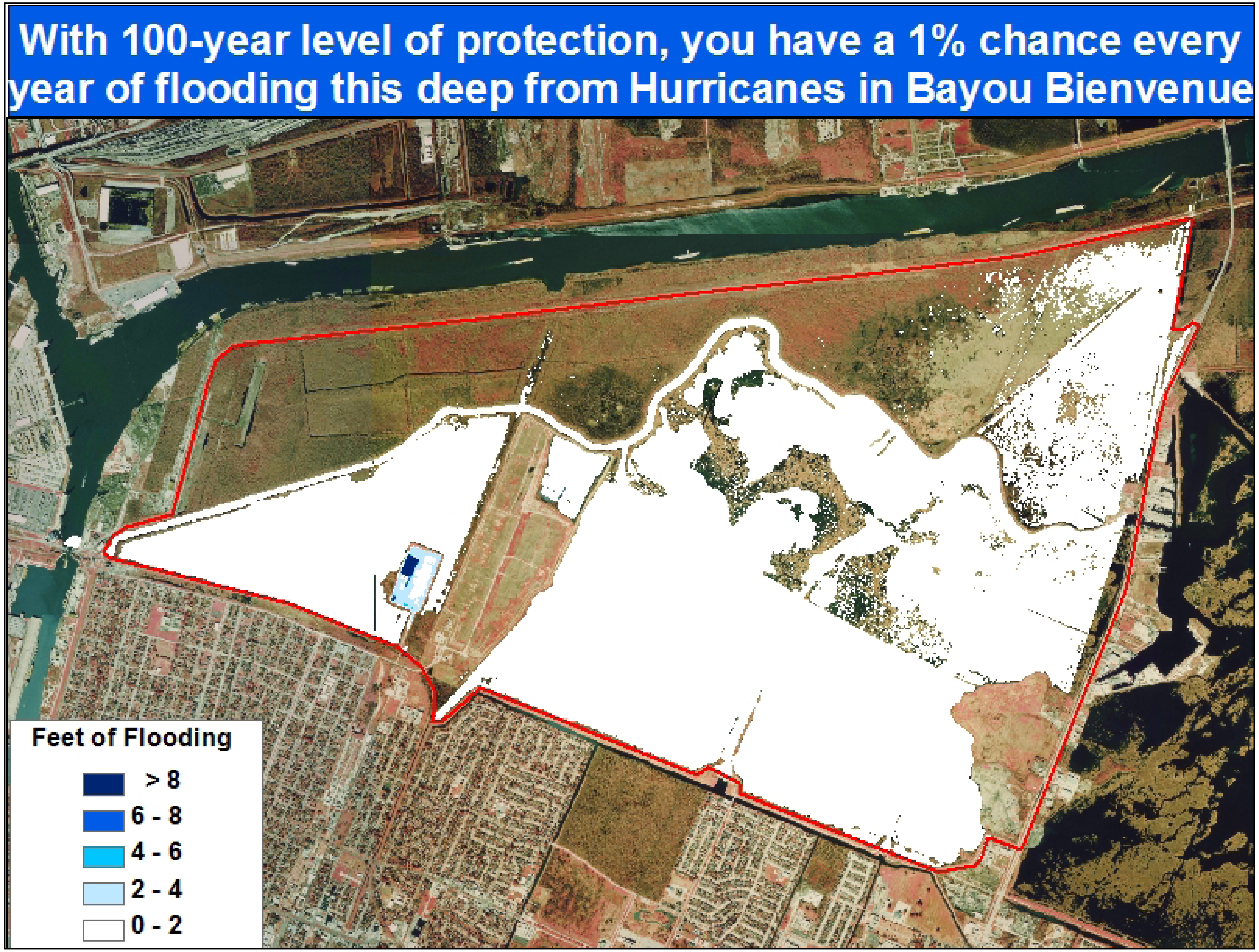


Figure 28. Flood risk map released by U.S. Army Corps of Engineers for Bayou Bienvenue.

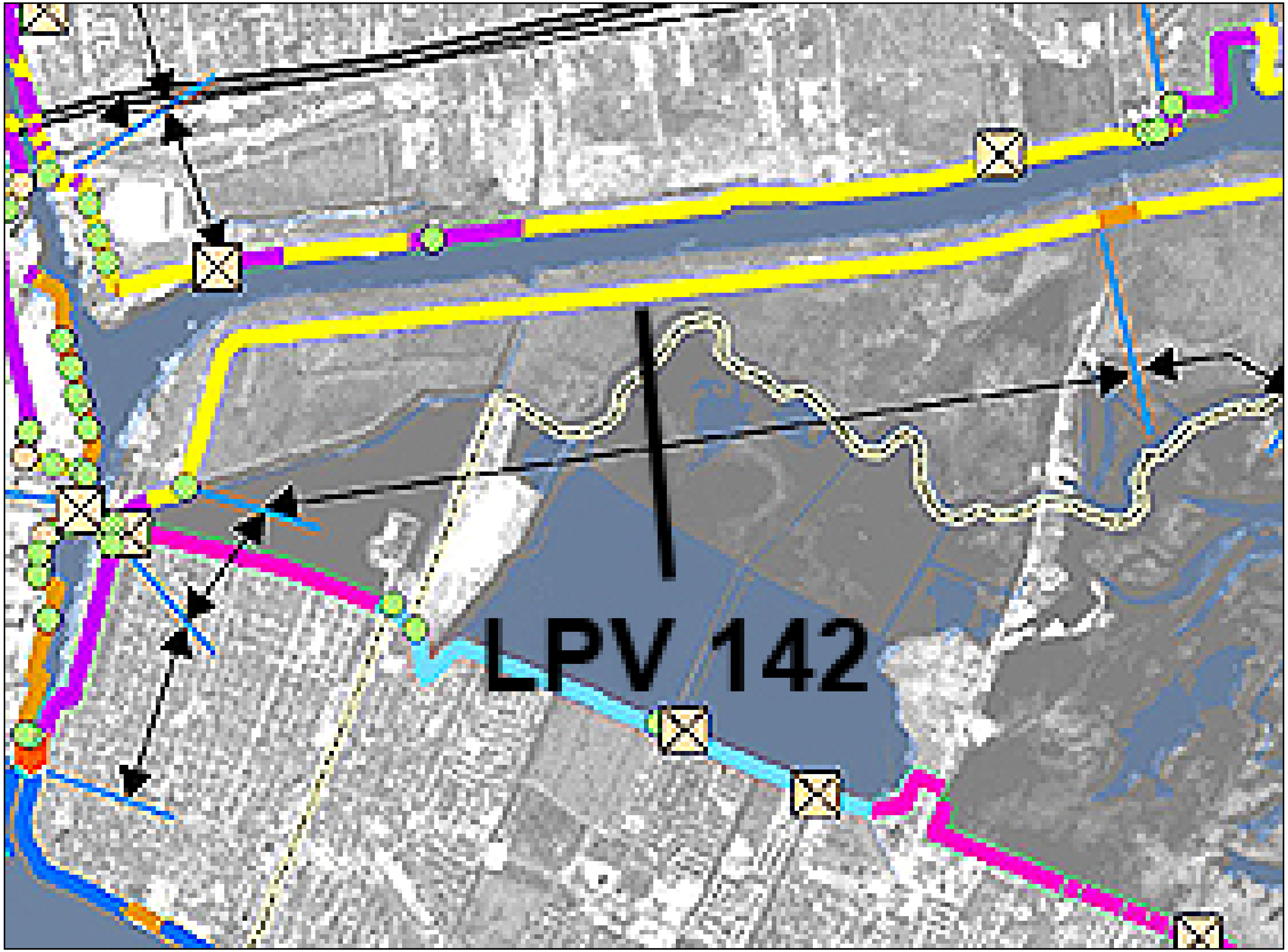


Figure 29. Task Force Guardian Contract IHNC 07 GIWW Levee files.

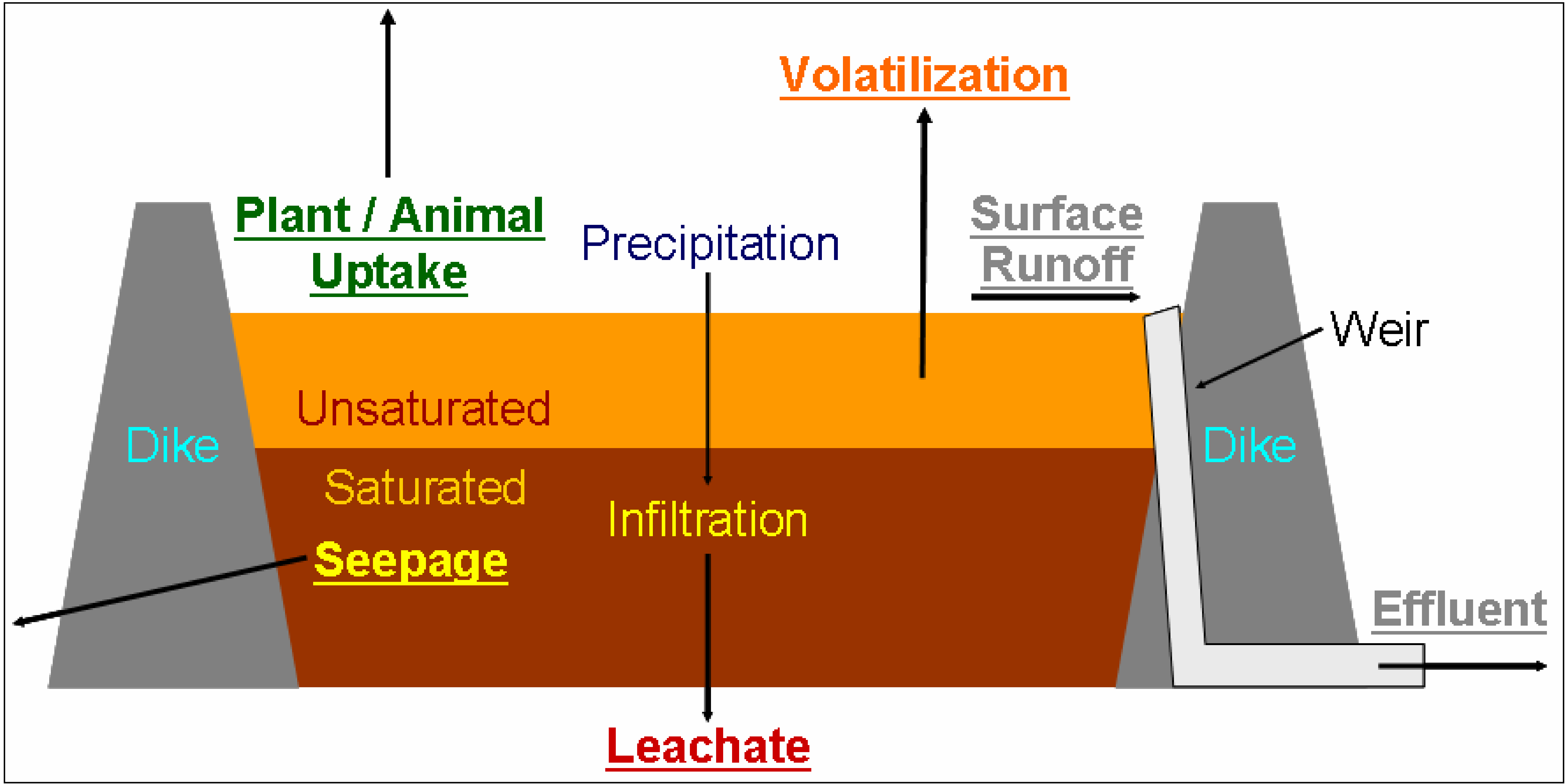


Figure 30. CDF Contaminant Pathways.

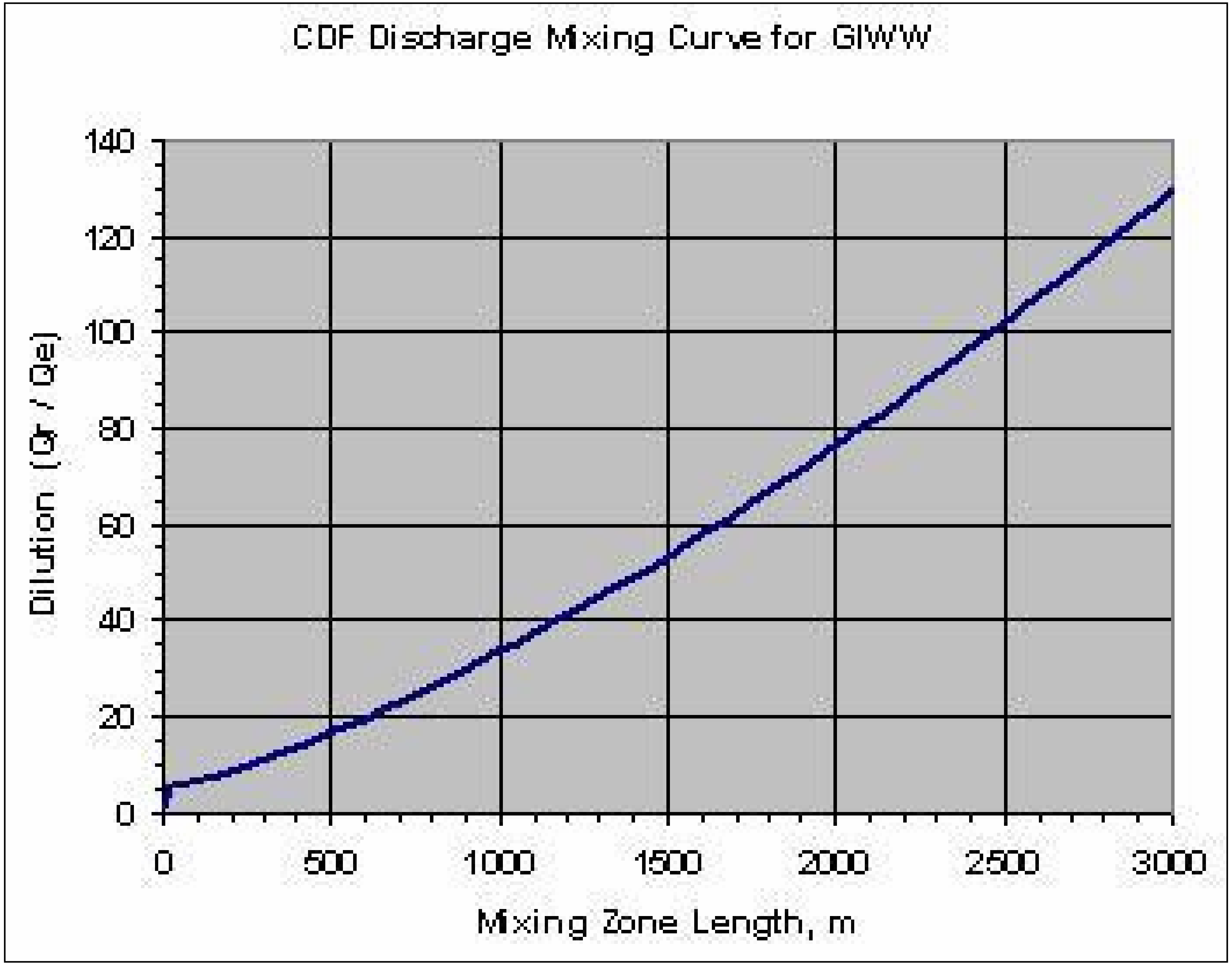


Figure 31. Attainable dilution versus mixing zone length for the GIWW.

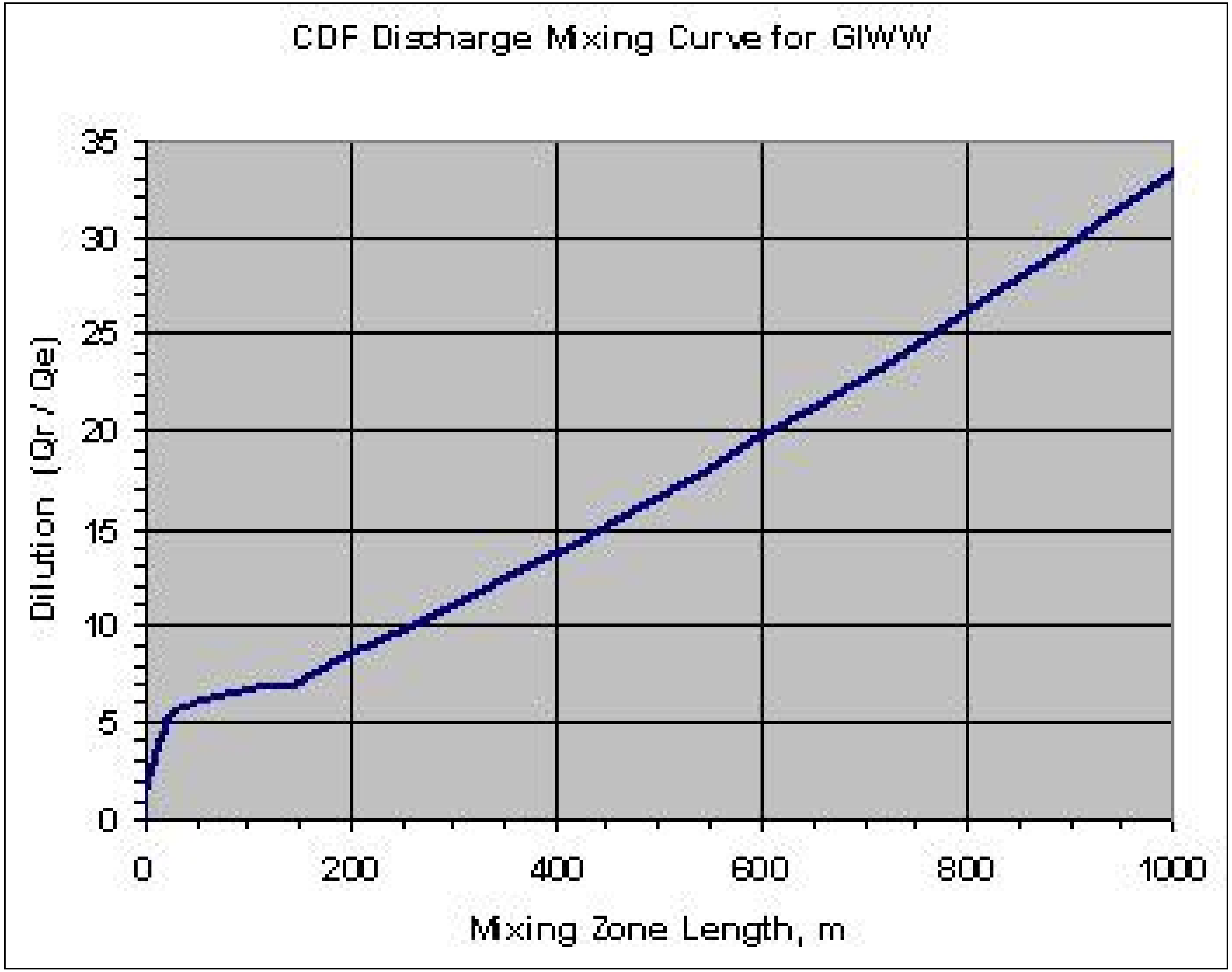


Figure 32. Attainable dilution versus mixing zone length for the GIWW (<1,000 ft).

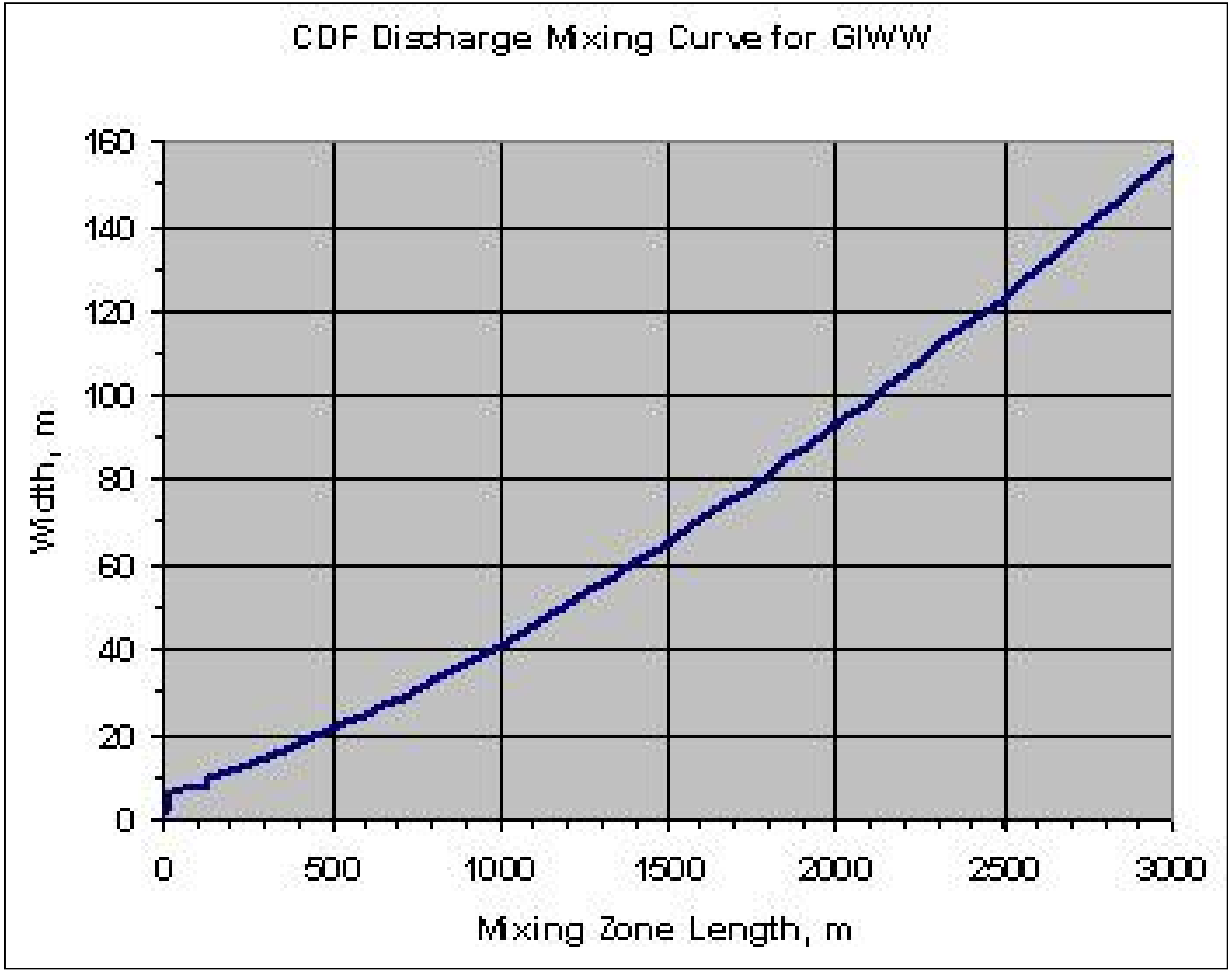


Figure 33. Mixing zone width as a function of distance from discharge point (GIWW).

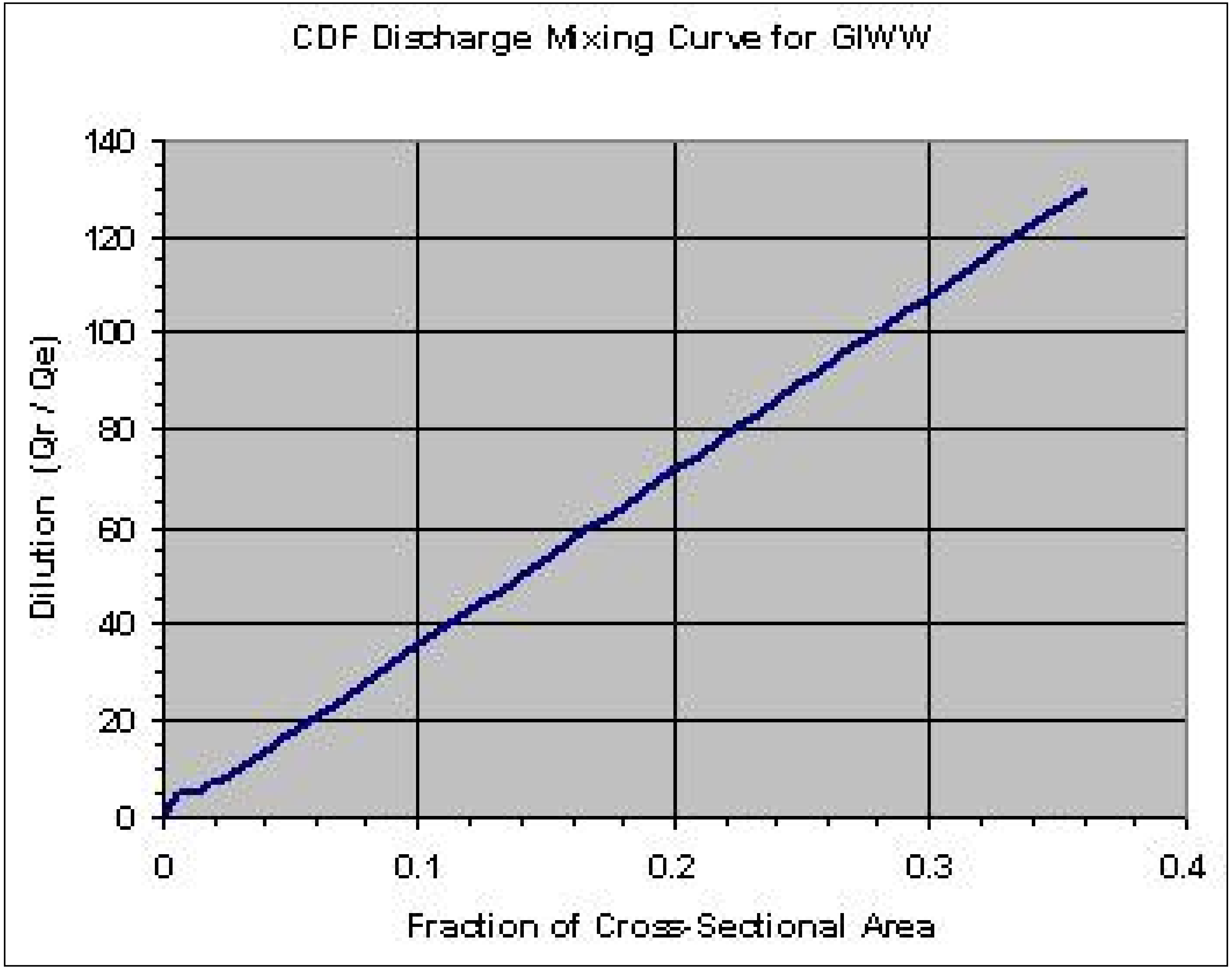


Figure 34. Attainable dilution as a function of cross sectional area (GIWW).

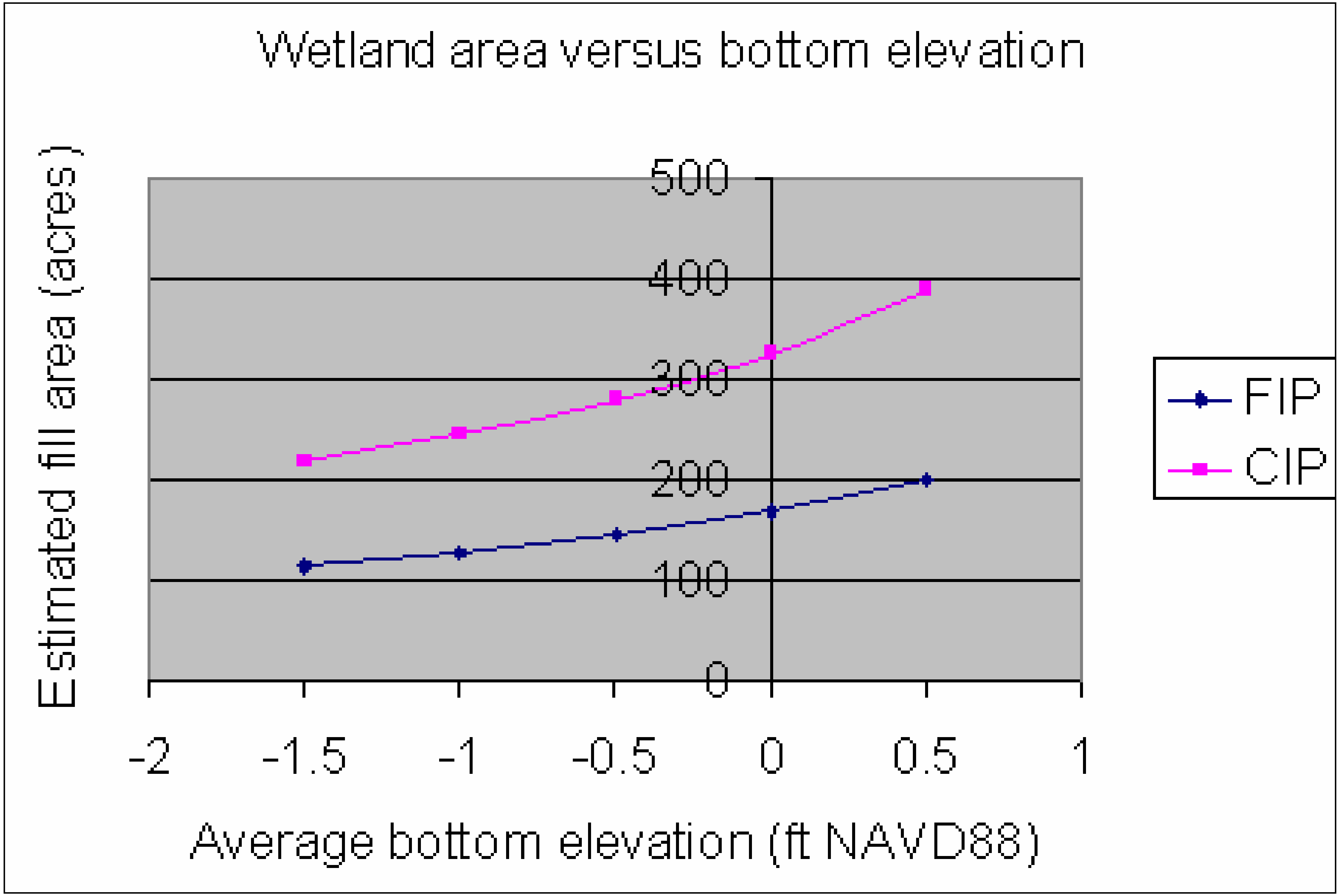


Figure 35. Estimated maximum restorable wetland area.

Table 1. Dredging and Disposal Plan.

Dredging and Disposal Plan									Float-in-Place		Cast-in-Place		Cell Volumes Alternative I				Volume to Selected Placements Alternative II							
DMMU/ Location	Material Type	Open Water Suitability (No Benthic Toxicity)		Total Volume		Volume by Section		Lock Construction Phase	Year	Required Fill Volumes (yd^3)	Year	Required Fill Volumes (yd^3)	Float in Place		Cast in Place		Float in Place				Cast in Place			
													CDF		CDF		Open Water	Wetland	CDF		Open Water	Wetland	CDF	
	N/NN/F/S[1]	Freshwater	Marine	FIP	CIP	FIP	CIP						Disposal	Fill Storage	Disposal	Fill Storage			Disposal	Fill Storage			Disposal	Fill Storage
D1-05-1 thru 6	NN	USm	USm	48,100	48,100	48,100	48,100	North Channel Excavation	7	106,762 n	6	354,203 n	48,100	0	48,100	0	0	0	48,100	0	0	0	48,100	0
D2-05-1 thru 6	NN	USm	USm	88,700	155,200	88,700	155,200		7		6		88,700	0	15,5200	0	0	0	88,700	0	0	0	155,200	0
D3-05-1 thru 3	F	S	S	412,750	586,300	62,850	196,700	New Lock Excavation	2-3	None	2-3	None	0	62,850	0	196,700	412,750	0	0	0	586,300	0	0	0
D3-05-4 thru 6	NN	S	US			349,900	389,600		2-3		2-3		349,900	0	389,600	0		0	0	0		0	0	0
D3-05-1N thru 6N	N	S	US			a	a		2-3		2-3		a	a	a	a		0	0	0		0	0	0
D4-05-1 thru 8	NN	S	US	152,800	257,800	152,800	257,800		2-3		2-3		152,800	0	257,800	0	152,800	0	0	0	257,800	0	0	0
D5-05-1 thru 8	NN	US	US	143,400	245,200	78,500	83,500		2-3		2-3		78,500	0	83,500	0	0	0	78,500	0	0	0	83,500	0
D4/5-05-1N-16N	N	S	S	b	b	64,900 h	161,700 h		2-3		2-3					161,700 k,l	64,900	0	0	0	161,700	0	0	0
D6-05-1 & 2	NN	S	S	463,100	997,700	463,100	997,700	North Bypass Channel	1		1		0	463,100	0	997,700	0	0	0	463,100	346,678	0	0	651,022
D6-05-3 thru 6	F	S	S						1		1													
D6-05-1N thru 6N	N	S	S						1		1													
D7-05-1 thru 4	NN	US	S	413,000	620,900	101,500	152,500		1		1		101,500	0	152,500	0	0	0	101,500	0	0	0	152,500	0
D7-05-5 thru 9	F	S	S			228,000	79,400		1		1		0	311,500	0	468,400	311,500	0	0	0	468,400	0	0	0
D7-05-1N-4N	N	S	S			c	c		1		1													
D7-05-5N-9N	N					83,500	389,000																	
D8-05-1 thru 4	NN	S	US	132,000	162,000	132,000	162,000	South Channel Excavation	7		7		132,000	0	162,000	0	132,000	0	0	0	162,000	0	0	0

Dredging and Disposal Plan									Float-in-Place		Cast-in-Place		Cell Volumes Alternative I				Volume to Selected Placements Alternative II							
DMMU/ Location	Material Type	Open Water Suitability (No Benthic Toxicity)		Total Volume		Volume by Section		Lock Construction Phase	Year	Required Fill Volumes (yd³)	Year	Required Fill Volumes (yd³)	Float in Place		Cast in Place		Float in Place				Cast in Place			
													CDF		CDF		Open Water	Wetland	CDF		Open Water	Wetland	CDF	
	N/NN/F/S¹	Freshwater	Marine	FIP	CIP	FIP	CIP						Disposal	Fill Storage	Disposal	Fill Storage			Disposal	Fill Storage			Disposal	Fill Storage
D9-05-1&3	NN	S	US	192,200	192,200	192,200	192,200	Lock Demo/River Excavation to St Claude	11	None	11	None	150,000	0	150,000	0	150,000	0	0	0	150,000	0	0	0
D9-05-2&4	NN	S	S					South Channel Excavation	7		7		42,200	0	42,200	0	42,200	0	0	0	42,200	0	0	0
D10-05-1	F	S	S	131,400	131,300	18,300	18,300	South Bypass Channel	7	246,825 j	7	246,825 j	0	131,400	0	131,300	131,400	0	0	0	131,300			
D10-05-2	F	d	d			e	e		7		7													
D10-05-3&4	S	S	S			113,100	113,000		7		7													
D10-05-1N	N	d	d			f	f		7		7													
D10-05-2N	N	d	d			e	e		7		7													
D10-05-3N &4N	N	S	S			g	g		7		7													
D11-05-1&2	NN	d	d	38,782	38,782	38,782 i	38,782 i	River Excavation to St Claude	11		11		0	0	0	0	0	0	0	0	0	0	0	0
Totals				2,216,232	3,435,482	2,216,232	3,435,482		Total	353,587	Total	601,028	1,143,700	1,033,750	1,440,900	1,955,800	1,397,550	0	316,800	463,100	2,306,378	0	439,300	651,02
									Cover Allowance	50,000	Cover Allowance	50,000	Grand Total	2,177,450	Grand Total	3,396,700	Grand Total			2,177,450	Grand Total			339,6700
									Grand Total	403,587	Grand Total	651,028												

¹ Native/Non-native/Fill/Sediment.
a. Included with 1-3 and 4-6 volumes above.
b. 4/5 is a vertical designation, volume included with 4 and 5.
c. Native below project depth (at -36ft).
d. Unknown assumed S.
e. Site 2 not sampled.
f. Included with 1 above.
g. Included with 3 & 4 above.
h. DMMU 5 native volumes only, DMMU 4 volumes were estimated as NN to full project depth.
i. Not scheduled for dredging.
j. Letter report assumes 70K of material being dredged plus remainder from previously stockpiled goes to fill; however, water management at the lock fill site would be a problem if dredging hydraulically due to the small size of the site and limited hydraulic retention time.
k. DMMU 4/5 underlying DMMU 5 is suitable for open water freshwater or marine placement. If not separated from DMMU 5 the amount going to the CDF for permanent disposal is greater than actually necessary.
l. Assumes NN can be removed separately from underlying N sediments.
m. Not tested, assumed unsuitable.
n. Letter report specifies backfill of West Side of New lock after U/S and D/S approach - assumed to correspond to main north channel.

Table 2. Summary of SETTLE Model Parameters.

DMMU	(yds^3)	Percent Fines (%)	In-Situ Solids (%)	SG	ZSV (ft/hr)	Influent Pipe Diameter (in)	Average Pipeline Velocity (fps)	Influent SS (g/L)	Dredging Period		Dike Ht (ft)	Freeboard (ft)	Ponding (ft)	Withdrawal (ft)	Percent Ponded (%)	Average Storage Area (acres)	Hydraulic Efficiency (%)	Storage Volume (acre*ft)	Clarification Area (acres)	Effluent TSS (mg/L)
									(hrs/day)	(days/wk)										
Cast In Place Option 1																				
Fill Cell																				
6	997700	76	65.76	2.607	0.086	24	15	141.8	20	7	17	2	2	2	98	198	46%	1573.26	82.03	24.63
7	468400	86	65.71	2.61	0.068	24	15	119.8	20	7	17	2	2	2	98	198	46%	840.46	103.75	19.18
3	196700	86.5	60.41	2.61	0.079	24	15	103.8	20	7	17	2	2	2	98	198	46%	416.85	89.3	25.52
10	131300	93	59.63	2.62	0.051	24	15	101	20	7	17	2	2	2	98	198	46%	325.68	138.33	357.94
5	161700	59.6	68.47	2.63	0.081	24	15	140.4	20	7	17	2	2	2	98	198	46%	268.44	87.1	33.09
Disposal Cell																				
7	152500	84	51.76	2.605	0.209	24	15	83.1	20	7	17	2	2	2	98	124	51%	275.73	36.33	23.71
3	389600	86.5	60.41	2.61	0.079	24	15	103.8	20	7	17	2	2	2	98	124	51%	740.44	80.55	34.71
4	257800	90.7	56.99	2.6	0.147	24	15	70.8	20	7	17	2	2	2	98	124	51%	480.9	51.94	22.51
5	88500	91	49.87	2.59	0.142	24	15	89.4	20	7	17	2	2	2	98	124	51%	150.2	53.77	21.43
1	48100	83.11	40.19	2.65	0.157	24	15	130.3	20	7	17	2	2	2	98	124	51%	62.5	48.64	54.26
2	155200	79.7	45.89	2.65	0.222	24	15	134.5	20	7	17	2	2	2	98	124	51%	196.41	34.4	48.64
8	162200	98.7	47.5	2.578	0.155	24	15	96.7	20	7	17	2	2	2	98	124	51%	273.09	49.26	33.88
9	42200	95.8	59.68	2.604	0.18	24	15	105.2	20	7	17	2	2	2	98	124	51%	77.34	42.2	80.65
9	150000	95.8	59.68	2.604	0.18	24	15	105.2	20	7	17	2	2	2	98	124	51%	221.7	42.2	8.065
Cast In Place Option 2																				
Fill Cell																				
6	651022	76	65.76	2.607	0.086	24	15	141.8	20	7	17	2	2	2	98	83	43%	1082.46	87.75	34.26
Disposal Cell																				
7	152500	84	51.76	2.605	0.209	24	15	83.1	20	7	17	2	2	2	98	39	60%	275.73	31.05	41.36
5	83500	91	49.87	2.59	0.142	24	15	89.4	20	7	17	2	2	2	98	39	60%	150.2	45.71	38.55
1	48100	83.11	40.19	2.65	0.157	24	15	130.3	20	7	17	2	2	2	98	39	60%	62.5	41.34	103.35
2	155200	79.7	45.89	2.65	0.222	24	15	134.5	20	7	17	2	2	2	98	39	60%	196.41	29.24	73.16
Float In Place Option 1																				
Fill Cell																				
6	463100	76	65.76	2.607	0.086	24	15	141.8	20	7	17	2	2	2	98	109	54%	803.01	69.88	34.59
7	311500	86	65.71	2.61	0.068	24	15	119.8	20	7	17	2	2	2	98	109	54%	598.94	88.38	26.79
3	62850	86.5	60.41	2.61	0.079	24	15	103.8	20	7	17	2	2	2	98	109	54%	159.87	76.07	36.14
10	131400	93	59.63	2.62	0.051	24	15	101	20	7	17	2	2	2	98	109	54%	325.9	117.84	443.33
4/5	64900	59.6	49.73	2.63	0.142	24	15	140.4	20	7	17	2	2	2	98	109	54%	91.1	50.79	23.11
Disposal Cell																				
7	101500	84	51.76	2.605	0.209	24	15	83.1	20	7	17	2	2	2	98	101	51%	194.88	36.53	21.88
3	349900	86.5	60.41	2.61	0.079	24	15	103.8	20	7	17	2	2	2	98	101	51%	676.45	80.55	29.35
4	152800	90.7	56.99	2.6	0.147	24	15	70.8	20	7	17	2	2	2	98	101	51%	316.63	51.94	19.34
5	78500	91	49.87	2.59	0.142	24	15	89.4	20	7	17	2	2	2	98	101	51%	142.34	53.77	19.79

DMMU	(yds^3)	Percent Fines (%)	In-Situ Solids (%)	SG	ZSV (ft/hr)	Influent Pipe Diameter (in)	Average Pipeline Velocity (fps)	Influent SS (g/L)	Dredging Period		Dike Ht (ft)	Freeboard (ft)	Ponding (ft)	Withdrawal (ft)	Percent Ponded (%)	Average Storage Area (acres)	Hydraulic Efficiency (%)	Storage Volume (acre*ft)	Clarification Area (acres)	Effluent TSS (mg/L)
									(hrs/day)	(days/wk)										
1	48100	83.1	40.19	2.65	0.157	24	15	130.3	20	7	17	2	2	2	98	101	51%	62.5	48.64	50.65
2	88700	79.7	45.86	2.65	0.222	24	15	134.5	20	7	17	2	2	2	98	101	51%	118.86	34.4	43.08
8	132000	98.7	47.5	2.578	0.155	24	15	96.7	20	7	17	2	2	2	98	101	51%	229.05	49.26	30.01
9	42000	95.8	59.68	2.604	0.18	24	15	105.2	20	7	17	2	2	2	98	101	51%	77.34	42.27	79.75
9	150000	95.8	59.68	2.604	0.18	24	15	105.2	20	7	17	2	2	2	98	101	51%	221.7	42.27	79.75
Float In Place Option 2																				
Fill Cell																				
6	463100	76	65.76	2.607	0.086	24	15	141.8	20	7	17	2	2	2	98	62	38%	803.01	99.3	37.26
Disposal Cell																				
7	101500	84	51.79	2.605	0.209	24	15	83.1	20	7	17	2	2	2	98	29	38%	194.88	49.03	55.18
5	78500	91	49.87	2.59	0.142	24	15	89.4	20	7	17	2	2	2	98	29	38%	142.34	72.17	50.81
1	48100	83.1	40.16	2.65	0.157	24	15	130.3	20	7	17	2	2	2	98	29	38%	62.5	65.27	133.74
2	88700	79.7	45.89	2.65	0.222	24	15	134.5	20	7	17	2	2	2	98	29	38%	118.86	46.16	83.91

Table 3. CIP CDF Disposal Volumes and Depths Alternative 1

Disposal Cell																										
			Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
7	152500	1	276	166	276	166	166	166	166	166	166	166	166	166	166	1.87	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12	1.12
3	389600	2&3	740	496		740	496	496	496	496	496	496	496	496	496		5.01	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36	3.36
4	257800	2&3	480	283		480	283	283	283	283	283	283	283	283	283		3.25	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
5	83500	2&3	150	87		150	87	87	87	87	87	87	87	87	87		1.02	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
1	48100	6	63	37					63	37	37	37	37	37	37					0.42	0.25	0.25	0.25	0.25	0.25	0.25
2	155200	6	196	130						196	130	130	130	130	130						1.33	0.88	0.88	0.88	0.88	0.88
8	162000	7	273	158							273	158	158	158	158							1.85	1.07	1.07	1.07	1.07
9	42200	7	103	38								103	38	38	38								0.69	0.25	0.25	0.25
9	150000	11	222												222											1.50
Total	1,440,900				276	1536	1031	1031	1094	1264	1470	1458	1393	1393	1615	2	10	7	7	7	9	10	10	9	9	11
Ratio Required/Available					0.17	0.95	0.64	0.64	0.68	0.78	0.91	0.90	0.86	0.86	1.00	0.17	0.95	0.64	0.64	0.68	0.78	0.91	0.90	0.86	0.86	1.00
Fill Cell																										
			Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
6	997700	1	1573	1255	1573	1255	1255	1255	1255	1255	1255	1255				8.42	6.72	6.72	6.72	6.72	6.72	6.72	6.72			
7	468400	1	840	557	840	557	557	557	557	557	557	557				4.50	2.98	2.98	2.98	2.98	2.98	2.98	2.98			
3	196700	2&3	417	250		417	250	250	250	250	250	250				0.00	2.23	1.34	1.34	1.34	1.34	1.34	1.34			
10	131300	7	326	130							326	130				0.00	0.00	0.00	0.00	0.00	0.00	1.74	0.70			
5	161700	2&3	268	180		268	180	180	180	180	180	180					1.44	0.96	0.96	0.96	0.96	0.96	0.96			
Total	1,955,800				2414	2497	2242	2242	2242	2242	2567	2371				13	13	12	12	12	12	14	13			
Ratio Required/Available					0.94	0.97	0.87	0.87	0.87	0.87	1.00	0.92				0.94	0.97	0.87	0.87	0.87	0.87	1.00	0.92			

Table 4. FIP CDF Disposal Volumes and Depths Alternative 1

Disposal Cell																										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
			Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
7	101500	1	195	110	195	110	110	110	110	110	110	110	110	110	110	1.31	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74	0.74
3	349900	2&3	676	445		676	445	445	445	445	445	445	445	445	445		4.55	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99	2.99
4	152800	2&3	317	168		317	168	168	168	168	168	168	168	168	168		2.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
5	78500	2&3	142	82		142	82	82	82	82	82	82	82	82	82		0.96	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
1	48100	7	63	37							63	37	37	37	37							0.42	0.25	0.25	0.25	0.25
2	88700	7	119	74							119	74	74	74	74							0.80	0.50	0.50	0.50	0.50
8	132000	7	229	129							229	129	129	129	129							1.54	0.87	0.87	0.87	0.87
9	42200	7	103	38							103	38	38	38	38							0.69	0.25	0.25	0.25	0.25
9	150000	11	222												222											1.49
Total	1143700				195	1246	805	805	805	805	1318	1082	1082	1082	1304	1	8	5	5	5	5	9	7	7	7	9
Ratio Required/Available					0.15	0.94	0.61	0.61	0.61	0.61	1.00	0.82	0.82	0.82	0.99	0.15	0.94	0.61	0.61	0.61	0.61	1.00	0.82	0.82	0.82	0.99
Fill Cell																										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
			Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
6	463100	1	803	589	803	589	589	589	589	589	589	589				4.47	3.28	3.28	3.28	3.28	3.28	3.28	3.28			
7	311500	1	599	376	599	376	376	376	376	376	376	376				3.33	2.09	2.09	2.09	2.09	2.09	2.09	2.09			
3	62850	2&3	100	58		100	58	58	58	58	58	58					0.56	0.32	0.32	0.32	0.32	0.32	0.32			
10	131400	7	326	239							326	239										1.81	1.33			
4/5	64900	2&3	120	72		120	72	72	72	72	72	72					0.67	0.40	0.40	0.40	0.40	0.40	0.40			
Total	1033750				1402	1185	1095	1095	1095	1095	1421	1334				8	7	6	6	6	6	8	7			
Ratio Required/Available					0.99	0.83	0.77	0.77	0.77	0.77	1.00	0.94				0.99	0.83	0.77	0.77	0.77	0.77	1.00	0.94			

Table 5. CIP CDF Disposal Volumes and Depths Alternative 2

Disposal Cell																										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
			Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
7	152500	1	276	166	276	166	166	166	166	166						4.33	2.60	2.60	2.60	2.60	2.60					
5	83500	2&3	150	87		150	87	87	87	87							2.36	1.37	1.37	1.37	1.37					
1	48100	6	63							63											0.98					
2	155200	6	196							196											3.09					
Total	439300				276	316	253	253	253	512						4	5	4	4	4	8					
Ratio Required/Available					0.54	0.62	0.49	0.49	0.49	1.00						0.54	0.62	0.49	0.49	0.49	1.00					
Fill Cell																										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
			Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
6	651022	1	1082		1082											6										
Total	651022				1082											6										
Ratio Required/Available					1.00											1.00										

Table 6. FIP CDF Disposal Volumes and Depths Alternative 2

Disposal Cell																										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
			Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
7	101500	1	195	110	195	110	110	110	110	110	110					3.52	1.99	1.99	1.99	1.99	1.99	1.99				
5	78500	2&3	142	82		142	82	82	82	82	82						2.57	1.48	1.48	1.48	1.48	1.48				
1	48100	7	63								63											1.13				
2	88700	7	119								119											2.15				
Total	316800				195	253	192	192	192	192	373					4	5	3	3	3	3	7				
Ratio Required/Available					0.52	0.68	0.52	0.52	0.52	0.52	1.00					0.52	0.68	0.52	0.52	0.52	0.52	1.00				
Fill Cell																										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Disposal Volumes (ac-ft)		Storage Volume in Use by DMMU at the End of Each Year (ac-ft)											Storage Depth in Use by DMMU at the End of Each Year (ft)										
			Initial	365 Day	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
6	463100	1	803		803											6										
Total	463100				803											6										
Ratio Required/Available					1.00											1.00										

Table 7. CDF Configuration Summary

Alternative/Cell	Site								Perimeter Dike		
	Total Area (acres)	Average Storage Area (acres)	Storage Volume		Ponding Needed (acres)	Estimated Hydraulic Efficiency (%)	Predicted Effluent TSS (mg/L)		Height (ft)	Centerline Length (ft)	Additional Dike Footprint (acres)
			(ac-ft)	(yd^3)			Maximum	Mean[1]			
Cast-in-Place Alternative 1											
Disposal Cell	200	124.2	1614	2,603,840	81	51	81	39	17	10644	75.8
Fill Cell	305	197.5	2567.4	4,142,067	139	46	358	43	17	15449	108
Cast-in-Place Alternative 2											
Disposal Cell	96	39.4	511.8	825,637	46	60	103	59	17	7728	56.6
Fill Cell	170	83.3	1082.7	1,746,743	88	43	34	N/A	17	12993	86.7
Float-in-Place Alternative 1											
Disposal Cell	172	101.4	1318.4	2,127,002	81	51	80	36	17	9845	70.6
Fill Cell	200	109.3	1421	2,292,610	118	54	443	51	17	12897	90.7
Float-in-Place Alternative 2											
Disposal Cell	71	28.7	372.5	600,944	72	38	134	75	17	5559	42.3
Fill Cell	138	61.8	803.4	1,296,120	99	38	37	N/A	17	10698	76.2
[1] Geometric mean											

Table 8. Latitude and Longitude of Nearby Utility Lines

Item	Facility Description	Owner	Location of Reading	Latitude	Longitude
1	54" Sewer Force Main	S&WB	Center Line of Levee	29 59 46.5	89 59 17.8
			Flood Side Toe of Levee	29 59 46.8	89 59 17.3
2	10 " NGL Pipeline	Louis Dreyfus	Flood Side Toe of Levee	30 00 03.8	89 56 30.0
			Protected Side Toe of Levee	30 00 02.8	89 56 28.8
3	24" Gas Line	Entergy	At the Floodwall	30 00 03.6	89 56 28.9
			Protected Side Toe of Levee	30 00 03.6	89 56 29.0

Table 9. CIP Alternative 1 – Pumping Schedule for Effluent Management

Fill Cell																
						Annual Pumping Volume (gal)										
DMMU	In-Situ Volume (yd³)	Year Dredged	Dredging Duration (days)	Pumping Duration (days)	Total Volume (gal)	1	2	3	4	5	6	7	8	9	10	11
6	997,700	1	62.0	48.3	1,469,451,747	1,469,451,747										
7	468,400	1	34.4	26.8	815,308,711	815,308,711										
3	196,700	2&3	14.5	11.3	343,662,102		343,662,102									
10	131,300	7	9.8	7.6	232,268,179							232,268,179				
4/5	161,700	2&3	10.9	8.5	258,339,098		258,339,098									
Total	1,955,800				3,119,029,838	2,284,760,459	602,001,200	0	0	0	0	232,268,179	0	0	0	0
Days/Yr						75.0	19.8	0	0	0	0	7.6	0	0	0	0
Disposal Cell																
						Annual Pumping Volume (gal)										
DMMU	In-Situ Volume (yd³)	Year Dredged	Dredging Duration (days)	Pumping Duration (days)	Total Volume (gal)	1	2	3	4	5	6	7	8	9	10	11
7	152,500	1	11.1	8.6	263,079,264	263,079,264										
3	389,600	2&3	28.8	22.4	681,398,996		681398996									
4	257,800	2&3	25.5	19.8	604,371,283		604371283									
5	83,500	2&3	5.4	4.2	127,984,507		127984507									
1	48,100	6	1.6	1.2	37,921,335						37,921,335					
2	155,200	6	6.0	4.7	142,205,008						142,205,008					
8	162,000	7	9.0	7.0	213,307,512							213,307,512				
9	42,200	7	3.2	2.5	74,657,629							74,657,629				
9	150,000	11	10.7	8.3	253,598,931											253,598,931
Total	1,440,900				2,398,524,465	263079264	1413754786	0	0	0	180126343	287965141	0	0	0	253598931
Days/Yr						8.6	46.4	0	0	0	5.9	9.5	0	0	0	8.3

Table 10. FIP Alternative 1 – Pumping Schedule for Effluent Management

Fill Cell																
						Annual Pumping Volume (gal)										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Dredging Duration (days)	Pumping Duration (days)	Total Volume (gal)	1	2	3	4	5	6	7	8	9	10	11
6	463,100	1	28.8	22.4	681,398,996	681,398,996										
7	311,500	1	22.9	17.8	542,749,113	542,749,113										
3	62,850	2&3	4.6	3.6	109,023,839		109,023,839									
10	131,400	7	9.8	7.6	232,268,179							232,268,179				
4/5	64,900	2&3	4.4	3.4	104,283,672		104,283,672									
Total	1,033,750				1,669,723,800	1,224,148,109	213,307,512	0	0	0	0	232,268,179	0	0	0	0
Days/Yr						40.2	7.0	0	0	0	0	7.6	0	0	0	0.0
Disposal Cell																
						Annual Pumping Volume (gal)										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Dredging Duration (days)	Pumping Duration (days)	Total Volume (gal)	1	2	3	4	5	6	7	8	9	10	11
7	101,500	1	7.5	5.8	177,756,260	177,756,260										
3	349,900	2&3	25.8	20.1	611,481,534		611481534									
4	152,800	2&3	15.1	11.8	357,882,603		357882603									
5	78,500	2&3	5.0	3.9	118,504,173		118504173									
1	48,100	7	1.6	1.2	37,921,335							37,921,335				
2	88,700	7	3.4	2.6	80,582,838							80,582,838				
8	132,000	7	7.3	5.7	173,016,093							173,016,093				
9	42,200	7	3.2	2.5	74,657,629							74,657,629				
9	150,000	11	10.7	8.3	253,598,931											253,598,931
Total	1,143,700				1,885,401,395	177756260	1087868310	0	0	0	0	366177895	0	0	0	253598931
Days/Yr						5.8	35.7	0	0	0	0	12.0	0	0	0	8.3

Table 11. CIP Alternative 2 – Pumping Schedule for Effluent Management

						Annual Pumping Volume (gal)										
DMMU	In-Situ Volume (yd^3)	Year Dredged	Dredging Duration (days)	Pumping Duration (days)	Total Volume (gal)	1	2	3	4	5	6	7	8	9	10	11
Fill Cell																
6	651,022	1	40.5	31.5	958,850,772	958,850,772										
Total	651,022				958,850,772	958,850,772	0	0	0	0	0	0	0	0	0	0
Days/Yr						31.5	0	0	0	0	0	0	0	0	0	0
Disposal Cell																
7	152,500	1	11.1	8.6	263,079,264	263,079,264										
5	83,500	2&3	5.4	4.2	127,984,507		127984507									
1	48,100	6	1.6	1.2	37,921,335						37,921,335					
2	155,200	6	6.0	4.7	142,205,008						142,205,008					
Total	439,300				571,190,115	263079264	127984507	0	0	0	180126343	0	0	0	0	0
Days/Yr						8.6	4.2	0	0	0	5.9	0	0	0	0	0

Table 12. FIP Alternative 2 – Pumping Schedule for Effluent Management

DMMU	In-Situ Volume (yd^3)	Year Dredged	Dredging Duration (days)	Pumping Duration (days)	Total Volume (gal)	Annual Pumping Volume (gal)										
						1	2	3	4	5	6	7	8	9	10	11
Fill Cell																
6	463,100	1	28.8	22.4	681,398,996	681,398,996										
Total	463,100				681,398,996	681,398,996	0	0	0	0	0	0	0	0	0	0
Days/Yr						22.4	0	0	0	0	0	0	0	0	0	0
Disposal Cell																
7	101,500	1	7.5	5.8	177,756,260	177,756,260										
5	78,500	2	5	3.9	118,504,173		118504173									
1	48,100	7	2	1.2	37,921,335							37,921,335				
2	88,700	7	3	2.6	80,582,838							80,582,838				
Totals	316,800				414,764,606	177756260	118504173	0	0	0	0	118504173	0	0	0	0
Days/Yr						5.8	3.9	0	0	0	0	3.9	0	0	0	0

Table 13. Geometric Mean Elutriate Concentrations and Dilution Ratios

Contaminants	Geometric Mean Elutriate Concentration[a] (µg/L)	Receiving Water Concentrations		Minimum Federal/LA Marine/Brackish Acute Criteria (µg/L)	Dilution Ratio by Receiving Water	
		DMMU1 (µg/L)	Bayou Bienvenue (µg/L)		DMMU1	Bayou Bienvenue
Organotins						
Tributyltin	0.035	0.021	0.0215	0.0074	5.67	5.28
Chlorinated Pesticides						
Dieldrin	0.002	0.0059	0.00054	0.0019	0.00	0.07
PCB Congeners						
PCB Total	0.038	0.053	0.01	0.0140	0.00	6.00

[a] Where maximum value was equal to 1/2 the RL, the highest qualified value was used as the maximum

[b] USEPA Region 4 Screening Water Quality Values for Hazardous Waste Sites

Table 14. Predicted Dissolved Contaminant Concentrations Requiring Dilution in Effluent and Estimated Dilution Requirements

Contaminants	Maximum Elutriate Concentration[a] (µg/L)	Receiving Water Concentrations (µg/L)		Minimum Federal/LA Marine/Brackish Acute Criteria (µg/L)	Dilution Ratio by Receiving Water	
		DMMU1	Bayou Bienvenue		DMMU1	Bayou Bienvenue
Metals						
Copper	25.3	3.60	2.40	3.10	59.3	31.7
Lead	15.2	0.46	0.39	8.08	0.93	0.93
Nickel	13.3	0.87	3.6	8.20	0.70	1.11
Chromium III	216.0	6.60	3.05	103.0	1.17	1.13
Organotins						
Tributyltin	6.70	0.021	0.0215	0.0074	3179	3105
Inorganic/General Chemistry						
Cyanide	6.60	5.00	5.00	1.00	2.20	2.20
Chlorinated Pesticides						
p,p'-DDT (4,4')	0.006	0.0011	0.0013	0.0010	43.5	35.2
Dieldrin	0.082	0.0059	0.00054	0.0019	128.0	58.9
Endrin	0.003	0.0014	0.0013	0.0023	0.78	0.70
Heptachlor	0.025	0.00065	0.054	0.0036	7.25	0.00
Heptachlor epoxide	0.041	0.0055	0.0013	0.0036	63.5	16.3
alpha-Chlordane	0.005	0.00065	0.0028	0.0040	0.21	0.58
gamma-Chlordane	0.066	0.00065	0.0072	0.0040	18.5	80.7
4,4'-DDD	0.140	0.00065	0.0013	0.0060	25.0	28.5
Endosulfan II	0.039	0.0092	0.019	0.0087	31.4	9.53
Methoxychlor	0.052	0.00125	0.0025	0.0300	0.77	0.80
gamma-BHC (Lindane)	0.029	0.01	0.005	0.016[b]	2.17	1.18
PCB Congeners						
PCB(Aroclor-1016)	0.840	0.0047	0.01	0.03 [b]	32.0	40.5
PCB(Aroclor-1248)	0.240	0.0047	0.01	0.03 [b]	8.30	10.5
PCB(Aroclor-1254)	0.450	0.036	0.01	0.03 [b]	114.0	21.0
PCB(Aroclor-1260)	1.60	0.017	0.01	0.03 [b]	120.8	78.5
PCB Total	2.20	0.053	0.01	0.0140	404.1	546.5

[a] Where maximum value was equal to 1/2 the RL, the highest qualified value was used as the maximum

[b] USEPA Region 4 Screening Water Quality Values for Hazardous Waste Sites

Table 15. Predicted Dissolved Contaminant Concentrations Requiring Dilution in Runoff and Estimated Dilution Requirements

Contaminants	Maximum Estimated Runoff Concentration[a] (µg/L)	Receiving Water Concentrations (µg/L)		Minimum Federal/LA Marine/Brackish Acute Criteria	Dilution Ratio by Receiving Water	
		DMMU1	Bayou Bienvenue	(µg/L)	DMMU1	Bayou Bienvenue
Metals						
Copper	25.3	3.6	2.4	3.63	59.3	17.6
Organotins						
Tributyltin	6.70	0.021	0.0215	0.42	15.7	15.8
Inorganic/General Chemistry						
Cyanide	6.60	5	5	1.00	2.20	2.20
Chlorinated Pesticides						
4,4'-DDD	0.140	0.00065	0.0013	0.03	3.75	3.83
Endosulfan II	0.039	0.0092	0.019	0.03	0.20	0.33
PCB Congeners						
PCB(Aroclor-1260)	1.60	0.017	0.01	1.05[b]	0.53	0.53
PCB Total	2.20	0.053	0.01	2.00	0.10	0.10

[a] Where maximum value was equal to 1/2 the RL, the highest qualified value was used as the maximum

[b] USEPA Region 4 Screening Water Quality Values for Hazardous Waste Sites

Table 16. Construction, Operating and Maintenance Cost Estimates

Description	Estimated Project Cost ($)	
	20% Contingency	60% Contingency
Cast in Place - Alternative 1	33,616,307	44,821,743
Cast in Place - Alternative 2	23,153,315	30,871,086
Float in Place - Alternative 1	29,019,960	38,693,280

Appendix A
Site Drawings

IHNC CONCEPTUAL CDF DESIGN
NEW ORLEANS, LA
MARCH 2008

SITE MAP
N.T.S

U.S.A.C.E.
ENGINEERING
RESEARCH AND
DEVELOPMENT
CENTER

Date:	4-21-08
Scale:	As Shown
Drawing Code:	
Contract Number:	

U.S.A.C.E. ENGINEERING, RESEARCH
AND DEVELOPMENT CENTER
VICKSBURG, MISSISSIPPI

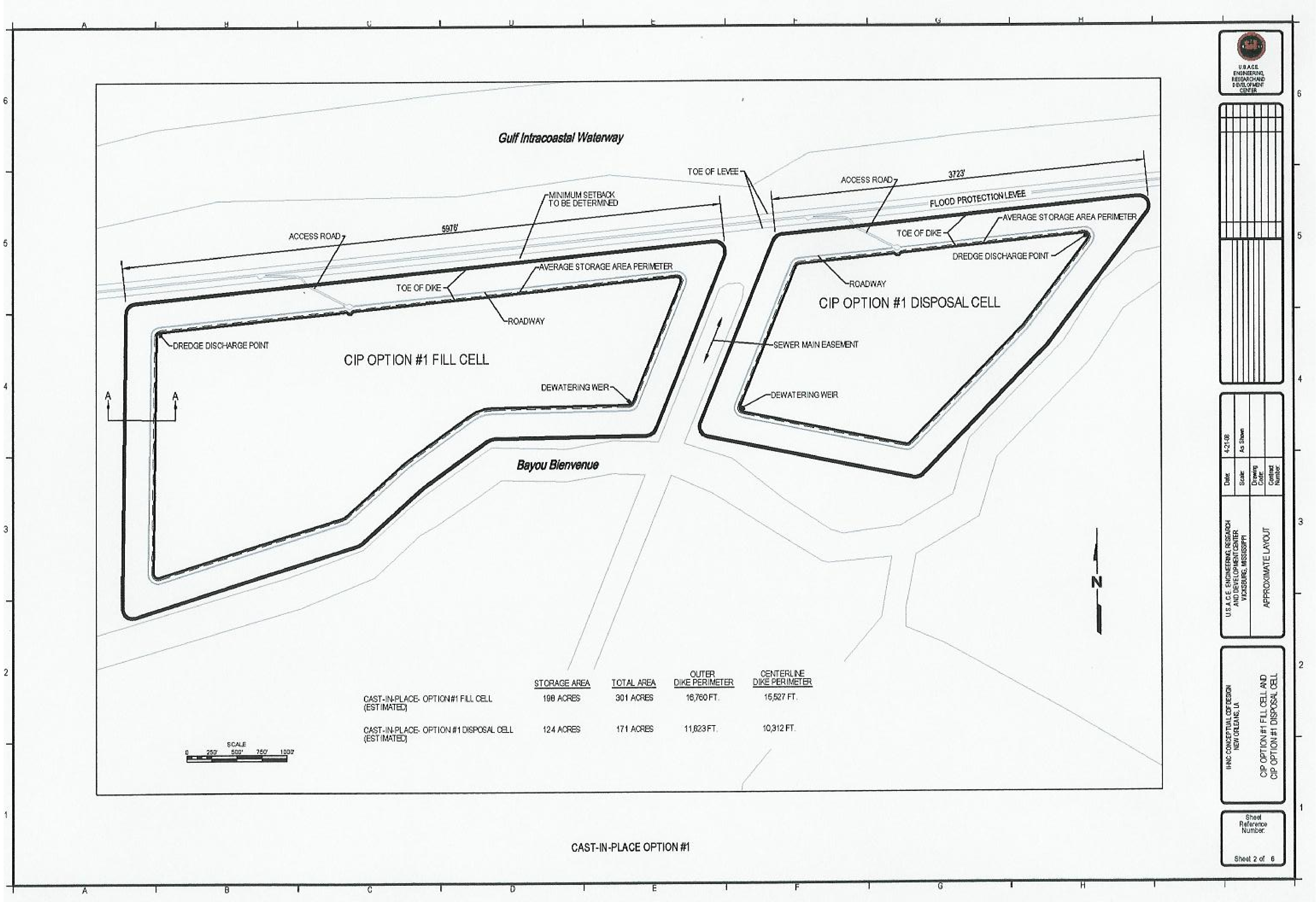
IHNC CONCEPTUAL CDF DESIGN
NEW ORLEANS, LA

SITE MAP

Sheet Reference Number.

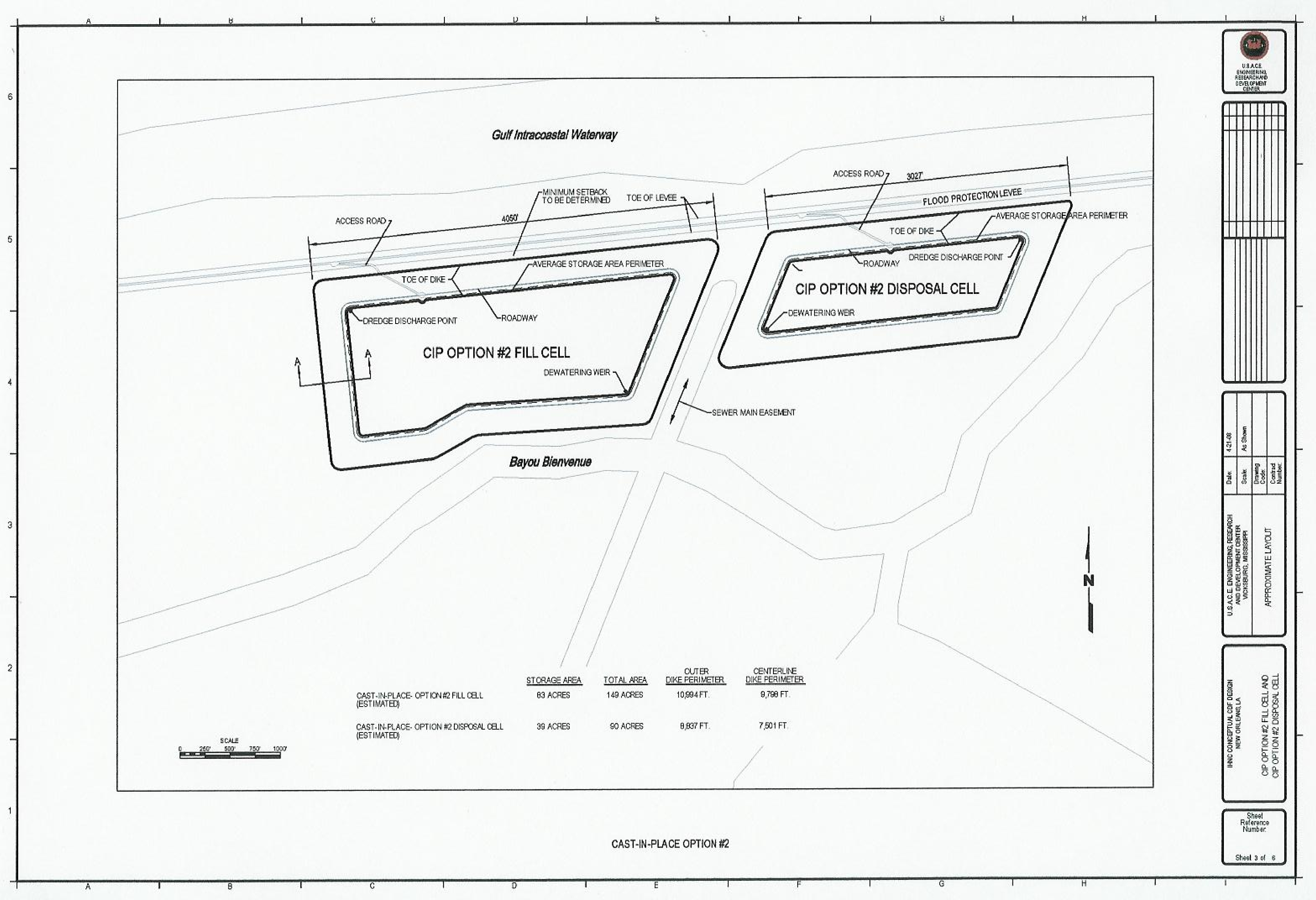
Sheet 1 of 6

Figure A1. Site map.



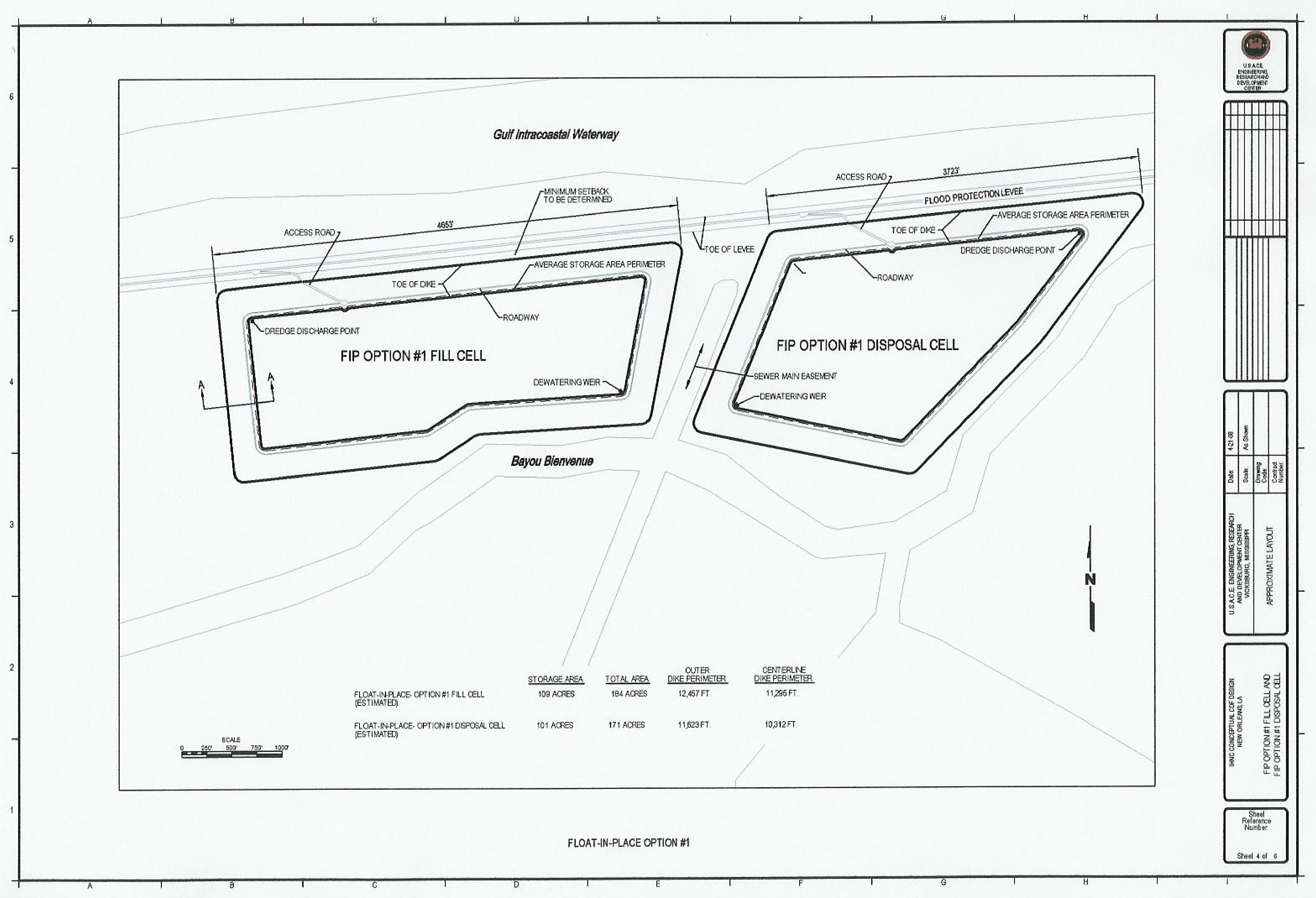
	STORAGE AREA	TOTAL AREA	OUTER DIKE PERIMETER	CENTERLINE DIKE PERIMETER
CAST-IN-PLACE- OPTION #1 FILL CELL (ESTIMATED)	198 ACRES	301 ACRES	16,760 FT.	15,527 FT.
CAST-IN-PLACE- OPTION #1 DISPOSAL CELL (ESTIMATED)	124 ACRES	171 ACRES	11,623 FT.	10,312 FT.

Figure A2. Cast-In-Place Option #1.



	STORAGE AREA	TOTAL AREA	OUTER DIKE PERIMETER	CENTERLINE DIKE PERIMETER
CAST-IN-PLACE- OPTION #2 FILL CELL (ESTIMATED)	83 ACRES	149 ACRES	10,994 FT.	9,798 FT.
CAST-IN-PLACE- OPTION #2 DISPOSAL CELL (ESTIMATED)	39 ACRES	90 ACRES	8,837 FT.	7,501 FT.

Figure A3. Cast-In-Place Option #2.



	STORAGE AREA	TOTAL AREA	OUTER DIKE PERIMETER	CENTERLINE DIKE PERIMETER
FLOAT-IN-PLACE- OPTION #1 FILL CELL (ESTIMATED)	109 ACRES	184 ACRES	12,457 FT.	11,295 FT.
FLOAT-IN-PLACE- OPTION #1 DISPOSAL CELL (ESTIMATED)	101 ACRES	171 ACRES	11,623 FT.	10,312 FT.

Figure A4. Float-In-Place Option #1.

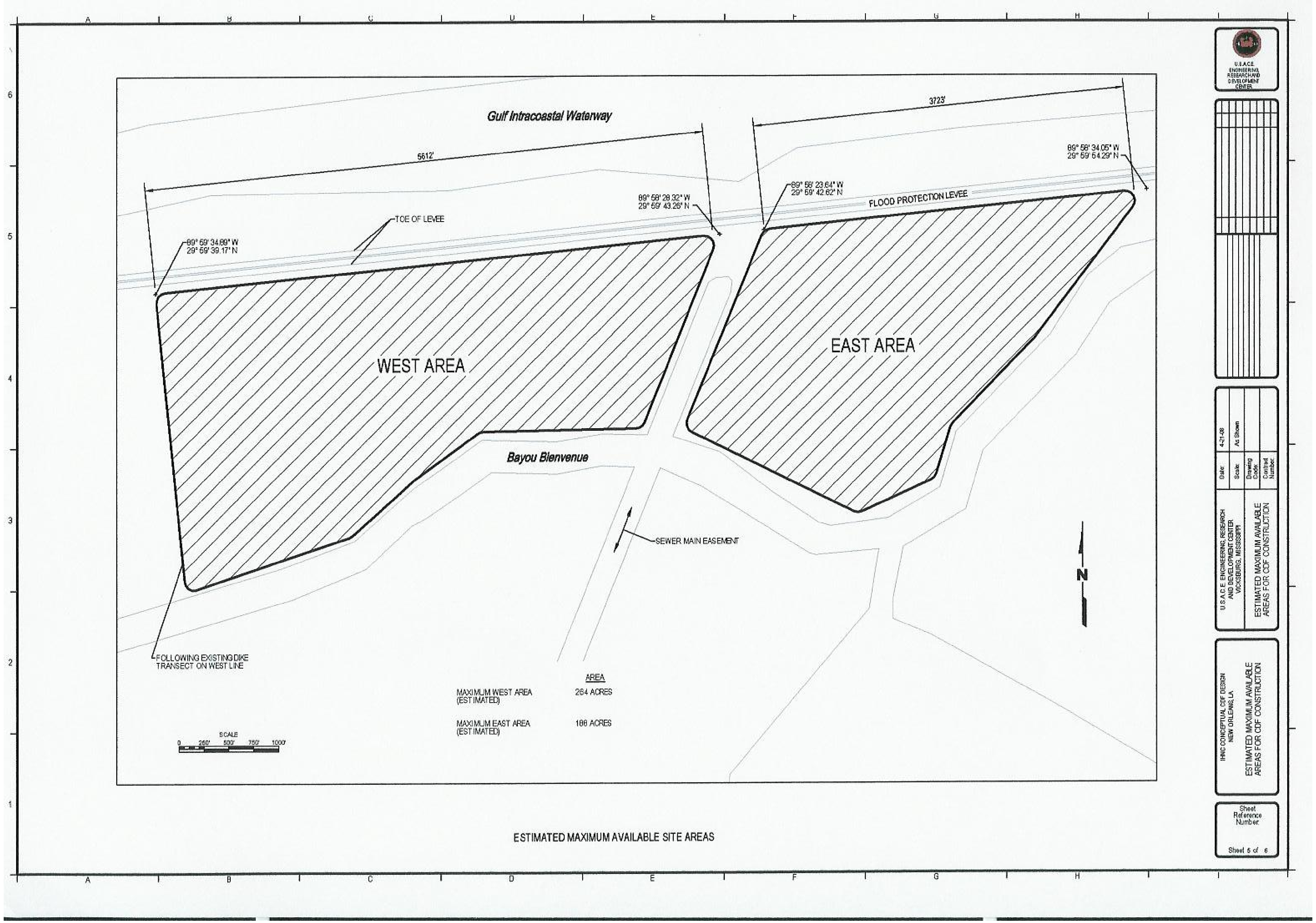


Figure A5. Estimated Maximum Available Site Areas.

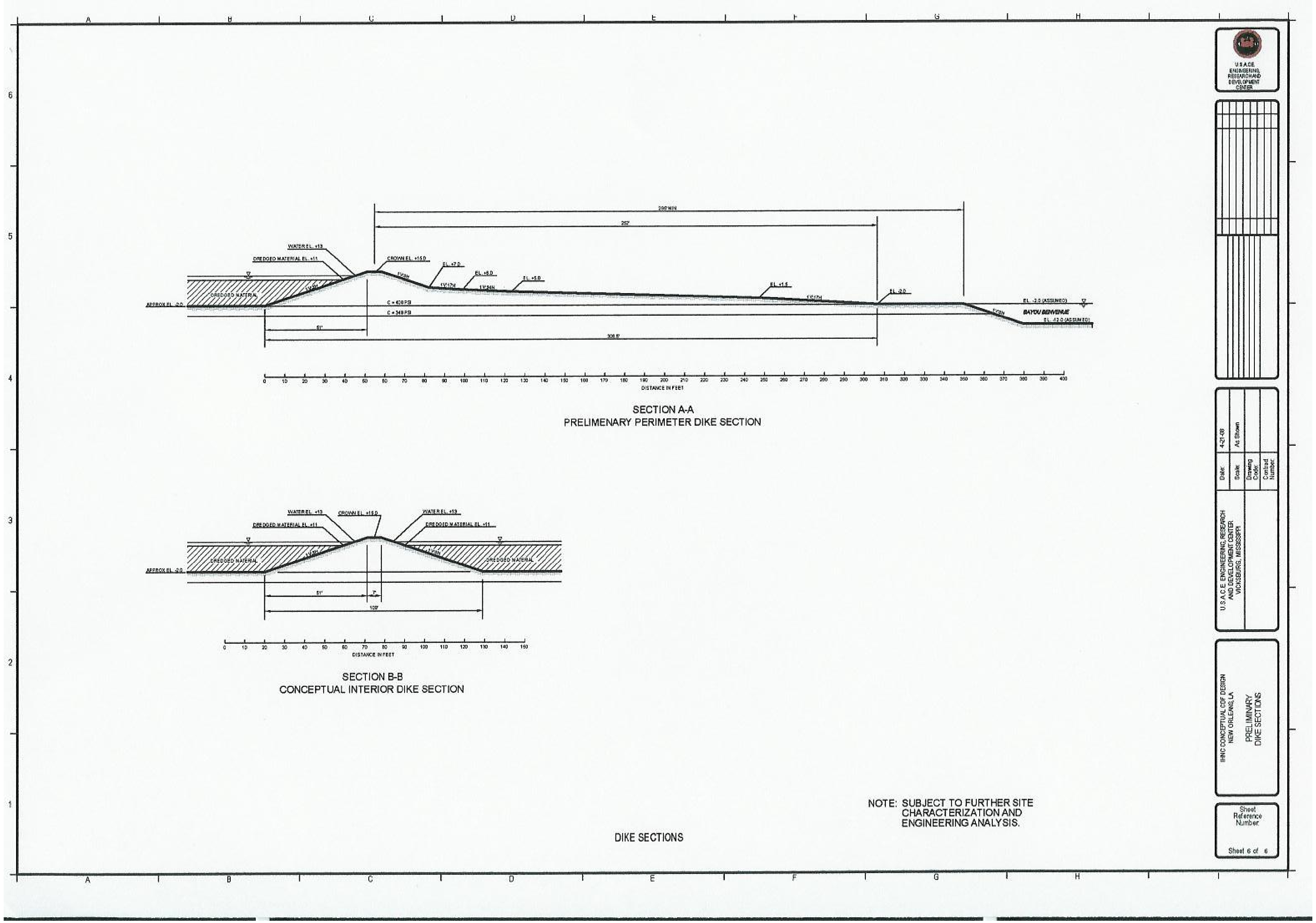


Figure A6. Dike Sections.

Figure A7. Site rendering.

Appendix B
CDF Management

Operation and Management of Containment Areas

General Considerations

Management activities are required before, during, and following the dredging operation to maximize the retention of suspended solids and the storage capacity of the areas. These activities include site preparation, removal and use of existing dredged material for construction purposes, surface water management, suspended solids monitoring, inlet and weir management, thin-lift placement, separation of coarse material, dredged material dewatering, and disposal area reuse management. Management activities described in this part are not applicable in all cases, but should be considered as possibilities for improving the efficiency and prolonging the service life of containment areas.

Predredging Management Activities

1. Site Preparation. Immediately before a disposal operation, the desirability of vegetation within the containment area should be evaluated. Although vegetation may be beneficial because it helps dewater dredged material by transpiration and may improve the effluent quality by filtering, very dense vegetation may severely reduce the available storage capacity of the containment area and may restrict the flow of dredged slurry throughout the area, causing short-circuiting. Irregular topography within the containment area will directly affect resulting topography of the dredged material surface following the dredging operation. It may be beneficial to grade existing topography from planned inlet locations toward the weir locations to facilitate drainage of the area.
2. Use of Existing Dredged Material. If dikes must be strengthened or raised to provide adequate storage capacity for the next lift of dredged material, the use of the dried dredged material or suitable construction material from within the containment for this purpose will be beneficial. In addition to eliminating the costs associated with the acquisition of borrow, additional storage capacity is generated by removing material from within the area. Consideration should also be given to the use of any coarse-grained material present from previous dredging operations for

underdrainage blankets or for other planned applications requiring more select material.

3. Placement of Weirs and Inflow Points.
    a. General placement for site operation and management control. Outflow weirs are usually placed on the site perimeter adjacent to the water or at the point of lowest elevation. The dredge pipe inlet is usually located as far away as practicable from these outflow weirs or at a location closest to the dredging areas. However, these objectives may sometimes be conflicting. If the disposal area is large or if it has irregular foundation topography, considerable difficulty may be encountered in properly distributing the material throughout the area and obtaining the surface elevation gradients necessary for implementation of a surface trenching program. One alternative is to use interior or cross dikes to subdivide the area and thus change the large area into several smaller areas. Effective operation may require that the dredge pipe location be moved periodically from one part of the site to another, to ensure a proper filling sequence and obtain proper surface elevation gradients. Also, shifting inflow from one point of the site to another and changing outflow weir location may facilitate obtaining a proper suspended solids concentration in disposal site effluent.
    b. Installation and operation of multiple outflow weirs. In conjunction with provisions for moving the inflow point over the disposal site, it may also be worthwhile to contemplate installation of more outflow weirs than would be strictly required by design methods. Availability of more outflow points allows greater flexibility in site operation and subsequent drainage for dewatering, as well as greater freedom in movement of dredge inflow points while still maintaining the flow distances required to obtain satisfactory suspended solids concentrations in disposal site effluent. Also, a higher degree of flexibility in both disposal site inflow and outflow control will allow operation of the area in such a manner that desired surface topography can be produced, facilitating future surface trenching operations.
4. Improvement of Site Access.
    a. Adequate provisions for site access are essential when the long-term operation and management plan for a disposal site includes provision for future dewatering activities and/or removal of dewatered material for dike raising or other productive use. General considerations for site access may include:
        (1) Access roads on or adjacent to perimeter and interior dikes.

    (2) Crossing points on interior ditches used for drainage or dewatering.
    (3) Access for equipment and personnel to reach weir structures for repair or maintenance.
    (4) Ramps for access onto dikes from both inside and outside dike faces.
    (5) Ramps for pipelines leading to inflow points.
    (6) Equipment turnarounds.
    (7) Stockpiles of materials for sandbagging and emergency dike repairs.
    (8) Offloading ramps for equipment transported by water.
  b. If future borrow of interior dewatered dredged material is contemplated, it may be most cost-effective to construct small access roads into the area, as a substructure for future haul roads or dragline access. Such stable platforms may be covered with some fine-grained dredged material, but their emplacement in the disposal area will allow subsequent equipment operation without immobilization.

Management During Disposal

1. Surface Water Management.
   a. The management of surface water during the disposal operation can be accomplished by controlling the elevation of the outlet weir(s) throughout the disposal operation to regulate the depth of water ponded within the containment area. Proper management of surface water is required to ensure containment area efficiency.
   b. At the beginning of the disposal operation, the outlet weir is set at a predetermined elevation to ensure that the ponded water will be deep enough for settling as the containment area is being filled. As the disposal operation begins, slurry is pumped into the area; no effluent is released until the water level reaches the weir crest elevation. Effluent is then released from the area at about the same rate as slurry is pumped into the area. Thereafter, the ponding depth decreases as the thickness of the dredged material deposit increases. After completion of the disposal operation and the activities requiring ponded water, the water is removed as quickly as effluent water quality standards will allow. Figure B1 illustrates the concept.

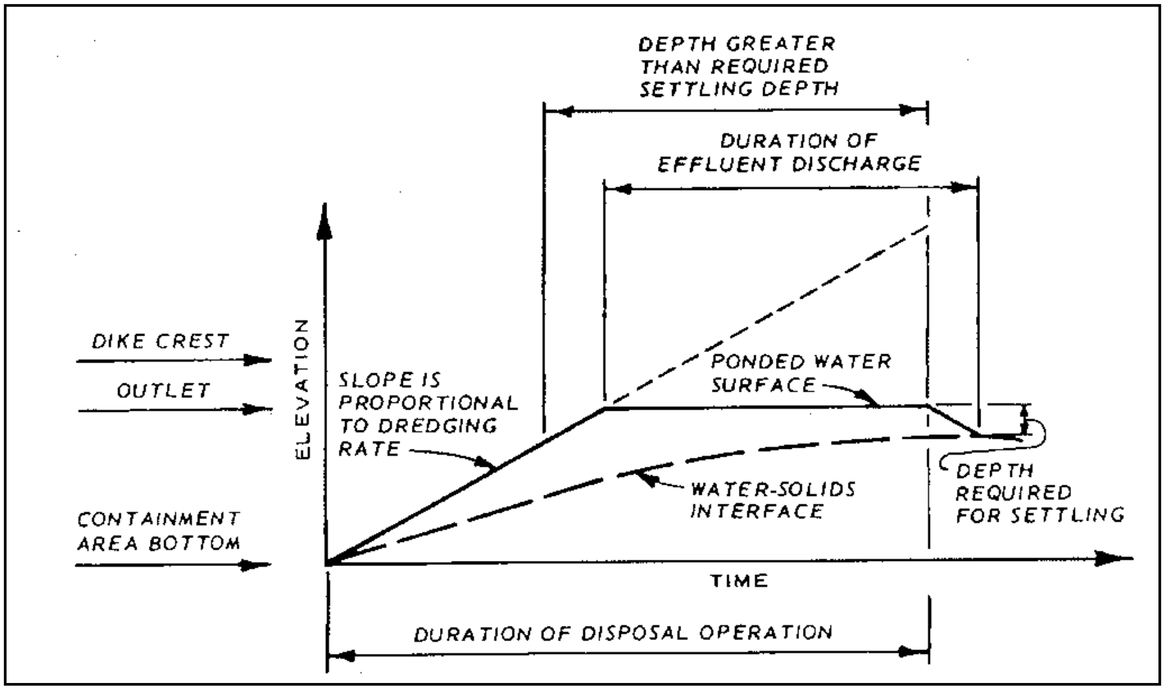


Figure B1. Surface water management.

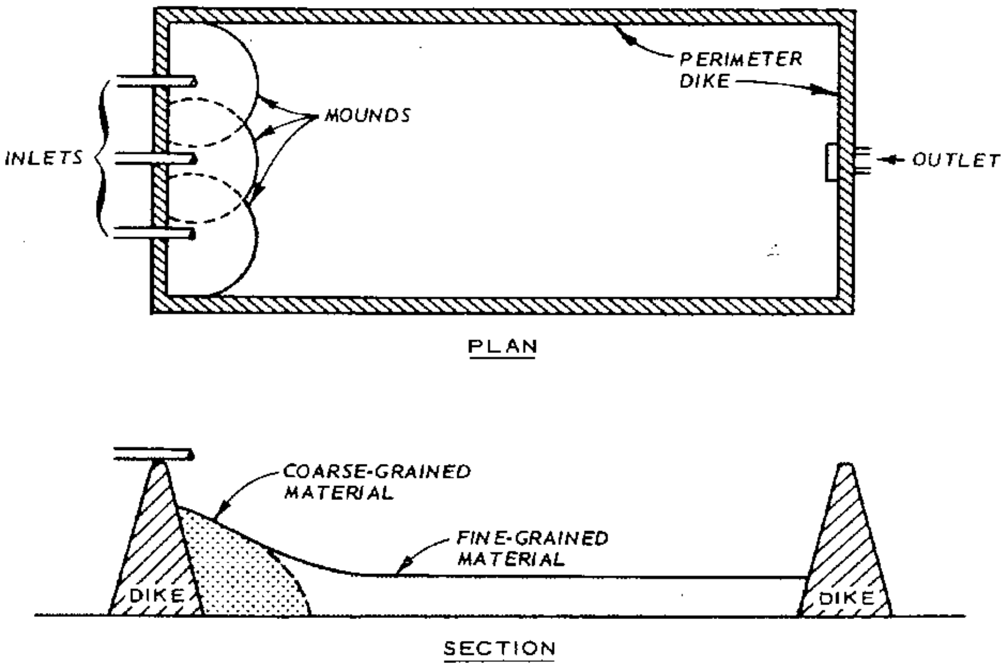
2. Suspended Solids Monitoring. A well-planned monitoring program during the entire dredging and decanting operation is desirable to ensure that effluent suspended solids remain within acceptable limits or to verify conditions for future design or site evaluations. Since suspended solids concentrations are determined on a grams per liter basis requiring laboratory tests, it is desirable to complete a series of laboratory tests during the initial stages of operation. Indirect indicators of suspended solids concentration, such as visual comparison of effluent samples with samples of known concentration or utilization of a properly calibrated instrument, may then be used during the remainder of the operation, supplemented with laboratory determination of effluent solids concentrations as needed for record purposes.
   a. Samples of both inflow and outflow can be taken for laboratory tests.
   b. When the dredging operation commences, samples should be taken from the inlet pipe at approximately 12-hour intervals to verify design assumptions. Effluent quality samples should be taken periodically at approximately 6-hour intervals during the dredging operation for laboratory solids determinations to supplement visual estimates of effluent suspended solids concentrations. The sampling interval may be changed based on the observed efficiency of the containment area and the variability of the effluent suspended solids concentrations.

  More frequent sampling will be necessary as the containment area is filled and effluent concentrations increase.

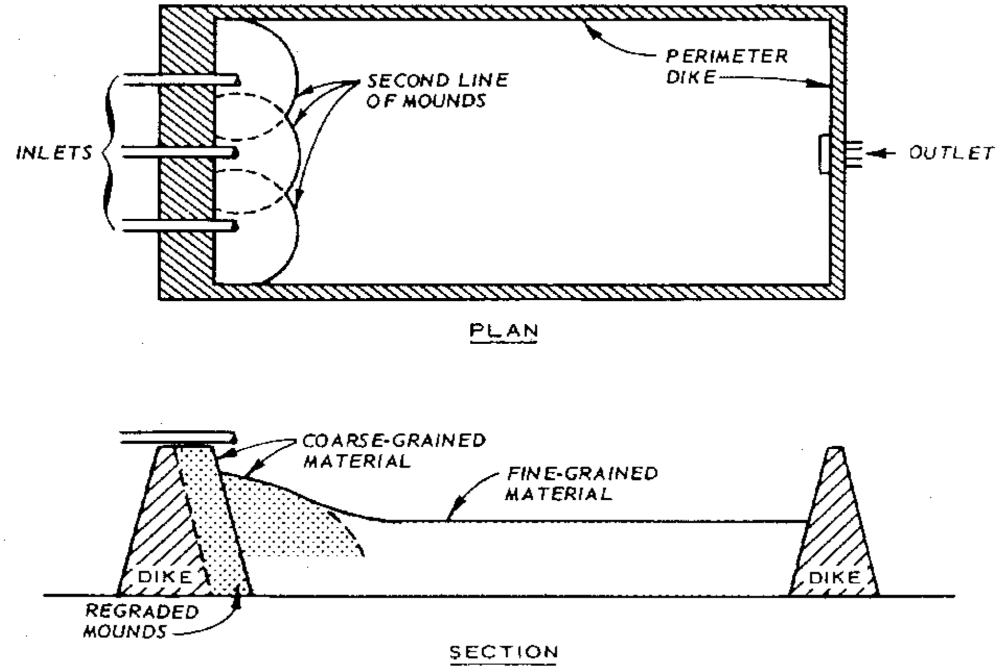
3. Inlet and Weir Management.
   a. If multiple weirs are used, discharging the weirs alternately is sometimes useful for preventing short-circuiting. As the area between the inlet and one outlet fills or as the inlet location is moved, the flow may channelize in a more or less direct route from inlet to weir. If this occurs, the flow should be diverted to another weir. Simultaneous discharge of slurry from several inlets located on the perimeter can also be advantageous, because the lower velocity of the slurry flow results in more pronounced mounding around the edge of the containment area. This mounding in turn increases the slope from inlet to outlet, and drainage will be improved.
   b. The removal of water following the dredging operation can be somewhat expedited by managing inlets and weirs during the disposal operation to place a dredged material deposit that slopes continually and as deeply as practical toward the outlets. Figure B2 shows a containment area with a weir in one end and an inlet zone in the opposite end. Inlets are located at various points in the inlet zone, discharging either simultaneously (multiple inlets) or alternately (single movable inlet or multiple inlets discharging singly). A common practice is to use a single inlet, changing its location between disposal operations. The result of this practice is the buildup of several mounds, one near each inlet location. By careful management of the inlet locations, a continuous line of mounds can be constructed, as shown in Figure B2. When the line of mounds is complete, the dredged material will slope downward toward the weir. If the mound area is graded between disposal operations, the process can then be repeated by extending the pipe over the previous mound area and constructing a new line of mounds, as shown in Figure B2.
4. Thin-Lift Placement of Dredged Material. Gains in long-term storage capacity of containment areas through natural drying processes can be increased by placing the dredged material in thin lifts. Thin-lift placement also greatly enhances potential gains in capacity through active dewatering and disposal area reuse management programs.
   a. One approach to placing dredged material in thin lifts is to obtain sufficient land area to ensure adequate storage capacity without the need for thick lifts. Implementation of this approach requires careful long-range planning to ensure that the large land area is used effectively for dredged material dewatering, rather than simply being a

containment area whose service life is longer than that of a smaller area.

b. Large containment areas, especially those used nearly continuously, are difficult to manage for effective natural drying of dredged material. The practice of continuous disposal does not allow sufficient time for natural drying. However, dividing a large containment area into several compartments can facilitate operation because each compartment can be managed separately so that some compartments are being filled while the dredged material in others is being dewatered.



a. First Line of Mounds



b. Second Line of Mounds

Figure B2. Inlet-weir management to provide smooth slope for inlet to weir

Postdredging Management Activities

1. Periodic site inspections and continuous site management following the dredging operation are desirable. Once the dredging operation has been completed and the ponded water has been decanted, site management efforts should be concentrated on maximizing the containment storage capacity gained from continued drying and consolidation of dredged material and foundation soils. To ensure that precipitation does not pond water, the weir crest elevation must be kept at levels allowing efficient release of runoff water. This will require periodic lowering of the weir crest elevation as the dredged material surface settles.
2. Removal of ponded water will expose the dredged material surface to evaporation and promote the formation of a dried surface crust. Some erosion of the newly exposed dredged material may be inevitable during storm events; however, erosion will be minimized once the dried crust begins to form within the containment area.
3. Natural processes often need man-made assistance to effectively dewater dredged material since dewatering is greatly influenced by climate and is relatively slow. When natural dewatering is not acceptable for one reason or another, then additional dewatering techniques should be considered.

Dredged Material Dewatering Operations

1. General.
    a. Surface trenching for improved drainage and use of underdrains are the only technically feasible and economically justifiable dewatering techniques for dredged material containment areas. The use of underdrains has been successfully applied on a small scale; however, their use in large disposal areas has not been proven economical as compared with surface drainage techniques. Accordingly, this section describes only techniques recommended for improvement of surface drainage through trenching.
    b. Four major reasons exist for dewatering fine-grained dredged material placed in confined disposal areas:
        (1) Promotion of shrinkage and consolidation, leading to creation of more volume in the existing disposal site for additional dredged material.
        (2) Reclamation of the dredged material into more stable soil form for removal and use in dike raising, other engineered construction, or other productive uses, again creating more available volume in the existing disposal site.

        (3) Creation of stable fast land at a known final elevation and with predictable geotechnical properties.
        (4) Benefits for control of mosquito breeding.
2. Conceptual Basis for Dewatering by Progressive Trenching. The following mechanisms were found to control evaporative dewatering of fine-grained dredged material placed in confined disposal areas:
    a. Establishment of good surface drainage allows evaporative forces to dry the dredged material from the surface downward, even at disposal area locations where precipitation exceeds evaporation (negative net evaporation).
    b. The most practical mechanism for precipitation removal is by runoff through crust desiccation cracks to surface drainage trenches and off the site through outlet weirs.
    c. To maintain effective drainage, the flow-line elevation of any surface drainage trench must always be lower than the base of crust desiccation cracks; otherwise, ponding will occur in the cracks. As drying occurs, the cracks will become progressively deeper.
    d. Below the desiccation crust, the fine-grained subcrust material may be expected to exist at water contents at or above the liquid limit (LL). Thus, it will be difficult to physically construct trenches much deeper than the bottom of the adjacent desiccation crust.
    e. To promote continuing surface drainage as drying occurs, it is necessary to progressively deepen site drainage trenches as the water table falls and the surface crust becomes thicker; thus, the name "progressive trenching" was developed for the concept.
    f. During conduct of a progressive trenching program, the elevation difference between the internal water table and the flow line of any drainage trench will be relatively small. When the relatively low permeability of fine-grained dredged material is combined with the small hydraulic gradient likely under these circumstances, it appears doubtful that appreciable water can be drained from the dredged material by gravity seepage. Thus, criteria for trench location and spacing should be based on site topography so that precipitation is rapidly removed and ponding is prevented, rather than to achieve marked drawdown from seepage.
3. Effects of Dewatering. The net observable effects of implementing any program of dewatering by improved surface drainage will be as follows:
    a. Disappearance of ponded surface water.
    b. Runoff of the majority of precipitation from the site within a few hours.
    c. Gradual drying o f the dredged material to more stable soil form.

   d. Vertical settlement of the surface of the disposal area.
   e. Ability to work within the disposal area with conventional equipment.
4. Initial Dewatering (Passive Phase).
   a. Once the disposal operation is completed, dredged material usually undergoes hindered sedimentation and self-weight consolidation (called the "decant phase"), and water will be brought to the surface of the consolidating material at a faster rate than can normally be evaporated, During this phase, it is extremely important that continued drainage of decant water and/or precipitation through outlet weirs be facilitated. Weir flow-line elevations may have to be lowered periodically as the surface of the newly placed dredged material subsides.
   b. Once the fine-grained dredged material approaches the decant point water content, or saturation limit as described previously, the rate at which water is brought to the surface will gradually drop below the climatic evaporative demand. If precipitation runoff through site outflow weirs is facilitated, a thin drying crust or skin will form on the newly deposited dredged material. The thin skin may be only several hundredths of a foot thick, but its presence may be observed by noting small desiccation cracks that begin to form at 3- to 6-foot intervals, as shown in Figure B3. Once the dredged material has reached this consistency, active dewatering operations may be initiated.
5. Dewatering by Progressive Trenching.
   a. Three procedures have been found viable to initiate active dredged material dewatering by improved surface drainage, once the material has achieved consistency conditions shown in Figure B3: periodic perimeter trenching by dragline, with draglines working initially from perimeter dikes and subsequently from berms established inside the perimeter dikes; periodic interior site trenching; or a combination of these two methods. This section presents information necessary to properly conduct dewatering operations by these procedures. Only the last two procedures will result in total site dewatering at the maximum rates. The first procedure would have, in many instances, an effective interior dewatering rate considerably less than the predicted maximum rate, though the exact lower rate would be highly site-specific.

Figure B3. Surface of fine-grained dredged material at the earliest time when surface trenching should be attempted; initial cracks are spaced at 3- to 6-foot intervals, and the surface water content approaches 1.8 x LL

b. Perimeter dragline trenching operations.

   (1) Construction of trenches around the inside perimeter of confined disposal sites is a procedure that has been used for many years to dewater and/or reclaim fine-grained dredged material. In many instances, the purpose of dewatering has been to obtain convenient borrow for use in perimeter dike raising activities. Draglines and backhoes have been found to be adaptable to certain activities because of their relatively long boom length and/or method of operation and control. The perimeter trenching scheme should be planned carefully so as not to interfere with operations necessary for later dewatering or other management activities.

   (2) When initiating dragline trenching operations, the largest size, longest boom length dragline that can be transported efficiently to the disposal site and can operate efficiently on top of disposal site dikes should be obtained. Operations should begin at an outflow weir location, where the dragline, operating from the perimeter dike, should dig a sump around the weir extending into the disposal area to maximum boom and bucket reach. The very wet excavated material is cast against the interior side of the adjacent perimeter dike. It may be necessary to board up the weir to prevent the very

wet dredged material from falling into the weir box during the sump-digging operation. A localized low spot some 1 or 2 inches in elevation below the surrounding dredged material can be formed. Once the sump has been completed, weir boards should be removed to the level of the dredged material, and, if necessary, handwork should be conducted to ensure that any water flowing into the sump depression will exit through the outflow weir.

(3) Once the sump has been completed, the dragline should operate along the perimeter dike, casting its bucket the maximum practicable distance into the disposal area, dragging material back in a wide shallow arc to be cast on the inside of the perimeter dike. A wide shallow depression 1 to 2 inches lower than the surrounding dredged material will be formed. The cast material will stand on only an extremely shallow (1 vertical on 10 horizontal or less) slope. A small dragline should be able to accomplish between 200 and 400 linear feet of trenching per working day.

(4) Dredged material near the ditch edge will tend to dry slightly faster than material located farther out in the disposal site, with resulting dredged material shrinkage giving a slight elevation gradient from the site interior toward the perimeter trenches, also facilitating drainage (Figure B4). In addition, desiccation crack formation will be more pronounced near the drainage trenches, facilitating precipitation runoff through the cracks to the perimeter trenches.

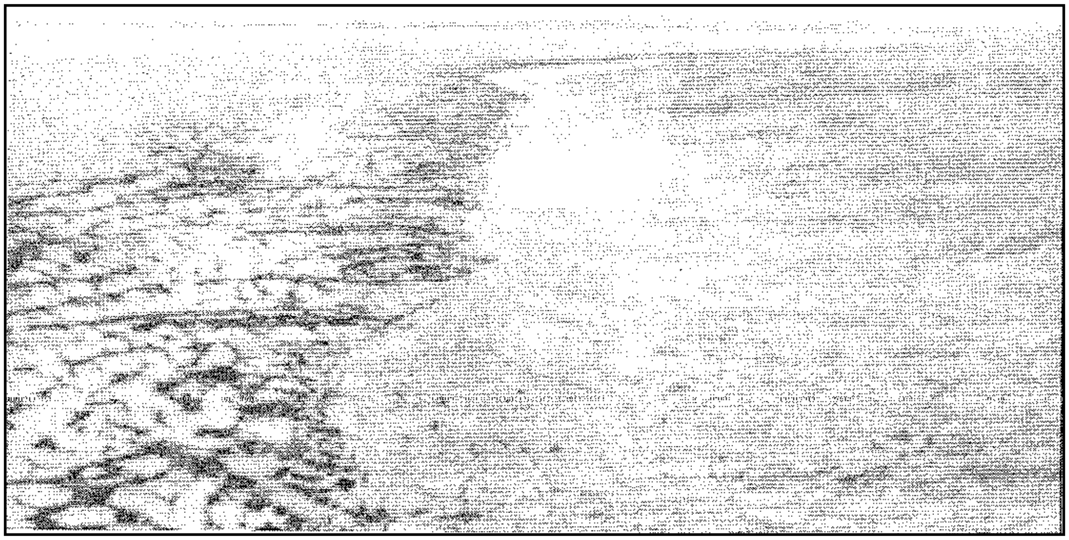


Figure B4. Shallow initial perimeter trench constructed by dragline operating from perimeter dike.

(5) Once appreciable desiccation drying has occurred in the dredged material adjacent to the perimeter trench and the material cast on the interior slope of the perimeter dike has dried, the perimeter trenches and weir sumps should be deepened. The exact time between initial and secondary trench deepening will vary according to the engineering properties of the dredged material and existing climatological conditions, ranging from 2 or 3 weeks during hot, dry summer months up to 8 or 10 weeks in colder, wetter portions of the year. Inspection of the existing trenches is the most reliable guideline for initiating new trench work, since desiccation cracks 1 or 2 inches deep should be observed in the bottom of existing trenches before additional trenching is begun. Depending on the size of the disposal area, relative costs of mobilization and demobilization of dragline equipment, and the relative priority and/or need for dewatering, it may prove convenient to employ one or more draglines continuously over an interval of several months to periodically work the site. A second trenching cycle should be started upon completion of an initial cycle, a third cycle upon completion of the second cycle, etc., as needed.

(6) During the second trenching, wide shallow trenches with a maximum depth of 2 to 6 inches below the surface of adjacent dredged material can be constructed, and sumps can be dug to approximately 8 to 12 inches below surrounding dredged material. These deeper trenches will again facilitate more rapid dewatering of dredged material adjacent to their edges, with resulting shrinkage and deeper desiccation cracks providing a still steeper drainage flow gradient from the site Interior to the perimeter trenches.

(7) After two or perhaps three complete periodic perimeter dragline trenching cycles, the next phase of the trenching operation may be initiated. In this phase, the dragline takes the now dry material placed on the interior of the perimeter dike and spreads it to form a low berm adjacent to the dike inside the disposal area. The dragline then moves onto this berm, using single or double mats if required and using the increased digging reach now available, and widens and extends the ditch into the disposal site interior, as shown in Figure B5. The interior side of the ditch is composed of material previously dried, and a ditch 12 to 18 inches deep may be constructed, as shown in Figure B6. Material excavated from this trench is again cast on the interior slope of the perimeter dike to dry

and be used either for raising the perimeter dike or for subsequent berming farther into the disposal area.

(8) After two or more additional periodic trench deepenings, working from the berm inside the disposal area, trenches up to 3 to 5 feet deep may be completed. Trenches of this depth will cause accelerated drying of the dredged material adjacent to the trench and produce desiccation cracks extending almost the entire thickness of the adjacent dredged material, as shown in Figure B7. A well-developed perimeter trench network leading to outflow weirs is now possible, as shown in Figure B8, and precipitation runoff is facilitated through gradual development of a network of desiccation cracks which extend from the perimeter trenches to the interior of the site.

(9) Once a perimeter trench system such as that shown in Figure B8 is established, progressive deepening operations should be conducted at less frequent intervals, and major activity should be changed from deepening perimeter trenches and weir sumps to that of continued inspection to make sure that the ditches and sumps remain open and facilitate free drainage. As a desiccation crack network develops with the cracks becoming wider and deeper, precipitation runoff rate will be increased and precipitation ponding in the site interior will be reduced. As such ponding is reduced, more and more evaporative drying will occur, and the desiccation crack network will propagate toward the disposal area interior. Figure B8 is a view of the 500-acre Morris Island Disposal Site of the Charleston District, where a 3-foot lift of dredged material was dewatered down to approximately a 1.7-foot thickness at the perimeter over a 12-month period by an aggressive program, undertaken by the District, of site drainage improvement with dragline perimeter trenching. Figure B9 shows the 12-inch desiccation crust achieved at a location approximately 200 yards from the disposal area perimeter. The dredged material was a CH clay with an LL over 100. However, despite the marked success with perimeter trenching, a close inspection of Figure B8 shows that ponded water still exists in the site interior.

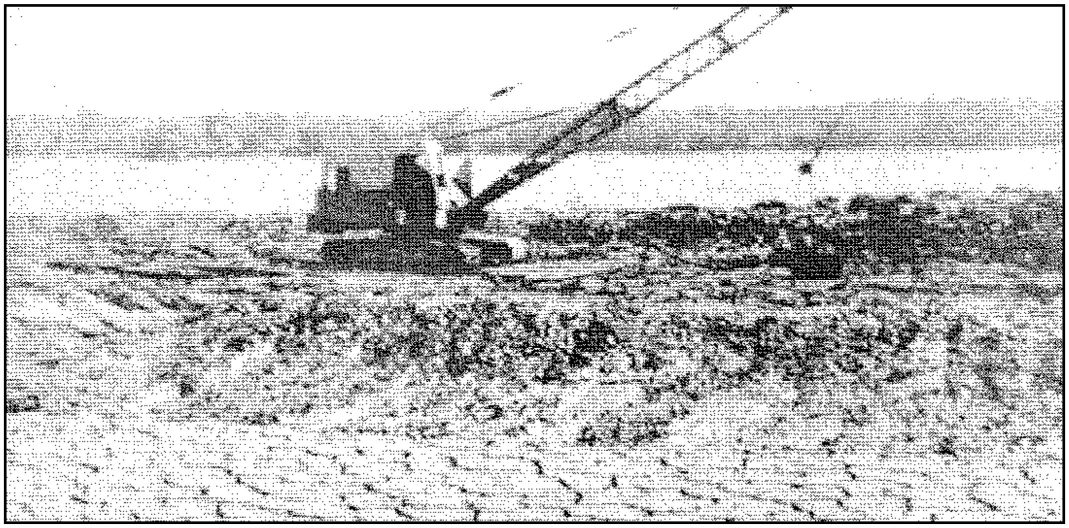


Figure B5. Small dragline on mats working on berm deepens shallow perimeter drainage trench.

Figure B6. Construction of ditch 12 to 18 inches deep with excavated material cast on interior slope of perimeter dike.

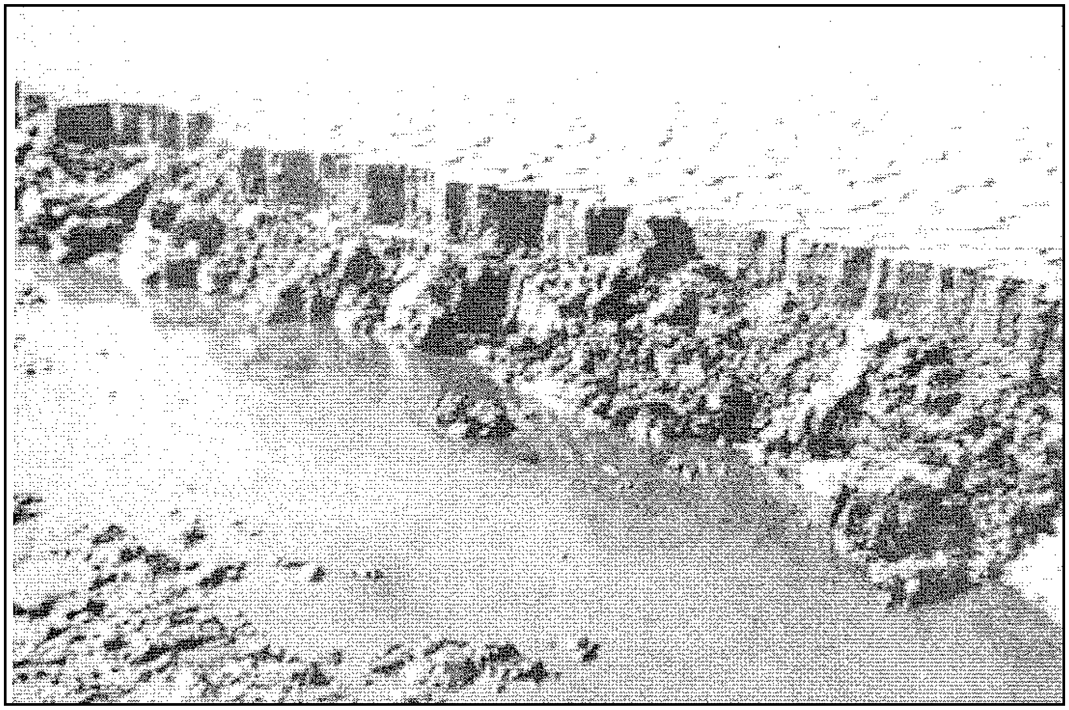


Figure B7. Desiccation crust adjacent to perimeter 3- to 5-foot-deep drainage trench.

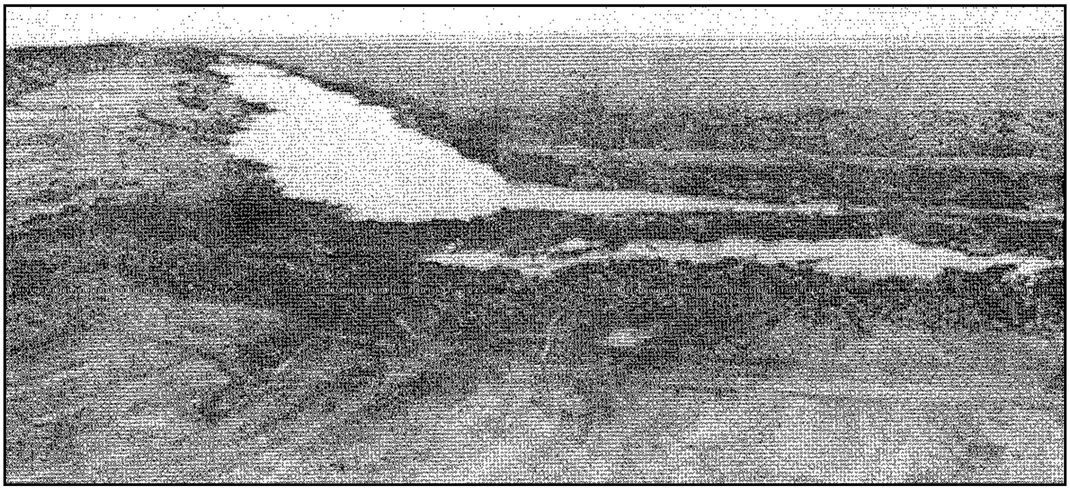


Figure B8. A well-developed perimeter trenching system, Morris Island Disposal Site, Charleston District.

Figure B9. Desiccation crust achieved in highly plastic clay dredged material 200 yards into disposal area by perimeter trenching over 12-month period.

c. Interior trenching.
   (1) Riverine utility craft. The high water content of dredged material during the initial dewatering stages requires the use of some type of amphibious or low-ground-pressure equipment for construction of trenches in the site interior. The Riverine Utility Craft (RUC), an amphibious vehicle using twin screws for propulsion and flotation, can successfully construct shallow trenches in fine-grained dredged material shortly after formation of a thin surface crust. It can also be effective in working with other equipment in constructing sump areas around outflow weirs for collection of surface water. The RUC was initially developed in the 1960's as a reconnaissance vehicle for military applications and was used on an experimental basis for trenching operations. RUC vehicles have since been successfully applied in dewatering operations in the Mobile, Charleston, and Norfolk Districts for both trenching and surveying/sampling applications. Even though this vehicle is perhaps the only tool that can be used to construct shallow trenches in dredged material with little or no developed surface crust, its potential use in dewatering operations is limited. The RUC is susceptible to maintenance problems because of the nature of the drive train and frame, which were not designed for heavy use in trenching operations on a

production basis. The nonavailability of RUC vehicles limits their potential widespread use for routine dewatering operations. Only two vehicles are available Corps-wide. Also, field experience has shown that the early stages of evaporative dewatering and crust development occur at acceptable rates considering only the natural drying processes, perhaps aided by perimeter trenching as described previously. Once a surface crust of 4 to 6 inches has developed, more productive trenching equipment as described in the following paragraphs can be used.

(2) Rotary trenchers. The use of trenching equipment with continuously operating rotary excavation devices and low-ground-pressure chassis is recommended for routine dewatering operations. This type of equipment has been used successfully in dewatering operations in the Savannah District and in the other numerous locations along the Atlantic Coast for mosquito control. The Charleston, Norfolk, and Philadelphia Districts have also used this equipment for dewatering operations. The major features of the equipment include a mechanical excavation implement with cutting wheel or wheels used to cut a trench up to 3 feet deep. The low-ground-pressure chassis may be tracked or rubber tired. The major advantage of rotary trenchers is their ability to continuously excavate while slowly moving within the containment area. This allows them to construct trenches in areas where the use of dragline or backhoe equipment would cause mobility problems. Photographs of tracked and rubber-tired trenchers are shown in Figures B10 and B11. The excavating wheels can be arranged in configurations that create hemispherical or trapezoidal trench cross sections and can throw material to one or both sides of the trench. The material is spread in a thin layer by the throwing action, which allows it to dry quickly and prevents the creation of a windrow which might block drainage to the trench. Photographs of the excavating devices, ongoing trenching operations, and configuration of constructed trenches are shown in Figures B12 through B17. Based on past experience, an initial crust thickness of 4 to 6 inches is required for effective mobility of the equipment. This crust thickness can be easily formed within the first year of dewatering effort if surface water is effectively drained from the area, assisted by perimeter trenches constructed by draglines operating from the dikes. A suggested scheme for perimeter and

interior trenching using a combination of draglines and a rotary trencher or other suitable equipment is shown in Figure B18.

(3) Trench spacing. The minimum number of trenches necessary to prevent precipitation ponding on the disposal area surface should be constructed. These trenches should extend directly to low spots containing ponded water. However, the greater the number of trenches per unit of disposal site area, the shorter the distance that precipitation runoff will have to drain through desiccation cracks before encountering a drainage trench. Thus, closely spaced trenches should produce more rapid precipitation runoff and may slightly increase the rate of evaporative dewatering. Conversely, the greater the number of trenches constructed per unit of disposal site area, the greater the cost of dewatering operations and the greater their impact on subsequent dike raising or other borrowing operations. However, the rotary trenchers have a relatively high operational speed, and it is therefore recommended that the maximum number of drainage trenches be placed consistent with the specific trenching plan selected. Trench spacing of 100 to 200 feet have normally been used. If topographic data are available for the disposal site interior, they may be used as the basis for preliminary planning of the trenching plan.

(4) Parallel trenching. The most common trench pattern would employ parallel trenching. A complete circuit of the disposal area with a perimeter trench is joined with parallel trenches cut back and forth across the disposal area, ending in the perimeter trench. Spacing between parallel trenches can be varied as described above. A parallel pattern is illustrated in Figure B17. A schematic of a parallel trenching pattern with radial combinations is shown in Figure B18.

(5) Radial trenching pattern. Small disposal areas or irregularly shaped disposal areas may be well suited for a radial trenching pattern for effective drainage of water to the weir structures. The radial patterns should run parallel to the direction of the surface slopes existing within the area. Radial trenching patterns can also be used to provide drainage from localized low spots to the main drainage trench pattern. When the disposal area is extremely large in area1 extent or when interior cross dikes or other obstructions exist within the disposal area, sequential sets of radial trenches may be constructed, with the sets farthest into the disposal area interior acting as collectors funneling into one of the radial trenches extending from the outflow weir.

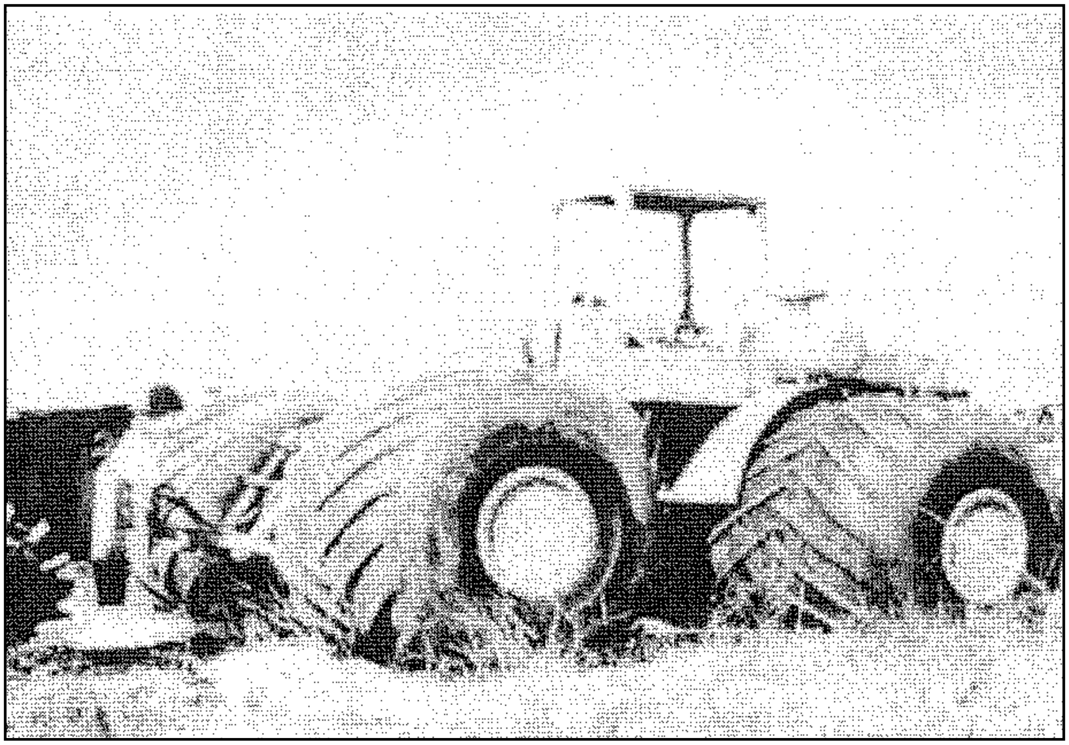


Figure B10. Rubber-tired rotary trencher.

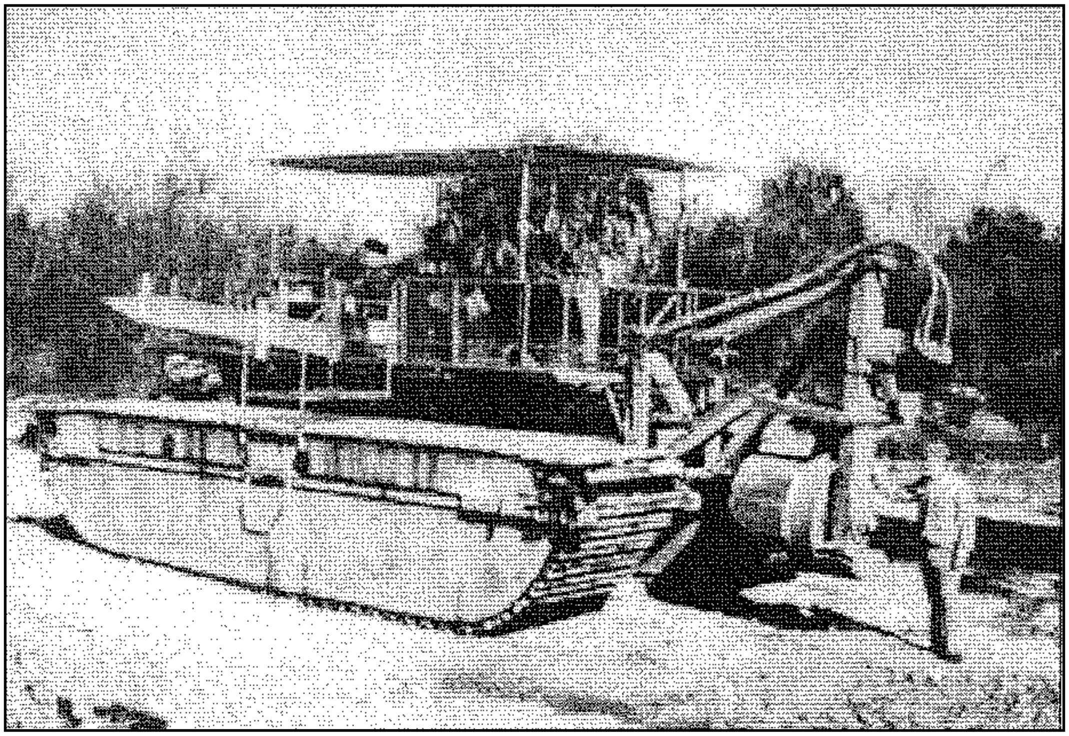


Figure B11. Track-mounted rotary trencher used in mosquito control activities.

Figure B12. View of hemispherical rotary trenching implement

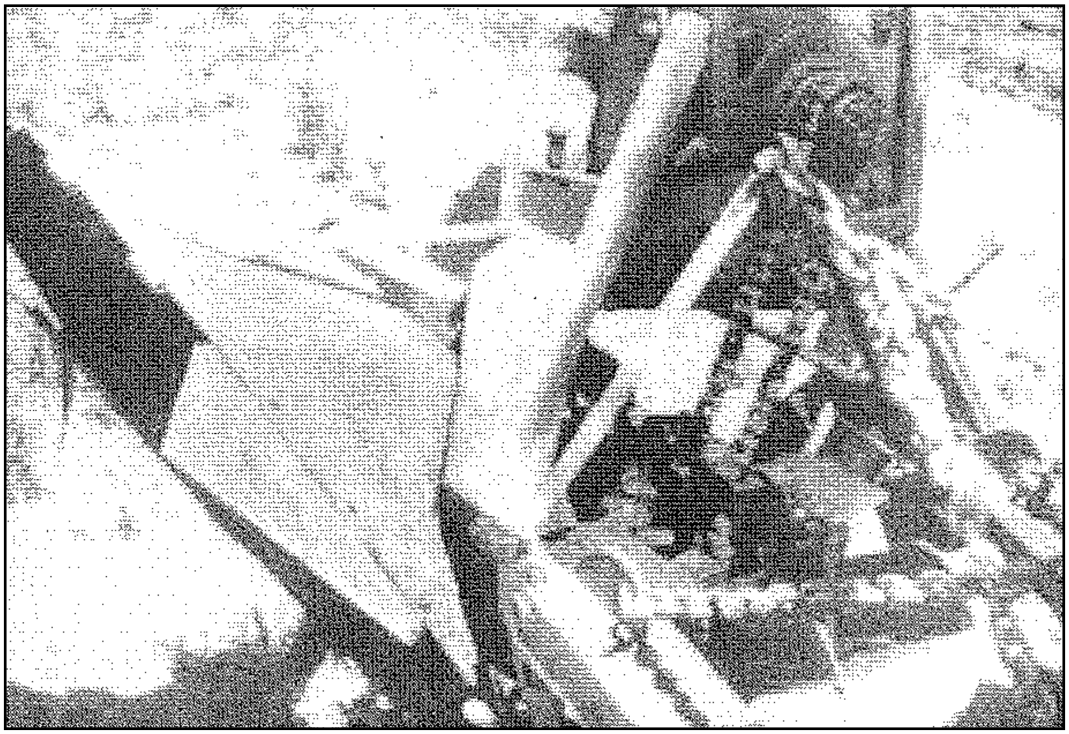


Figure B13. View of the trapezoidal rotary trenching implement.

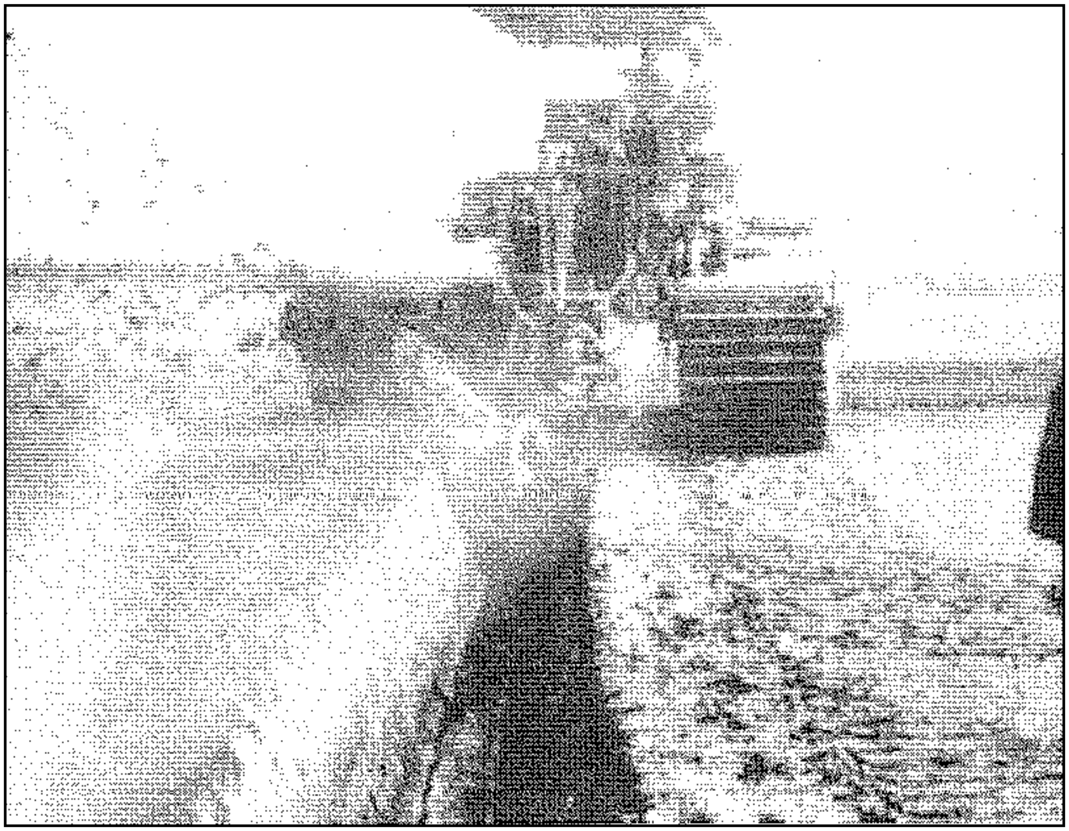


Figure B14. View of rotary trenching device in operation.

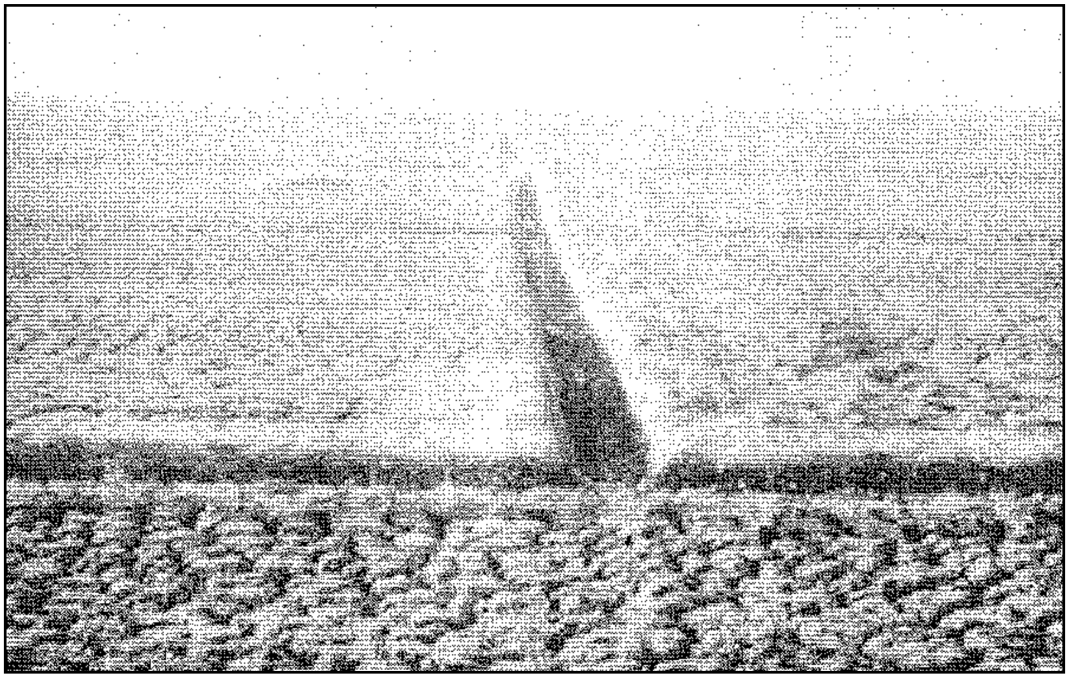


Figure B15. General view of trenches formed by rotary trencher.

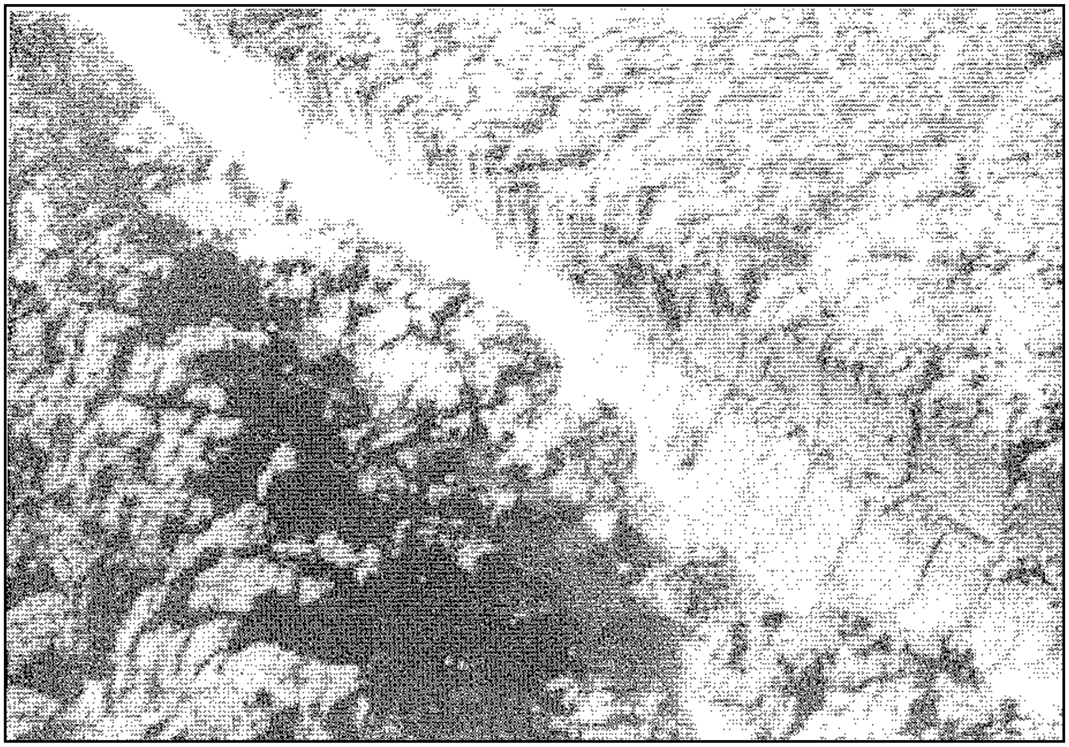


Figure B16. Close-up view of trenches formed by rotary trencher.

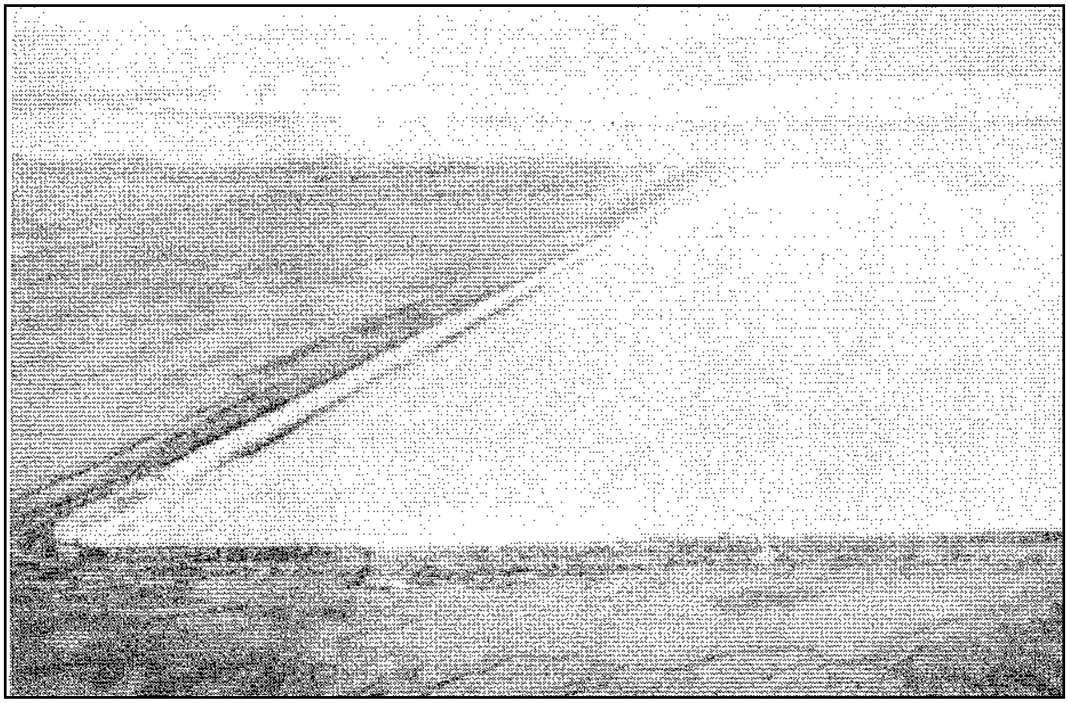


Figure B17. General view of confined disposal area showing parallel trenches in place.

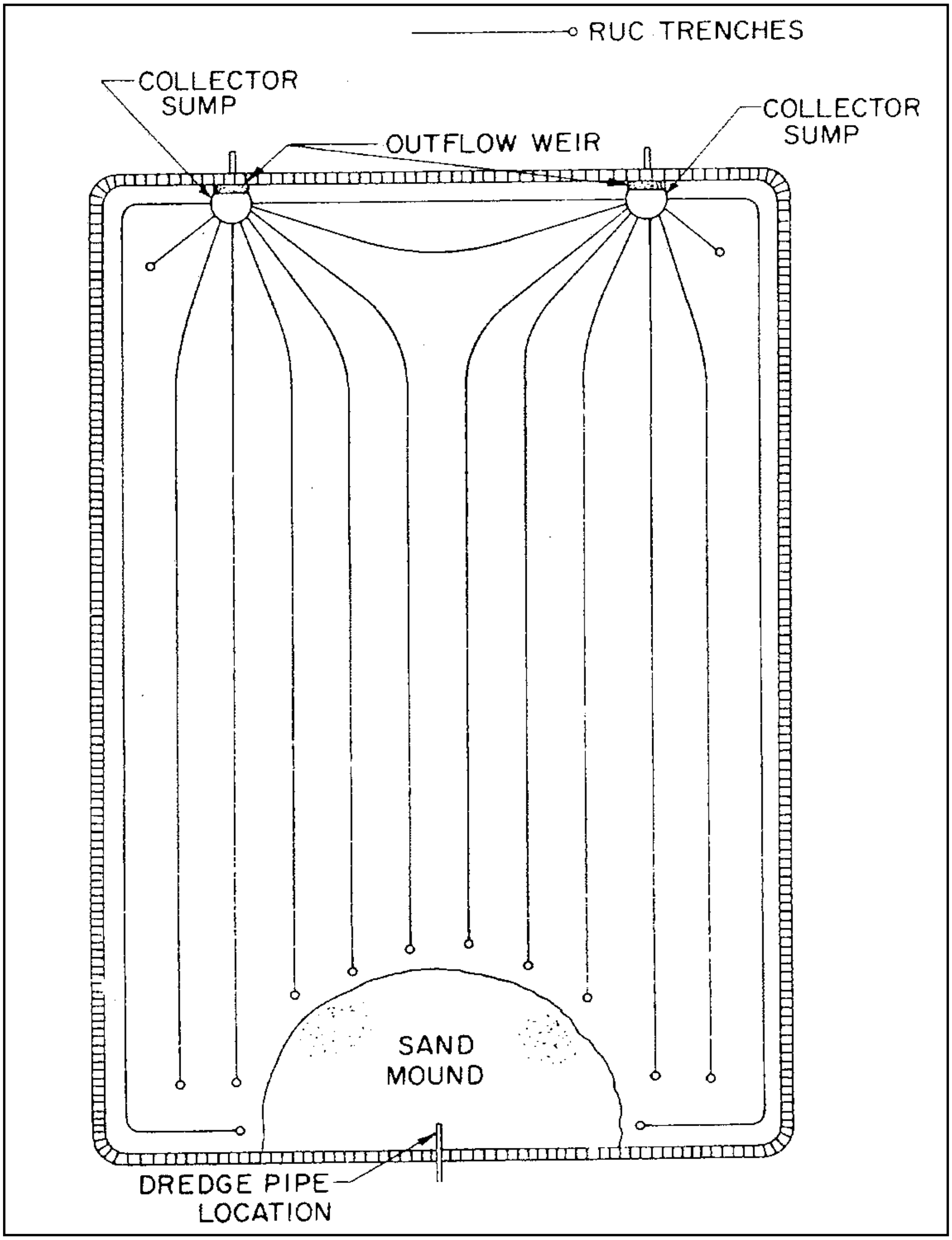


Figure B18. Combination radial-parallel trenching scheme.

Long-Term Management Plans for Containment Areas

1. Adequate dredged material disposal areas are becoming increasingly difficult to secure in many areas of the country. For this reason, it is necessary that the remaining resources of confined disposal sites be

properly utilized and managed. A management plan is a vehicle that can be used to assure the most effective use of containment in future years.

2. The following objectives would normally be set in the plan development:
   a. Maximize volumetric disposal capacity.
   b. Dewater and densify fine,-grained material to the greatest extent feasible.
   c. Reclaim and remove useable material for productive use.
   d. Maintain acceptable water quality of effluent.
   e. Abide by all legal and policy and easement constraints.
3. Development of a management plan should include an extensive evaluation of management alternatives based on data accumulated through field investigations and laboratory testing. Integration of the disposal plan with overall navigation system needs is essential. The plan should be developed using the latest available technical approaches for evaluation of the benefits of management practices.

Appendix C
Cost Estimates

Inner Harbor Navigation Canal Lock Replacement Project

New Orleans, Louisiana

Screening Level Cost Estimates

of the

On-Site Confined Disposal Facility (CDF) Alternatives

Prepared for:

New Orleans District

US Army Corps of Engineers

Prepared by:

Huntington District

US Army Corps of Engineers

May 2008

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COST ANALYSIS

1.1 Alternatives Considered

An alternatives array was developed based on projected construction timelines and dredging volumes for two lock construction methods under consideration for the IHNC lock replacement project (cast-in-place (CIP) and float-in-place (FIP). Confined disposal costs were developed for a total of 3 lock construction/disposal alternative combinations (Table 1).

Table I: Array of Alternatives Estimated

Lock Construction	Disposal Alternative	Cell Type	Cross-Sectional Area (SF/LF)	Total Length (LF)	Dike Volume (ECY)	Average Storage Area (ACR)	Dike Footprint (ACR)	Total Area (ACR)
CIP	1	Disposal	1,964	10,677	920,956	124	76	200
		Fill	1,964	15,533	1,270,498	198	108	306
	2	Disposal	1,964	7,673	708,831	39	57	96
		Fill	1,964	12,234	1,040,986	83	87	170
FIP	1	Disposal	1,964	9,755	862,833	101	71	172
		Fill	1,964	12,864	1,084,852	109	91	200

1.2 Cost Methodology

1.2.1 GENERAL

The Screening Level Cost Estimate for the construction and operation of the confined disposal facility (CDF) for the Inner Harbor Navigation Canal (IHNC) Project has been prepared to an equivalent price level of 1 October 2007 (FY08). The facility would be scaled to accommodate disposal of all dredged material requiring upland disposal, dredged in conjunction with construction of the new lock. The dredge material will be placed in separate cells based upon suitability for open water placement or construction fill. Material demonstrating benthic toxicity will be placed in a separate (disposal) cell from material considered suitable for unrestricted placement. Different dredging volumes and project durations are associated with each construction alternative (CIP and FIP), and these differences are reflected in the cost estimates.

1.2.2 DIRECT COSTS

Direct costs were based on anticipated equipment and labor necessary to conduct the alternatives as scoped and were calculated independent of the contractor assigned to perform the tasks. Following formulation of the direct cost, a determination was made as to whether the work would be performed by the prime contractor or a subcontractor. In this case, all work was assumed to be performed by the prime contractor. In some cases, historical unit prices were used that considered all of these direct cost factors.

Labor-Wage Determination

Labor rates from the IHNC Lock Replacement estimate were used for this analysis. These rates had been finalized during FY 2007. For that project, the total labor rate was developed using the base wage, fringe benefits, Federal Insurance Contributions Act (FICA), Federal Unemployment Tax Act (FUTA), and Workman's Compensation rates for each craft.

Overtime

Overtime is not anticipated and therefore not included.

Equipment Rates

The Equipment Region 3, 2005 library, based on EP 1110-1-8, Construction Equipment Ownership and Operation Expense Schedule was adjusted for current fuel costs and used for equipments.

Crews

Project specific crews have been developed for use in estimating the direct costs of construction for those items not estimated using quotes or historical cost information. Crew members consist of selected complements of labor classifications and equipment pieces assembled to perform specific tasks. Productivity has been assigned to each crew reflective of the expected output per unit of measure for the specific activities listed in the cost estimate.

Material Prices

Historical material prices were used for the majority of this cost estimate.

Quantities

The quantities used in this cost analysis were either provided by ERDC as part of their technical analysis or developed by the cost engineer.

1.2.3 INDIRECT COSTS

Prime Contractor

Field Office Overhead (FOOH)

The indirect costs for Field Office Overhead (FOOH) were included as a percentage of the direct costs based on historical data. For this project, 20% was used for FOOH. This value represents the anticipated prime contractor field overhead costs for such items as project supervision, contractor quality control, contractor field office supplies, personal protective equipment, field engineering, and other incidental field overhead costs.

Home Office Overhead (HOOH)

For Home Office Overhead (HOOH) expense, the cost estimate included an allowance applied as a percentage of direct cost plus field overhead. HOOH included items such as office rental/ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.), insurance, and miscellaneous. In this case, a value of 5% was assumed for the prime contractor.

Profit

Profit was included as a percentage of the direct and indirect costs at the rate of 10%.

Bond

The performance and payment bond costs were included as percentage of the rate 1.5%.

Subcontractors

All work associated with this analysis would likely be performed by the prime contractor. Therefore, no sub contractor costs have been estimated.

1.2.4 ESCALATION

Escalation was not included in this estimate.

1.2.5 CONTINGENCY

Maximum and minimum contingencies were developed by the project delivery team in order to reflect the uncertainties of the design assumptions and to demonstrate a range of costs for each alternative as opposed to a single point estimate. As a result contingencies ranged from a low value of 20% to a high value of 60%. There is some uncertainty regarding how much on-site material will be suitable for dike construction. In addition, dike layout has not been finalized and site sampling to characterize foundation materials has not been completed. The dike length and profile that will be required is therefore preliminary at this point and subject to further modification. Regional availability of materials for dike construction is also uncertain given the present high demand for borrow material to reconstruct flood control levees in New Orleans. As further geotechnical information regarding the foundation and borrow materials required, and engineering design analysis are completed, the estimates will be refined and the contingencies will be reduced.

1.3 Summary

Table II summarizes the estimated alternative costs. While the initial construction costs are somewhat similar among the three alternatives, the Cast-in-Place Alternative #2 is estimated to have the least initial investment by a narrow margin. It is this same alternative, however, that is shown clearly to be the least expensive insofar as operation and maintenance is concerned. As a result, the CIP Alternative #2 is considered to be the least cost alternative.

Table II: Estimated Alternative Cost (PL 1 October 2007)

Alternative	Low Range (20% Contingency)	High Range (60% Contingency)
Cast in Place - Alternative 1	**$33,616,307**	**$44,821,743**
Initial Construction Costs	$20,137,519	$26,850,025
Operation and Maintentance	$13,478,789	$17,971,718
Cast in Place - Alternative 2	**$23,153,315**	**$30,871,086**
Initial Construction Costs	$16,066,157	$21,421,542
Operation and Maintentance	$7,087,158	$9,449,544
Float in Place - Alternative 1	**$29,019,960**	**$38,693,280**
Initial Construction Costs	$17,821,174	$23,761,565
Operation and Maintentance	$11,198,786	$14,931,714

Figure 1 illustrates a range of estimated costs for each alternative. While certain issues remain yet to be addressed in the scope of work and estimate that could significantly affect cost, the common scope elements included in the CDF design for each alternative would strongly suggest that each of the outstanding issues would have a similar impact on the estimated cost of each. Therefore, none of these issues are considered to have the potential to change the conclusion that the least cost CDF alternative is the CIP Alternative #2.

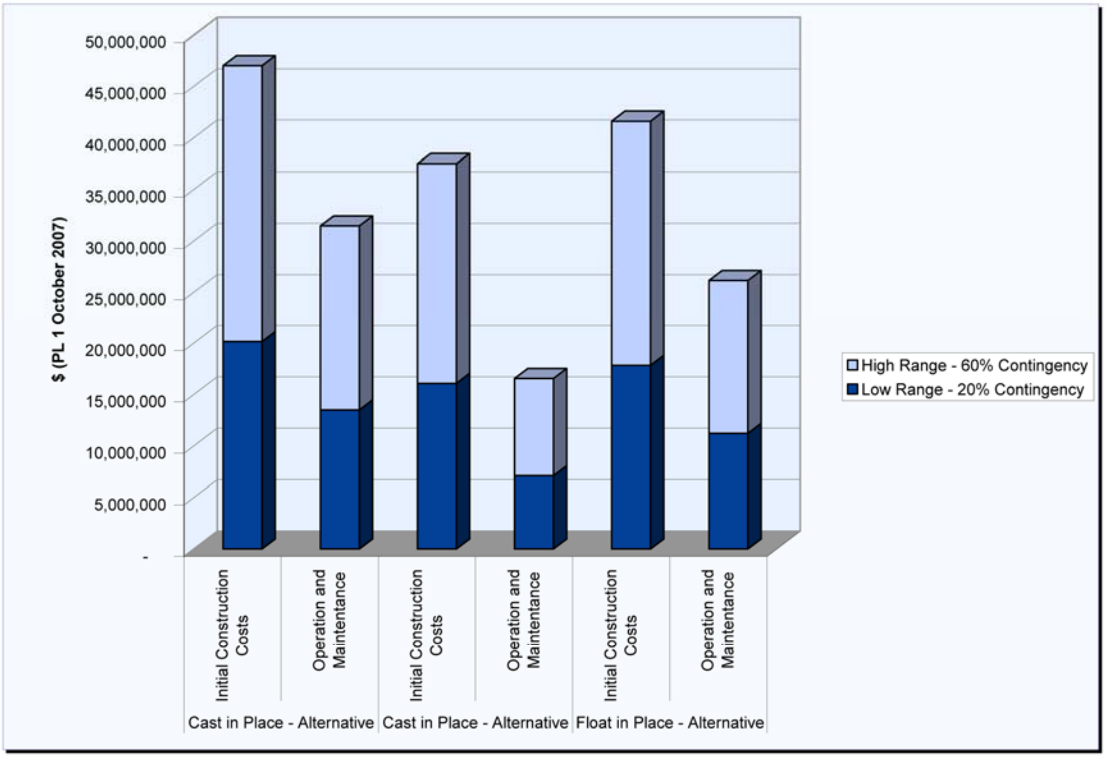
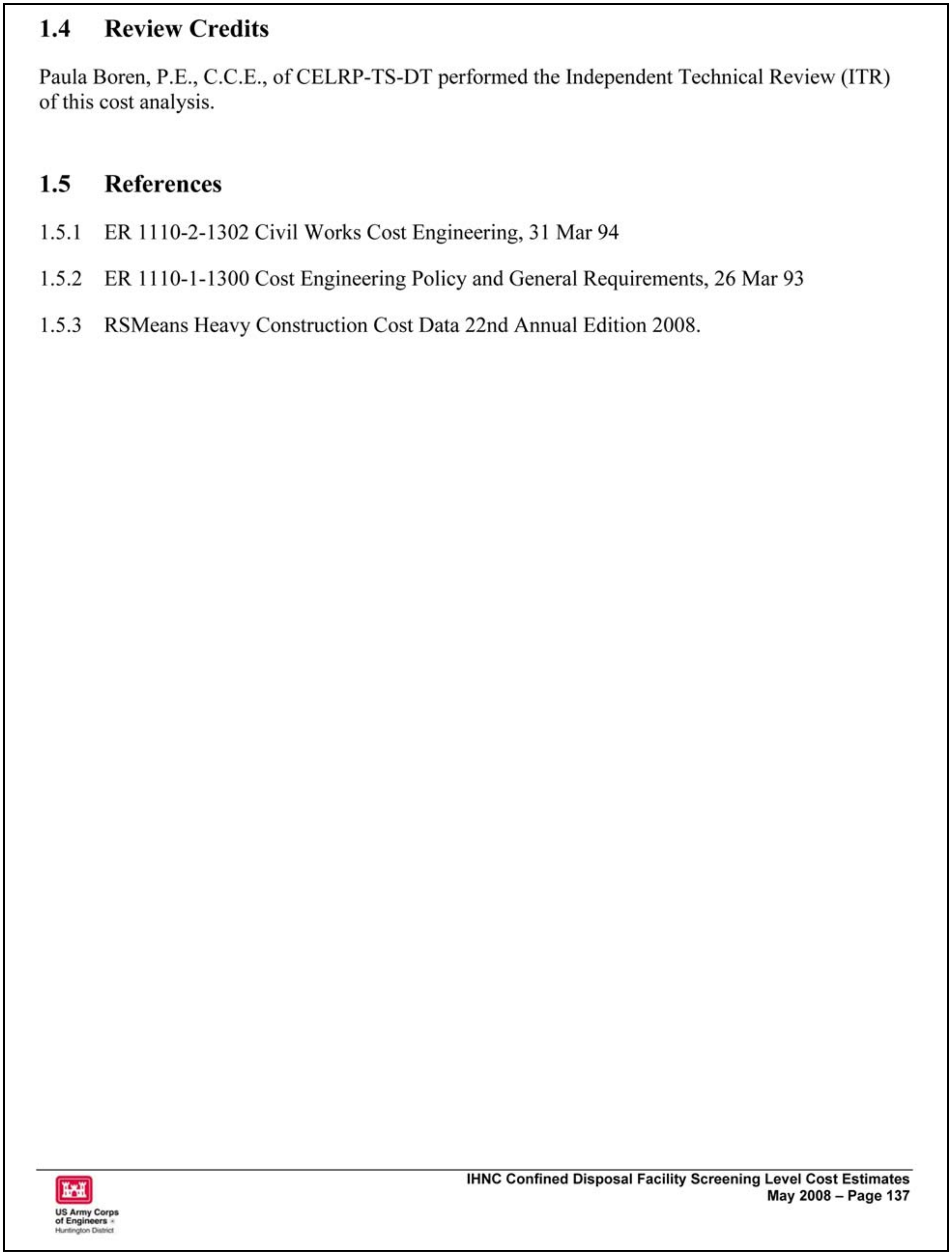


Figure 1: Estimated Alternative Costs (PL 1 October 2007)



1.4 Review Credits

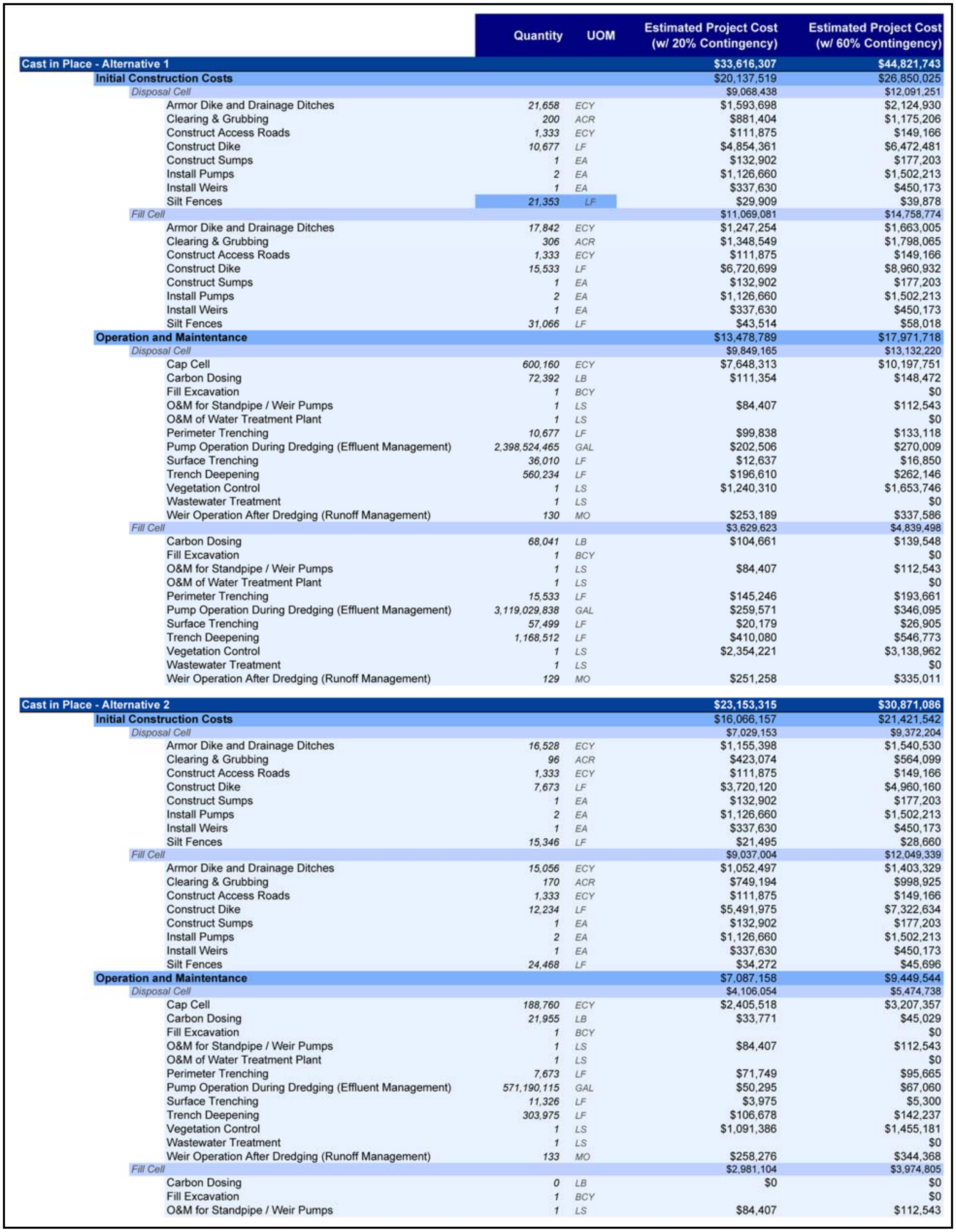
Paula Boren, P.E., C.C.E., of CELRP-TS-DT performed the Independent Technical Review (ITR) of this cost analysis.

1.5 References

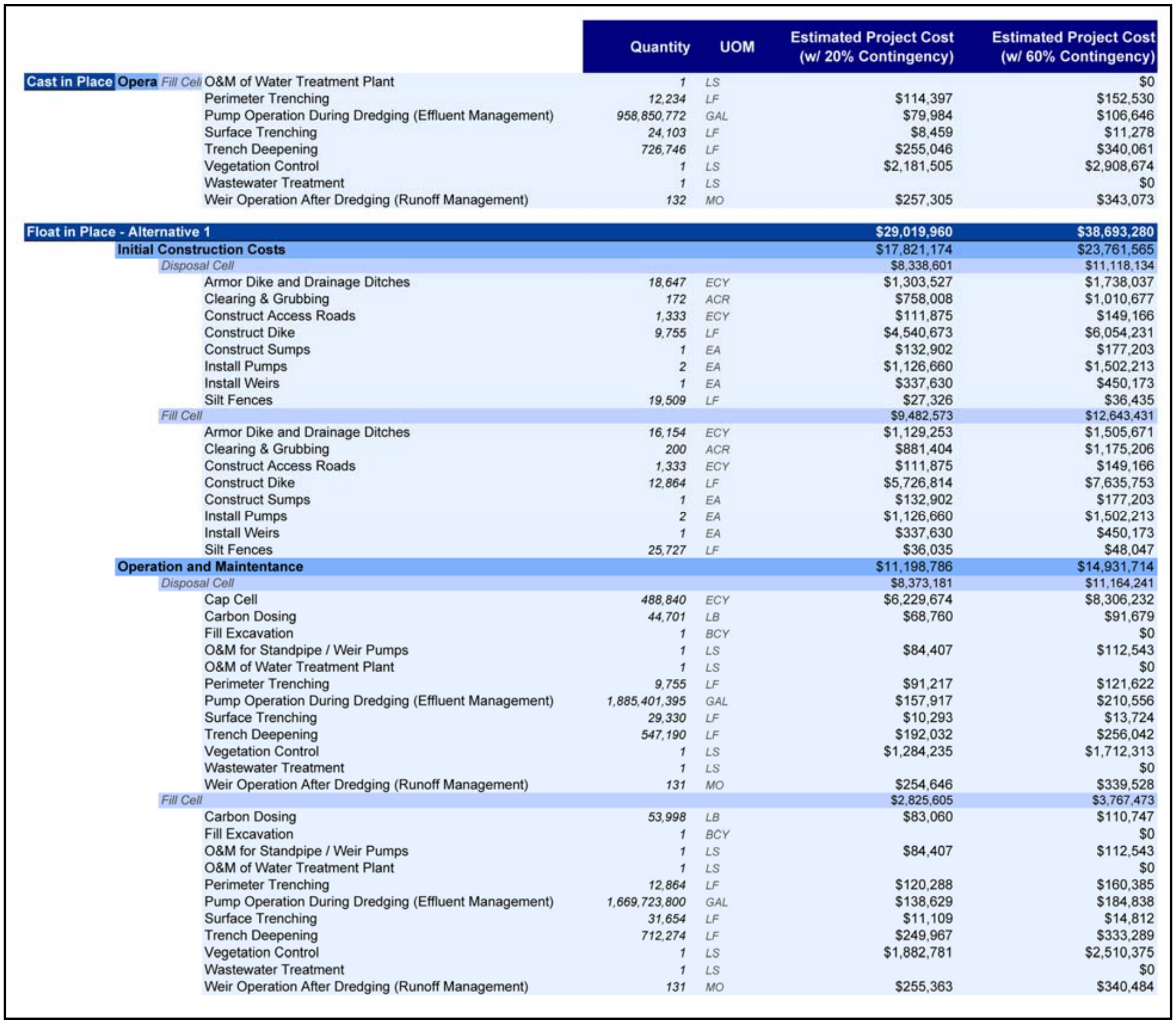
1.5.1 ER 1110-2-1302 Civil Works Cost Engineering, 31 Mar 94

1.5.2 ER 1110-1-1300 Cost Engineering Policy and General Requirements, 26 Mar 93

1.5.3 RSMeans Heavy Construction Cost Data 22nd Annual Edition 2008.



	Quantity	UOM	Estimated Project Cost (w/ 20% Contingency)	Estimated Project Cost (w/ 60% Contingency)
Cast in Place - Alternative 1			**$33,616,307**	**$44,821,743**
Initial Construction Costs			$20,137,519	$26,850,025
Disposal Cell			$9,068,438	$12,091,251
Armor Dike and Drainage Ditches	21,658	ECY	$1,593,698	$2,124,930
Clearing & Grubbing	200	ACR	$881,404	$1,175,206
Construct Access Roads	1,333	ECY	$111,875	$149,166
Construct Dike	10,677	LF	$4,854,361	$6,472,481
Construct Sumps	1	EA	$132,902	$177,203
Install Pumps	2	EA	$1,126,660	$1,502,213
Install Weirs	1	EA	$337,630	$450,173
Silt Fences	21,353	LF	$29,909	$39,878
Fill Cell			$11,069,081	$14,758,774
Armor Dike and Drainage Ditches	17,842	ECY	$1,247,254	$1,663,005
Clearing & Grubbing	306	ACR	$1,348,549	$1,798,065
Construct Access Roads	1,333	ECY	$111,875	$149,166
Construct Dike	15,533	LF	$6,720,699	$8,960,932
Construct Sumps	1	EA	$132,902	$177,203
Install Pumps	2	EA	$1,126,660	$1,502,213
Install Weirs	1	EA	$337,630	$450,173
Silt Fences	31,066	LF	$43,514	$58,018
Operation and Maintenance			$13,478,789	$17,971,718
Disposal Cell			$9,849,165	$13,132,220
Cap Cell	600,160	ECY	$7,648,313	$10,197,751
Carbon Dosing	72,392	LB	$111,354	$148,472
Fill Excavation	1	BCY		$0
O&M for Standpipe / Weir Pumps	1	LS	$84,407	$112,543
O&M of Water Treatment Plant	1	LS		$0
Perimeter Trenching	10,677	LF	$99,838	$133,118
Pump Operation During Dredging (Effluent Management)	2,398,524,465	GAL	$202,506	$270,009
Surface Trenching	36,010	LF	$12,637	$16,850
Trench Deepening	560,234	LF	$196,610	$262,146
Vegetation Control	1	LS	$1,240,310	$1,653,746
Wastewater Treatment	1	LS		$0
Weir Operation After Dredging (Runoff Management)	130	MO	$253,189	$337,586
Fill Cell			$3,629,623	$4,839,498
Carbon Dosing	68,041	LB	$104,661	$139,548
Fill Excavation	1	BCY		$0
O&M for Standpipe / Weir Pumps	1	LS	$84,407	$112,543
O&M of Water Treatment Plant	1	LS		$0
Perimeter Trenching	15,533	LF	$145,246	$193,661
Pump Operation During Dredging (Effluent Management)	3,119,029,838	GAL	$259,571	$346,095
Surface Trenching	57,499	LF	$20,179	$26,905
Trench Deepening	1,168,512	LF	$410,080	$546,773
Vegetation Control	1	LS	$2,354,221	$3,138,962
Wastewater Treatment	1	LS		$0
Weir Operation After Dredging (Runoff Management)	129	MO	$251,258	$335,011
Cast in Place - Alternative 2			**$23,153,315**	**$30,871,086**
Initial Construction Costs			$16,066,157	$21,421,542
Disposal Cell			$7,029,153	$9,372,204
Armor Dike and Drainage Ditches	16,528	ECY	$1,155,398	$1,540,530
Clearing & Grubbing	96	ACR	$423,074	$564,099
Construct Access Roads	1,333	ECY	$111,875	$149,166
Construct Dike	7,673	LF	$3,720,120	$4,960,160
Construct Sumps	1	EA	$132,902	$177,203
Install Pumps	2	EA	$1,126,660	$1,502,213
Install Weirs	1	EA	$337,630	$450,173
Silt Fences	15,346	LF	$21,495	$28,660
Fill Cell			$9,037,004	$12,049,339
Armor Dike and Drainage Ditches	15,056	ECY	$1,052,497	$1,403,329
Clearing & Grubbing	170	ACR	$749,194	$998,925
Construct Access Roads	1,333	ECY	$111,875	$149,166
Construct Dike	12,234	LF	$5,491,975	$7,322,634
Construct Sumps	1	EA	$132,902	$177,203
Install Pumps	2	EA	$1,126,660	$1,502,213
Install Weirs	1	EA	$337,630	$450,173
Silt Fences	24,468	LF	$34,272	$45,696
Operation and Maintenance			$7,087,158	$9,449,544
Disposal Cell			$4,106,054	$5,474,738
Cap Cell	188,760	ECY	$2,405,518	$3,207,357
Carbon Dosing	21,955	LB	$33,771	$45,029
Fill Excavation	1	BCY		$0
O&M for Standpipe / Weir Pumps	1	LS	$84,407	$112,543
O&M of Water Treatment Plant	1	LS		$0
Perimeter Trenching	7,673	LF	$71,749	$95,665
Pump Operation During Dredging (Effluent Management)	571,190,115	GAL	$50,295	$67,060
Surface Trenching	11,326	LF	$3,975	$5,300
Trench Deepening	303,975	LF	$106,678	$142,237
Vegetation Control	1	LS	$1,091,386	$1,455,181
Wastewater Treatment	1	LS		$0
Weir Operation After Dredging (Runoff Management)	133	MO	$258,276	$344,368
Fill Cell			$2,981,104	$3,974,805
Carbon Dosing	0	LB	$0	$0
Fill Excavation	1	BCY		$0
O&M for Standpipe / Weir Pumps	1	LS	$84,407	$112,543



				Quantity	UOM	Estimated Project Cost (w/ 20% Contingency)	Estimated Project Cost (w/ 60% Contingency)
Cast in Place	**Opera**	*Fill Cel*	O&M of Water Treatment Plant	1	LS		$0
			Perimeter Trenching	12,234	LF	$114,397	$152,530
			Pump Operation During Dredging (Effluent Management)	958,850,772	GAL	$79,984	$106,646
			Surface Trenching	24,103	LF	$8,459	$11,278
			Trench Deepening	726,746	LF	$255,046	$340,061
			Vegetation Control	1	LS	$2,181,505	$2,908,674
			Wastewater Treatment	1	LS		$0
			Weir Operation After Dredging (Runoff Management)	132	MO	$257,305	$343,073
Float in Place - Alternative 1						$29,019,960	$38,693,280
	Initial Construction Costs					$17,821,174	$23,761,565
		Disposal Cell				$8,338,601	$11,118,134
			Armor Dike and Drainage Ditches	18,647	ECY	$1,303,527	$1,738,037
			Clearing & Grubbing	172	ACR	$758,008	$1,010,677
			Construct Access Roads	1,333	ECY	$111,875	$149,166
			Construct Dike	9,755	LF	$4,540,673	$6,054,231
			Construct Sumps	1	EA	$132,902	$177,203
			Install Pumps	2	EA	$1,126,660	$1,502,213
			Install Weirs	1	EA	$337,630	$450,173
			Silt Fences	19,509	LF	$27,326	$36,435
		Fill Cell				$9,482,573	$12,643,431
			Armor Dike and Drainage Ditches	16,154	ECY	$1,129,253	$1,505,671
			Clearing & Grubbing	200	ACR	$881,404	$1,175,206
			Construct Access Roads	1,333	ECY	$111,875	$149,166
			Construct Dike	12,864	LF	$5,726,814	$7,635,753
			Construct Sumps	1	EA	$132,902	$177,203
			Install Pumps	2	EA	$1,126,660	$1,502,213
			Install Weirs	1	EA	$337,630	$450,173
			Silt Fences	25,727	LF	$36,035	$48,047
	Operation and Maintenance					$11,198,786	$14,931,714
		Disposal Cell				$8,373,181	$11,164,241
			Cap Cell	488,840	ECY	$6,229,674	$8,306,232
			Carbon Dosing	44,701	LB	$68,760	$91,679
			Fill Excavation	1	BCY		$0
			O&M for Standpipe / Weir Pumps	1	LS	$84,407	$112,543
			O&M of Water Treatment Plant	1	LS		$0
			Perimeter Trenching	9,755	LF	$91,217	$121,622
			Pump Operation During Dredging (Effluent Management)	1,885,401,395	GAL	$157,917	$210,556
			Surface Trenching	29,330	LF	$10,293	$13,724
			Trench Deepening	547,190	LF	$192,032	$256,042
			Vegetation Control	1	LS	$1,284,235	$1,712,313
			Wastewater Treatment	1	LS		$0
			Weir Operation After Dredging (Runoff Management)	131	MO	$254,646	$339,528
		Fill Cell				$2,825,605	$3,767,473
			Carbon Dosing	53,998	LB	$83,060	$110,747
			Fill Excavation	1	BCY		$0
			O&M for Standpipe / Weir Pumps	1	LS	$84,407	$112,543
			O&M of Water Treatment Plant	1	LS		$0
			Perimeter Trenching	12,864	LF	$120,288	$160,385
			Pump Operation During Dredging (Effluent Management)	1,669,723,800	GAL	$138,629	$184,838
			Surface Trenching	31,654	LF	$11,109	$14,812
			Trench Deepening	712,274	LF	$249,967	$333,289
			Vegetation Control	1	LS	$1,882,781	$2,510,375
			Wastewater Treatment	1	LS		$0
			Weir Operation After Dredging (Runoff Management)	131	MO	$255,363	$340,484

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U.S. Army Corps of Engineers
Project : IHNC CDF Alternatives

MII Preliminary Cost Estimate

Time 16:45:26

Title Page

Estimated by Joseph Pham

Designed by

Prepared by Joseph Pham

Preparation Date 3/21/2008

Effective Date of Pricing 10/1/2007

Estimated Construction Time 2,910 Days

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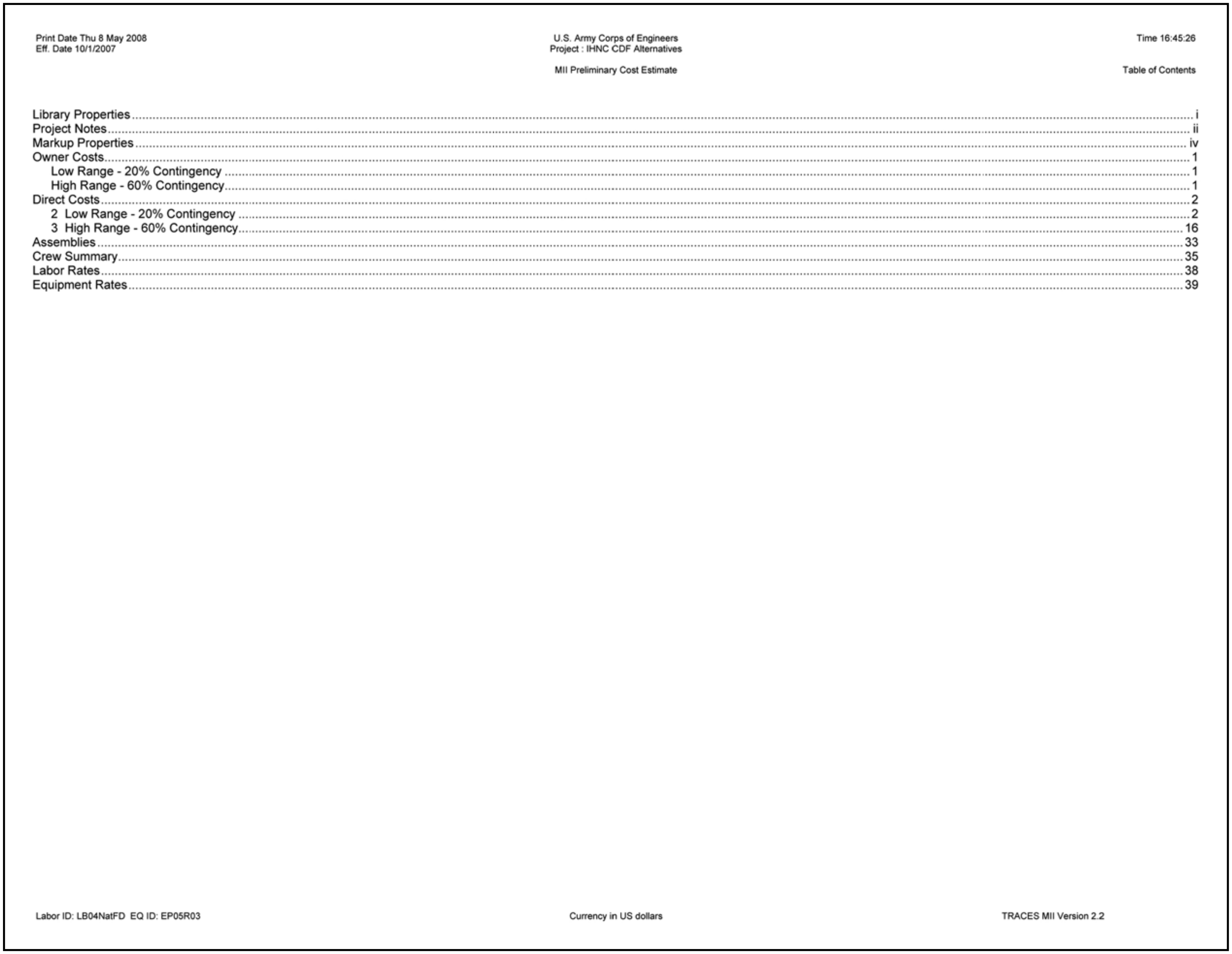
Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

TRACES MII Version 2.2



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U.S. Army Corps of Engineers
Project : IHNC CDF Alternatives

MII Preliminary Cost Estimate

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Library Properties Page i

Designed by

Estimated by
Joseph Pham

Prepared by
Joseph Pham

Design Document

Document Date	3/21/2008
District	New Orleans, LA
Contact	Don Whitmore
Budget Year	2008
UOM System	Original

Direct Costs

- LaborCost
- EQCost
- MatlCost
- SubBidCost
- UserCost1

Timeline/Currency

Preparation Date	3/21/2008
Escalation Date	8/15/2015
Eff. Pricing Date	10/1/2007
Estimated Duration	2910 Day(s)
Currency	US dollars
Exchange Rate	1.000000

Costbook CB04aEB: MII English Cost Book 2004b Final

Labor LB04NatFD: Labor National 2004
Note: http://www.wdol.gov/

Labor Rates

- LaborCost1
- LaborCost2
- LaborCost3
- LaborCost4

Equipment EP05R03: MII Equipment Region 3 2005
Note: Equipment Region 3, 2005 updated as current oil price in Louisiana state 3/11/08.

03 SOUTHEAST

Sales Tax	7.40
Working Hours per Year	1,530
Labor Adjustment Factor	0.82
Cost of Money	4.25
Cost of Money Discount	25.00
Tire Recap Cost Factor	1.50
Tire Recap Wear Factor	1.80
Tire Repair Factor	0.15
Equipment Cost Factor	1.00
Standby Depreciation Factor	0.50

Fuel

Electricity	0.070
Gas	3.516
Diesel Off-Road	3.442
Diesel On-Road	3.912

Shipping Rates

Over 0 CWT	2.45
Over 240 CWT	2.55
Over 300 CWT	3.18
Over 400 CWT	4.02
Over 500 CWT	4.43
Over 700 CWT	3.36
Over 800 CWT	3.23

Labor ID: LB04NatFD EQ ID: EP05R03

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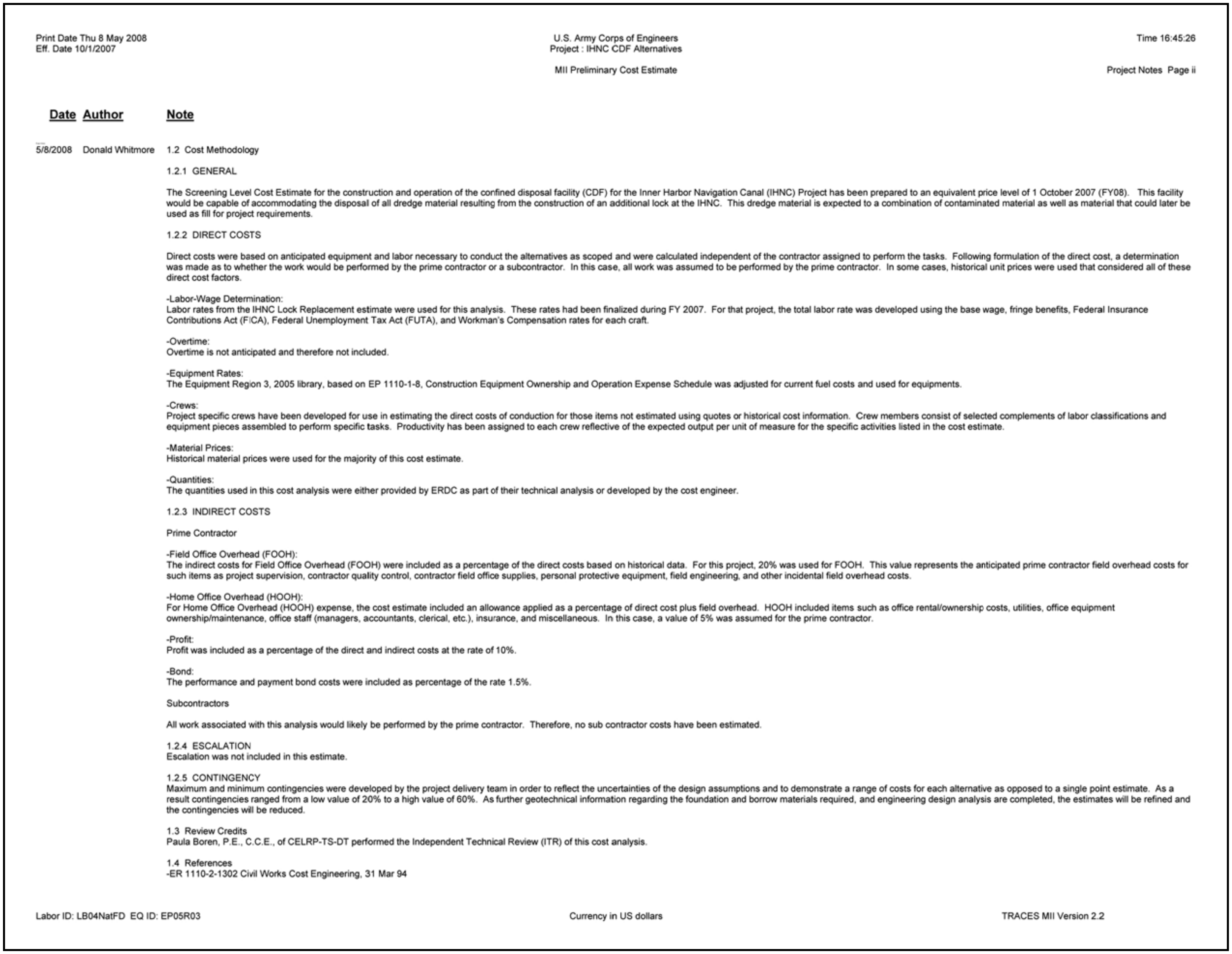

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U.S. Army Corps of Engineers
Project : IHNC CDF Alternatives

MII Preliminary Cost Estimate

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Project Notes Page ii

Date	Author	Note
5/8/2008	Donald Whitmore	1.2 Cost Methodology

1.2.1 GENERAL

The Screening Level Cost Estimate for the construction and operation of the confined disposal facility (CDF) for the Inner Harbor Navigation Canal (IHNC) Project has been prepared to an equivalent price level of 1 October 2007 (FY08). This facility would be capable of accommodating the disposal of all dredge material resulting from the construction of an additional lock at the IHNC. This dredge material is expected to a combination of contaminated material as well as material that could later be used as fill for project requirements.

1.2.2 DIRECT COSTS

Direct costs were based on anticipated equipment and labor necessary to conduct the alternatives as scoped and were calculated independent of the contractor assigned to perform the tasks. Following formulation of the direct cost, a determination was made as to whether the work would be performed by the prime contractor or a subcontractor. In this case, all work was assumed to be performed by the prime contractor. In some cases, historical unit prices were used that considered all of these direct cost factors.

-Labor-Wage Determination:
Labor rates from the IHNC Lock Replacement estimate were used for this analysis. These rates had been finalized during FY 2007. For that project, the total labor rate was developed using the base wage, fringe benefits, Federal Insurance Contributions Act (FICA), Federal Unemployment Tax Act (FUTA), and Workman's Compensation rates for each craft.

-Overtime:
Overtime is not anticipated and therefore not included.

-Equipment Rates:
The Equipment Region 3, 2005 library, based on EP 1110-1-8, Construction Equipment Ownership and Operation Expense Schedule was adjusted for current fuel costs and used for equipments.

-Crews:
Project specific crews have been developed for use in estimating the direct costs of conduction for those items not estimated using quotes or historical cost information. Crew members consist of selected complements of labor classifications and equipment pieces assembled to perform specific tasks. Productivity has been assigned to each crew reflective of the expected output per unit of measure for the specific activities listed in the cost estimate.

-Material Prices:
Historical material prices were used for the majority of this cost estimate.

-Quantities:
The quantities used in this cost analysis were either provided by ERDC as part of their technical analysis or developed by the cost engineer.

1.2.3 INDIRECT COSTS

Prime Contractor

-Field Office Overhead (FOOH):
The indirect costs for Field Office Overhead (FOOH) were included as a percentage of the direct costs based on historical data. For this project, 20% was used for FOOH. This value represents the anticipated prime contractor field overhead costs for such items as project supervision, contractor quality control, contractor field office supplies, personal protective equipment, field engineering, and other incidental field overhead costs.

-Home Office Overhead (HOOH):
For Home Office Overhead (HOOH) expense, the cost estimate included an allowance applied as a percentage of direct cost plus field overhead. HOOH included items such as office rental/ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.), insurance, and miscellaneous. In this case, a value of 5% was assumed for the prime contractor.

-Profit:
Profit was included as a percentage of the direct and indirect costs at the rate of 10%.

-Bond:
The performance and payment bond costs were included as percentage of the rate 1.5%.

Subcontractors

All work associated with this analysis would likely be performed by the prime contractor. Therefore, no sub contractor costs have been estimated.

1.2.4 ESCALATION
Escalation was not included in this estimate.

1.2.5 CONTINGENCY
Maximum and minimum contingencies were developed by the project delivery team in order to reflect the uncertainties of the design assumptions and to demonstrate a range of costs for each alternative as opposed to a single point estimate. As a result contingencies ranged from a low value of 20% to a high value of 60%. As further geotechnical information regarding the foundation and borrow materials required, and engineering design analysis are completed, the estimates will be refined and the contingencies will be reduced.

1.3 Review Credits
Paula Boren, P.E., C.C.E., of CELRP-TS-DT performed the Independent Technical Review (ITR) of this cost analysis.

1.4 References
-ER 1110-2-1302 Civil Works Cost Engineering, 31 Mar 94

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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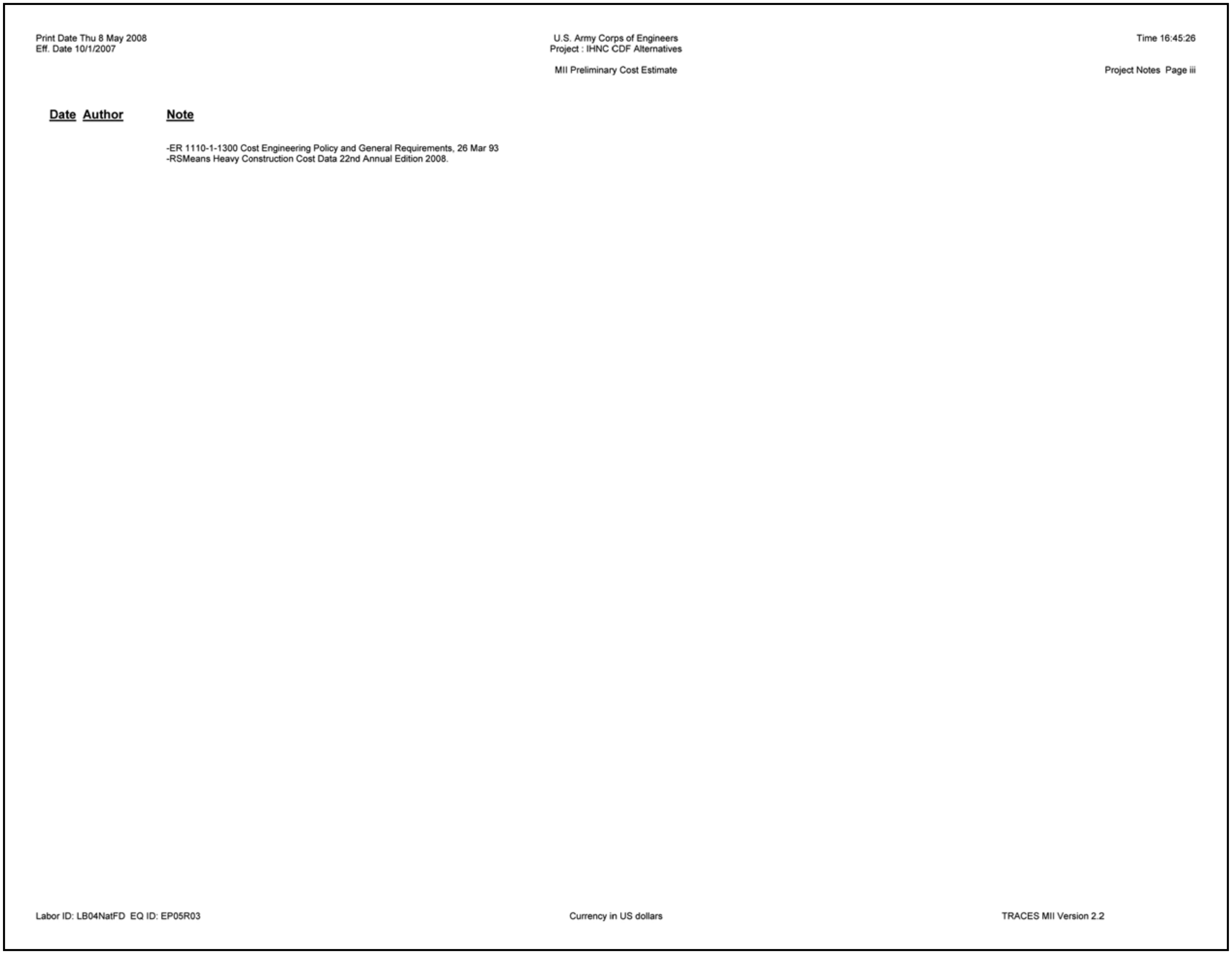

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MII Preliminary Cost Estimate

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Project Notes Page iii

Date	Author	Note
		-ER 1110-1-1300 Cost Engineering Policy and General Requirements, 26 Mar 93 -RSMeans Heavy Construction Cost Data 22nd Annual Edition 2008.

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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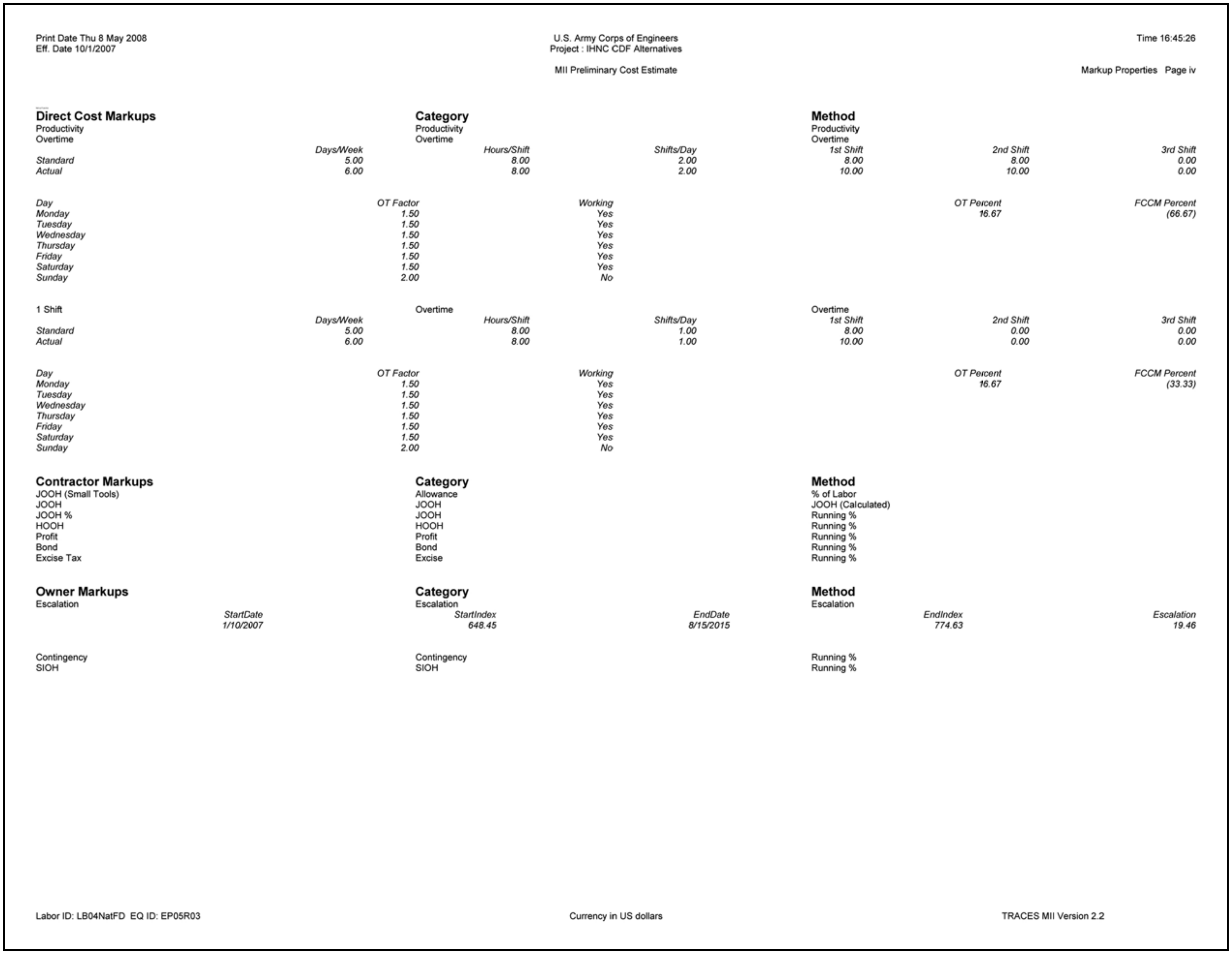

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U.S. Army Corps of Engineers
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MII Preliminary Cost Estimate

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Markup Properties Page iv

Direct Cost Markups	**Category**	**Method**
Productivity	Productivity	Productivity
Overtime	Overtime	Overtime

	Days/Week	*Hours/Shift*	*Shifts/Day*	*1st Shift*	*2nd Shift*	*3rd Shift*
Standard	*5.00*	*8.00*	*2.00*	*8.00*	*8.00*	*0.00*
Actual	*6.00*	*8.00*	*2.00*	*10.00*	*10.00*	*0.00*

Day	*OT Factor*	*Working*	*OT Percent*	*FCCM Percent*
Monday	*1.50*	*Yes*	*16.67*	*(66.67)*
Tuesday	*1.50*	*Yes*		
Wednesday	*1.50*	*Yes*		
Thursday	*1.50*	*Yes*		
Friday	*1.50*	*Yes*		
Saturday	*1.50*	*Yes*		
Sunday	*2.00*	*No*		

1 Shift		Overtime		Overtime		
	Days/Week	*Hours/Shift*	*Shifts/Day*	*1st Shift*	*2nd Shift*	*3rd Shift*
Standard	*5.00*	*8.00*	*1.00*	*8.00*	*0.00*	*0.00*
Actual	*6.00*	*8.00*	*1.00*	*10.00*	*0.00*	*0.00*

Day	*OT Factor*	*Working*	*OT Percent*	*FCCM Percent*
Monday	*1.50*	*Yes*	*16.67*	*(33.33)*
Tuesday	*1.50*	*Yes*		
Wednesday	*1.50*	*Yes*		
Thursday	*1.50*	*Yes*		
Friday	*1.50*	*Yes*		
Saturday	*1.50*	*Yes*		
Sunday	*2.00*	*No*		

Contractor Markups	**Category**	**Method**
JOOH (Small Tools)	Allowance	% of Labor
JOOH	JOOH	JOOH (Calculated)
JOOH %	JOOH	Running %
HOOH	HOOH	Running %
Profit	Profit	Running %
Bond	Bond	Running %
Excise Tax	Excise	Running %

Owner Markups	**Category**	**Method**
Escalation	Escalation	Escalation

StartDate	*StartIndex*	*EndDate*	*EndIndex*	*Escalation*
1/10/2007	*648.45*	*8/15/2015*	*774.63*	*19.46*

Contingency	Contingency	Running %
SIOH	SIOH	Running %

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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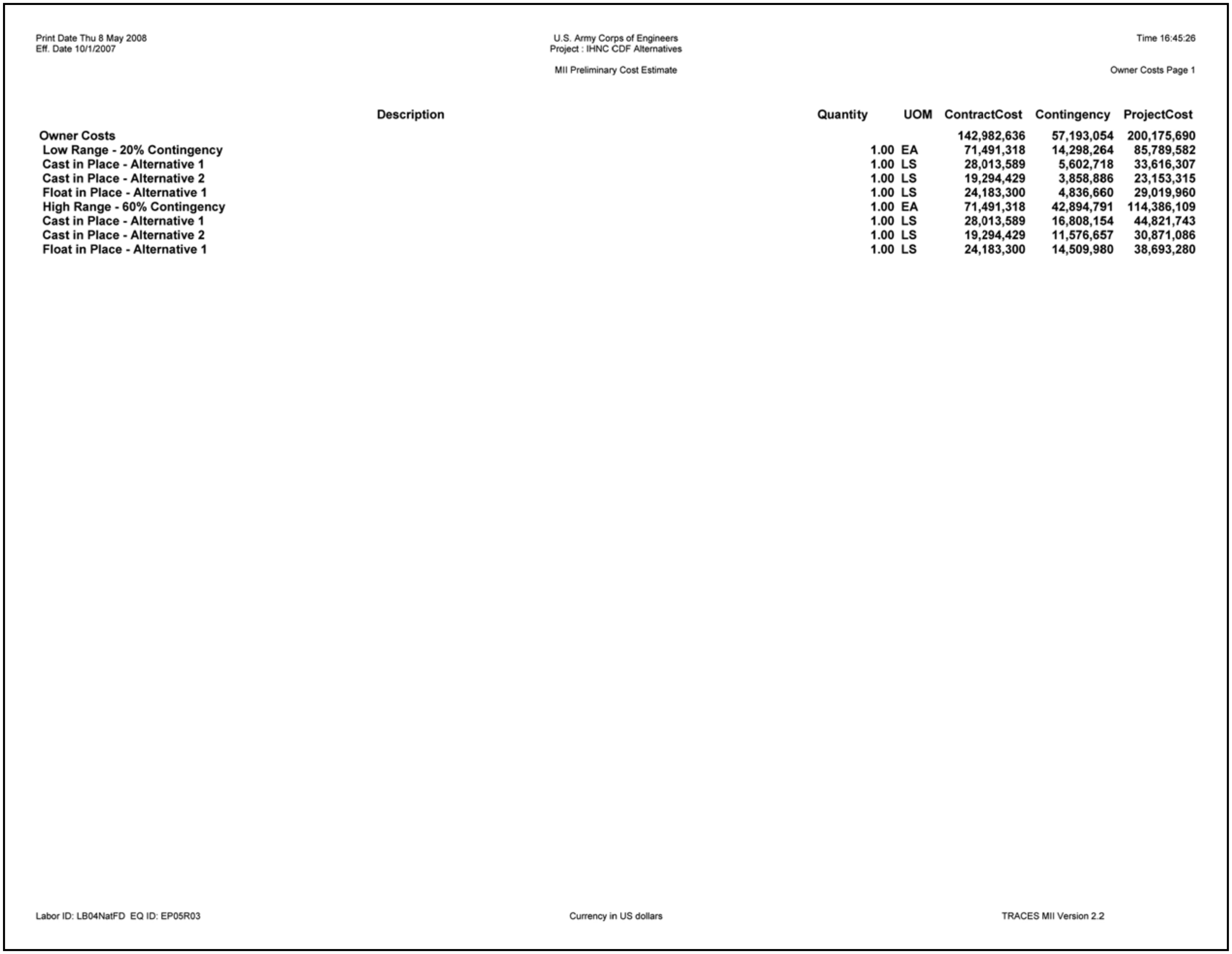

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U.S. Army Corps of Engineers
Project : IHNC CDF Alternatives

MII Preliminary Cost Estimate

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Owner Costs Page 1

Description	Quantity	UOM	ContractCost	Contingency	ProjectCost
Owner Costs			**142,982,636**	**57,193,054**	**200,175,690**
Low Range - 20% Contingency	**1.00**	**EA**	**71,491,318**	**14,298,264**	**85,789,582**
Cast in Place - Alternative 1	**1.00**	**LS**	**28,013,589**	**5,602,718**	**33,616,307**
Cast in Place - Alternative 2	**1.00**	**LS**	**19,294,429**	**3,858,886**	**23,153,315**
Float in Place - Alternative 1	**1.00**	**LS**	**24,183,300**	**4,836,660**	**29,019,960**
High Range - 60% Contingency	**1.00**	**EA**	**71,491,318**	**42,894,791**	**114,386,109**
Cast in Place - Alternative 1	**1.00**	**LS**	**28,013,589**	**16,808,154**	**44,821,743**
Cast in Place - Alternative 2	**1.00**	**LS**	**19,294,429**	**11,576,657**	**30,871,086**
Float in Place - Alternative 1	**1.00**	**LS**	**24,183,300**	**14,509,980**	**38,693,280**

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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U.S. Army Corps of Engineers
Project : IHNC CDF Alternatives

MII Preliminary Cost Estimate

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Direct Costs Page 2

Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
Direct Costs				**372,815.69**	**38,836,614**	**40,807,894**	**18,153,004**	**3,840,000**	**101,637,512**
				186,407.85	*19,418,307.09*	*20,403,946.90*	*9,076,502.21*	*1,920,000.00*	*50,818,756.19*
2 Low Range - 20% Contingency	**1.00**	**EA**		**186,407.85**	**19,418,307**	**20,403,947**	**9,076,502**	**1,920,000**	**50,818,756**
2.1 Cast in Place - Alternative 1	**1.00**	**LS**		**71,240.33**	**7,653,047**	**8,280,492**	**3,339,589**	**640,000**	**19,913,128**
				32,511.66	*4,062,026.82*	*4,281,836.30*	*3,044,900.70*	*540,000.00*	*11,928,763.82*
2.1.1 Initial Construction Costs	**1.00**	**EA**		**32,511.66**	**4,062,027**	**4,281,836**	**3,044,901**	**540,000**	**11,928,764**
				13,888.97	*1,728,548.71*	*1,801,962.16*	*1,571,315.50*	*270,000.00*	*5,371,826.36*
2.1.1.1 Disposal Cell	**1.00**	**EA**		**13,888.97**	**1,728,549**	**1,801,962**	**1,571,315**	**270,000**	**5,371,826**
				0.99	*118.82*	*137.22*	*13.28*	*0.00*	*269.32*
2.1.1.1.1 Construct Dike	**10,677.00**	**LF**		**10,568.27**	**1,268,615**	**1,465,102**	**141,837**	**0**	**2,875,554**
2.1.1.1.1.1 USR Dike Spread and Compact	1,023,284.44	LCY		*0.01* 10,232.84	*1.22* 1,245,552	*1.41* 1,442,314	*0.00* 0	*0.00* 0	*2.63* 2,687,867
(Note: Allow 10% compaction.)									
2.1.1.1.1.2 USR Fine Grade	76.17	ACR		*2.00* 152.33	*104.04* 7,924	*82.80* 6,307	*0.00* 0	*0.00* 0	*186.84* 14,231
2.1.1.1.1.3 USR Seeding	76.17	ACR		*2.00* 152.33	*149.61* 11,395	*159.47* 12,146	*1,067.22* 81,287	*0.00* 0	*1,376.30* 104,828
2.1.1.1.1.4 USR Place Gravel on Crest Crest of Dike	1,537.78	LCY		*0.02* 30.76	*2.43* 3,744	*2.82* 4,335	*39.38* 60,550	*0.00* 0	*44.63* 68,629
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
2.1.1.1.2 Clearing & Grubbing	**200.00**	**ACR**		**1,600.00**	**269,884**	**252,229**	**0**	**0**	**522,113**
2.1.1.1.2.1 USR Clear and Grub	200.00	EA		*8.00* 1,600.00	*1,349.42* 269,884	*1,261.15* 252,229	*0.00* 0	*0.00* 0	*2,610.57* 522,113
				0.01	*0.46*	*0.00*	*0.37*	*0.00*	*0.83*
2.1.1.1.3 Silt Fences	**21,353.00**	**LF**		**213.53**	**9,731**	**0**	**7,986**	**0**	**17,717**
2.1.1.1.3.1 USR Install Silt Fence	21,353.00	LF		*0.01* 213.53	*0.46* 9,731	*0.00* 0	*0.37* 7,986	*0.00* 0	*0.83* 17,717
				0.05	*5.47*	*2.88*	*35.24*	*0.00*	*43.59*
2.1.1.1.4 Armor Dike and Drainage Ditches	**21,658.00**	**ECY**		**1,139.89**	**118,533**	**62,358**	**763,160**	**0**	**944,051**
2.1.1.1.4.1 USR Place Armor for Dikes and Drainage Ditches	22,797.89	LCY		*0.05* 1,139.89	*5.20* 118,533	*2.74* 62,358	*33.48* 763,160	*0.00* 0	*41.41* 944,051
				0.00	*0.00*	*0.00*	*0.00*	*200,000.00*	*200,000.00*
2.1.1.1.5 Install Weirs	**1.00**	**EA**		**0.00**	**0**	**0**	**0**	**200,000**	**200,000**
2.1.1.1.5.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
				160.00	*28,092.06*	*5,604.94*	*300,000.00*	*0.00*	*333,697.00*

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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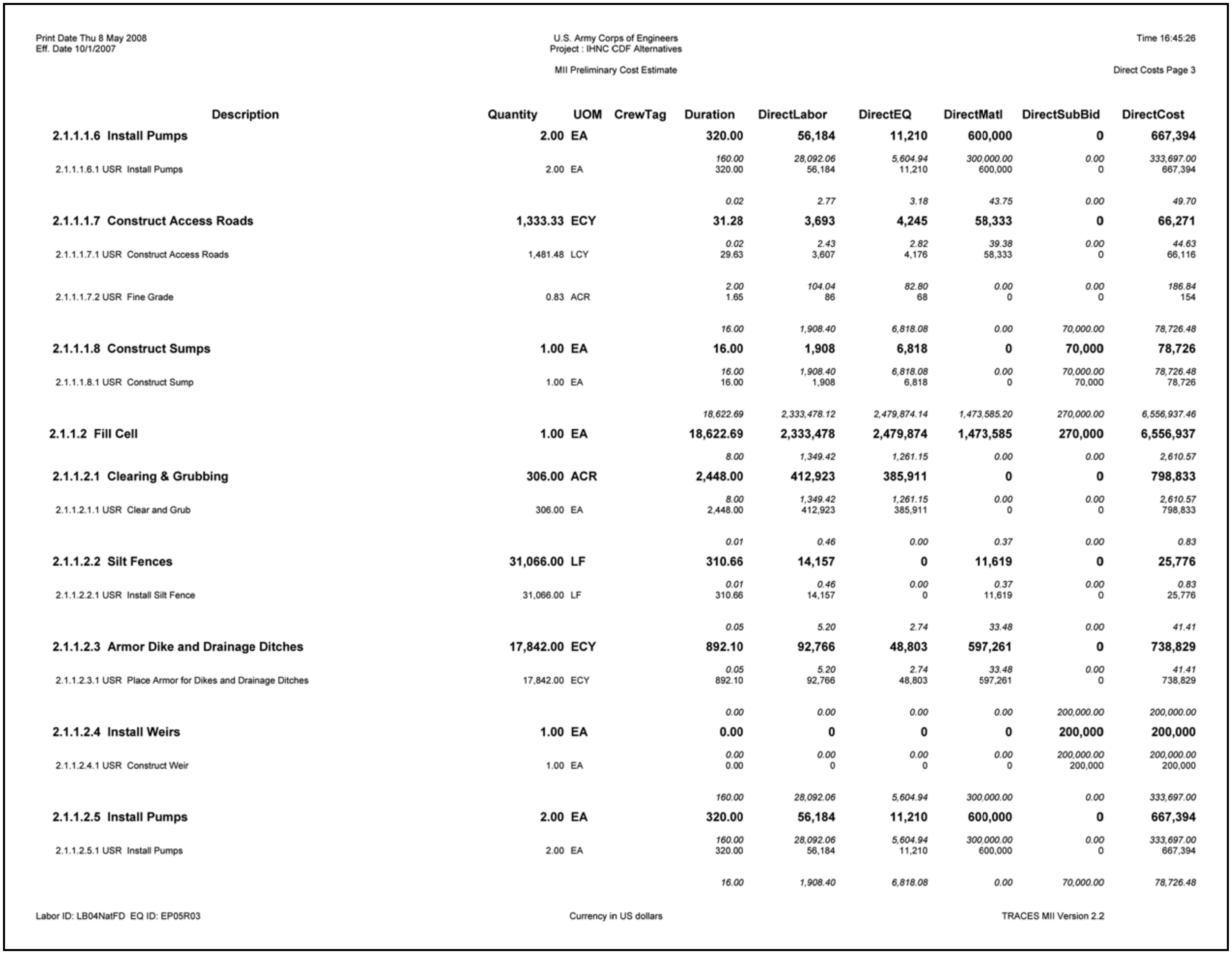

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.1.1.1.6 Install Pumps	**2.00**	**EA**		**320.00**	**56,184**	**11,210**	**600,000**	**0**	**667,394**
2.1.1.1.6.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
				0.02	*2.77*	*3.18*	*43.75*	*0.00*	*49.70*
2.1.1.1.7 Construct Access Roads	**1,333.33**	**ECY**		**31.28**	**3,693**	**4,245**	**58,333**	**0**	**66,271**
2.1.1.1.7.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
2.1.1.1.7.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
				16.00	*1,908.40*	*6,818.08*	*0.00*	*70,000.00*	*78,726.48*
2.1.1.1.8 Construct Sumps	**1.00**	**EA**		**16.00**	**1,908**	**6,818**	**0**	**70,000**	**78,726**
2.1.1.1.8.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
				18,622.69	*2,333,478.12*	*2,479,874.14*	*1,473,585.20*	*270,000.00*	*6,556,937.46*
2.1.1.2 Fill Cell	**1.00**	**EA**		**18,622.69**	**2,333,478**	**2,479,874**	**1,473,585**	**270,000**	**6,556,937**
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
2.1.1.2.1 Clearing & Grubbing	**306.00**	**ACR**		**2,448.00**	**412,923**	**385,911**	**0**	**0**	**798,833**
2.1.1.2.1.1 USR Clear and Grub	306.00	EA		*8.00* 2,448.00	*1,349.42* 412,923	*1,261.15* 385,911	*0.00* 0	*0.00* 0	*2,610.57* 798,833
				0.01	*0.46*	*0.00*	*0.37*	*0.00*	*0.83*
2.1.1.2.2 Silt Fences	**31,066.00**	**LF**		**310.66**	**14,157**	**0**	**11,619**	**0**	**25,776**
2.1.1.2.2.1 USR Install Silt Fence	31,066.00	LF		*0.01* 310.66	*0.46* 14,157	*0.00* 0	*0.37* 11,619	*0.00* 0	*0.83* 25,776
				0.05	*5.20*	*2.74*	*33.48*	*0.00*	*41.41*
2.1.1.2.3 Armor Dike and Drainage Ditches	**17,842.00**	**ECY**		**892.10**	**92,766**	**48,803**	**597,261**	**0**	**738,829**
2.1.1.2.3.1 USR Place Armor for Dikes and Drainage Ditches	17,842.00	ECY		*0.05* 892.10	*5.20* 92,766	*2.74* 48,803	*33.48* 597,261	*0.00* 0	*41.41* 738,829
				0.00	*0.00*	*0.00*	*0.00*	*200,000.00*	*200,000.00*
2.1.1.2.4 Install Weirs	**1.00**	**EA**		**0.00**	**0**	**0**	**0**	**200,000**	**200,000**
2.1.1.2.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
				160.00	*28,092.06*	*5,604.94*	*300,000.00*	*0.00*	*333,697.00*
2.1.1.2.5 Install Pumps	**2.00**	**EA**		**320.00**	**56,184**	**11,210**	**600,000**	**0**	**667,394**
2.1.1.2.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
				16.00	*1,908.40*	*6,818.08*	*0.00*	*70,000.00*	*78,726.48*

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Currency in US dollars

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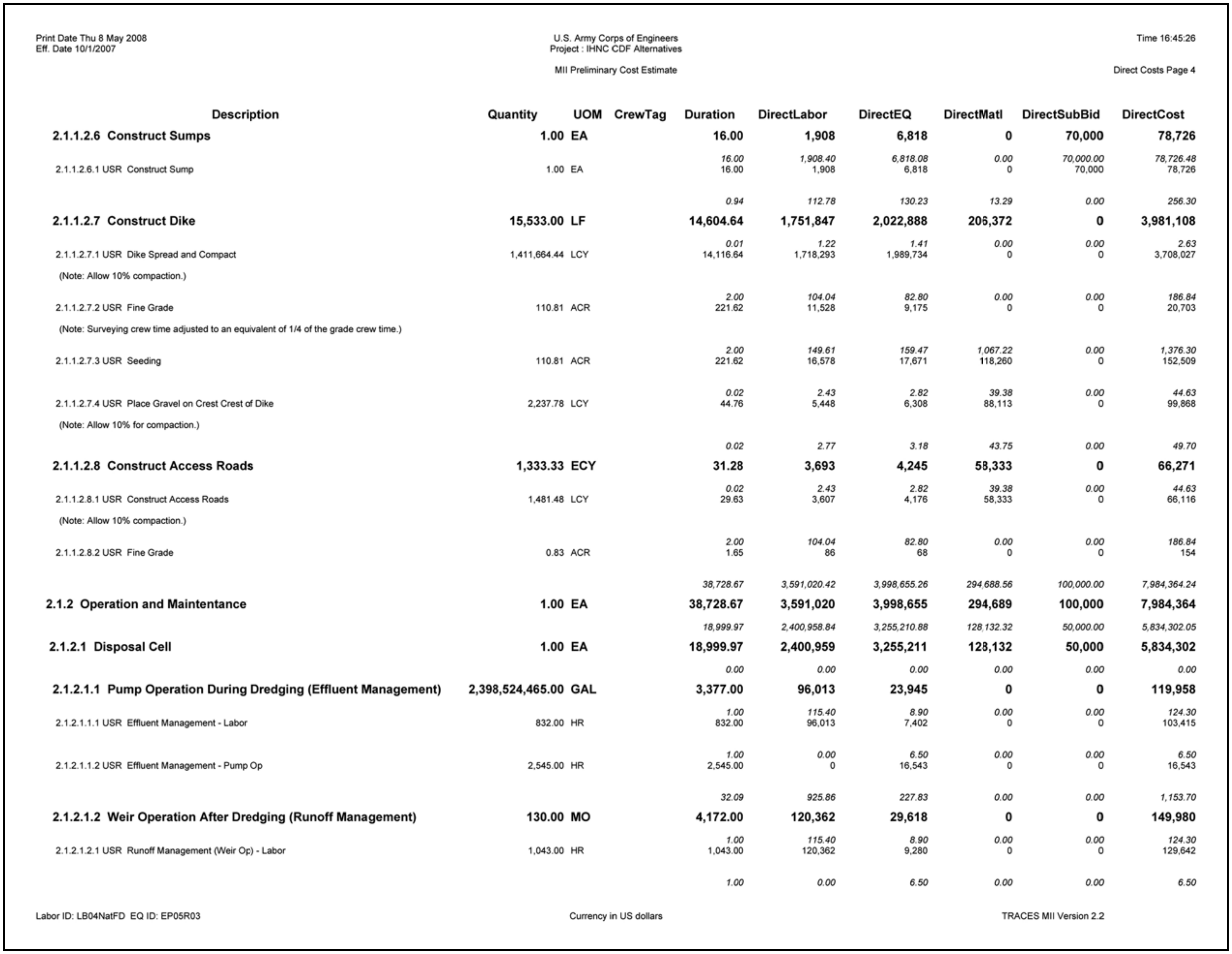

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.1.1.2.6 Construct Sumps	**1.00**	**EA**		**16.00**	**1,908**	**6,818**	**0**	**70,000**	**78,726**
2.1.1.2.6.1 USR Construct Sump	1.00	EA		16.00 16.00	1,908.40 1,908	6,818.08 6,818	0.00 0	70,000.00 70,000	78,726.48 78,726
2.1.1.2.7 Construct Dike	**15,533.00**	**LF**		0.94 **14,604.64**	112.78 **1,751,847**	130.23 **2,022,888**	13.29 **206,372**	0.00 **0**	256.30 **3,981,108**
2.1.1.2.7.1 USR Dike Spread and Compact	1,411,664.44	LCY		0.01 14,116.64	1.22 1,718,293	1.41 1,989,734	0.00 0	0.00 0	2.63 3,708,027
(Note: Allow 10% compaction.)									
2.1.1.2.7.2 USR Fine Grade	110.81	ACR		2.00 221.62	104.04 11,528	82.80 9,175	0.00 0	0.00 0	186.84 20,703
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
2.1.1.2.7.3 USR Seeding	110.81	ACR		2.00 221.62	149.61 16,578	159.47 17,671	1,067.22 118,260	0.00 0	1,376.30 152,509
2.1.1.2.7.4 USR Place Gravel on Crest Crest of Dike	2,237.78	LCY		0.02 44.76	2.43 5,448	2.82 6,308	39.38 88,113	0.00 0	44.63 99,868
(Note: Allow 10% for compaction.)									
2.1.1.2.8 Construct Access Roads	**1,333.33**	**ECY**		0.02 **31.28**	2.77 **3,693**	3.18 **4,245**	43.75 **58,333**	0.00 **0**	49.70 **66,271**
2.1.1.2.8.1 USR Construct Access Roads	1,481.48	LCY		0.02 29.63	2.43 3,607	2.82 4,176	39.38 58,333	0.00 0	44.63 66,116
(Note: Allow 10% compaction.)									
2.1.1.2.8.2 USR Fine Grade	0.83	ACR		2.00 1.65	104.04 86	82.80 68	0.00 0	0.00 0	186.84 154
2.1.2 Operation and Maintentance	**1.00**	**EA**		38,728.67 **38,728.67**	3,591,020.42 **3,591,020**	3,998,655.26 **3,998,655**	294,688.56 **294,689**	100,000.00 **100,000**	7,984,364.24 **7,984,364**
2.1.2.1 Disposal Cell	**1.00**	**EA**		18,999.97 **18,999.97**	2,400,958.84 **2,400,959**	3,255,210.88 **3,255,211**	128,132.32 **128,132**	50,000.00 **50,000**	5,834,302.05 **5,834,302**
2.1.2.1.1 Pump Operation During Dredging (Effluent Management)	**2,398,524,465.00**	**GAL**		0.00 **3,377.00**	0.00 **96,013**	0.00 **23,945**	0.00 **0**	0.00 **0**	0.00 **119,958**
2.1.2.1.1.1 USR Effluent Management - Labor	832.00	HR		1.00 832.00	115.40 96,013	8.90 7,402	0.00 0	0.00 0	124.30 103,415
2.1.2.1.1.2 USR Effluent Management - Pump Op	2,545.00	HR		1.00 2,545.00	0.00 0	6.50 16,543	0.00 0	0.00 0	6.50 16,543
2.1.2.1.2 Weir Operation After Dredging (Runoff Management)	**130.00**	**MO**		32.09 **4,172.00**	925.86 **120,362**	227.83 **29,618**	0.00 **0**	0.00 **0**	1,153.70 **149,980**
2.1.2.1.2.1 USR Runoff Management (Weir Op) - Labor	1,043.00	HR		1.00 1,043.00	115.40 120,362	8.90 9,280	0.00 0	0.00 0	124.30 129,642
				1.00	0.00	6.50	0.00	0.00	6.50

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.1.2.1.2.2 USR Runoff Management - Pump Op	3,129.00	HR		3,129.00	0	20,339	0	0	20,339
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.1.2.1.4 Perimeter Trenching	**10,677.00**	**LF**		**213.54**	**15,168**	**43,973**	**0**	**0**	**59,141**
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.1.2.1.4.1 USR Dragline Trenching Around Perimeter	10,677.00	LF		213.54	15,168	43,973	0	0	59,141
2.1.2.1.5 Vegetation Control	**1.00**	**LS**		**5,608.00**	**419,502**	**244,996**	**70,219**	**0**	**734,716**
				1.00	*74.80*	*42.87*	*0.00*	*0.00*	*117.68*
2.1.2.1.5.1 USR Mowing	5,484.00	ACR		5,484.00	410,226	235,109	0	0	645,335
				1.00	*74.80*	*79.74*	*566.28*	*0.00*	*720.82*
2.1.2.1.5.2 USR Till and Apply Herbicide	124.00	ACR		124.00	9,276	9,887	70,219	0	89,382
2.1.2.1.8 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
2.1.2.1.8.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.01	*2.82*	*4.73*	*0.00*	*0.00*	*7.55*
2.1.2.1.9 Cap Cell	**600,160.00**	**ECY**		**5,557.04**	**1,691,206**	**2,839,388**	**0**	**0**	**4,530,594**
				0.01	*2.54*	*4.26*	*0.00*	*0.00*	*6.79*
2.1.2.1.9.1 USR Cap Cell	666,844.44	LCY		5,557.04	1,691,206	2,839,388	0	0	4,530,594
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.1.2.1.10 Surface Trenching	**36,010.00**	**LF**		**0.00**	**3,247**	**4,239**	**0**	**0**	**7,486**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.1.2.1.10.1 USR Surface Trenching	36,010.00	LF		0.00	3,247	4,239	0	0	7,486
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.1.2.1.11 Trench Deepening	**560,234.00**	**LF**		**0.00**	**50,513**	**65,952**	**0**	**0**	**116,465**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.1.2.1.11.1 USR Trench Deepening	560,234.00	LF		0.00	50,513	65,952	0	0	116,465
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
2.1.2.1.12 Carbon Dosing	**72,392.00**	**LB**		**72.39**	**4,949**	**3,100**	**57,914**	**0**	**65,962**
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
2.1.2.1.12.1 USR Carbon Dosing	72,392.00	LB		72.39	4,949	3,100	57,914	0	65,962
				19,728.70	*1,190,061.58*	*743,444.38*	*166,556.24*	*50,000.00*	*2,150,062.20*
2.1.2.2 Fill Cell	**1.00**	**EA**		**19,728.70**	**1,190,062**	**743,444**	**166,556**	**50,000**	**2,150,062**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
2.1.2.2.1 Pump Operation During Dredging (Effluent Management)	**3,119,029,838.00**	**GAL**		**4,373.00**	**122,786**	**30,975**	**0**	**0**	**153,761**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
2.1.2.2.1.1 USR Effluent Management - Labor	1,064.00	HR		1,064.00	122,786	9,467	0	0	132,252
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
2.1.2.2.1.2 USR Effluent Management - Pump Op	3,309.00	HR		3,309.00	0	21,509	0	0	21,509

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
				32.10	*925.88*	*227.89*	*0.00*	*0.00*	*1,153.77*
2.1.2.2.2 Weir Operation After Dredging (Runoff Management)	**129.00**	**MO**		**4,141.00**	**119,439**	**29,398**	**0**	**0**	**148,837**
2.1.2.2.2.1 USR Runoff Management (Weir Op) - Labor	1,035.00	HR		*1.00* 1,035.00	*115.40* 119,439	*8.90* 9,209	*0.00* 0	*0.00* 0	*124.30* 128,648
2.1.2.2.2.2 USR Runoff Management - Pump Op	3,106.00	HR		*1.00* 3,106.00	*0.00* 0	*6.50* 20,189	*0.00* 0	*0.00* 0	*6.50* 20,189
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.1.2.2.4 Perimeter Trenching	**15,533.00**	**LF**		**310.66**	**22,066**	**63,972**	**0**	**0**	**86,038**
2.1.2.2.4.1 USR Dragline Trenching Around Perimeter	15,533.00	LF		*0.02* 310.66	*1.42* 22,066	*4.12* 63,972	*0.00* 0	*0.00* 0	*5.54* 86,038
2.1.2.2.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
2.1.2.2.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.1.2.2.8 Surface Trenching	**57,499.00**	**LF**		**0.00**	**5,184**	**6,769**	**0**	**0**	**11,953**
2.1.2.2.8.1 USR Initial Surface Trenching	57,499.00	LF		*0.00* 0.00	*0.09* 5,184	*0.12* 6,769	*0.00* 0	*0.00* 0	*0.21* 11,953
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.1.2.2.9 Trench Deepening	**1,168,512.00**	**LF**		**0.00**	**105,357**	**137,560**	**0**	**0**	**242,917**
2.1.2.2.9.1 USR Trench Deepening	1,168,512.00	LF		*0.00* 0.00	*0.09* 105,357	*0.12* 137,560	*0.00* 0	*0.00* 0	*0.21* 242,917
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
2.1.2.2.10 Carbon Dosing	**68,041.00**	**LB**		**68.04**	**4,651**	**2,914**	**54,433**	**0**	**61,998**
2.1.2.2.10.1 USR Carbon Dosing	68,041.00	LB		*0.00* 68.04	*0.07* 4,651	*0.04* 2,914	*0.80* 54,433	*0.00* 0	*0.91* 61,998
2.1.2.2.11 Vegetation Control	**1.00**	**LS**		**10,836.00**	**810,578**	**471,857**	**112,123**	**0**	**1,394,559**
2.1.2.2.11.1 USR Mowing	10,638.00	ACR		*1.00* 10,638.00	*74.80* 795,766	*42.87* 456,070	*0.00* 0	*0.00* 0	*117.68* 1,251,836
2.1.2.2.11.2 USR Till and Apply Herbicide	198.00	ACR		*1.00* 198.00	*74.80* 14,811	*79.74* 15,788	*566.28* 112,123	*0.00* 0	*720.82* 142,722
2.2 Cast in Place - Alternative 2	**1.00**	**LS**		**53,578.61**	**5,224,859**	**5,110,394**	**2,739,963**	**640,000**	**13,715,216**
				24,907.74	*3,074,428.50*	*3,249,289.24*	*2,653,313.26*	*540,000.00*	*9,517,030.99*
2.2.1 Initial Construction Costs	**1.00**	**EA**		**24,907.74**	**3,074,428**	**3,249,289**	**2,653,313**	**540,000**	**9,517,031**
				10,232.11	*1,259,495.22*	*1,315,033.19*	*1,319,296.59*	*270,000.00*	*4,163,824.99*
2.2.1.1 Disposal Cell	**1.00**	**EA**		**10,232.11**	**1,259,495**	**1,315,033**	**1,319,297**	**270,000**	**4,163,825**
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
2.2.1.1.1 Clearing & Grubbing	**96.00**	**ACR**		**768.00**	**129,544**	**121,070**	**0**	**0**	**250,614**

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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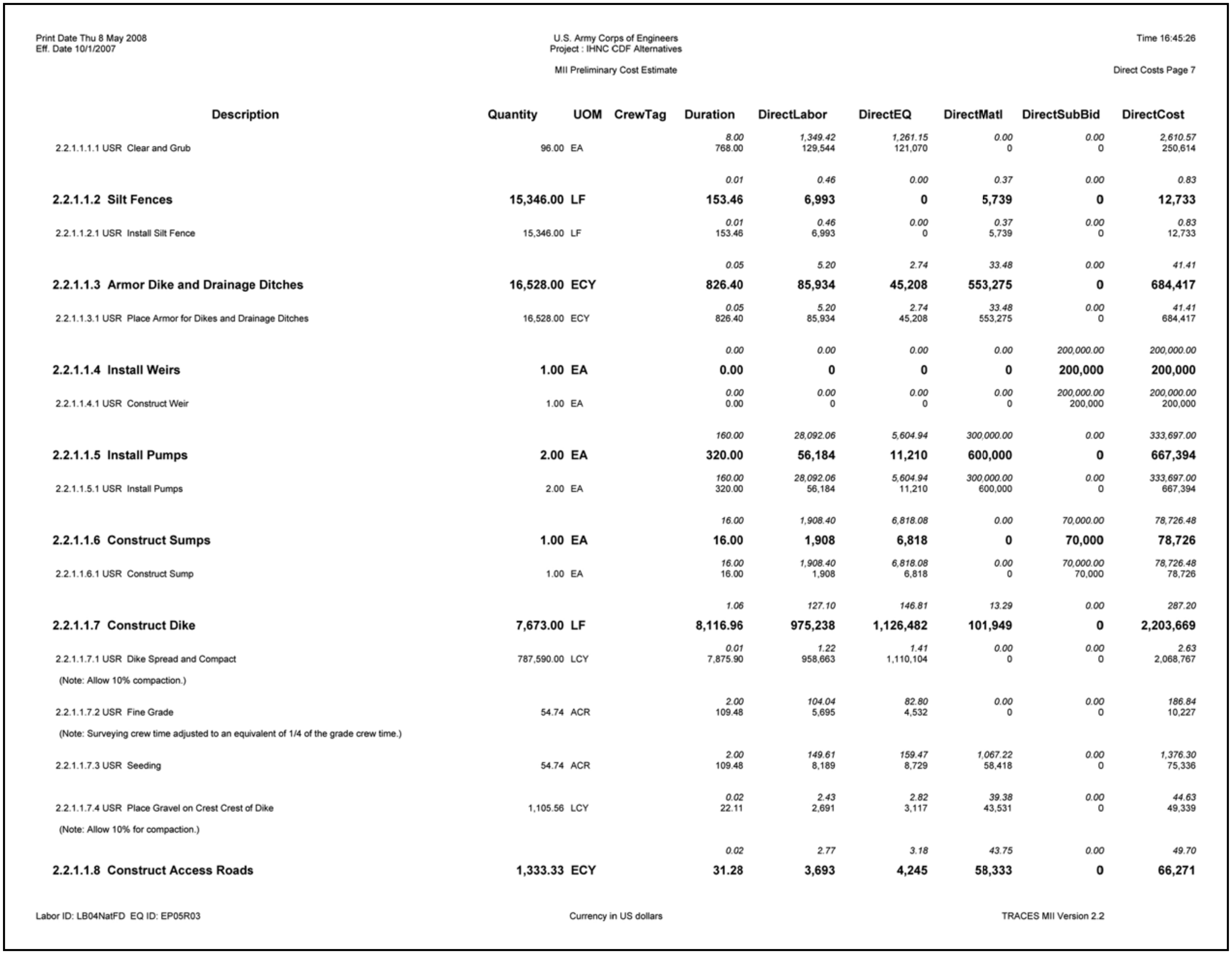

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.2.1.1.1.1 USR Clear and Grub	96.00	EA		*8.00* 768.00	*1,349.42* 129,544	*1,261.15* 121,070	*0.00* 0	*0.00* 0	*2,610.57* 250,614
2.2.1.1.2 Silt Fences	**15,346.00**	**LF**		*0.01* **153.46**	*0.46* **6,993**	*0.00* **0**	*0.37* **5,739**	*0.00* **0**	*0.83* **12,733**
2.2.1.1.2.1 USR Install Silt Fence	15,346.00	LF		*0.01* 153.46	*0.46* 6,993	*0.00* 0	*0.37* 5,739	*0.00* 0	*0.83* 12,733
2.2.1.1.3 Armor Dike and Drainage Ditches	**16,528.00**	**ECY**		*0.05* **826.40**	*5.20* **85,934**	*2.74* **45,208**	*33.48* **553,275**	*0.00* **0**	*41.41* **684,417**
2.2.1.1.3.1 USR Place Armor for Dikes and Drainage Ditches	16,528.00	ECY		*0.05* 826.40	*5.20* 85,934	*2.74* 45,208	*33.48* 553,275	*0.00* 0	*41.41* 684,417
2.2.1.1.4 Install Weirs	**1.00**	**EA**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*200,000.00* **200,000**	*200,000.00* **200,000**
2.2.1.1.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
2.2.1.1.5 Install Pumps	**2.00**	**EA**		*160.00* **320.00**	*28,092.06* **56,184**	*5,604.94* **11,210**	*300,000.00* **600,000**	*0.00* **0**	*333,697.00* **667,394**
2.2.1.1.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
2.2.1.1.6 Construct Sumps	**1.00**	**EA**		*16.00* **16.00**	*1,908.40* **1,908**	*6,818.08* **6,818**	*0.00* **0**	*70,000.00* **70,000**	*78,726.48* **78,726**
2.2.1.1.6.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
2.2.1.1.7 Construct Dike	**7,673.00**	**LF**		*1.06* **8,116.96**	*127.10* **975,238**	*146.81* **1,126,482**	*13.29* **101,949**	*0.00* **0**	*287.20* **2,203,669**
2.2.1.1.7.1 USR Dike Spread and Compact	787,590.00	LCY		*0.01* 7,875.90	*1.22* 958,663	*1.41* 1,110,104	*0.00* 0	*0.00* 0	*2.63* 2,068,767
(Note: Allow 10% compaction.)									
2.2.1.1.7.2 USR Fine Grade	54.74	ACR		*2.00* 109.48	*104.04* 5,695	*82.80* 4,532	*0.00* 0	*0.00* 0	*186.84* 10,227
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
2.2.1.1.7.3 USR Seeding	54.74	ACR		*2.00* 109.48	*149.61* 8,189	*159.47* 8,729	*1,067.22* 58,418	*0.00* 0	*1,376.30* 75,336
2.2.1.1.7.4 USR Place Gravel on Crest Crest of Dike	1,105.56	LCY		*0.02* 22.11	*2.43* 2,691	*2.82* 3,117	*39.38* 43,531	*0.00* 0	*44.63* 49,339
(Note: Allow 10% for compaction.)									
2.2.1.1.8 Construct Access Roads	**1,333.33**	**ECY**		*0.02* **31.28**	*2.77* **3,693**	*3.18* **4,245**	*43.75* **58,333**	*0.00* **0**	*49.70* **66,271**

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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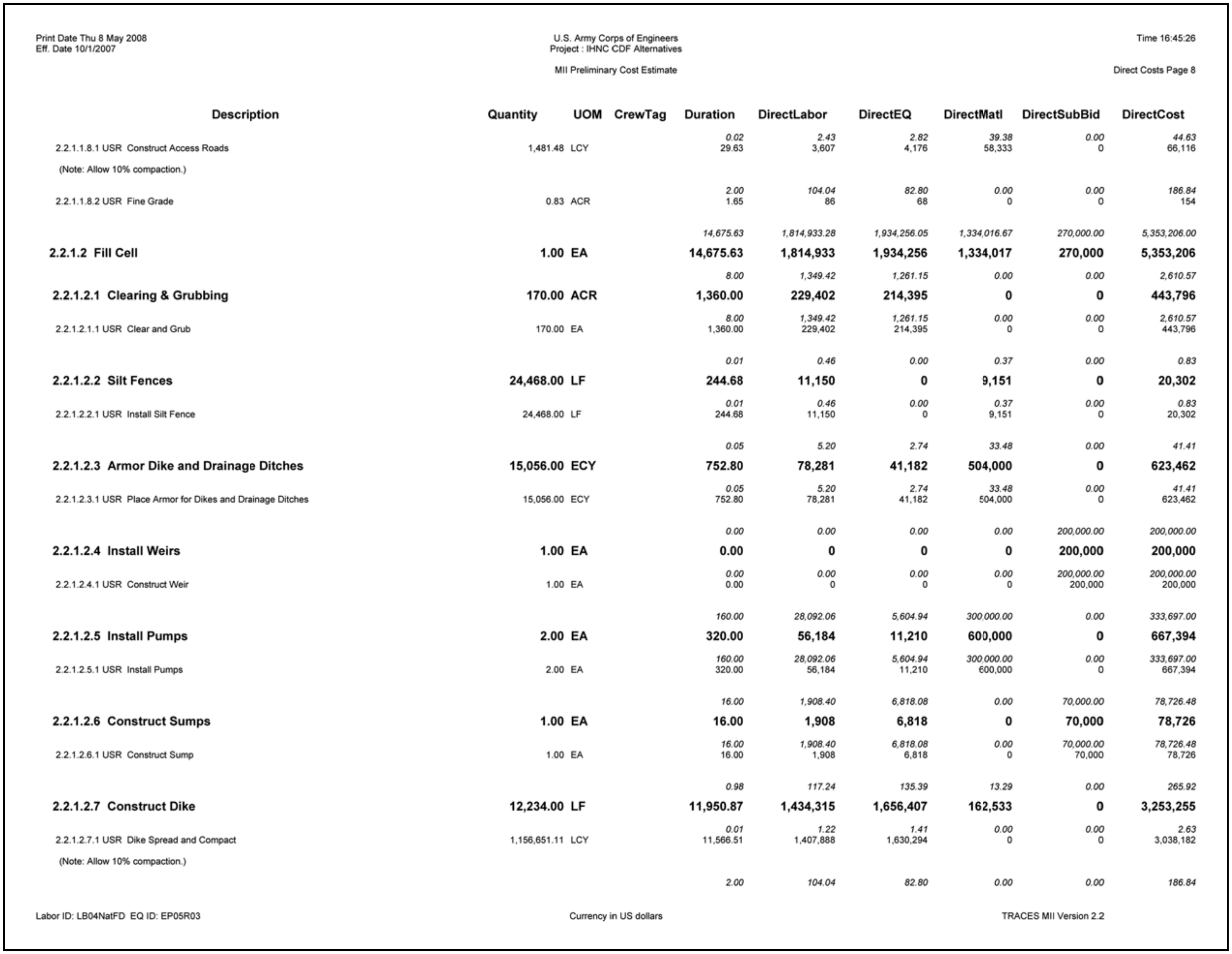

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.2.1.1.8.1 USR Construct Access Roads	1,481.48	LCY		0.02 29.63	2.43 3,607	2.82 4,176	39.38 58,333	0.00 0	44.63 66,116
(Note: Allow 10% compaction.)									
2.2.1.1.8.2 USR Fine Grade	0.83	ACR		2.00 1.65	104.04 86	82.80 68	0.00 0	0.00 0	186.84 154
2.2.1.2 Fill Cell	**1.00**	**EA**		14,675.63 **14,675.63**	1,814,933.28 **1,814,933**	1,934,256.05 **1,934,256**	1,334,016.67 **1,334,017**	270,000.00 **270,000**	5,353,206.00 **5,353,206**
2.2.1.2.1 Clearing & Grubbing	**170.00**	**ACR**		8.00 **1,360.00**	1,349.42 **229,402**	1,261.15 **214,395**	0.00 **0**	0.00 **0**	2,610.57 **443,796**
2.2.1.2.1.1 USR Clear and Grub	170.00	EA		8.00 1,360.00	1,349.42 229,402	1,261.15 214,395	0.00 0	0.00 0	2,610.57 443,796
2.2.1.2.2 Silt Fences	**24,468.00**	**LF**		0.01 **244.68**	0.46 **11,150**	0.00 **0**	0.37 **9,151**	0.00 **0**	0.83 **20,302**
2.2.1.2.2.1 USR Install Silt Fence	24,468.00	LF		0.01 244.68	0.46 11,150	0.00 0	0.37 9,151	0.00 0	0.83 20,302
2.2.1.2.3 Armor Dike and Drainage Ditches	**15,056.00**	**ECY**		0.05 **752.80**	5.20 **78,281**	2.74 **41,182**	33.48 **504,000**	0.00 **0**	41.41 **623,462**
2.2.1.2.3.1 USR Place Armor for Dikes and Drainage Ditches	15,056.00	ECY		0.05 752.80	5.20 78,281	2.74 41,182	33.48 504,000	0.00 0	41.41 623,462
2.2.1.2.4 Install Weirs	**1.00**	**EA**		0.00 **0.00**	0.00 **0**	0.00 **0**	0.00 **0**	200,000.00 **200,000**	200,000.00 **200,000**
2.2.1.2.4.1 USR Construct Weir	1.00	EA		0.00 0.00	0.00 0	0.00 0	0.00 0	200,000.00 200,000	200,000.00 200,000
2.2.1.2.5 Install Pumps	**2.00**	**EA**		160.00 **320.00**	28,092.06 **56,184**	5,604.94 **11,210**	300,000.00 **600,000**	0.00 **0**	333,697.00 **667,394**
2.2.1.2.5.1 USR Install Pumps	2.00	EA		160.00 320.00	28,092.06 56,184	5,604.94 11,210	300,000.00 600,000	0.00 0	333,697.00 667,394
2.2.1.2.6 Construct Sumps	**1.00**	**EA**		16.00 **16.00**	1,908.40 **1,908**	6,818.08 **6,818**	0.00 **0**	70,000.00 **70,000**	78,726.48 **78,726**
2.2.1.2.6.1 USR Construct Sump	1.00	EA		16.00 16.00	1,908.40 1,908	6,818.08 6,818	0.00 0	70,000.00 70,000	78,726.48 78,726
2.2.1.2.7 Construct Dike	**12,234.00**	**LF**		0.98 **11,950.87**	117.24 **1,434,315**	135.39 **1,656,407**	13.29 **162,533**	0.00 **0**	265.92 **3,253,255**
2.2.1.2.7.1 USR Dike Spread and Compact	1,156,651.11	LCY		0.01 11,566.51	1.22 1,407,888	1.41 1,630,294	0.00 0	0.00 0	2.63 3,038,182
(Note: Allow 10% compaction.)									
				2.00	104.04	82.80	0.00	0.00	186.84

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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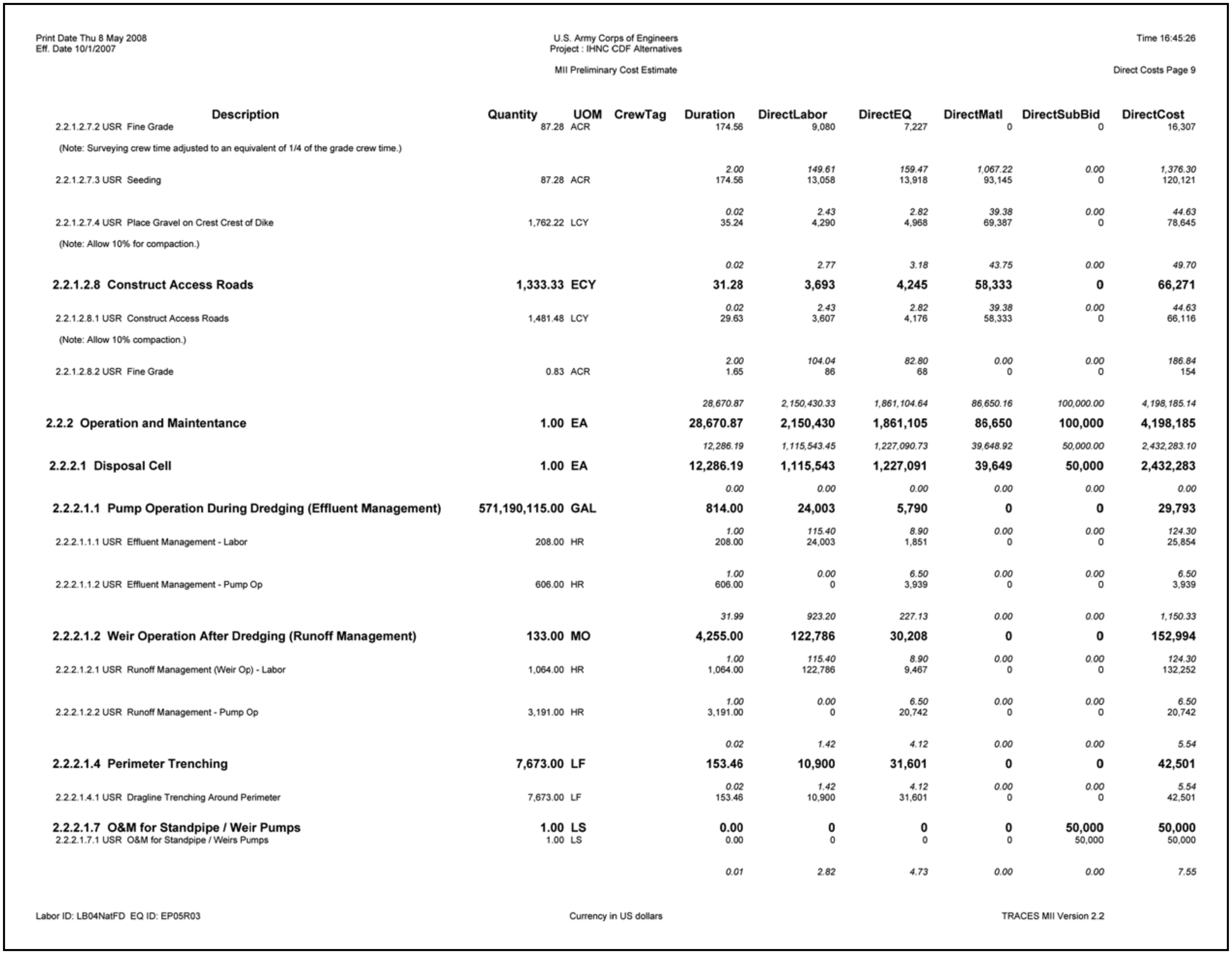

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.2.1.2.7.2 USR Fine Grade	87.28	ACR		174.56	9,080	7,227	0	0	16,307
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
				2.00	*149.61*	*159.47*	*1,067.22*	*0.00*	*1,376.30*
2.2.1.2.7.3 USR Seeding	87.28	ACR		174.56	13,058	13,918	93,145	0	120,121
				0.02	*2.43*	*2.82*	*39.38*	*0.00*	*44.63*
2.2.1.2.7.4 USR Place Gravel on Crest Crest of Dike	1,762.22	LCY		35.24	4,290	4,968	69,387	0	78,645
(Note: Allow 10% for compaction.)									
				0.02	*2.77*	*3.18*	*43.75*	*0.00*	*49.70*
2.2.1.2.8 Construct Access Roads	**1,333.33**	**ECY**		**31.28**	**3,693**	**4,245**	**58,333**	**0**	**66,271**
				0.02	*2.43*	*2.82*	*39.38*	*0.00*	*44.63*
2.2.1.2.8.1 USR Construct Access Roads	1,481.48	LCY		29.63	3,607	4,176	58,333	0	66,116
(Note: Allow 10% compaction.)									
				2.00	*104.04*	*82.80*	*0.00*	*0.00*	*186.84*
2.2.1.2.8.2 USR Fine Grade	0.83	ACR		1.65	86	68	0	0	154
				28,670.87	*2,150,430.33*	*1,861,104.64*	*86,650.16*	*100,000.00*	*4,198,185.14*
2.2.2 Operation and Maintentance	**1.00**	**EA**		**28,670.87**	**2,150,430**	**1,861,105**	**86,650**	**100,000**	**4,198,185**
				12,286.19	*1,115,543.45*	*1,227,090.73*	*39,648.92*	*50,000.00*	*2,432,283.10*
2.2.2.1 Disposal Cell	**1.00**	**EA**		**12,286.19**	**1,115,543**	**1,227,091**	**39,649**	**50,000**	**2,432,283**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
2.2.2.1.1 Pump Operation During Dredging (Effluent Management)	**571,190,115.00**	**GAL**		**814.00**	**24,003**	**5,790**	**0**	**0**	**29,793**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
2.2.2.1.1.1 USR Effluent Management - Labor	208.00	HR		208.00	24,003	1,851	0	0	25,854
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
2.2.2.1.1.2 USR Effluent Management - Pump Op	606.00	HR		606.00	0	3,939	0	0	3,939
				31.99	*923.20*	*227.13*	*0.00*	*0.00*	*1,150.33*
2.2.2.1.2 Weir Operation After Dredging (Runoff Management)	**133.00**	**MO**		**4,255.00**	**122,786**	**30,208**	**0**	**0**	**152,994**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
2.2.2.1.2.1 USR Runoff Management (Weir Op) - Labor	1,064.00	HR		1,064.00	122,786	9,467	0	0	132,252
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
2.2.2.1.2.2 USR Runoff Management - Pump Op	3,191.00	HR		3,191.00	0	20,742	0	0	20,742
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.2.2.1.4 Perimeter Trenching	**7,673.00**	**LF**		**153.46**	**10,900**	**31,601**	**0**	**0**	**42,501**
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.2.2.1.4.1 USR Dragline Trenching Around Perimeter	7,673.00	LF		153.46	10,900	31,601	0	0	42,501
2.2.2.1.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
2.2.2.1.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.01	*2.82*	*4.73*	*0.00*	*0.00*	*7.55*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.2.2.1.8 Cap Cell	**188,760.00**	**ECY**		**1,747.78**	**531,912**	**893,033**	**0**	**0**	**1,424,945**
2.2.2.1.8.1 USR Cap Cell	209,733.33	LCY		*0.01* 1,747.78	*2.54* 531,912	*4.26* 893,033	*0.00* 0	*0.00* 0	*6.79* 1,424,945
2.2.2.1.9 Surface Trenching	**11,326.00**	**LF**		*0.00* **0.00**	*0.09* **1,021**	*0.12* **1,333**	*0.00* **0**	*0.00* **0**	*0.21* **2,355**
2.2.2.1.9.1 USR Surface Trenching	11,326.00	LF		*0.00* 0.00	*0.09* 1,021	*0.12* 1,333	*0.00* 0	*0.00* 0	*0.21* 2,355
2.2.2.1.10 Trench Deepening	**303,975.00**	**LF**		*0.00* **0.00**	*0.09* **27,408**	*0.12* **35,785**	*0.00* **0**	*0.00* **0**	*0.21* **63,192**
2.2.2.1.10.1 USR Trench Deepening	303,975.00	LF		*0.00* 0.00	*0.09* 27,408	*0.12* 35,785	*0.00* 0	*0.00* 0	*0.21* 63,192
2.2.2.1.11 Carbon Dosing	**21,955.00**	**LB**		*0.00* **21.96**	*0.07* **1,501**	*0.04* **940**	*0.80* **17,564**	*0.00* **0**	*0.91* **20,005**
2.2.2.1.11.1 USR Carbon Dosing	21,955.00	LB		*0.00* 21.96	*0.07* 1,501	*0.04* 940	*0.80* 17,564	*0.00* 0	*0.91* 20,005
2.2.2.1.12 Vegetation Control	**1.00**	**LS**		**5,294.00**	**396,013**	**228,401**	**22,085**	**0**	**646,499**
2.2.2.1.12.1 USR Mowing	5,255.00	ACR		*1.00* 5,255.00	*74.80* 393,096	*42.87* 225,291	*0.00* 0	*0.00* 0	*117.68* 618,387
2.2.2.1.12.2 USR Till and Apply Herbicide	39.00	ACR		*1.00* 39.00	*74.80* 2,917	*79.74* 3,110	*566.28* 22,085	*0.00* 0	*720.82* 28,112
2.2.2.2 Fill Cell	**1.00**	**EA**		*16,384.68* **16,384.68**	*1,034,886.88* **1,034,887**	*634,013.91* **634,014**	*47,001.24* **47,001**	*50,000.00* **50,000**	*1,765,902.03* **1,765,902**
2.2.2.2.1 Pump Operation During Dredging (Effluent Management)	**958,850,772.00**	**GAL**		*0.00* **1,345.00**	*0.00* **37,851**	*0.00* **9,529**	*0.00* **0**	*0.00* **0**	*0.00* **47,380**
2.2.2.2.1.1 USR Effluent Management - Labor	328.00	HR		*1.00* 328.00	*115.40* 37,851	*8.90* 2,918	*0.00* 0	*0.00* 0	*124.30* 40,769
2.2.2.2.1.2 USR Effluent Management - Pump Op	1,017.00	HR		*1.00* 1,017.00	*0.00* 0	*6.50* 6,611	*0.00* 0	*0.00* 0	*6.50* 6,611
2.2.2.2.2 Weir Operation After Dredging (Runoff Management)	**132.00**	**MO**		*32.11* **4,239.00**	*926.70* **122,324**	*227.99* **30,094**	*0.00* **0**	*0.00* **0**	*1,154.69* **152,419**
2.2.2.2.2.1 USR Runoff Management (Weir Op) - Labor	1,060.00	HR		*1.00* 1,060.00	*115.40* 122,324	*8.90* 9,431	*0.00* 0	*0.00* 0	*124.30* 131,755
2.2.2.2.2.2 USR Runoff Management - Pump Op	3,179.00	HR		*1.00* 3,179.00	*0.00* 0	*6.50* 20,664	*0.00* 0	*0.00* 0	*6.50* 20,664
2.2.2.2.4 Perimeter Trenching	**12,234.00**	**LF**		*0.02* **244.68**	*1.42* **17,380**	*4.12* **50,385**	*0.00* **0**	*0.00* **0**	*5.54* **67,765**

Labor ID: LB04NatFD EQ ID: EP05R03

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.2.2.2.4.1 USR Dragline Trenching Around Perimeter	12,234.00	LF		*0.02* 244.68	*1.42* 17,380	*4.12* 50,385	*0.00* 0	*0.00* 0	*5.54* 67,765
2.2.2.2.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
2.2.2.2.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
2.2.2.2.8 Surface Trenching	**24,103.00**	**LF**		*0.00* **0.00**	*0.09* **2,173**	*0.12* **2,837**	*0.00* **0**	*0.00* **0**	*0.21* **5,011**
2.2.2.2.8.1 USR Surface Trenching	24,103.00	LF		*0.00* 0.00	*0.09* 2,173	*0.12* 2,837	*0.00* 0	*0.00* 0	*0.21* 5,011
2.2.2.2.9 Trench Deepening	**726,746.00**	**LF**		*0.00* **0.00**	*0.09* **65,526**	*0.12* **85,554**	*0.00* **0**	*0.00* **0**	*0.21* **151,080**
2.2.2.2.9.1 USR Trench Deepening	726,746.00	LF		*0.00* 0.00	*0.09* 65,526	*0.12* 85,554	*0.00* 0	*0.00* 0	*0.21* 151,080
2.2.2.2.10 Carbon Dosing	**0.00**	**LB**		*0.00* **0.00**	*0.07* **0**	*0.04* **0**	*0.80* **0**	*0.00* **0**	*0.91* **0**
2.2.2.2.10.1 USR Carbon Dosing	0.00	LB		*0.00* 0.00	*0.07* 0	*0.04* 0	*0.80* 0	*0.00* 0	*0.91* 0
2.2.2.2.11 Vegetation Control	**1.00**	**LS**		**10,556.00**	**789,633**	**455,614**	**47,001**	**0**	**1,292,248**
2.2.2.2.11.1 USR Mowing	10,473.00	ACR		*1.00* 10,473.00	*74.80* 783,424	*42.87* 448,996	*0.00* 0	*0.00* 0	*117.68* 1,232,420
2.2.2.2.11.2 USR Till and Apply Herbicide	83.00	ACR		*1.00* 83.00	*74.80* 6,209	*79.74* 6,618	*566.28* 47,001	*0.00* 0	*720.82* 59,828
2.3 Float in Place - Alternative 1	**1.00**	**LS**		**61,588.90**	**6,540,401**	**7,013,061**	**2,996,950**	**640,000**	**17,190,412**
2.3.1 Initial Construction Costs	**1.00**	**EA**		*28,254.53* **28,254.53**	*3,510,129.86* **3,510,130**	*3,707,440.52* **3,707,441**	*2,799,071.53* **2,799,072**	*540,000.00* **540,000**	*10,556,641.91* **10,556,642**
2.3.1.1 Disposal Cell	**1.00**	**EA**		*12,764.22* **12,764.22**	*1,587,743.83* **1,587,744**	*1,662,303.33* **1,662,303**	*1,419,448.97* **1,419,449**	*270,000.00* **270,000**	*4,939,496.13* **4,939,496**
2.3.1.1.1 Clearing & Grubbing	**172.00**	**ACR**		*8.00* **1,376.00**	*1,349.42* **232,100**	*1,261.15* **216,917**	*0.00* **0**	*0.00* **0**	*2,610.57* **449,017**
2.3.1.1.1.1 USR Clear and Grub	172.00	EA		*8.00* 1,376.00	*1,349.42* 232,100	*1,261.15* 216,917	*0.00* 0	*0.00* 0	*2,610.57* 449,017
2.3.1.1.2 Silt Fences	**19,509.00**	**LF**		*0.01* **195.09**	*0.46* **8,891**	*0.00* **0**	*0.37* **7,296**	*0.00* **0**	*0.83* **16,187**
2.3.1.1.2.1 USR Install Silt Fence	19,509.00	LF		*0.01* 195.09	*0.46* 8,891	*0.00* 0	*0.37* 7,296	*0.00* 0	*0.83* 16,187
2.3.1.1.3 Armor Dike and Drainage Ditches	**18,647.00**	**ECY**		*0.05* **932.35**	*5.20* **96,951**	*2.74* **51,004**	*33.48* **624,208**	*0.00* **0**	*41.41* **772,164**

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.3.1.1.3.1 USR Place Armor for Dikes and Drainage Ditches	18,647.00	ECY		*0.05* 932.35	*5.20* 96,951	*2.74* 51,004	*33.48* 624,208	*0.00* 0	*41.41* 772,164
2.3.1.1.4 Install Weirs	**1.00**	**EA**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*200,000.00* **200,000**	*200,000.00* **200,000**
2.3.1.1.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
2.3.1.1.5 Install Pumps	**2.00**	**EA**		*160.00* **320.00**	*28,092.06* **56,184**	*5,604.94* **11,210**	*300,000.00* **600,000**	*0.00* **0**	*333,697.00* **667,394**
2.3.1.1.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
2.3.1.1.6 Construct Sumps	**1.00**	**EA**		*16.00* **16.00**	*1,908.40* **1,908**	*6,818.08* **6,818**	*0.00* **0**	*70,000.00* **70,000**	*78,726.48* **78,726**
2.3.1.1.6.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
2.3.1.1.7 Construct Dike	**9,755.00**	**LF**		*1.01* **9,893.50**	*121.79* **1,188,016**	*140.66* **1,372,109**	*13.29* **129,611**	*0.00* **0**	*275.73* **2,689,737**
2.3.1.1.7.1 USR Dike Spread and Compact	958,703.33	LCY		*0.01* 9,587.03	*1.22* 1,166,944	*1.41* 1,351,287	*0.00* 0	*0.00* 0	*2.63* 2,518,231
(Note: Allow 10% compaction.)									
2.3.1.1.7.2 USR Fine Grade	69.59	ACR		*2.00* 139.18	*104.04* 7,240	*82.80* 5,762	*0.00* 0	*0.00* 0	*186.84* 13,002
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
2.3.1.1.7.3 USR Seeding	69.59	ACR		*2.00* 139.18	*149.61* 10,411	*159.47* 11,098	*1,067.22* 74,267	*0.00* 0	*1,376.30* 95,776
2.3.1.1.7.4 USR Place Gravel on Crest Crest of Dike	1,405.56	LCY		*0.02* 28.11	*2.43* 3,422	*2.82* 3,962	*39.38* 55,344	*0.00* 0	*44.63* 62,728
(Note: Allow 10% for compaction.)									
2.3.1.1.8 Construct Access Roads	**1,333.33**	**ECY**		*0.02* **31.28**	*2.77* **3,693**	*3.18* **4,245**	*43.75* **58,333**	*0.00* **0**	*49.70* **66,271**
2.3.1.1.8.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
(Note: Allow 10% compaction.)									
2.3.1.1.8.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
2.3.1.2 Fill Cell	**1.00**	**EA**		*15,490.30* **15,490.30**	*1,922,386.03* **1,922,386**	*2,045,137.19* **2,045,137**	*1,379,622.56* **1,379,623**	*270,000.00* **270,000**	*5,617,145.78* **5,617,146**
2.3.1.2.1 Clearing & Grubbing	**200.00**	**ACR**		*8.00* **1,600.00**	*1,349.42* **269,884**	*1,261.15* **252,229**	*0.00* **0**	*0.00* **0**	*2,610.57* **522,113**

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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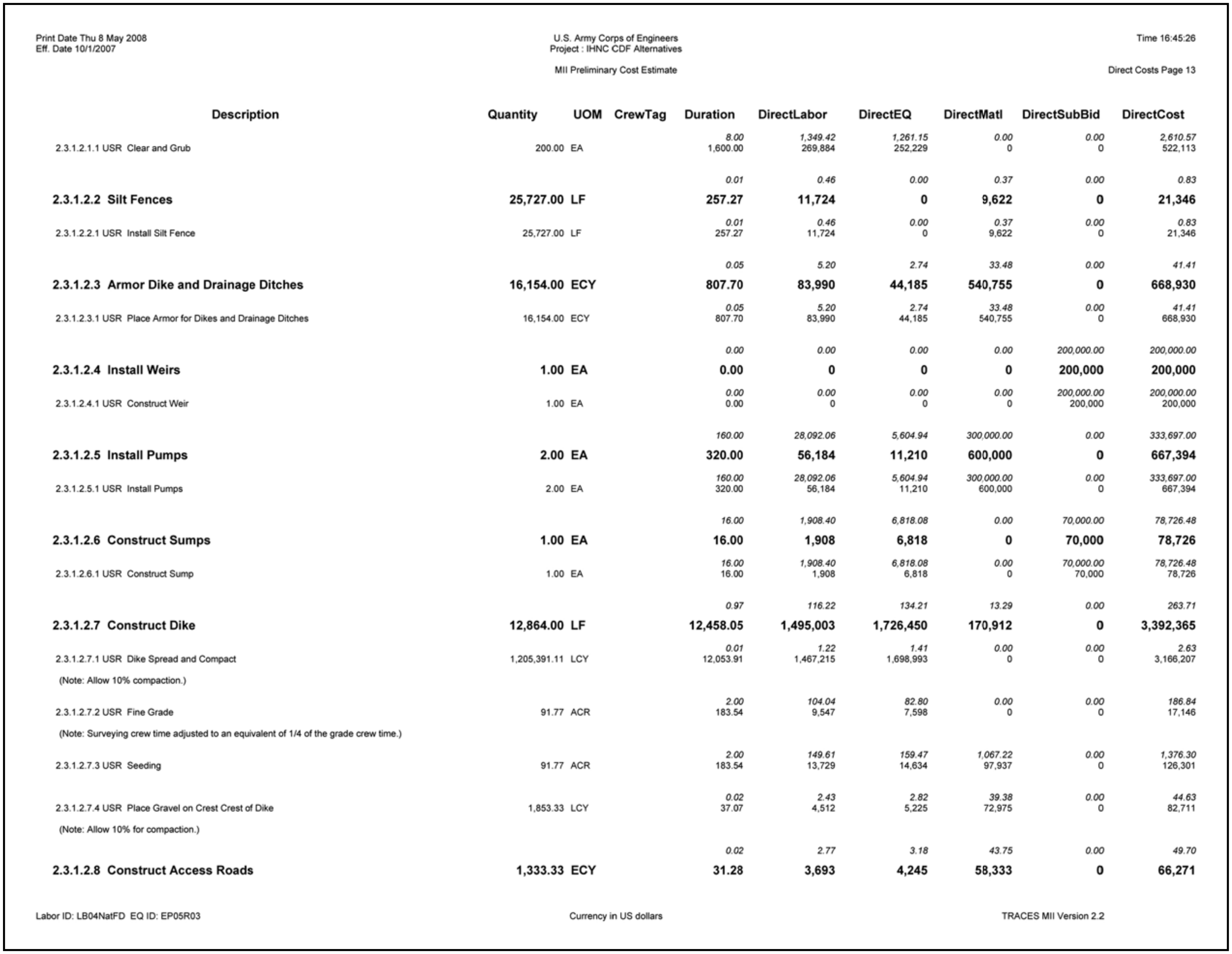

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.3.1.2.1.1 USR Clear and Grub	200.00	EA		*8.00* 1,600.00	*1,349.42* 269,884	*1,261.15* 252,229	*0.00* 0	*0.00* 0	*2,610.57* 522,113
2.3.1.2.2 Silt Fences	**25,727.00**	**LF**		*0.01* **257.27**	*0.46* **11,724**	*0.00* **0**	*0.37* **9,622**	*0.00* **0**	*0.83* **21,346**
2.3.1.2.2.1 USR Install Silt Fence	25,727.00	LF		*0.01* 257.27	*0.46* 11,724	*0.00* 0	*0.37* 9,622	*0.00* 0	*0.83* 21,346
2.3.1.2.3 Armor Dike and Drainage Ditches	**16,154.00**	**ECY**		*0.05* **807.70**	*5.20* **83,990**	*2.74* **44,185**	*33.48* **540,755**	*0.00* **0**	*41.41* **668,930**
2.3.1.2.3.1 USR Place Armor for Dikes and Drainage Ditches	16,154.00	ECY		*0.05* 807.70	*5.20* 83,990	*2.74* 44,185	*33.48* 540,755	*0.00* 0	*41.41* 668,930
2.3.1.2.4 Install Weirs	**1.00**	**EA**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*200,000.00* **200,000**	*200,000.00* **200,000**
2.3.1.2.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
2.3.1.2.5 Install Pumps	**2.00**	**EA**		*160.00* **320.00**	*28,092.06* **56,184**	*5,604.94* **11,210**	*300,000.00* **600,000**	*0.00* **0**	*333,697.00* **667,394**
2.3.1.2.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
2.3.1.2.6 Construct Sumps	**1.00**	**EA**		*16.00* **16.00**	*1,908.40* **1,908**	*6,818.08* **6,818**	*0.00* **0**	*70,000.00* **70,000**	*78,726.48* **78,726**
2.3.1.2.6.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
2.3.1.2.7 Construct Dike	**12,864.00**	**LF**		*0.97* **12,458.05**	*116.22* **1,495,003**	*134.21* **1,726,450**	*13.29* **170,912**	*0.00* **0**	*263.71* **3,392,365**
2.3.1.2.7.1 USR Dike Spread and Compact	1,205,391.11	LCY		*0.01* 12,053.91	*1.22* 1,467,215	*1.41* 1,698,993	*0.00* 0	*0.00* 0	*2.63* 3,166,207
(Note: Allow 10% compaction.)									
2.3.1.2.7.2 USR Fine Grade	91.77	ACR		*2.00* 183.54	*104.04* 9,547	*82.80* 7,598	*0.00* 0	*0.00* 0	*186.84* 17,146
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
2.3.1.2.7.3 USR Seeding	91.77	ACR		*2.00* 183.54	*149.61* 13,729	*159.47* 14,634	*1,067.22* 97,937	*0.00* 0	*1,376.30* 126,301
2.3.1.2.7.4 USR Place Gravel on Crest Crest of Dike	1,853.33	LCY		*0.02* 37.07	*2.43* 4,512	*2.82* 5,225	*39.38* 72,975	*0.00* 0	*44.63* 82,711
(Note: Allow 10% for compaction.)									
2.3.1.2.8 Construct Access Roads	**1,333.33**	**ECY**		*0.02* **31.28**	*2.77* **3,693**	*3.18* **4,245**	*43.75* **58,333**	*0.00* **0**	*49.70* **66,271**

Labor ID: LB04NatFD EQ ID: EP05R03

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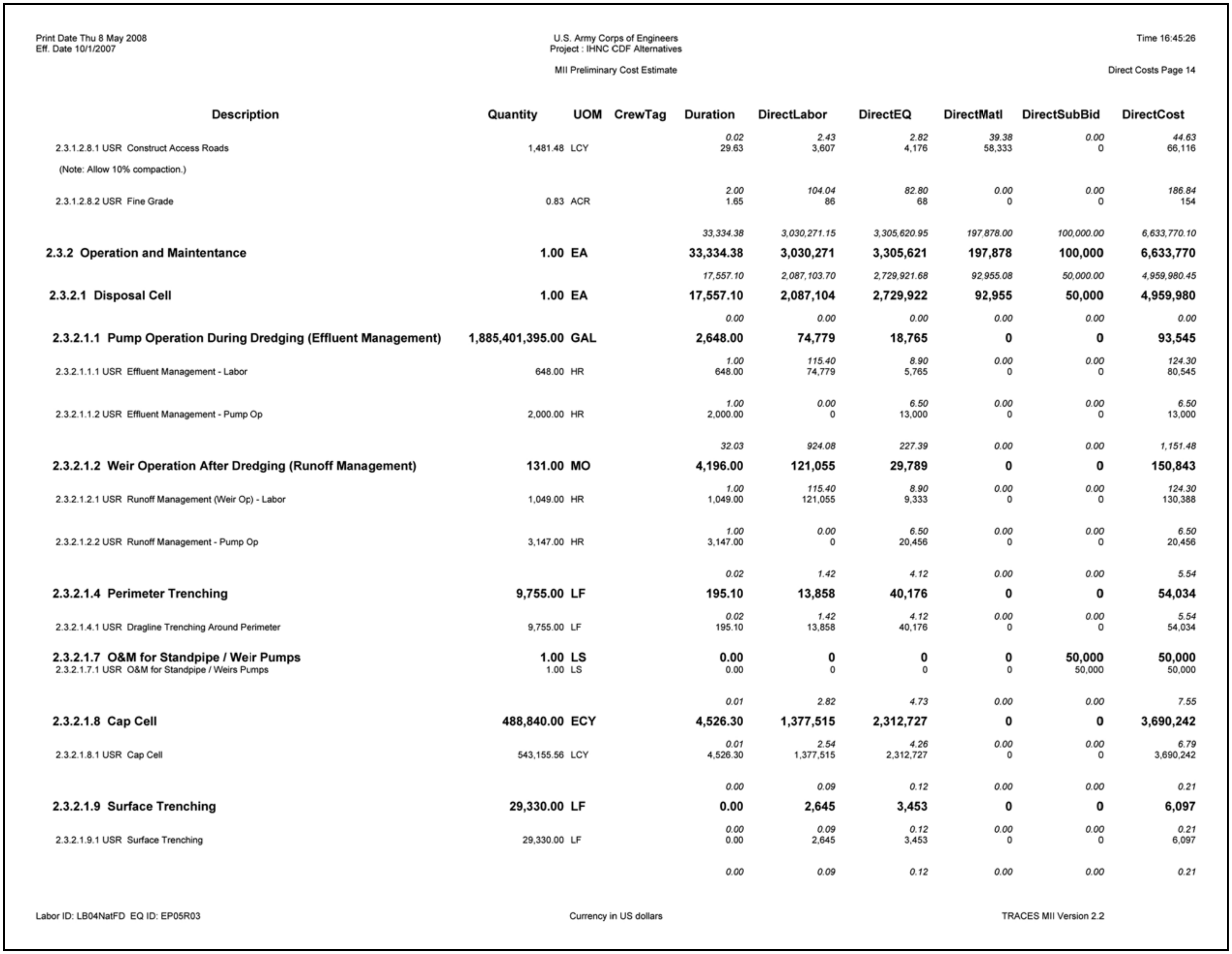

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
				0.02	*2.43*	*2.82*	*39.38*	*0.00*	*44.63*
2.3.1.2.8.1 USR Construct Access Roads	1,481.48	LCY		29.63	3,607	4,176	58,333	0	66,116
(Note: Allow 10% compaction.)									
				2.00	*104.04*	*82.80*	*0.00*	*0.00*	*186.84*
2.3.1.2.8.2 USR Fine Grade	0.83	ACR		1.65	86	68	0	0	154
				33,334.38	*3,030,271.15*	*3,305,620.95*	*197,878.00*	*100,000.00*	*6,633,770.10*
2.3.2 Operation and Maintentance	**1.00**	**EA**		**33,334.38**	**3,030,271**	**3,305,621**	**197,878**	**100,000**	**6,633,770**
				17,557.10	*2,087,103.70*	*2,729,921.68*	*92,955.08*	*50,000.00*	*4,959,980.45*
2.3.2.1 Disposal Cell	**1.00**	**EA**		**17,557.10**	**2,087,104**	**2,729,922**	**92,955**	**50,000**	**4,959,980**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
2.3.2.1.1 Pump Operation During Dredging (Effluent Management)	**1,885,401,395.00**	**GAL**		**2,648.00**	**74,779**	**18,765**	**0**	**0**	**93,545**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
2.3.2.1.1.1 USR Effluent Management - Labor	648.00	HR		648.00	74,779	5,765	0	0	80,545
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
2.3.2.1.1.2 USR Effluent Management - Pump Op	2,000.00	HR		2,000.00	0	13,000	0	0	13,000
				32.03	*924.08*	*227.39*	*0.00*	*0.00*	*1,151.48*
2.3.2.1.2 Weir Operation After Dredging (Runoff Management)	**131.00**	**MO**		**4,196.00**	**121,055**	**29,789**	**0**	**0**	**150,843**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
2.3.2.1.2.1 USR Runoff Management (Weir Op) - Labor	1,049.00	HR		1,049.00	121,055	9,333	0	0	130,388
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
2.3.2.1.2.2 USR Runoff Management - Pump Op	3,147.00	HR		3,147.00	0	20,456	0	0	20,456
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.3.2.1.4 Perimeter Trenching	**9,755.00**	**LF**		**195.10**	**13,858**	**40,176**	**0**	**0**	**54,034**
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
2.3.2.1.4.1 USR Dragline Trenching Around Perimeter	9,755.00	LF		195.10	13,858	40,176	0	0	54,034
2.3.2.1.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
2.3.2.1.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.01	*2.82*	*4.73*	*0.00*	*0.00*	*7.55*
2.3.2.1.8 Cap Cell	**488,840.00**	**ECY**		**4,526.30**	**1,377,515**	**2,312,727**	**0**	**0**	**3,690,242**
				0.01	*2.54*	*4.26*	*0.00*	*0.00*	*6.79*
2.3.2.1.8.1 USR Cap Cell	543,155.56	LCY		4,526.30	1,377,515	2,312,727	0	0	3,690,242
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.3.2.1.9 Surface Trenching	**29,330.00**	**LF**		**0.00**	**2,645**	**3,453**	**0**	**0**	**6,097**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.3.2.1.9.1 USR Surface Trenching	29,330.00	LF		0.00	2,645	3,453	0	0	6,097
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
2.3.2.1.10 Trench Deepening	**547,190.00**	**LF**		**0.00**	**49,337**	**64,416**	**0**	**0**	**113,753**
2.3.2.1.10.1 USR Trench Deepening	547,190.00	LF		*0.00* 0.00	*0.09* 49,337	*0.12* 64,416	*0.00* 0	*0.00* 0	*0.21* 113,753
2.3.2.1.11 Carbon Dosing	**44,701.00**	**LB**		*0.00* **44.70**	*0.07* **3,056**	*0.04* **1,914**	*0.80* **35,761**	*0.00* **0**	*0.91* **40,731**
2.3.2.1.11.1 USR Carbon Dosing	44,701.00	LB		*0.00* 44.70	*0.07* 3,056	*0.04* 1,914	*0.80* 35,761	*0.00* 0	*0.91* 40,731
2.3.2.1.12 Vegetation Control	**1.00**	**LS**		**5,947.00**	**444,860**	**258,682**	**57,194**	**0**	**760,736**
2.3.2.1.12.1 USR Mowing	5,846.00	ACR		*1.00* 5,846.00	*74.80* 437,305	*42.87* 250,628	*0.00* 0	*0.00* 0	*117.68* 687,933
2.3.2.1.12.2 USR Till and Apply Herbicide	101.00	ACR		*1.00* 101.00	*74.80* 7,555	*79.74* 8,053	*566.28* 57,194	*0.00* 0	*720.82* 72,803
2.3.2.2 Fill Cell	**1.00**	**EA**		*15,777.28* **15,777.28**	*943,167.45* **943,167**	*575,699.27* **575,699**	*104,922.92* **104,923**	*50,000.00* **50,000**	*1,673,789.64* **1,673,790**
2.3.2.2.1 Pump Operation During Dredging (Effluent Management)	**1,669,723,800.00**	**GAL**		*0.00* **2,340.00**	*0.00* **65,547**	*0.00* **16,572**	*0.00* **0**	*0.00* **0**	*0.00* **82,119**
2.3.2.2.1.1 USR Effluent Management - Labor	568.00	HR		*1.00* 568.00	*115.40* 65,547	*8.90* 5,054	*0.00* 0	*0.00* 0	*124.30* 70,601
2.3.2.2.1.2 USR Effluent Management - Pump Op	1,772.00	HR		*1.00* 1,772.00	*0.00* 0	*6.50* 11,518	*0.00* 0	*0.00* 0	*6.50* 11,518
2.3.2.2.2 Weir Operation After Dredging (Runoff Management)	**131.00**	**MO**		*32.11* **4,207.00**	*926.72* **121,401**	*227.99* **29,867**	*0.00* **0**	*0.00* **0**	*1,154.72* **151,268**
2.3.2.2.2.1 USR Runoff Management (Weir Op) - Labor	1,052.00	HR		*1.00* 1,052.00	*115.40* 121,401	*8.90* 9,360	*0.00* 0	*0.00* 0	*124.30* 130,761
2.3.2.2.2.2 USR Runoff Management - Pump Op	3,155.00	HR		*1.00* 3,155.00	*0.00* 0	*6.50* 20,508	*0.00* 0	*0.00* 0	*6.50* 20,508
2.3.2.2.4 Perimeter Trenching	**12,864.00**	**LF**		*0.02* **257.28**	*1.42* **18,275**	*4.12* **52,980**	*0.00* **0**	*0.00* **0**	*5.54* **71,255**
2.3.2.2.4.1 USR Dragline Trenching Around Perimeter	12,864.00	LF		*0.02* 257.28	*1.42* 18,275	*4.12* 52,980	*0.00* 0	*0.00* 0	*5.54* 71,255
2.3.2.2.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
2.3.2.2.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
2.3.2.2.8 Surface Trenching	**31,654.00**	**LF**		*0.00* **0.00**	*0.09* **2,854**	*0.12* **3,726**	*0.00* **0**	*0.00* **0**	*0.21* **6,580**
2.3.2.2.8.1 USR Surface Trenching	31,654.00	LF		*0.00* 0.00	*0.09* 2,854	*0.12* 3,726	*0.00* 0	*0.00* 0	*0.21* 6,580

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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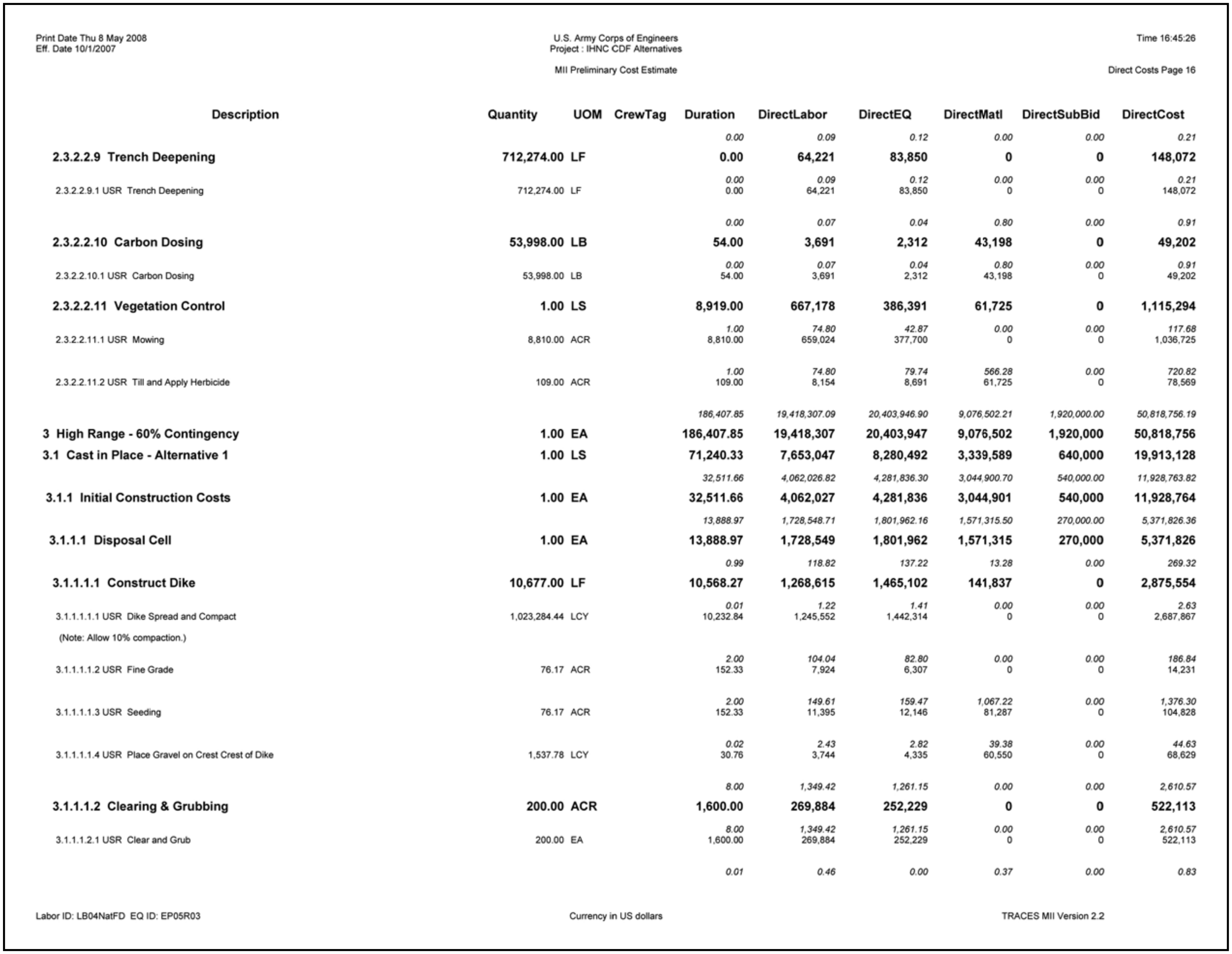

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
2.3.2.2.9 Trench Deepening	**712,274.00**	**LF**		**0.00**	**64,221**	**83,850**	**0**	**0**	**148,072**
2.3.2.2.9.1 USR Trench Deepening	712,274.00	LF		*0.00* 0.00	*0.09* 64,221	*0.12* 83,850	*0.00* 0	*0.00* 0	*0.21* 148,072
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
2.3.2.2.10 Carbon Dosing	**53,998.00**	**LB**		**54.00**	**3,691**	**2,312**	**43,198**	**0**	**49,202**
2.3.2.2.10.1 USR Carbon Dosing	53,998.00	LB		*0.00* 54.00	*0.07* 3,691	*0.04* 2,312	*0.80* 43,198	*0.00* 0	*0.91* 49,202
2.3.2.2.11 Vegetation Control	**1.00**	**LS**		**8,919.00**	**667,178**	**386,391**	**61,725**	**0**	**1,115,294**
2.3.2.2.11.1 USR Mowing	8,810.00	ACR		*1.00* 8,810.00	*74.80* 659,024	*42.87* 377,700	*0.00* 0	*0.00* 0	*117.68* 1,036,725
2.3.2.2.11.2 USR Till and Apply Herbicide	109.00	ACR		*1.00* 109.00	*74.80* 8,154	*79.74* 8,691	*566.28* 61,725	*0.00* 0	*720.82* 78,569
				186,407.85	*19,418,307.09*	*20,403,946.90*	*9,076,502.21*	*1,920,000.00*	*50,818,756.19*
3 High Range - 60% Contingency	**1.00**	**EA**		**186,407.85**	**19,418,307**	**20,403,947**	**9,076,502**	**1,920,000**	**50,818,756**
3.1 Cast in Place - Alternative 1	**1.00**	**LS**		**71,240.33**	**7,653,047**	**8,280,492**	**3,339,589**	**640,000**	**19,913,128**
				32,511.66	*4,062,026.82*	*4,281,836.30*	*3,044,900.70*	*540,000.00*	*11,928,763.82*
3.1.1 Initial Construction Costs	**1.00**	**EA**		**32,511.66**	**4,062,027**	**4,281,836**	**3,044,901**	**540,000**	**11,928,764**
				13,888.97	*1,728,548.71*	*1,801,962.16*	*1,571,315.50*	*270,000.00*	*5,371,826.36*
3.1.1.1 Disposal Cell	**1.00**	**EA**		**13,888.97**	**1,728,549**	**1,801,962**	**1,571,315**	**270,000**	**5,371,826**
				0.99	*118.82*	*137.22*	*13.28*	*0.00*	*269.32*
3.1.1.1.1 Construct Dike	**10,677.00**	**LF**		**10,568.27**	**1,268,615**	**1,465,102**	**141,837**	**0**	**2,875,554**
3.1.1.1.1.1 USR Dike Spread and Compact	1,023,284.44	LCY		*0.01* 10,232.84	*1.22* 1,245,552	*1.41* 1,442,314	*0.00* 0	*0.00* 0	*2.63* 2,687,867
(Note: Allow 10% compaction.)									
3.1.1.1.1.2 USR Fine Grade	76.17	ACR		*2.00* 152.33	*104.04* 7,924	*82.80* 6,307	*0.00* 0	*0.00* 0	*186.84* 14,231
3.1.1.1.1.3 USR Seeding	76.17	ACR		*2.00* 152.33	*149.61* 11,395	*159.47* 12,146	*1,067.22* 81,287	*0.00* 0	*1,376.30* 104,828
3.1.1.1.1.4 USR Place Gravel on Crest Crest of Dike	1,537.78	LCY		*0.02* 30.76	*2.43* 3,744	*2.82* 4,335	*39.38* 60,550	*0.00* 0	*44.63* 68,629
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
3.1.1.1.2 Clearing & Grubbing	**200.00**	**ACR**		**1,600.00**	**269,884**	**252,229**	**0**	**0**	**522,113**
3.1.1.1.2.1 USR Clear and Grub	200.00	EA		*8.00* 1,600.00	*1,349.42* 269,884	*1,261.15* 252,229	*0.00* 0	*0.00* 0	*2,610.57* 522,113
				0.01	*0.46*	*0.00*	*0.37*	*0.00*	*0.83*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.1.1.1.3 Silt Fencing	**21,353.00**	**LF**		**213.53**	**9,731**	**0**	**7,986**	**0**	**17,717**
3.1.1.1.3.1 USR Install Silt Fence	21,353.00	LF		*0.01* 213.53	*0.46* 9,731	*0.00* 0	*0.37* 7,986	*0.00* 0	*0.83* 17,717
				0.05	*5.47*	*2.88*	*35.24*	*0.00*	*43.59*
3.1.1.1.4 Armor Dike and Drainage Ditches	**21,658.00**	**ECY**		**1,139.89**	**118,533**	**62,358**	**763,160**	**0**	**944,051**
3.1.1.1.4.1 USR Place Armor for Dikes and Drainage Ditches	22,797.89	LCY		*0.05* 1,139.89	*5.20* 118,533	*2.74* 62,358	*33.48* 763,160	*0.00* 0	*41.41* 944,051
				0.00	*0.00*	*0.00*	*0.00*	*200,000.00*	*200,000.00*
3.1.1.1.5 Install Weirs	**1.00**	**EA**		**0.00**	**0**	**0**	**0**	**200,000**	**200,000**
3.1.1.1.5.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
				160.00	*28,092.06*	*5,604.94*	*300,000.00*	*0.00*	*333,697.00*
3.1.1.1.6 Install Pumps	**2.00**	**EA**		**320.00**	**56,184**	**11,210**	**600,000**	**0**	**667,394**
3.1.1.1.6.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
				0.02	*2.77*	*3.18*	*43.75*	*0.00*	*49.70*
3.1.1.1.7 Construct Access Roads	**1,333.33**	**ECY**		**31.28**	**3,693**	**4,245**	**58,333**	**0**	**66,271**
3.1.1.1.7.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
3.1.1.1.7.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
				16.00	*1,908.40*	*6,818.08*	*0.00*	*70,000.00*	*78,726.48*
3.1.1.1.8 Construct Sumps	**1.00**	**EA**		**16.00**	**1,908**	**6,818**	**0**	**70,000**	**78,726**
3.1.1.1.8.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
				18,622.69	*2,333,478.12*	*2,479,874.14*	*1,473,585.20*	*270,000.00*	*6,556,937.46*
3.1.1.2 Fill Cell	**1.00**	**EA**		**18,622.69**	**2,333,478**	**2,479,874**	**1,473,585**	**270,000**	**6,556,937**
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
3.1.1.2.1 Clearing & Grubbing	**306.00**	**ACR**		**2,448.00**	**412,923**	**385,911**	**0**	**0**	**798,833**
3.1.1.2.1.1 USR Clear and Grub	306.00	EA		*8.00* 2,448.00	*1,349.42* 412,923	*1,261.15* 385,911	*0.00* 0	*0.00* 0	*2,610.57* 798,833
				0.01	*0.46*	*0.00*	*0.37*	*0.00*	*0.83*
3.1.1.2.2 Silt Fences	**31,066.00**	**LF**		**310.66**	**14,157**	**0**	**11,619**	**0**	**25,776**
3.1.1.2.2.1 USR Install Silt Fence	31,066.00	LF		*0.01* 310.66	*0.46* 14,157	*0.00* 0	*0.37* 11,619	*0.00* 0	*0.83* 25,776
				0.05	*5.20*	*2.74*	*33.48*	*0.00*	*41.41*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.1.1.2.3 Armor Dike and Drainage Ditches	**17,842.00**	**ECY**		**892.10**	**92,766**	**48,803**	**597,261**	**0**	**738,829**
3.1.1.2.3.1 USR Place Armor for Dikes and Drainage Ditches	17,842.00	ECY		*0.05* 892.10	*5.20* 92,766	*2.74* 48,803	*33.48* 597,261	*0.00* 0	*41.41* 738,829
3.1.1.2.4 Install Weirs	**1.00**	**EA**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*200,000.00* **200,000**	*200,000.00* **200,000**
3.1.1.2.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
3.1.1.2.5 Install Pumps	**2.00**	**EA**		*160.00* **320.00**	*28,092.06* **56,184**	*5,604.94* **11,210**	*300,000.00* **600,000**	*0.00* **0**	*333,697.00* **667,394**
3.1.1.2.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
3.1.1.2.6 Construct Sumps	**1.00**	**EA**		*16.00* **16.00**	*1,908.40* **1,908**	*6,818.08* **6,818**	*0.00* **0**	*70,000.00* **70,000**	*78,726.48* **78,726**
3.1.1.2.6.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
3.1.1.2.7 Construct Dike	**15,533.00**	**LF**		*0.94* **14,604.64**	*112.78* **1,751,847**	*130.23* **2,022,888**	*13.29* **206,372**	*0.00* **0**	*256.30* **3,981,108**
3.1.1.2.7.1 USR Dike Spread and Compact	1,411,664.44	LCY		*0.01* 14,116.64	*1.22* 1,718,293	*1.41* 1,989,734	*0.00* 0	*0.00* 0	*2.63* 3,708,027
(Note: Allow 10% compaction.)									
3.1.1.2.7.2 USR Fine Grade	110.81	ACR		*2.00* 221.62	*104.04* 11,528	*82.80* 9,175	*0.00* 0	*0.00* 0	*186.84* 20,703
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
3.1.1.2.7.3 USR Seeding	110.81	ACR		*2.00* 221.62	*149.61* 16,578	*159.47* 17,671	*1,067.22* 118,260	*0.00* 0	*1,376.30* 152,509
3.1.1.2.7.4 USR Place Gravel on Crest Crest of Dike	2,237.78	LCY		*0.02* 44.76	*2.43* 5,448	*2.82* 6,308	*39.38* 88,113	*0.00* 0	*44.63* 99,868
(Note: Allow 10% for compaction.)									
3.1.1.2.8 Construct Access Roads	**1,333.33**	**ECY**		*0.02* **31.28**	*2.77* **3,693**	*3.18* **4,245**	*43.75* **58,333**	*0.00* **0**	*49.70* **66,271**
3.1.1.2.8.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
(Note: Allow 10% compaction.)									
3.1.1.2.8.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
3.1.2 Operation and Maintentance	**1.00**	**EA**		*38,728.67* **38,728.67** *18,999.97*	*3,591,020.42* **3,591,020** *2,400,958.84*	*3,998,655.26* **3,998,655** *3,255,210.88*	*294,688.56* **294,689** *128,132.32*	*100,000.00* **100,000** *50,000.00*	*7,984,364.24* **7,984,364** *5,834,302.05*

Labor ID: LB04NatFD EQ ID: EP05R03

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.1.2.1 Disposal Cell	**1.00**	**EA**		**18,999.97**	**2,400,959**	**3,255,211**	**128,132**	**50,000**	**5,834,302**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.1.2.1.1 Pump Operation During Dredging (Effluent Management)	**2,398,524,465.00**	**GAL**		**3,377.00**	**96,013**	**23,945**	**0**	**0**	**119,958**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
3.1.2.1.1.1 USR Effluent Management - Labor	832.00	HR		832.00	96,013	7,402	0	0	103,415
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
3.1.2.1.1.2 USR Effluent Management - Pump Op	2,545.00	HR		2,545.00	0	16,543	0	0	16,543
				32.09	*925.86*	*227.83*	*0.00*	*0.00*	*1,153.70*
3.1.2.1.2 Weir Operation After Dredging (Runoff Management)	**130.00**	**MO**		**4,172.00**	**120,362**	**29,618**	**0**	**0**	**149,980**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
3.1.2.1.2.1 USR Runoff Management (Weir Op) - Labor	1,043.00	HR		1,043.00	120,362	9,280	0	0	129,642
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
3.1.2.1.2.2 USR Runoff Management - Pump Op	3,129.00	HR		3,129.00	0	20,339	0	0	20,339
3.1.2.1.3 Wastewater Treatment	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.1.2.1.3.1 USR Waste Water Treatment	1.00	LS		0.00	0	0	0	0	0
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.1.2.1.4 Perimeter Trenching	**10,677.00**	**LF**		**213.54**	**15,168**	**43,973**	**0**	**0**	**59,141**
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.1.2.1.4.1 USR Dragline Trenching Around Perimeter	10,677.00	LF		213.54	15,168	43,973	0	0	59,141
3.1.2.1.5 Vegetation Control	**1.00**	**LS**		**5,608.00**	**419,502**	**244,996**	**70,219**	**0**	**734,716**
				1.00	*74.80*	*42.87*	*0.00*	*0.00*	*117.68*
3.1.2.1.5.1 USR Mowing	5,484.00	ACR		5,484.00	410,226	235,109	0	0	645,335
				1.00	*74.80*	*79.74*	*566.28*	*0.00*	*720.82*
3.1.2.1.5.2 USR Till and Apply Herbicide	124.00	ACR		124.00	9,276	9,887	70,219	0	89,382
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.1.2.1.6 Fill Excavation	**1.00**	**BCY**		**0.00**	**0**	**0**	**0**	**0**	**0**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.1.2.1.6.1 USR Fill Excavation	1.00	BCY		0.00	0	0	0	0	0
3.1.2.1.7 O&M of Water Treatment Plant	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.1.2.1.7.1 USR O&M for Water Treatment Plant	1.00	LS		0.00	0	0	0	0	0
3.1.2.1.8 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
3.1.2.1.8.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.01	*2.82*	*4.73*	*0.00*	*0.00*	*7.55*
3.1.2.1.9 Cap Cell	**600,160.00**	**ECY**		**5,557.04**	**1,691,206**	**2,839,388**	**0**	**0**	**4,530,594**
				0.01	*2.54*	*4.26*	*0.00*	*0.00*	*6.79*
3.1.2.1.9.1 USR Cap Cell	666,844.44	LCY		5,557.04	1,691,206	2,839,388	0	0	4,530,594

Labor ID: LB04NatFD EQ ID: EP05R03

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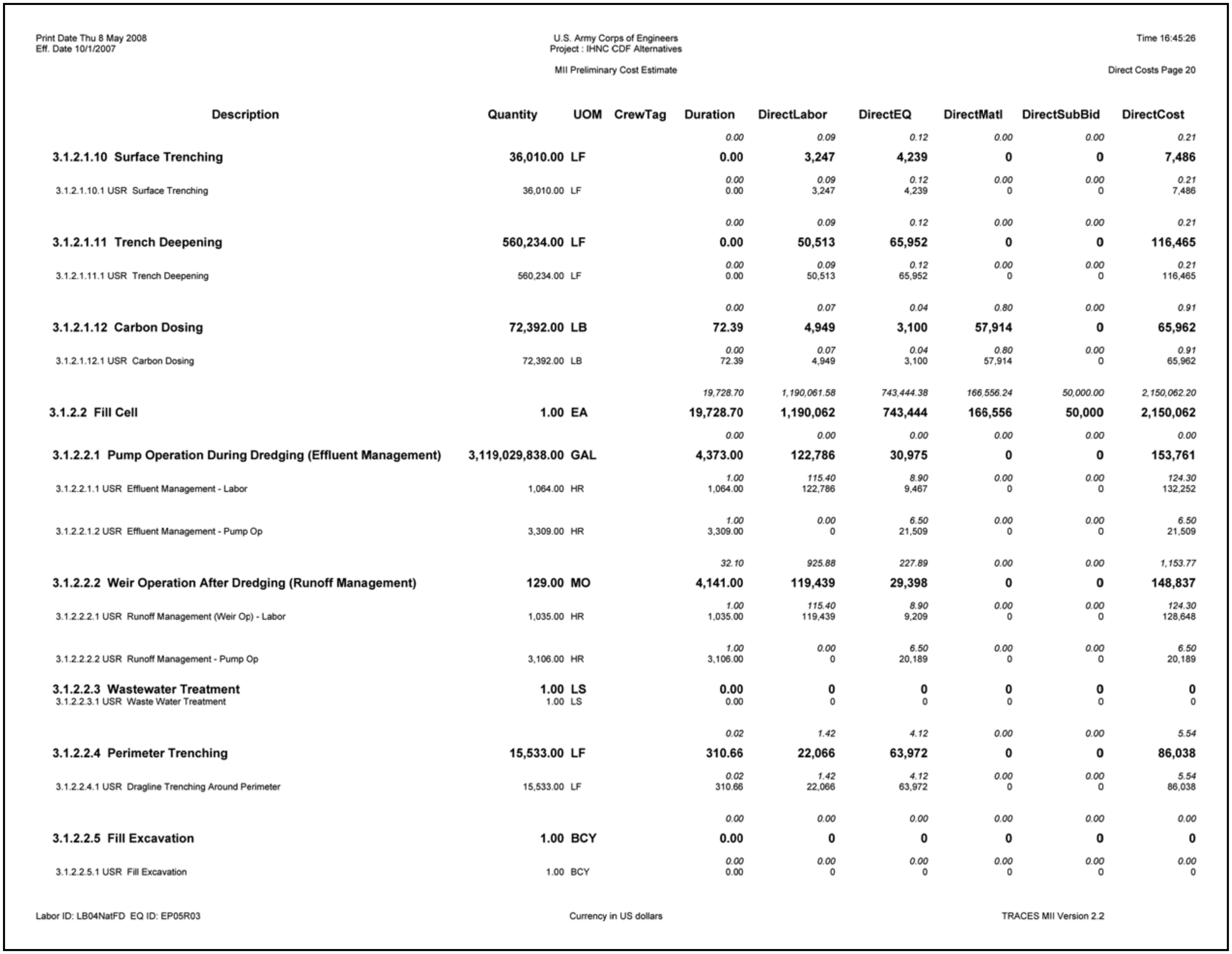

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.1.10 Surface Trenching	**36,010.00**	**LF**		**0.00**	**3,247**	**4,239**	**0**	**0**	**7,486**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.1.10.1 USR Surface Trenching	36,010.00	LF		0.00	3,247	4,239	0	0	7,486
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.1.11 Trench Deepening	**560,234.00**	**LF**		**0.00**	**50,513**	**65,952**	**0**	**0**	**116,465**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.1.11.1 USR Trench Deepening	560,234.00	LF		0.00	50,513	65,952	0	0	116,465
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.1.2.1.12 Carbon Dosing	**72,392.00**	**LB**		**72.39**	**4,949**	**3,100**	**57,914**	**0**	**65,962**
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.1.2.1.12.1 USR Carbon Dosing	72,392.00	LB		72.39	4,949	3,100	57,914	0	65,962
				19,728.70	*1,190,061.58*	*743,444.38*	*166,556.24*	*50,000.00*	*2,150,062.20*
3.1.2.2 Fill Cell	**1.00**	**EA**		**19,728.70**	**1,190,062**	**743,444**	**166,556**	**50,000**	**2,150,062**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.1.2.2.1 Pump Operation During Dredging (Effluent Management)	**3,119,029,838.00**	**GAL**		**4,373.00**	**122,786**	**30,975**	**0**	**0**	**153,761**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
3.1.2.2.1.1 USR Effluent Management - Labor	1,064.00	HR		1,064.00	122,786	9,467	0	0	132,252
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
3.1.2.2.1.2 USR Effluent Management - Pump Op	3,309.00	HR		3,309.00	0	21,509	0	0	21,509
				32.10	*925.88*	*227.89*	*0.00*	*0.00*	*1,153.77*
3.1.2.2.2 Weir Operation After Dredging (Runoff Management)	**129.00**	**MO**		**4,141.00**	**119,439**	**29,398**	**0**	**0**	**148,837**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
3.1.2.2.2.1 USR Runoff Management (Weir Op) - Labor	1,035.00	HR		1,035.00	119,439	9,209	0	0	128,648
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
3.1.2.2.2.2 USR Runoff Management - Pump Op	3,106.00	HR		3,106.00	0	20,189	0	0	20,189
3.1.2.2.3 Wastewater Treatment	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.1.2.2.3.1 USR Waste Water Treatment	1.00	LS		0.00	0	0	0	0	0
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.1.2.2.4 Perimeter Trenching	**15,533.00**	**LF**		**310.66**	**22,066**	**63,972**	**0**	**0**	**86,038**
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.1.2.2.4.1 USR Dragline Trenching Around Perimeter	15,533.00	LF		310.66	22,066	63,972	0	0	86,038
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.1.2.2.5 Fill Excavation	**1.00**	**BCY**		**0.00**	**0**	**0**	**0**	**0**	**0**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.1.2.2.5.1 USR Fill Excavation	1.00	BCY		0.00	0	0	0	0	0

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.1.2.2.6 O&M of Water Treatment Plant	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.1.2.2.6.1 USR O&M for Water Treatment Plant	1.00	LS		0.00	0	0	0	0	0
3.1.2.2.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
3.1.2.2.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.2.8 Surface Trenching	**57,499.00**	**LF**		**0.00**	**5,184**	**6,769**	**0**	**0**	**11,953**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.2.8.1 USR Initial Surface Trenching	57,499.00	LF		0.00	5,184	6,769	0	0	11,953
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.2.9 Trench Deepening	**1,168,512.00**	**LF**		**0.00**	**105,357**	**137,560**	**0**	**0**	**242,917**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.1.2.2.9.1 USR Trench Deepening	1,168,512.00	LF		0.00	105,357	137,560	0	0	242,917
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.1.2.2.10 Carbon Dosing	**68,041.00**	**LB**		**68.04**	**4,651**	**2,914**	**54,433**	**0**	**61,998**
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.1.2.2.10.1 USR Carbon Dosing	68,041.00	LB		68.04	4,651	2,914	54,433	0	61,998
3.1.2.2.11 Vegetation Control	**1.00**	**LS**		**10,836.00**	**810,578**	**471,857**	**112,123**	**0**	**1,394,559**
				1.00	*74.80*	*42.87*	*0.00*	*0.00*	*117.68*
3.1.2.2.11.1 USR Mowing	10,638.00	ACR		10,638.00	795,766	456,070	0	0	1,251,836
				1.00	*74.80*	*79.74*	*566.28*	*0.00*	*720.82*
3.1.2.2.11.2 USR Till and Apply Herbicide	198.00	ACR		198.00	14,811	15,788	112,123	0	142,722
3.2 Cast in Place - Alternative 2	**1.00**	**LS**		**53,578.61**	**5,224,859**	**5,110,394**	**2,739,963**	**640,000**	**13,715,216**
				24,907.74	*3,074,428.50*	*3,249,289.24*	*2,653,313.26*	*540,000.00*	*9,517,030.99*
3.2.1 Initial Construction Costs	**1.00**	**EA**		**24,907.74**	**3,074,428**	**3,249,289**	**2,653,313**	**540,000**	**9,517,031**
				10,232.11	*1,259,495.22*	*1,315,033.19*	*1,319,296.59*	*270,000.00*	*4,163,824.99*
3.2.1.1 Disposal Cell	**1.00**	**EA**		**10,232.11**	**1,259,495**	**1,315,033**	**1,319,297**	**270,000**	**4,163,825**
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
3.2.1.1.1 Clearing & Grubbing	**96.00**	**ACR**		**768.00**	**129,544**	**121,070**	**0**	**0**	**250,614**
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
3.2.1.1.1.1 USR Clear and Grub	96.00	EA		768.00	129,544	121,070	0	0	250,614
				0.01	*0.46*	*0.00*	*0.37*	*0.00*	*0.83*
3.2.1.1.2 Silt Fences	**15,346.00**	**LF**		**153.46**	**6,993**	**0**	**5,739**	**0**	**12,733**
				0.01	*0.46*	*0.00*	*0.37*	*0.00*	*0.83*
3.2.1.1.2.1 USR Install Silt Fence	15,346.00	LF		153.46	6,993	0	5,739	0	12,733
				0.05	*5.20*	*2.74*	*33.48*	*0.00*	*41.41*
3.2.1.1.3 Armor Dike and Drainage Ditches	**16,528.00**	**ECY**		**826.40**	**85,934**	**45,208**	**553,275**	**0**	**684,417**

Labor ID: LB04NatFD EQ ID: EP05R03

Currency in US dollars

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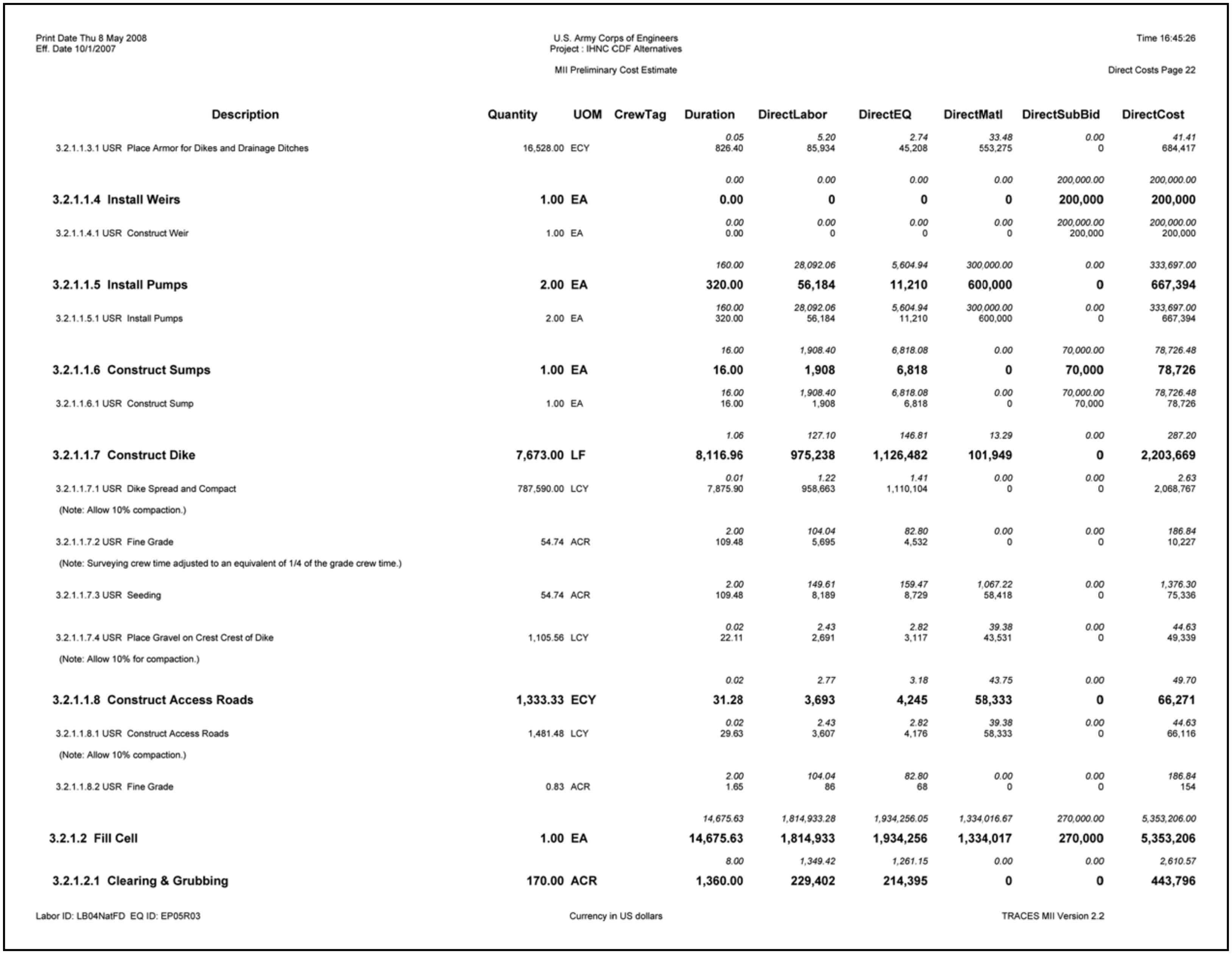

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.2.1.1.3.1 USR Place Armor for Dikes and Drainage Ditches	16,528.00	ECY		0.05 826.40	5.20 85,934	2.74 45,208	33.48 553,275	0.00 0	41.41 684,417
3.2.1.1.4 Install Weirs	**1.00**	**EA**		0.00 **0.00**	0.00 **0**	0.00 **0**	0.00 **0**	200,000.00 **200,000**	200,000.00 **200,000**
3.2.1.1.4.1 USR Construct Weir	1.00	EA		0.00 0.00	0.00 0	0.00 0	0.00 0	200,000.00 200,000	200,000.00 200,000
3.2.1.1.5 Install Pumps	**2.00**	**EA**		160.00 **320.00**	28,092.06 **56,184**	5,604.94 **11,210**	300,000.00 **600,000**	0.00 **0**	333,697.00 **667,394**
3.2.1.1.5.1 USR Install Pumps	2.00	EA		160.00 320.00	28,092.06 56,184	5,604.94 11,210	300,000.00 600,000	0.00 0	333,697.00 667,394
3.2.1.1.6 Construct Sumps	**1.00**	**EA**		16.00 **16.00**	1,908.40 **1,908**	6,818.08 **6,818**	0.00 **0**	70,000.00 **70,000**	78,726.48 **78,726**
3.2.1.1.6.1 USR Construct Sump	1.00	EA		16.00 16.00	1,908.40 1,908	6,818.08 6,818	0.00 0	70,000.00 70,000	78,726.48 78,726
3.2.1.1.7 Construct Dike	**7,673.00**	**LF**		1.06 **8,116.96**	127.10 **975,238**	146.81 **1,126,482**	13.29 **101,949**	0.00 **0**	287.20 **2,203,669**
3.2.1.1.7.1 USR Dike Spread and Compact	787,590.00	LCY		0.01 7,875.90	1.22 958,663	1.41 1,110,104	0.00 0	0.00 0	2.63 2,068,767
(Note: Allow 10% compaction.)									
3.2.1.1.7.2 USR Fine Grade	54.74	ACR		2.00 109.48	104.04 5,695	82.80 4,532	0.00 0	0.00 0	186.84 10,227
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
3.2.1.1.7.3 USR Seeding	54.74	ACR		2.00 109.48	149.61 8,189	159.47 8,729	1,067.22 58,418	0.00 0	1,376.30 75,336
3.2.1.1.7.4 USR Place Gravel on Crest Crest of Dike	1,105.56	LCY		0.02 22.11	2.43 2,691	2.82 3,117	39.38 43,531	0.00 0	44.63 49,339
(Note: Allow 10% for compaction.)									
3.2.1.1.8 Construct Access Roads	**1,333.33**	**ECY**		0.02 **31.28**	2.77 **3,693**	3.18 **4,245**	43.75 **58,333**	0.00 **0**	49.70 **66,271**
3.2.1.1.8.1 USR Construct Access Roads	1,481.48	LCY		0.02 29.63	2.43 3,607	2.82 4,176	39.38 58,333	0.00 0	44.63 66,116
(Note: Allow 10% compaction.)									
3.2.1.1.8.2 USR Fine Grade	0.83	ACR		2.00 1.65	104.04 86	82.80 68	0.00 0	0.00 0	186.84 154
3.2.1.2 Fill Cell	**1.00**	**EA**		14,675.63 **14,675.63**	1,814,933.28 **1,814,933**	1,934,256.05 **1,934,256**	1,334,016.67 **1,334,017**	270,000.00 **270,000**	5,353,206.00 **5,353,206**
3.2.1.2.1 Clearing & Grubbing	**170.00**	**ACR**		8.00 **1,360.00**	1,349.42 **229,402**	1,261.15 **214,395**	0.00 **0**	0.00 **0**	2,610.57 **443,796**

Labor ID: LB04NatFD EQ ID: EP05R03

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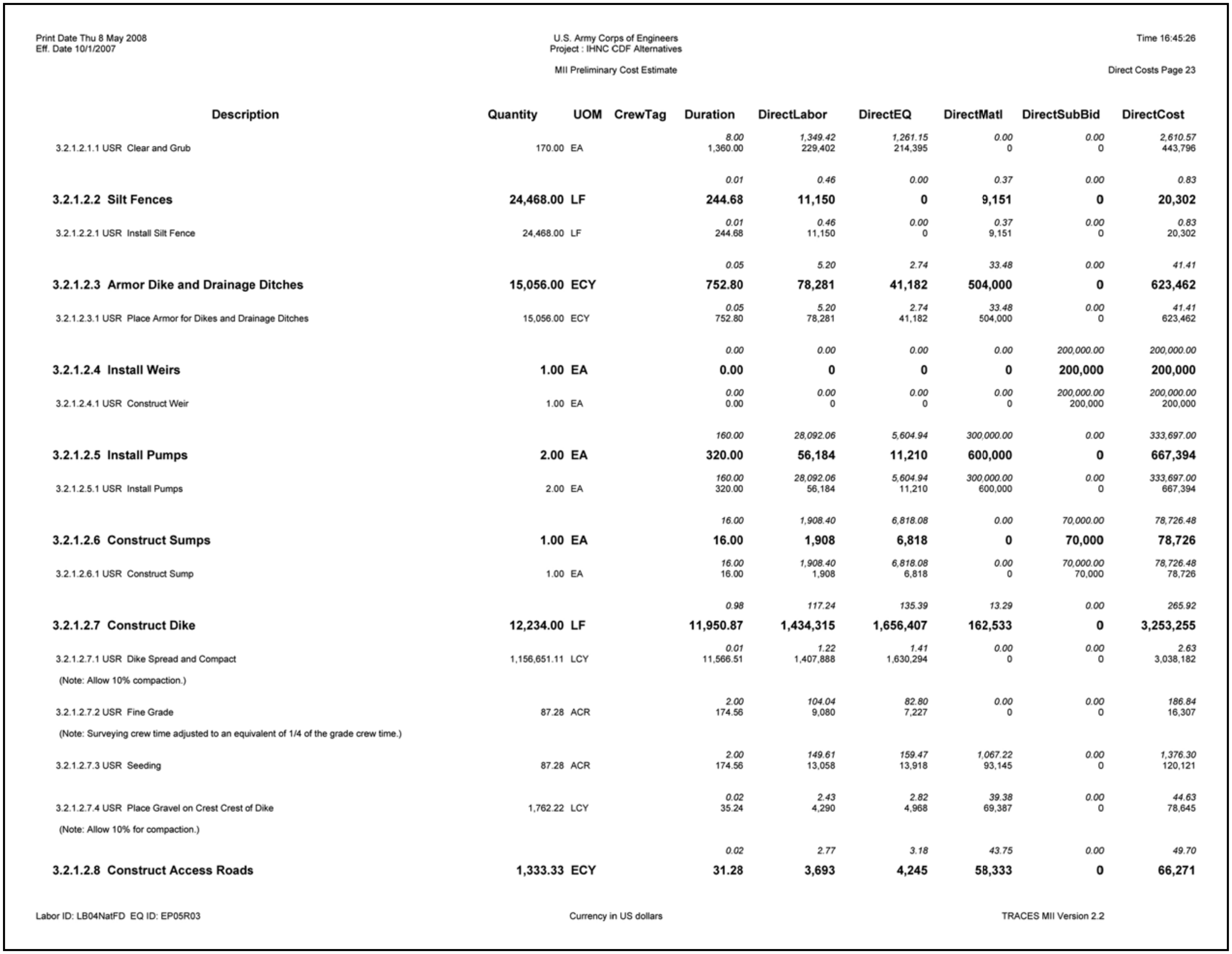

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.2.1.2.1.1 USR Clear and Grub	170.00	EA		8.00 1,360.00	1,349.42 229,402	1,261.15 214,395	0.00 0	0.00 0	2,610.57 443,796
3.2.1.2.2 Silt Fences	**24,468.00**	**LF**		0.01 **244.68**	0.46 **11,150**	0.00 **0**	0.37 **9,151**	0.00 **0**	0.83 **20,302**
3.2.1.2.2.1 USR Install Silt Fence	24,468.00	LF		0.01 244.68	0.46 11,150	0.00 0	0.37 9,151	0.00 0	0.83 20,302
3.2.1.2.3 Armor Dike and Drainage Ditches	**15,056.00**	**ECY**		0.05 **752.80**	5.20 **78,281**	2.74 **41,182**	33.48 **504,000**	0.00 **0**	41.41 **623,462**
3.2.1.2.3.1 USR Place Armor for Dikes and Drainage Ditches	15,056.00	ECY		0.05 752.80	5.20 78,281	2.74 41,182	33.48 504,000	0.00 0	41.41 623,462
3.2.1.2.4 Install Weirs	**1.00**	**EA**		0.00 **0.00**	0.00 **0**	0.00 **0**	0.00 **0**	200,000.00 **200,000**	200,000.00 **200,000**
3.2.1.2.4.1 USR Construct Weir	1.00	EA		0.00 0.00	0.00 0	0.00 0	0.00 0	200,000.00 200,000	200,000.00 200,000
3.2.1.2.5 Install Pumps	**2.00**	**EA**		160.00 **320.00**	28,092.06 **56,184**	5,604.94 **11,210**	300,000.00 **600,000**	0.00 **0**	333,697.00 **667,394**
3.2.1.2.5.1 USR Install Pumps	2.00	EA		160.00 320.00	28,092.06 56,184	5,604.94 11,210	300,000.00 600,000	0.00 0	333,697.00 667,394
3.2.1.2.6 Construct Sumps	**1.00**	**EA**		16.00 **16.00**	1,908.40 **1,908**	6,818.08 **6,818**	0.00 **0**	70,000.00 **70,000**	78,726.48 **78,726**
3.2.1.2.6.1 USR Construct Sump	1.00	EA		16.00 16.00	1,908.40 1,908	6,818.08 6,818	0.00 0	70,000.00 70,000	78,726.48 78,726
3.2.1.2.7 Construct Dike	**12,234.00**	**LF**		0.98 **11,950.87**	117.24 **1,434,315**	135.39 **1,656,407**	13.29 **162,533**	0.00 **0**	265.92 **3,253,255**
3.2.1.2.7.1 USR Dike Spread and Compact	1,156,651.11	LCY		0.01 11,566.51	1.22 1,407,888	1.41 1,630,294	0.00 0	0.00 0	2.63 3,038,182
(Note: Allow 10% compaction.)									
3.2.1.2.7.2 USR Fine Grade	87.28	ACR		2.00 174.56	104.04 9,080	82.80 7,227	0.00 0	0.00 0	186.84 16,307
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
3.2.1.2.7.3 USR Seeding	87.28	ACR		2.00 174.56	149.61 13,058	159.47 13,918	1,067.22 93,145	0.00 0	1,376.30 120,121
3.2.1.2.7.4 USR Place Gravel on Crest Crest of Dike	1,762.22	LCY		0.02 35.24	2.43 4,290	2.82 4,968	39.38 69,387	0.00 0	44.63 78,645
(Note: Allow 10% for compaction.)									
3.2.1.2.8 Construct Access Roads	**1,333.33**	**ECY**		0.02 **31.28**	2.77 **3,693**	3.18 **4,245**	43.75 **58,333**	0.00 **0**	49.70 **66,271**

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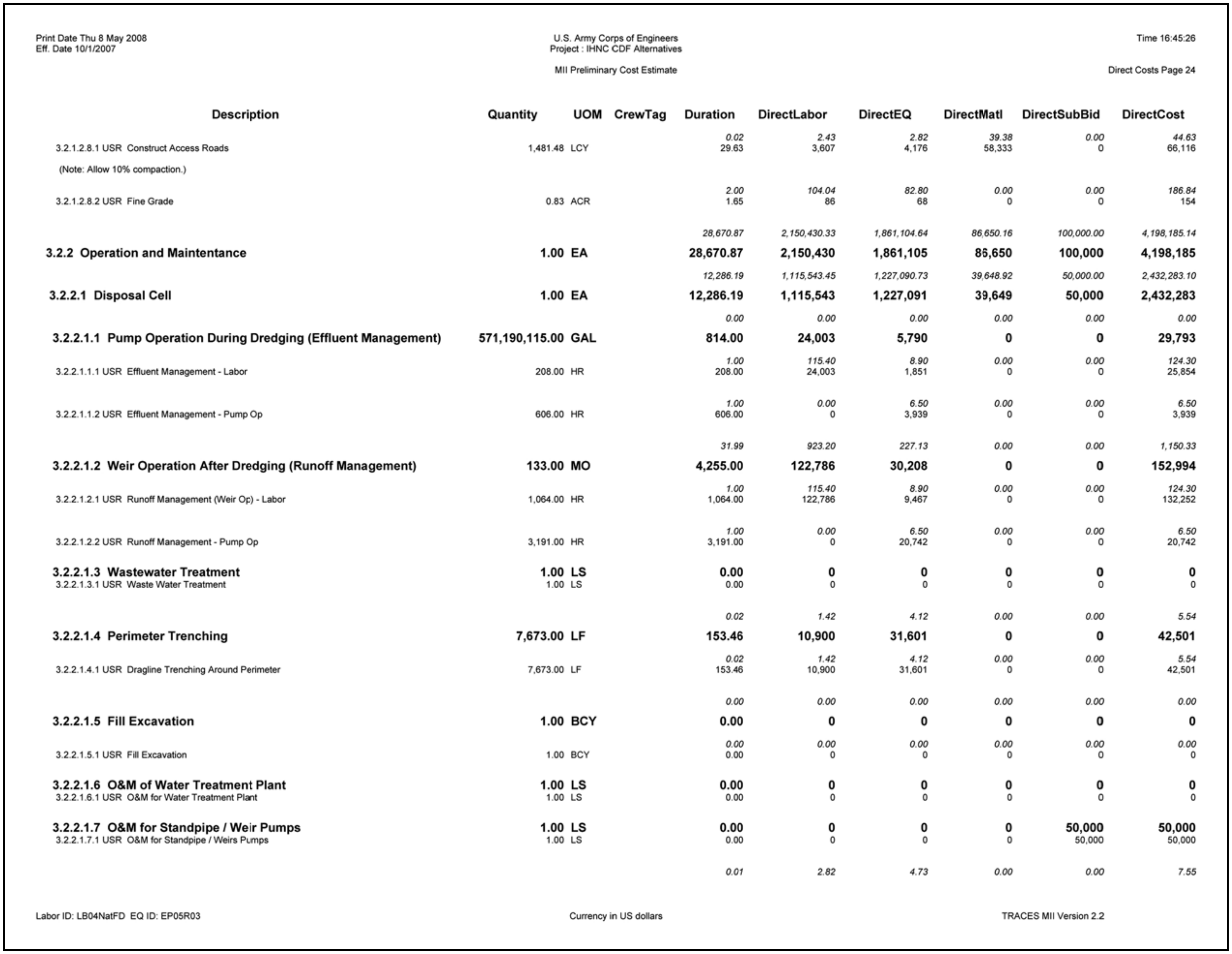

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.2.1.2.8.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
(Note: Allow 10% compaction.)									
3.2.1.2.8.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
3.2.2 Operation and Maintentance	**1.00**	**EA**		*28,670.87* **28,670.87**	*2,150,430.33* **2,150,430**	*1,861,104.64* **1,861,105**	*86,650.16* **86,650**	*100,000.00* **100,000**	*4,198,185.14* **4,198,185**
3.2.2.1 Disposal Cell	**1.00**	**EA**		*12,286.19* **12,286.19**	*1,115,543.45* **1,115,543**	*1,227,090.73* **1,227,091**	*39,648.92* **39,649**	*50,000.00* **50,000**	*2,432,283.10* **2,432,283**
3.2.2.1.1 Pump Operation During Dredging (Effluent Management)	**571,190,115.00**	**GAL**		*0.00* **814.00**	*0.00* **24,003**	*0.00* **5,790**	*0.00* **0**	*0.00* **0**	*0.00* **29,793**
3.2.2.1.1.1 USR Effluent Management - Labor	208.00	HR		*1.00* 208.00	*115.40* 24,003	*8.90* 1,851	*0.00* 0	*0.00* 0	*124.30* 25,854
3.2.2.1.1.2 USR Effluent Management - Pump Op	606.00	HR		*1.00* 606.00	*0.00* 0	*6.50* 3,939	*0.00* 0	*0.00* 0	*6.50* 3,939
3.2.2.1.2 Weir Operation After Dredging (Runoff Management)	**133.00**	**MO**		*31.99* **4,255.00**	*923.20* **122,786**	*227.13* **30,208**	*0.00* **0**	*0.00* **0**	*1,150.33* **152,994**
3.2.2.1.2.1 USR Runoff Management (Weir Op) - Labor	1,064.00	HR		*1.00* 1,064.00	*115.40* 122,786	*8.90* 9,467	*0.00* 0	*0.00* 0	*124.30* 132,252
3.2.2.1.2.2 USR Runoff Management - Pump Op	3,191.00	HR		*1.00* 3,191.00	*0.00* 0	*6.50* 20,742	*0.00* 0	*0.00* 0	*6.50* 20,742
3.2.2.1.3 Wastewater Treatment	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.2.2.1.3.1 USR Waste Water Treatment	1.00	LS		0.00	0	0	0	0	0
3.2.2.1.4 Perimeter Trenching	**7,673.00**	**LF**		*0.02* **153.46**	*1.42* **10,900**	*4.12* **31,601**	*0.00* **0**	*0.00* **0**	*5.54* **42,501**
3.2.2.1.4.1 USR Dragline Trenching Around Perimeter	7,673.00	LF		*0.02* 153.46	*1.42* 10,900	*4.12* 31,601	*0.00* 0	*0.00* 0	*5.54* 42,501
3.2.2.1.5 Fill Excavation	**1.00**	**BCY**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*0.00* **0**
3.2.2.1.5.1 USR Fill Excavation	1.00	BCY		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*0.00* 0	*0.00* 0
3.2.2.1.6 O&M of Water Treatment Plant	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.2.2.1.6.1 USR O&M for Water Treatment Plant	1.00	LS		0.00	0	0	0	0	0
3.2.2.1.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
3.2.2.1.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.01	*2.82*	*4.73*	*0.00*	*0.00*	*7.55*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.2.2.1.8 Cap Cell	**188,760.00**	**ECY**		**1,747.78**	**531,912**	**893,033**	**0**	**0**	**1,424,945**
3.2.2.1.8.1 USR Cap Cell	209,733.33	LCY		*0.01* 1,747.78	*2.54* 531,912	*4.26* 893,033	*0.00* 0	*0.00* 0	*6.79* 1,424,945
3.2.2.1.9 Surface Trenching	**11,326.00**	**LF**		*0.00* **0.00**	*0.09* **1,021**	*0.12* **1,333**	*0.00* **0**	*0.00* **0**	*0.21* **2,355**
3.2.2.1.9.1 USR Surface Trenching	11,326.00	LF		*0.00* 0.00	*0.09* 1,021	*0.12* 1,333	*0.00* 0	*0.00* 0	*0.21* 2,355
3.2.2.1.10 Trench Deepening	**303,975.00**	**LF**		*0.00* **0.00**	*0.09* **27,408**	*0.12* **35,785**	*0.00* **0**	*0.00* **0**	*0.21* **63,192**
3.2.2.1.10.1 USR Trench Deepening	303,975.00	LF		*0.00* 0.00	*0.09* 27,408	*0.12* 35,785	*0.00* 0	*0.00* 0	*0.21* 63,192
3.2.2.1.11 Carbon Dosing	**21,955.00**	**LB**		*0.00* **21.96**	*0.07* **1,501**	*0.04* **940**	*0.80* **17,564**	*0.00* **0**	*0.91* **20,005**
3.2.2.1.11.1 USR Carbon Dosing	21,955.00	LB		*0.00* 21.96	*0.07* 1,501	*0.04* 940	*0.80* 17,564	*0.00* 0	*0.91* 20,005
3.2.2.1.12 Vegetation Control	**1.00**	**LS**		**5,294.00**	**396,013**	**228,401**	**22,085**	**0**	**646,499**
3.2.2.1.12.1 USR Mowing	5,255.00	ACR		*1.00* 5,255.00	*74.80* 393,096	*42.87* 225,291	*0.00* 0	*0.00* 0	*117.68* 618,387
3.2.2.1.12.2 USR Till and Apply Herbicide	39.00	ACR		*1.00* 39.00	*74.80* 2,917	*79.74* 3,110	*566.28* 22,085	*0.00* 0	*720.82* 28,112
3.2.2.2 Fill Cell	**1.00**	**EA**		*16,384.68* **16,384.68**	*1,034,886.88* **1,034,887**	*634,013.91* **634,014**	*47,001.24* **47,001**	*50,000.00* **50,000**	*1,765,902.03* **1,765,902**
3.2.2.2.1 Pump Operation During Dredging (Effluent Management)	**958,850,772.00**	**GAL**		*0.00* **1,345.00**	*0.00* **37,851**	*0.00* **9,529**	*0.00* **0**	*0.00* **0**	*0.00* **47,380**
3.2.2.2.1.1 USR Effluent Management - Labor	328.00	HR		*1.00* 328.00	*115.40* 37,851	*8.90* 2,918	*0.00* 0	*0.00* 0	*124.30* 40,769
3.2.2.2.1.2 USR Effluent Management - Pump Op	1,017.00	HR		*1.00* 1,017.00	*0.00* 0	*6.50* 6,611	*0.00* 0	*0.00* 0	*6.50* 6,611
3.2.2.2.2 Weir Operation After Dredging (Runoff Management)	**132.00**	**MO**		*32.11* **4,239.00**	*926.70* **122,324**	*227.99* **30,094**	*0.00* **0**	*0.00* **0**	*1,154.69* **152,419**
3.2.2.2.2.1 USR Runoff Management (Weir Op) - Labor	1,060.00	HR		*1.00* 1,060.00	*115.40* 122,324	*8.90* 9,431	*0.00* 0	*0.00* 0	*124.30* 131,755
3.2.2.2.2.2 USR Runoff Management - Pump Op	3,179.00	HR		*1.00* 3,179.00	*0.00* 0	*6.50* 20,664	*0.00* 0	*0.00* 0	*6.50* 20,664
3.2.2.2.3 Wastewater Treatment	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.2.2.2.3.1 USR Waste Water Treatment	1.00	LS		0.00	0	0	0	0	0

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				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.2.2.2.4 Perimeter Trenching	**12,234.00**	**LF**		**244.68**	**17,380**	**50,385**	**0**	**0**	**67,765**
3.2.2.2.4.1 USR Dragline Trenching Around Perimeter	12,234.00	LF		*0.02* 244.68	*1.42* 17,380	*4.12* 50,385	*0.00* 0	*0.00* 0	*5.54* 67,765
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.2.2.2.5 Fill Excavation	**1.00**	**BCY**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.2.2.2.5.1 USR Fill Excavation	1.00	BCY		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*0.00* 0	*0.00* 0
3.2.2.2.6 O&M of Water Treatment Plant	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.2.2.2.6.1 USR O&M for Water Treatment Plant	1.00	LS		0.00	0	0	0	0	0
3.2.2.2.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
3.2.2.2.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.2.2.2.8 Surface Trenching	**24,103.00**	**LF**		**0.00**	**2,173**	**2,837**	**0**	**0**	**5,011**
3.2.2.2.8.1 USR Surface Trenching	24,103.00	LF		*0.00* 0.00	*0.09* 2,173	*0.12* 2,837	*0.00* 0	*0.00* 0	*0.21* 5,011
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.2.2.2.9 Trench Deepening	**726,746.00**	**LF**		**0.00**	**65,526**	**85,554**	**0**	**0**	**151,080**
3.2.2.2.9.1 USR Trench Deepening	726,746.00	LF		*0.00* 0.00	*0.09* 65,526	*0.12* 85,554	*0.00* 0	*0.00* 0	*0.21* 151,080
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.2.2.2.10 Carbon Dosing	**0.00**	**LB**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.2.2.2.10.1 USR Carbon Dosing	0.00	LB		*0.00* 0.00	*0.07* 0	*0.04* 0	*0.80* 0	*0.00* 0	*0.91* 0
3.2.2.2.11 Vegetation Control	**1.00**	**LS**		**10,556.00**	**789,633**	**455,614**	**47,001**	**0**	**1,292,248**
3.2.2.2.11.1 USR Mowing	10,473.00	ACR		*1.00* 10,473.00	*74.80* 783,424	*42.87* 448,996	*0.00* 0	*0.00* 0	*117.68* 1,232,420
3.2.2.2.11.2 USR Till and Apply Herbicide	83.00	ACR		*1.00* 83.00	*74.80* 6,209	*79.74* 6,618	*566.28* 47,001	*0.00* 0	*720.82* 59,828
3.3 Float in Place - Alternative 1	**1.00**	**LS**		**61,588.90**	**6,540,401**	**7,013,061**	**2,996,950**	**640,000**	**17,190,412**
				28,254.53	*3,510,129.86*	*3,707,440.52*	*2,799,071.53*	*540,000.00*	*10,556,641.91*
3.3.1 Initial Construction Costs	**1.00**	**EA**		**28,254.53**	**3,510,130**	**3,707,441**	**2,799,072**	**540,000**	**10,556,642**
				12,764.22	*1,587,743.83*	*1,662,303.33*	*1,419,448.97*	*270,000.00*	*4,939,496.13*
3.3.1.1 Disposal Cell	**1.00**	**EA**		**12,764.22**	**1,587,744**	**1,662,303**	**1,419,449**	**270,000**	**4,939,496**
				8.00	*1,349.42*	*1,261.15*	*0.00*	*0.00*	*2,610.57*
3.3.1.1.1 Clearing & Grubbing	**172.00**	**ACR**		**1,376.00**	**232,100**	**216,917**	**0**	**0**	**449,017**

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.3.1.1.1.1 USR Clear and Grub	172.00	EA		*8.00* 1,376.00	*1,349.42* 232,100	*1,261.15* 216,917	*0.00* 0	*0.00* 0	*2,610.57* 449,017
3.3.1.1.2 Silt Fences	**19,509.00**	**LF**		*0.01* **195.09**	*0.46* **8,891**	*0.00* **0**	*0.37* **7,296**	*0.00* **0**	*0.83* **16,187**
3.3.1.1.2.1 USR Install Silt Fence	19,509.00	LF		*0.01* 195.09	*0.46* 8,891	*0.00* 0	*0.37* 7,296	*0.00* 0	*0.83* 16,187
3.3.1.1.3 Armor Dike and Drainage Ditches	**18,647.00**	**ECY**		*0.05* **932.35**	*5.20* **96,951**	*2.74* **51,004**	*33.48* **624,208**	*0.00* **0**	*41.41* **772,164**
3.3.1.1.3.1 USR Place Armor for Dikes and Drainage Ditches	18,647.00	ECY		*0.05* 932.35	*5.20* 96,951	*2.74* 51,004	*33.48* 624,208	*0.00* 0	*41.41* 772,164
3.3.1.1.4 Install Weirs	**1.00**	**EA**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*200,000.00* **200,000**	*200,000.00* **200,000**
3.3.1.1.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
3.3.1.1.5 Install Pumps	**2.00**	**EA**		*160.00* **320.00**	*28,092.06* **56,184**	*5,604.94* **11,210**	*300,000.00* **600,000**	*0.00* **0**	*333,697.00* **667,394**
3.3.1.1.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
3.3.1.1.6 Construct Sumps	**1.00**	**EA**		*16.00* **16.00**	*1,908.40* **1,908**	*6,818.08* **6,818**	*0.00* **0**	*70,000.00* **70,000**	*78,726.48* **78,726**
3.3.1.1.6.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
3.3.1.1.7 Construct Dike	**9,755.00**	**LF**		*1.01* **9,893.50**	*121.79* **1,188,016**	*140.66* **1,372,109**	*13.29* **129,611**	*0.00* **0**	*275.73* **2,689,737**
3.3.1.1.7.1 USR Dike Spread and Compact	958,703.33	LCY		*0.01* 9,587.03	*1.22* 1,166,944	*1.41* 1,351,287	*0.00* 0	*0.00* 0	*2.63* 2,518,231
(Note: Allow 10% compaction.)									
3.3.1.1.7.2 USR Fine Grade	69.59	ACR		*2.00* 139.18	*104.04* 7,240	*82.80* 5,762	*0.00* 0	*0.00* 0	*186.84* 13,002
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
3.3.1.1.7.3 USR Seeding	69.59	ACR		*2.00* 139.18	*149.61* 10,411	*159.47* 11,098	*1,067.22* 74,267	*0.00* 0	*1,376.30* 95,776
3.3.1.1.7.4 USR Place Gravel on Crest Crest of Dike	1,405.56	LCY		*0.02* 28.11	*2.43* 3,422	*2.82* 3,962	*39.38* 55,344	*0.00* 0	*44.63* 62,728
(Note: Allow 10% for compaction.)									
3.3.1.1.8 Construct Access Roads	**1,333.33**	**ECY**		*0.02* **31.28**	*2.77* **3,693**	*3.18* **4,245**	*43.75* **58,333**	*0.00* **0**	*49.70* **66,271**

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.3.1.1.8.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
(Note: Allow 10% compaction.)									
3.3.1.1.8.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
3.3.1.2 Fill Cell	**1.00**	**EA**		*15,490.30* **15,490.30**	*1,922,386.03* **1,922,386**	*2,045,137.19* **2,045,137**	*1,379,622.56* **1,379,623**	*270,000.00* **270,000**	*5,617,145.78* **5,617,146**
3.3.1.2.1 Clearing & Grubbing	**200.00**	**ACR**		*8.00* **1,600.00**	*1,349.42* **269,884**	*1,261.15* **252,229**	*0.00* **0**	*0.00* **0**	*2,610.57* **522,113**
3.3.1.2.1.1 USR Clear and Grub	200.00	EA		*8.00* 1,600.00	*1,349.42* 269,884	*1,261.15* 252,229	*0.00* 0	*0.00* 0	*2,610.57* 522,113
3.3.1.2.2 Silt Fences	**25,727.00**	**LF**		*0.01* **257.27**	*0.46* **11,724**	*0.00* **0**	*0.37* **9,622**	*0.00* **0**	*0.83* **21,346**
3.3.1.2.2.1 USR Install Silt Fence	25,727.00	LF		*0.01* 257.27	*0.46* 11,724	*0.00* 0	*0.37* 9,622	*0.00* 0	*0.83* 21,346
3.3.1.2.3 Armor Dike and Drainage Ditches	**16,154.00**	**ECY**		*0.05* **807.70**	*5.20* **83,990**	*2.74* **44,185**	*33.48* **540,755**	*0.00* **0**	*41.41* **668,930**
3.3.1.2.3.1 USR Place Armor for Dikes and Drainage Ditches	16,154.00	ECY		*0.05* 807.70	*5.20* 83,990	*2.74* 44,185	*33.48* 540,755	*0.00* 0	*41.41* 668,930
3.3.1.2.4 Install Weirs	**1.00**	**EA**		*0.00* **0.00**	*0.00* **0**	*0.00* **0**	*0.00* **0**	*200,000.00* **200,000**	*200,000.00* **200,000**
3.3.1.2.4.1 USR Construct Weir	1.00	EA		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*200,000.00* 200,000	*200,000.00* 200,000
3.3.1.2.5 Install Pumps	**2.00**	**EA**		*160.00* **320.00**	*28,092.06* **56,184**	*5,604.94* **11,210**	*300,000.00* **600,000**	*0.00* **0**	*333,697.00* **667,394**
3.3.1.2.5.1 USR Install Pumps	2.00	EA		*160.00* 320.00	*28,092.06* 56,184	*5,604.94* 11,210	*300,000.00* 600,000	*0.00* 0	*333,697.00* 667,394
3.3.1.2.6 Construct Sumps	**1.00**	**EA**		*16.00* **16.00**	*1,908.40* **1,908**	*6,818.08* **6,818**	*0.00* **0**	*70,000.00* **70,000**	*78,726.48* **78,726**
3.3.1.2.6.1 USR Construct Sump	1.00	EA		*16.00* 16.00	*1,908.40* 1,908	*6,818.08* 6,818	*0.00* 0	*70,000.00* 70,000	*78,726.48* 78,726
3.3.1.2.7 Construct Dike	**12,864.00**	**LF**		*0.97* **12,458.05**	*116.22* **1,495,003**	*134.21* **1,726,450**	*13.29* **170,912**	*0.00* **0**	*263.71* **3,392,365**
3.3.1.2.7.1 USR Dike Spread and Compact	1,205,391.11	LCY		*0.01* 12,053.91	*1.22* 1,467,215	*1.41* 1,698,993	*0.00* 0	*0.00* 0	*2.63* 3,166,207
(Note: Allow 10% compaction.)									
				2.00	*104.04*	*82.80*	*0.00*	*0.00*	*186.84*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.3.1.2.7.2 USR Fine Grade	91.77	ACR		183.54	9,547	7,598	0	0	17,146
(Note: Surveying crew time adjusted to an equivalent of 1/4 of the grade crew time.)									
3.3.1.2.7.3 USR Seeding	91.77	ACR		*2.00* 183.54	*149.61* 13,729	*159.47* 14,634	*1,067.22* 97,937	*0.00* 0	*1,376.30* 126,301
3.3.1.2.7.4 USR Place Gravel on Crest Crest of Dike	1,853.33	LCY		*0.02* 37.07	*2.43* 4,512	*2.82* 5,225	*39.38* 72,975	*0.00* 0	*44.63* 82,711
(Note: Allow 10% for compaction.)									
3.3.1.2.8 Construct Access Roads	**1,333.33**	**ECY**		*0.02* **31.28**	*2.77* **3,693**	*3.18* **4,245**	*43.75* **58,333**	*0.00* **0**	*49.70* **66,271**
3.3.1.2.8.1 USR Construct Access Roads	1,481.48	LCY		*0.02* 29.63	*2.43* 3,607	*2.82* 4,176	*39.38* 58,333	*0.00* 0	*44.63* 66,116
(Note: Allow 10% compaction.)									
3.3.1.2.8.2 USR Fine Grade	0.83	ACR		*2.00* 1.65	*104.04* 86	*82.80* 68	*0.00* 0	*0.00* 0	*186.84* 154
3.3.2 Operation and Maintentance	**1.00**	**EA**		*33,334.38* **33,334.38**	*3,030,271.15* **3,030,271**	*3,305,620.95* **3,305,621**	*197,878.00* **197,878**	*100,000.00* **100,000**	*6,633,770.10* **6,633,770**
3.3.2.1 Disposal Cell	**1.00**	**EA**		*17,557.10* **17,557.10**	*2,087,103.70* **2,087,104**	*2,729,921.68* **2,729,922**	*92,955.08* **92,955**	*50,000.00* **50,000**	*4,959,980.45* **4,959,980**
3.3.2.1.1 Pump Operation During Dredging (Effluent Management)	**1,885,401,395.00**	**GAL**		*0.00* **2,648.00**	*0.00* **74,779**	*0.00* **18,765**	*0.00* **0**	*0.00* **0**	*0.00* **93,545**
3.3.2.1.1.1 USR Effluent Management - Labor	648.00	HR		*1.00* 648.00	*115.40* 74,779	*8.90* 5,765	*0.00* 0	*0.00* 0	*124.30* 80,545
3.3.2.1.1.2 USR Effluent Management - Pump Op	2,000.00	HR		*1.00* 2,000.00	*0.00* 0	*6.50* 13,000	*0.00* 0	*0.00* 0	*6.50* 13,000
3.3.2.1.2 Weir Operation After Dredging (Runoff Management)	**131.00**	**MO**		*32.03* **4,196.00**	*924.08* **121,055**	*227.39* **29,789**	*0.00* **0**	*0.00* **0**	*1,151.48* **150,843**
3.3.2.1.2.1 USR Runoff Management (Weir Op) - Labor	1,049.00	HR		*1.00* 1,049.00	*115.40* 121,055	*8.90* 9,333	*0.00* 0	*0.00* 0	*124.30* 130,388
3.3.2.1.2.2 USR Runoff Management - Pump Op	3,147.00	HR		*1.00* 3,147.00	*0.00* 0	*6.50* 20,456	*0.00* 0	*0.00* 0	*6.50* 20,456
3.3.2.1.3 Wastewater Treatment	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.3.2.1.3.1 USR Waste Water Treatment	1.00	LS		0.00	0	0	0	0	0
3.3.2.1.4 Perimeter Trenching	**9,755.00**	**LF**		*0.02* **195.10**	*1.42* **13,858**	*4.12* **40,176**	*0.00* **0**	*0.00* **0**	*5.54* **54,034**
3.3.2.1.4.1 USR Dragline Trenching Around Perimeter	9,755.00	LF		*0.02* 195.10	*1.42* 13,858	*4.12* 40,176	*0.00* 0	*0.00* 0	*5.54* 54,034
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.3.2.1.5 Fill Excavation	**1.00**	**BCY**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.3.2.1.5.1 USR Fill Excavation	1.00	BCY		*0.00* 0.00	*0.00* 0	*0.00* 0	*0.00* 0	*0.00* 0	*0.00* 0
3.3.2.1.6 O&M of Water Treatment Plant	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.3.2.1.6.1 USR O&M for Water Treatment Plant	1.00	LS		0.00	0	0	0	0	0
3.3.2.1.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
3.3.2.1.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
3.3.2.1.8 Cap Cell	**488,840.00**	**ECY**		*0.01* **4,526.30**	*2.82* **1,377,515**	*4.73* **2,312,727**	*0.00* **0**	*0.00* **0**	*7.55* **3,690,242**
3.3.2.1.8.1 USR Cap Cell	543,155.56	LCY		*0.01* 4,526.30	*2.54* 1,377,515	*4.26* 2,312,727	*0.00* 0	*0.00* 0	*6.79* 3,690,242
3.3.2.1.9 Surface Trenching	**29,330.00**	**LF**		*0.00* **0.00**	*0.09* **2,645**	*0.12* **3,453**	*0.00* **0**	*0.00* **0**	*0.21* **6,097**
3.3.2.1.9.1 USR Surface Trenching	29,330.00	LF		*0.00* 0.00	*0.09* 2,645	*0.12* 3,453	*0.00* 0	*0.00* 0	*0.21* 6,097
3.3.2.1.10 Trench Deepening	**547,190.00**	**LF**		*0.00* **0.00**	*0.09* **49,337**	*0.12* **64,416**	*0.00* **0**	*0.00* **0**	*0.21* **113,753**
3.3.2.1.10.1 USR Trench Deepening	547,190.00	LF		*0.00* 0.00	*0.09* 49,337	*0.12* 64,416	*0.00* 0	*0.00* 0	*0.21* 113,753
3.3.2.1.11 Carbon Dosing	**44,701.00**	**LB**		*0.00* **44.70**	*0.07* **3,056**	*0.04* **1,914**	*0.80* **35,761**	*0.00* **0**	*0.91* **40,731**
3.3.2.1.11.1 USR Carbon Dosing	44,701.00	LB		*0.00* 44.70	*0.07* 3,056	*0.04* 1,914	*0.80* 35,761	*0.00* 0	*0.91* 40,731
3.3.2.1.12 Vegetation Control	**1.00**	**LS**		**5,947.00**	**444,860**	**258,682**	**57,194**	**0**	**760,736**
3.3.2.1.12.1 USR Mowing	5,846.00	ACR		*1.00* 5,846.00	*74.80* 437,305	*42.87* 250,628	*0.00* 0	*0.00* 0	*117.68* 687,933
3.3.2.1.12.2 USR Till and Apply Herbicide	101.00	ACR		*1.00* 101.00	*74.80* 7,555	*79.74* 8,053	*566.28* 57,194	*0.00* 0	*720.82* 72,803
3.3.2.2 Fill Cell	**1.00**	**EA**		*15,777.28* **15,777.28**	*943,167.45* **943,167**	*575,699.27* **575,699**	*104,922.92* **104,923**	*50,000.00* **50,000**	*1,673,789.64* **1,673,790**
3.3.2.2.1 Pump Operation During Dredging (Effluent Management)	**1,669,723,800.00**	**GAL**		*0.00* **2,340.00**	*0.00* **65,547**	*0.00* **16,572**	*0.00* **0**	*0.00* **0**	*0.00* **82,119**
3.3.2.2.1.1 USR Effluent Management - Labor	568.00	HR		*1.00* 568.00	*115.40* 65,547	*8.90* 5,054	*0.00* 0	*0.00* 0	*124.30* 70,601
3.3.2.2.1.2 USR Effluent Management - Pump Op	1,772.00	HR		*1.00* 1,772.00	*0.00* 0	*6.50* 11,518	*0.00* 0	*0.00* 0	*6.50* 11,518

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
				32.11	*926.72*	*227.99*	*0.00*	*0.00*	*1,154.72*
3.3.2.2.2 Weir Operation After Dredging (Runoff Management)	**131.00**	**MO**		**4,207.00**	**121,401**	**29,867**	**0**	**0**	**151,268**
				1.00	*115.40*	*8.90*	*0.00*	*0.00*	*124.30*
3.3.2.2.2.1 USR Runoff Management (Weir Op) - Labor	1,052.00	HR		1,052.00	121,401	9,360	0	0	130,761
				1.00	*0.00*	*6.50*	*0.00*	*0.00*	*6.50*
3.3.2.2.2.2 USR Runoff Management - Pump Op	3,155.00	HR		3,155.00	0	20,508	0	0	20,508
3.3.2.2.3 Wastewater Treatment	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.3.2.2.3.1 USR Waste Water Treatment	1.00	LS		0.00	0	0	0	0	0
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.3.2.2.4 Perimeter Trenching	**12,864.00**	**LF**		**257.28**	**18,275**	**52,980**	**0**	**0**	**71,255**
				0.02	*1.42*	*4.12*	*0.00*	*0.00*	*5.54*
3.3.2.2.4.1 USR Dragline Trenching Around Perimeter	12,864.00	LF		257.28	18,275	52,980	0	0	71,255
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.3.2.2.5 Fill Excavation	**1.00**	**BCY**		**0.00**	**0**	**0**	**0**	**0**	**0**
				0.00	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
3.3.2.2.5.1 USR Fill Excavation	1.00	BCY		0.00	0	0	0	0	0
3.3.2.2.6 O&M of Water Treatment Plant	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**0**	**0**
3.3.2.2.6.1 USR O&M for Water Treatment Plant	1.00	LS		0.00	0	0	0	0	0
3.3.2.2.7 O&M for Standpipe / Weir Pumps	**1.00**	**LS**		**0.00**	**0**	**0**	**0**	**50,000**	**50,000**
3.3.2.2.7.1 USR O&M for Standpipe / Weirs Pumps	1.00	LS		0.00	0	0	0	50,000	50,000
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.3.2.2.8 Surface Trenching	**31,654.00**	**LF**		**0.00**	**2,854**	**3,726**	**0**	**0**	**6,580**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.3.2.2.8.1 USR Surface Trenching	31,654.00	LF		0.00	2,854	3,726	0	0	6,580
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.3.2.2.9 Trench Deepening	**712,274.00**	**LF**		**0.00**	**64,221**	**83,850**	**0**	**0**	**148,072**
				0.00	*0.09*	*0.12*	*0.00*	*0.00*	*0.21*
3.3.2.2.9.1 USR Trench Deepening	712,274.00	LF		0.00	64,221	83,850	0	0	148,072
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.3.2.2.10 Carbon Dosing	**53,998.00**	**LB**		**54.00**	**3,691**	**2,312**	**43,198**	**0**	**49,202**
				0.00	*0.07*	*0.04*	*0.80*	*0.00*	*0.91*
3.3.2.2.10.1 USR Carbon Dosing	53,998.00	LB		54.00	3,691	2,312	43,198	0	49,202
3.3.2.2.11 Vegetation Control	**1.00**	**LS**		**8,919.00**	**667,178**	**386,391**	**61,725**	**0**	**1,115,294**
				1.00	*74.80*	*42.87*	*0.00*	*0.00*	*117.68*
3.3.2.2.11.1 USR Mowing	8,810.00	ACR		8,810.00	659,024	377,700	0	0	1,036,725
				1.00	*74.80*	*79.74*	*566.28*	*0.00*	*720.82*

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Description	Quantity	UOM	CrewTag	Duration	DirectLabor	DirectEQ	DirectMatl	DirectSubBid	DirectCost
3.3.2.2.11.2 USR Till and Apply Herbicide	109.00	ACR		109.00	8,154	8,691	61,725	0	78,569

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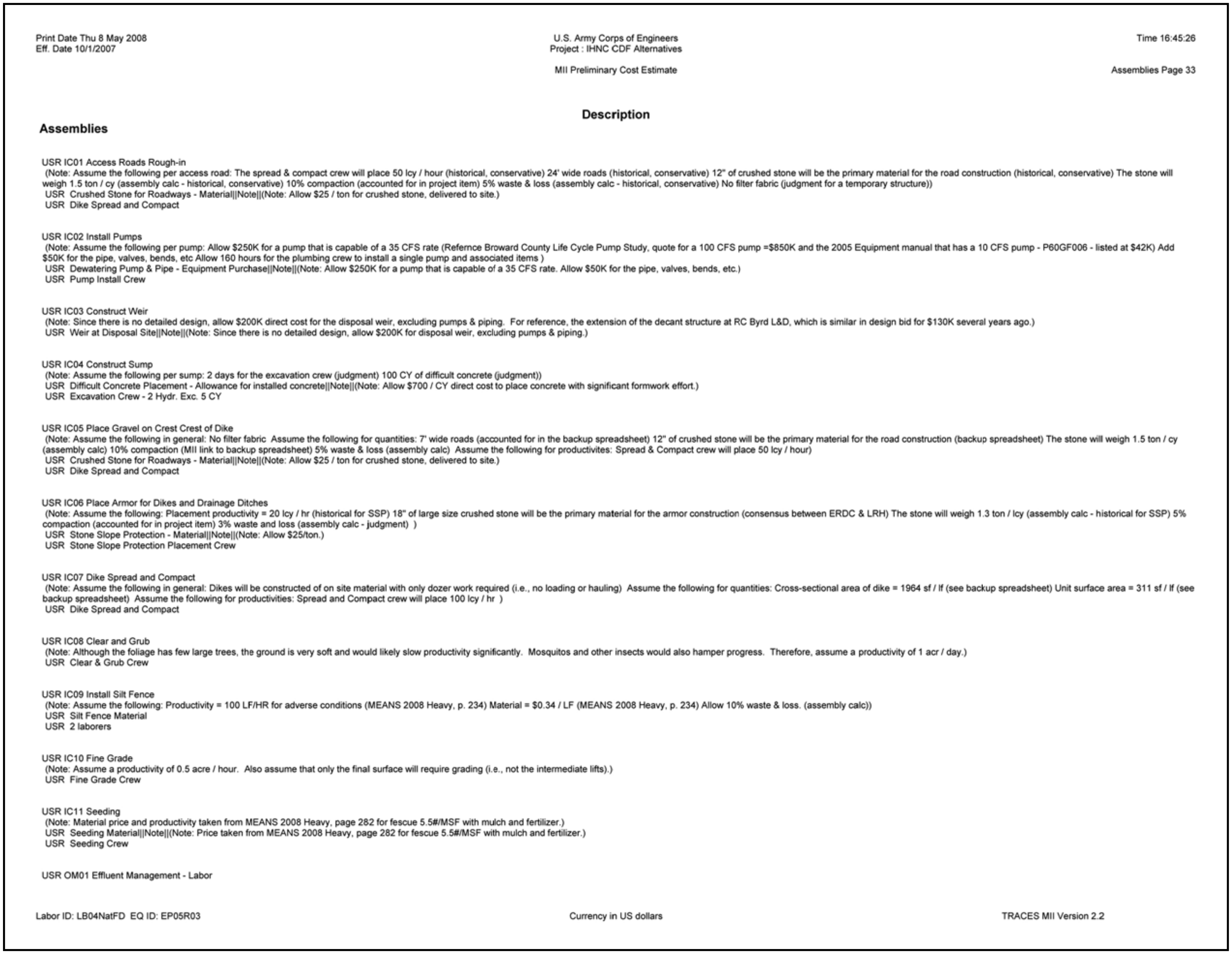

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Assemblies Page 33

Description

Assemblies

USR IC01 Access Roads Rough-in
(Note: Assume the following per access road: The spread & compact crew will place 50 lcy / hour (historical, conservative) 24' wide roads (historical, conservative) 12" of crushed stone will be the primary material for the road construction (historical, conservative) The stone will weigh 1.5 ton / cy (assembly calc - historical, conservative) 10% compaction (accounted for in project item) 5% waste & loss (assembly calc - historical, conservative) No filter fabric (judgment for a temporary structure))
USR Crushed Stone for Roadways - Material||Note||(Note: Allow $25 / ton for crushed stone, delivered to site.)
USR Dike Spread and Compact

USR IC02 Install Pumps
(Note: Assume the following per pump: Allow $250K for a pump that is capable of a 35 CFS rate (Refernce Broward County Life Cycle Pump Study, quote for a 100 CFS pump =$850K and the 2005 Equipment manual that has a 10 CFS pump - P60GF006 - listed at $42K) Add $50K for the pipe, valves, bends, etc Allow 160 hours for the plumbing crew to install a single pump and associated items)
USR Dewatering Pump & Pipe - Equipment Purchase||Note||(Note: Allow $250K for a pump that is capable of a 35 CFS rate. Allow $50K for the pipe, valves, bends, etc.)
USR Pump Install Crew

USR IC03 Construct Weir
(Note: Since there is no detailed design, allow $200K direct cost for the disposal weir, excluding pumps & piping. For reference, the extension of the decant structure at RC Byrd L&D, which is similar in design bid for $130K several years ago.)
USR Weir at Disposal Site||Note||(Note: Since there is no detailed design, allow $200K for disposal weir, excluding pumps & piping.)

USR IC04 Construct Sump
(Note: Assume the following per sump: 2 days for the excavation crew (judgment) 100 CY of difficult concrete (judgment))
USR Difficult Concrete Placement - Allowance for installed concrete||Note||(Note: Allow $700 / CY direct cost to place concrete with significant formwork effort.)
USR Excavation Crew - 2 Hydr. Exc. 5 CY

USR IC05 Place Gravel on Crest Crest of Dike
(Note: Assume the following in general: No filter fabric Assume the following for quantities: 7' wide roads (accounted for in the backup spreadsheet) 12" of crushed stone will be the primary material for the road construction (backup spreadsheet) The stone will weigh 1.5 ton / cy (assembly calc) 10% compaction (MII link to backup spreadsheet) 5% waste & loss (assembly calc) Assume the following for productivites: Spread & Compact crew will place 50 lcy / hour)
USR Crushed Stone for Roadways - Material||Note||(Note: Allow $25 / ton for crushed stone, delivered to site.)
USR Dike Spread and Compact

USR IC06 Place Armor for Dikes and Drainage Ditches
(Note: Assume the following: Placement productivity = 20 lcy / hr (historical for SSP) 18" of large size crushed stone will be the primary material for the armor construction (consensus between ERDC & LRH) The stone will weigh 1.3 ton / lcy (assembly calc - historical for SSP) 5% compaction (accounted for in project item) 3% waste and loss (assembly calc - judgment))
USR Stone Slope Protection - Material||Note||(Note: Allow $25/ton.)
USR Stone Slope Protection Placement Crew

USR IC07 Dike Spread and Compact
(Note: Assume the following in general: Dikes will be constructed of on site material with only dozer work required (i.e., no loading or hauling) Assume the following for quantities: Cross-sectional area of dike = 1964 sf / lf (see backup spreadsheet) Unit surface area = 311 sf / lf (see backup spreadsheet) Assume the following for productivities: Spread and Compact crew will place 100 lcy / hr)
USR Dike Spread and Compact

USR IC08 Clear and Grub
(Note: Although the foliage has few large trees, the ground is very soft and would likely slow productivity significantly. Mosquitos and other insects would also hamper progress. Therefore, assume a productivity of 1 acr / day.)
USR Clear & Grub Crew

USR IC09 Install Silt Fence
(Note: Assume the following: Productivity = 100 LF/HR for adverse conditions (MEANS 2008 Heavy, p. 234) Material = $0.34 / LF (MEANS 2008 Heavy, p. 234) Allow 10% waste & loss. (assembly calc))
USR Silt Fence Material
USR 2 laborers

USR IC10 Fine Grade
(Note: Assume a productivity of 0.5 acre / hour. Also assume that only the final surface will require grading (i.e., not the intermediate lifts).)
USR Fine Grade Crew

USR IC11 Seeding
(Note: Material price and productivity taken from MEANS 2008 Heavy, page 282 for fescue 5.5#/MSF with mulch and fertilizer.)
USR Seeding Material||Note||(Note: Price taken from MEANS 2008 Heavy, page 282 for fescue 5.5#/MSF with mulch and fertilizer.)
USR Seeding Crew

USR OM01 Effluent Management - Labor

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Description

(Note: See backup spreadsheet for calculation of duration.)
USR Pump Op Crew

USR OM02 Runoff Management (Weir Op) - Labor
(Note: See backup spreadsheet for calculation of duration.)
USR Pump Op Crew

USR OM03 Dragline Trenching Around Perimeter
(Note: Allow 50 LF per hour. No details on trench dimensions, however they would be rather small. Also, assume that the material can be left in the cells and therefore will require no loading and hauling.)
USR Dragline Trenching Crew

USR OM04 Mowing
(Note: Assume a mowing productivity of 1 acr / hr. Also, assume that the helper crew will be engaged only half of the time that the mowing crew is working.)
USR Mowing Crew
USR Vegetation Removal Helper Crew

USR OM05 O&M for Standpipe / Weirs Pumps
(Note: Allow $50K for the O&M of the weir and pumps for the duration of the CDF activities. All alternatives would have a similar such duration and therefore a difference for this item will not be considered to be significant.)
USR O&M of Weir and Pumps - Allowance||Note||(Note: Allow $50 for the O&M of the weir and pumps for the duration of the CDF activities. All alternatives would have a similar such duration and therefore a difference for this item will not be considered.)

USR OM06 Cap Cell
(Note: Only the disposal cells will require caps. This will happen upon completion of the work and once the disposal material has been dewatered to specification. Assume that the source material for this cap will be the material placed in the fill cell which, by this time, should be dry enough to use as fill.)
USR Large Exc. and Haul
USR Dike Spread and Compact

USR OM07 Effluent Management - Pump Op
(Note: See backup spreadsheet for calculation of duration.)
USR 15,500 gpm pump - Allowance for operating expense||Note||(Note: Reference Broward County LCC study. For the 100 CFS electric pumps with a Suction Bell intake and a non-siphon discharge the estimated energy usage was 525,700 kwh/yr / 3000 pump-hr/yr = 175 kwh/pump-hr. Our pumps are about 1/3 this size, so use 175 / 3 = 58 kwh/pump-hr. Further, assume $0.10/kwh. Finally, 58 kwh/pump-hr x $0.10/kwh = $5.80/pump-hr SAY = $6.00/pump-hour<--- Use $0.50/hr for repair.)

USR OM08 Runoff Management - Pump Op
(Note: See backup spreadsheet for calculation of duration.)
USR 15,500 gpm pump - Allowance for operating expense||Note||(Note: Reference Broward County LCC study. For the 100 CFS electric pumps with a Suction Bell intake and a non-siphon discharge the estimated energy usage was 525,700 kwh/yr / 3000 pump-hr/yr = 175 kwh/pump-hr. Our pumps are about 1/3 this size, so use 175 / 3 = 58 kwh/pump-hr. Further, assume $0.10/kwh. Finally, 58 kwh/pump-hr x $0.10/kwh = $5.80/pump-hr SAY = $6.00/pump-hour<--- Use $0.50/hr for repair.)

USR OM09 Trenching for Dewatering
(Note: This item of work covers the cost of cutting dewatering trenches through the disposed dredge material. This is to occur once a 4" - 6" crust forms on the material. Assume trench dimension of 24" wide x 24" deep, which will later be deepened as the material drys. (accounted for in the backup spreadsheet) Assume that the trenches will require deepening twice a year. (accounted for in the backup spreadsheet) See the backup spreadsheet for further time and volume assumptions.)
USR Trenching for Dewatering of Cells||Note||(Note: Reference MEANS 2008 Heavy, p. 214 which suggests about 400 bcy / hr for a 24" wide fly wheel trencher going thru heavy soil. However, due to the extreme conditions for this item of work, allow only 100 bcy / hr.)

USR OM10 Trench Deepening
(Note: This item of work is to cover the cost of deepening the initial surface trenches for the purpose of dewatering the dredge material. As the upper layers dry, the trenches must be deepened in order for the water from the lower layers to flow by gravity to the sump. Assume the trenches will be 2' wide and will be deepened by 2 feet each time.)
USR Trenching for Dewatering of Cells||Note||(Note: Reference MEANS 2008 Heavy, p. 214 which suggests about 400 bcy / hr for a 24" wide fly wheel trencher going thru heavy soil. However, due to the extreme conditions for this item of work, allow only 100 bcy / hr.)

USR OM11 Carbon Dosing
(Note: This item of work is to cover the broadcasting of powdered carbon over the ponding water. Assume that this exercise would be similar to that of hydroseeding and would require no marine work. This assumption was validated thru Trudy Estes of ERDC who is heavily involved with this project. For estimating crew cost, use a truck mounted hydroseeder and supporting labor. The hydroseeder would mix the water and carbon into a slurry. Assume the source for the water iwould be that water which had passed over the weir structure but had not yet been discharged. Therefore, no additional cost for water would be required. For productivity, reference MEANS 2008 Heavy, page 282 for hydroseeding. A productivity of 80 msf/hr is consistently shown. for the heaviest type of seed mixture, this equates to 640 lb/hr. Assume that the carbon dosing, however, can be made at a significantly higher weight per area ratio. Therefore, use a productivity of 1000 lb/hr. See backup spreadsheet for quantity calcs.)
USR Regenerated Powdered Activitated Carbon - Material Only||Note||(Note: Price per email from Trudy Estes, dated 4/23/2008. Email stated a range of $0.70 - $0.80 per pound.)
USR Carbon Dosing

USR OM12 Till and Apply Herbicide
USR Herbicidal Material||Note||(Note: Assume approximately half the price of seeding.)
USR Herbicidal Crew

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Crew Summary Page 35

Description	MemberType	ManHours	EQHours	CrewHours	CrewCost
Crew Summary		**1,347,230.68**	**929,491.84**	**395,142.59**	**69,741,425**
USR 2 laborers		*2.00* 5,498.76	*0.00* 0.00	2,749.38	*33.72* 92,709
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
USR Carbon Dosing		*3.00* 1,566.52	*1.00* 522.17	522.17	*93.40* 48,773
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	3.00			
MAP L15FG001 LANDSCAPING EQUIPMENT, HYDROSEEDER, 3000 GAL, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	EP / Average		1.00		
USR Clear & Grub Crew		*7.00* 128,128.00	*6.00* 109,824.00	18,304.00	*282.45* 5,170,023
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	4.00			
MIL B-LABORER Laborers, (Semi-Skilled)	Foreman	1.00			
MIL B-EQOPRMED Equip. Operators, Medium	Journeyman	1.00			
MIL B-TRKDVRHV Truck Drivers, Heavy	Journeyman	1.00			
GEN B20Z0890 BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	EP / Average		1.00		
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	EP / Average		2.00		
MAP T50XX027 TRUCK, HIGHWAY, 35,000 LBS GVW, 2 AXLE, 4X2 (CHASSIS ONLY-ADD OPTIONS)	EP / Average		1.00		
USR T15CA011 TRACTOR, CRAWLER (DOZER), 165 HP, LOW GROUND PRESSURE, W/5.09 CY SEMI-U BLADE (ADD ATTACHMENTS)	EP / Average		1.00		
USR T40MY005 TRUCK OPTIONS, DUMP BODY, REAR, 13.6 CY, AIR GATE (W/HOIST) (ADD 35,000 GVW TRUCK)	EP / Average		1.00		
USR Dike Spread and Compact		*4.00* 621,118.22	*2.00* 310,559.11	155,279.56	*233.59* 36,271,672
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	2.00			
MAP T15CA008 TRACTOR, CRAWLER (DOZER), 145 HP, POWERSHIFT, W/5.60 CY SEMI-U BLADE (ADD ATTACHMENTS)	EP / Average		1.00		
EP R30CA003 ROLLER, STATIC, SELF-PROPELLED, LANDFILL/SOIL COMPACTOR, SHEEPSFOOT, 4X4, 23 TON, 56" DIA, 14.25' WIDTH PER 2-PASS, W/BLADE	EP / Average		1.00		
USR Dragline Trenching Crew		*2.50* 6,873.60	*2.00* 5,498.88	2,749.44	*259.77* 714,217
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	1.00			
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	1.00			
MIL B-EQOPROIL Equip. Operators, Oilers	Journeyman	0.50			
MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	EP / Average		1.00		
EP B35HE004 BUCKET, DRAGLINE, 2.0 CY, LIGHT WEIGHT/PERFORATED	EP / Average		1.00		
USR Excavation Crew - 2 Hydr. Exc. 5 CY		*4.00* 768.00	*2.00* 384.00	192.00	*516.96* 99,256
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	1.00			
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	2.00			

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Description	MemberType	ManHours	EQHours	CrewHours	CrewCost
MIL B-EQOPROIL Equip. Operators, Oilers	Journeyman	1.00			
EP H25CA030 HYDRAULIC EXCAVATOR, CRAWLER, 175,500 LBS, 5.00 CY BUCKET, 34.75' MAX DIGGING DEPTH	EP / Severe		2.00		
USR Fine Grade Crew		*2.00* 3,962.49	*1.00* 1,981.24	1,981.24	*79.89* 158,281
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	1.00			
MIL B-EQOPRMED Equip. Operators, Medium	Journeyman	1.00			
GEN G15Z3080 GRADER, MOTOR, ARTICULATED, 135 HP (101KW), 12' (3.6M) BLADE WIDTH	EP / Average		1.00		
USR Herbicidal Crew		*3.00* 3,924.00	*2.00* 2,616.00	1,308.00	*135.09* 176,692
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
MIL B-EQOPRMED Equip. Operators, Medium	Journeyman	1.00			
USR T25JD009 TRACTOR, AGRICULTURAL, WHEEL, 140 HP, 4X4, PTO, 3 POINT HITCH	EP / Average		1.00		
MAP L15FG001 LANDSCAPING EQUIPMENT, HYDROSEEDER, 3000 GAL, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	EP / Average		1.00		
USR Large Exc. and Haul		*7.00* 165,635.56	*11.00* 260,284.44	23,662.22	*506.41* 11,982,882
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	1.00			
MIL B-EQOPROIL Equip. Operators, Oilers	Journeyman	1.00			
MIL B-TRKDVRHV Truck Drivers, Heavy	Journeyman	5.00			
EP H25CA030 HYDRAULIC EXCAVATOR, CRAWLER, 175,500 LBS, 5.00 CY BUCKET, 34.75' MAX DIGGING DEPTH	EP / Average		1.00		
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	EP / Average		5.00		
GEN T40Z6860 TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	EP / Average		5.00		
USR Mowing Crew		*2.00* 186,024.00	*1.00* 93,012.00	93,012.00	*75.40* 7,013,224
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	1.00			
MIL B-EQOPRMED Equip. Operators, Medium	Journeyman	1.00			
USR T25JD009 TRACTOR, AGRICULTURAL, WHEEL, 140 HP, 4X4, PTO, 3 POINT HITCH	EP / Average		1.00		
USR Pump Install Crew		*4.50* 17,280.00	*1.25* 4,800.00	3,840.00	*170.48* 654,637
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	0.25			
MIL B-EQOPROIL Equip. Operators, Oilers	Journeyman	0.25			
MIL B-PLUMBER Plumbers	Journeyman	2.00			
GEN C80Z2280 CRANE, HYDRAULIC, TRUCK MOUNTED, 65 TON (59.0MT), 126' (38.4M) BOOM, 8X4	EP / Average		0.25		
EP T50XX020 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP 4X4	EP / Average		1.00		
USR Pump Op Crew		*2.00* 39,804.00	*1.00* 19,902.00	19,902.00	*99.50* 1,980,192

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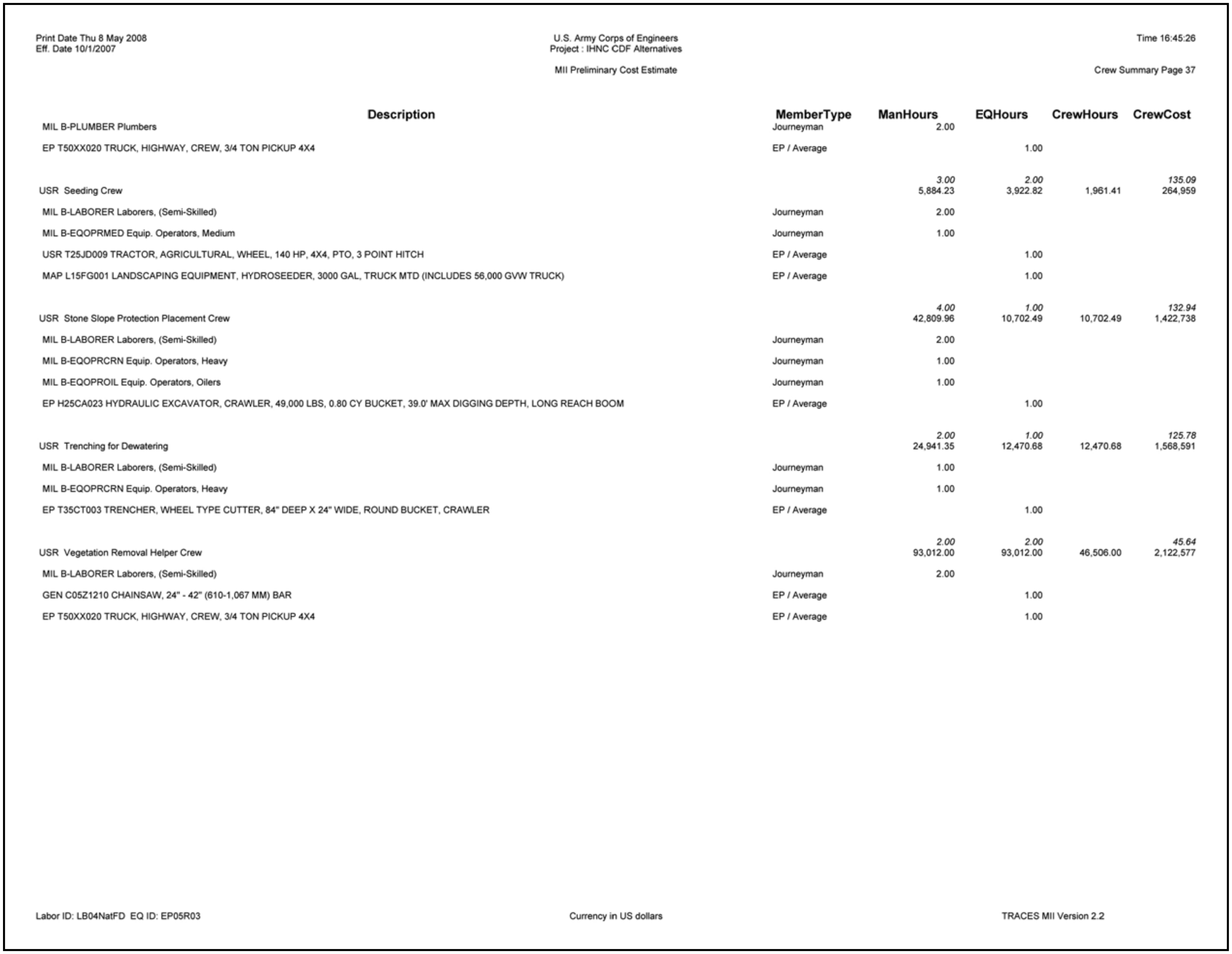

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Description	MemberType	ManHours	EQHours	CrewHours	CrewCost
MIL B-PLUMBER Plumbers	Journeyman	2.00			
EP T50XX020 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP 4X4	EP / Average		1.00		
USR Seeding Crew		*3.00* 5,884.23	*2.00* 3,922.82	1,961.41	*135.09* 264,959
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
MIL B-EQOPRMED Equip. Operators, Medium	Journeyman	1.00			
USR T25JD009 TRACTOR, AGRICULTURAL, WHEEL, 140 HP, 4X4, PTO, 3 POINT HITCH	EP / Average		1.00		
MAP L15FG001 LANDSCAPING EQUIPMENT, HYDROSEEDER, 3000 GAL, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	EP / Average		1.00		
USR Stone Slope Protection Placement Crew		*4.00* 42,809.96	*1.00* 10,702.49	10,702.49	*132.94* 1,422,738
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	1.00			
MIL B-EQOPROIL Equip. Operators, Oilers	Journeyman	1.00			
EP H25CA023 HYDRAULIC EXCAVATOR, CRAWLER, 49,000 LBS, 0.80 CY BUCKET, 39.0' MAX DIGGING DEPTH, LONG REACH BOOM	EP / Average		1.00		
USR Trenching for Dewatering		*2.00* 24,941.35	*1.00* 12,470.68	12,470.68	*125.78* 1,568,591
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	1.00			
MIL B-EQOPRCRN Equip. Operators, Heavy	Journeyman	1.00			
EP T35CT003 TRENCHER, WHEEL TYPE CUTTER, 84" DEEP X 24" WIDE, ROUND BUCKET, CRAWLER	EP / Average		1.00		
USR Vegetation Removal Helper Crew		*2.00* 93,012.00	*2.00* 93,012.00	46,506.00	*45.64* 2,122,577
MIL B-LABORER Laborers, (Semi-Skilled)	Journeyman	2.00			
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	EP / Average		1.00		
EP T50XX020 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP 4X4	EP / Average		1.00		

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Labor Rates Page 38

Description	ManHours	BaseWage	TaxableFringe	Payroll	WCI	NonTaxFringe	Subsistence	Total	LaborType
Labor Rates	**1,347,230.6832**	**27,060,403.74**	**0.00**	**3,431,800.39**	**6,079,255.07**	**2,265,154.97**	**0.00**	**38,836,614.18**	
MIL B-EQOPRCRN Equip. Operators, Heavy	361,487.9384	*24.5100* 8,860,069.37	*0.0000* 0.00	1,123,633.99	1,990,458.91	*4.9500* 1,789,365.29	*0.0000* 0.00	*38.0747* 13,763,527.57	Journeyman
MIL B-EQOPRMED Equip. Operators, Medium	116,566.6527	*21.6300* 2,521,336.70	*0.0000* 0.00	319,755.92	566,430.90	*0.0000* 0.00	*0.0000* 0.00	*29.2324* 3,407,523.52	Journeyman
MIL B-EQOPROIL Equip. Operators, Oilers	36,891.4317	*15.0500* 555,216.05	*0.0000* 0.00	70,412.50	124,732.06	*0.0000* 0.00	*0.0000* 0.00	*20.3397* 750,360.61	Journeyman
MIL B-LABORER Laborers, (Semi-Skilled)	629,881.5493	*16.8600* 10,619,802.92	*0.0000* 0.00	1,346,803.40	2,385,791.85	*0.0000* 0.00	*0.0000* 0.00	*22.7859* 14,352,398.18	Journeyman
MIL B-LABORER Laborers, (Semi-Skilled)	18,304.0000	*17.3600* 317,757.44	*0.0000* 0.00	40,298.00	71,385.80	*0.0000* 0.00	*0.0000* 0.00	*23.4616* 429,441.24	Foreman
MIL B-PLUMBER Plumbers	47,484.0000	*35.2800* 1,675,235.52	*0.0000* 0.00	212,453.37	376,350.04	*10.0200* 475,789.68	*0.0000* 0.00	*57.7000* 2,739,828.61	Journeyman
MIL B-TRKDVRHV Truck Drivers, Heavy	136,615.1111	*18.3800* 2,510,985.74	*0.0000* 0.00	318,443.21	564,105.51	*0.0000* 0.00	*0.0000* 0.00	*24.8401* 3,393,534.46	Journeyman

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Equipment Rates Page 39

Description	ConditionType	EQHours	Total
Equipment Rates		**989,803.8363**	**40,807,893.80**
EP B35HE004 BUCKET, DRAGLINE, 2.0 CY, LIGHT WEIGHT/PERFORATED	Average	2,749.4400	*1.9369* 5,325.29
EP H25CA023 HYDRAULIC EXCAVATOR, CRAWLER, 49,000 LBS, 0.80 CY BUCKET, 39.0' MAX DIGGING DEPTH, LONG REACH BOOM	Average	10,702.4895	*54.7052* 585,482.35
EP H25CA030 HYDRAULIC EXCAVATOR, CRAWLER, 175,500 LBS, 5.00 CY BUCKET, 34.75' MAX DIGGING DEPTH	Average	24,046.2222	*161.7041* 3,888,371.66
EP H25CA030 HYDRAULIC EXCAVATOR, CRAWLER, 175,500 LBS, 5.00 CY BUCKET, 34.75' MAX DIGGING DEPTH	Severe	48,092.4444	*213.0651* 10,246,821.99
EP R30CA003 ROLLER, STATIC, SELF-PROPELLED, LANDFILL/SOIL COMPACTOR, SHEEPSFOOT, 4X4, 23 TON, 56" DIA, 14.25' WIDTH PER 2-PASS, W/BLADE	Average	155,279.5556	*81.7100* 12,687,887.23
EP T35CT003 TRENCHER, WHEEL TYPE CUTTER, 84" DEEP X 24" WIDE, ROUND BUCKET, CRAWLER	Average	12,470.6756	*79.4623* 990,948.81
EP T50XX020 TRUCK, HIGHWAY, CREW, 3/4 TON PICKUP 4X4	Average	70,248.0000	*8.8971* 625,006.18
GEN B20Z0890 BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Average	18,304.0000	*22.3497* 409,088.50
GEN C05Z1210 CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Average	83,114.0000	*3.0238* 251,319.91
GEN C80Z2280 CRANE, HYDRAULIC, TRUCK MOUNTED, 65 TON (59.0MT), 126' (38.4M) BOOM, 8X4	Average	960.0000	*104.5349* 100,353.50
GEN G15Z3080 GRADER, MOTOR, ARTICULATED, 135 HP (101KW), 12' (3.6M) BLADE WIDTH	Average	1,981.2437	*41.3995* 82,022.52
GEN T40Z6860 TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Average	118,311.1111	*1.9997* 236,592.35
GEN T50Z7420 TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Average	118,311.1111	*39.6603* 4,692,248.53
MAP C85MA003 CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 7.0 CY, 140' BOOM (ADD BUCKET)	Average	2,749.4400	*203.9865* 560,848.58
MAP L15FG001 LANDSCAPING EQUIPMENT, HYDROSEEDER, 3000 GAL, TRUCK MTD (INCLUDES 56,000 GVW TRUCK)	Average	3,791.5830	*42.8245* 162,372.71
MAP T15CA008 TRACTOR, CRAWLER (DOZER), 145 HP, POWERSHIFT, W/5.60 CY SEMI-U BLADE (ADD ATTACHMENTS)	Average	155,279.5556	*59.2395* 9,198,687.04
MAP T50XX027 TRUCK, HIGHWAY, 35,000 LBS GVW, 2 AXLE, 4X2 (CHASSIS ONLY-ADD OPTIONS)	Average	18,304.0000	*43.5873* 797,822.36
USR 15,500 gpm pump - Allowance for operating expense	Average	60,312.0000	*6.5000* 392,028.00
USR T15CA011 TRACTOR, CRAWLER (DOZER), 165 HP, LOW GROUND PRESSURE, W/5.09 CY SEMI-U BLADE (ADD ATTACHMENTS)	Average	18,304.0000	*83.7722* 1,533,367.04
USR T25JD009 TRACTOR, AGRICULTURAL, WHEEL, 140 HP, 4X4, PTO, 3 POINT HITCH	Average	96,281.4090	*36.9113* 3,553,870.57
USR T40MY005 TRUCK OPTIONS, DUMP BODY, REAR, 13.6 CY, AIR GATE (W/HOIST) (ADD 35,000 GVW TRUCK)	Average	18,304.0000	*1.8864* 34,528.01

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