Construction Completion Report
French Drain and Groundwater Treatment System Installations
(SWMU's 1, 2, and 4)

Naval Air Station
Corpus Christi, Texas

Revision No. 00

Contract No. N62467-02-D-0475 CTO No. 0003

Submitted to

Department of the Navy, Southern Division
Naval Facilities Engineering Command

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CERTIFICATE OF COMPLETION

Eagle Construction and Environmental Services, L.P., attests that, to the best of its knowledge and belief, the work delivered under Contract No. N62467-02-D-0475, NAS Corpus Christi, Contract Task Order (CTO) No. 0003, has been completed, inspected, and tested, and is in compliance with the contract.

_____ _____

Project QC Manager Date

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1.0 Introduction

ARCADIS G&M, Inc. (ARCADIS) was contracted by Eagle Construction and Environmental Services, L.P. (EAGLE) to prepare this Construction Completion Report for work performed at the Naval Air Station in Corpus Christi, Texas (CC-NAS). The work was performed by EAGLE for the Department of the Navy, Southern Division, Naval Facilities Engineering Command (Southern Division, NAVFAC). This work was performed under Contract No. N62467-02-D-0475, Contract Task Order (CTO) No. 0003.

The objective of this report is to provide documentation of the construction activities associated with the installation of three French drains (interceptor/cut-off trenches) and one groundwater treatment system as proposed in the *Response Action Plan Installation Restoration Site 1, 3 and 4* (EnSafe Inc., September 10, 2002). Additional requirements were included in the NAVFAC Southern Division Statement of Work (SOW) located in the *Environmental Multiple Award Contracts (EMAC) Scope of Work #3 for Cutoff Trench, SWMU's 1, 2 and 4* (Solicitation No. N62467-03-R-X003). The cut-off trenches and treatment system were proposed to be installed along a man-made drainage ditch. The ditch is located near the main gate to CC-NAS and extends to the northwest, north and northeast (semi-circle) around solid waste management units (SWMUs) No. 1, 2, and 4. The three SWMUs are located at the Defense Property Disposal Office (DPDO) Liquid Waste Disposal Area (SWMU 1, or Site 1), the Corpus Christi Army Depot (SWMU 2, or Site 3) and the Aircraft Firefighter Training Area (SWMU 4, or Site 4). The length (area) of the ditch that is located immediately adjacent to the three SWMUs is subsequently referred to as the Site, the CC-NAS Project Site, the Affected Property or the Work Area. Figure 1-1 presents the Site Location Map.

The ditch surrounding the Site carries both groundwater and storm water run-off which empties into Laguna Madre southeast of the site. The drainage feature has been reported to receive discharges of groundwater that contain chemicals of concern (COCs) at or above Surface Water Protective Concentration Limits (PCLs). The ditch has therefore been considered an ecological receptor. The French drains were subsequently installed to recover groundwater (with COCs) before it reaches the ditch. Based on the *Response Action Plan*, the only COC detected above its PCL for surface water is chlorobenzene. Two additional COCs were also detected in groundwater above the PCLs for ingestion of groundwater and include vinyl chloride and cis-1,2-dichloroethene.

1.1 Project Scope

On February 19, 2003, EAGLE provided NAVFAC with a cost proposal to conduct the following activities at the Site:

- Preparation of design plans for the remediation system (French drains and groundwater treatment system) based on criteria set forth in the *Response Action Plan Installation Restoration Site 1, 3 and 4* (RAP) prepared by EnSafe Inc. (September 10, 2002) , and in the NAVFAC

Southern Division Statement of Work (SOW) located in the *Environmental Multiple Award Contracts (EMAC) Scope of Work #3 for Cutoff Trench, SWMU's 1, 2 and 4* (Solicitation No. N62467-03-R-X003).

- Installation of three French drains (interceptor/cut-off trenches) and one groundwater treatment system as proposed in the *Response Action Plan Installation Restoration Site 1, 3 and 4* (EnSafe Inc., September 10, 2002) and in the Statement of Work (SOW) located in the *Environmental Multiple Award Contracts (EMAC) Scope of Work #3 for Cutoff Trench, SWMU's 1, 2 and 4* (Solicitation No. N62467-03-R-X003).
- Surveying
- Erosion control
- Management of soil and groundwater excavated or recovered during construction activities
- Transportation and disposal of waste materials, consistent with regulatory requirements
- Operation of the system for 7 consecutive days upon initial startup

1.2 Site History

According to the *Affected Property Assessment Report* (APAR, August 2001) and the *Response Action Plan* (RAP, September 2002), both prepared by EnSafe Inc., four protective concentration level exceedance (PCLE) zones were identified at the subject site. These PCLE zones were reported to be the result of liquid waste disposal activities in the 1960's and 1970's at the Naval Air Station Corpus Christi (NASCC). The liquid waste came primarily from the Corpus Christi Army Depot (CCAD), SWMU 2, and was composed primarily of plating and solvent waste with some waste fuel. The waste was transported to the disposal area in bowsers, which allowed for mixing prior to disposal. Groundwater flow in the shallow aquifer flows radially away from the disposal sites. Natural attenuation has eliminated most of the contaminants and no PCLE zones are located at the original disposal sites. Daughter products from the breakdown process have accumulated at the edges of the affected property.

The man-made drainage ditch along the northern, western and southern boundaries of the affected property controls groundwater flow. The ditch along the northern boundary is a losing stream and creates a mounded barrier to flow. Along the western and southern boundaries, it is a gaining stream, receiving groundwater discharge. Three of the PCLE zones result from potential discharge to surface water of chlorobenzene at concentrations greater than the ecological benchmark for chlorobenzene in surface water. One PCLE zone for groundwater ingestion of cis-1,2-dichloroethene is co-located within one of the chlorobenzene PCLE zones. Two PCLE zones for groundwater ingestion of vinyl chloride have been identified, one of which is co-located within the cis-1,2-dichloroethene PCLE zone and one independently located as the fourth PCLE zone.

The following is a chronology of activities (starting with the most recent) associated with the affected property (Information obtained from the *Response Action Plan Installation Restoration Sites 1, 3, and 4*, EnSafe Inc., September 10, 2002).

Affected Property Assessment Report – 2001 Additional data were collected for inclusion in the APAR. EnSafe installed 20 direct push technology (DPT) points along the drainage ditch, analyzed surface soil samples from 54 locations, and analyzed subsurface soil samples from 20 locations. This data was included in the APAR (August 2001).

Follow-up Facility Investigation Reports – 1998 In two separate reports published in September 1998, EnSafe, Inc. addressed Texas Natural Resource Conservation Commission (TNRCC) comments and requests for additional investigations on the *Groundwater Assessment Report* (Building 8) and the *Facility Investigation Report Installation Restoration Sites 1, 3, and 4* (IR Sites 1, 3, and 4). These reports were submitted after the 1998 TNRCC approval of a RCRA Background Investigation Report prepared by Halff Associates, Inc.

Addendum to Facility Investigation Report – 1996 E/A&H responded to TNRCC comments on the *Facility Investigation Report* (1994). Comments that did not require further investigation were addressed in this report, and a separate work plan was provided to address the further investigation required by the TNRCC.

Groundwater Sampling Reports – 1996 E/A&H conducted a site wide round of sampling to obtain a current set of groundwater analytical data for Sites 1, 3, and 4. Using this data, work plans were developed to address areas where the horizontal extent of contamination had not been fully defined. Additional investigations in the deeper, confined aquifer were proposed due to the detections of VOCs in October 1993.

Facility Investigation Report, Installation Restoration Sites 1, 3, and 4 – 1994 In 1993, (E/A&H) conducted field investigations with the primary objectives being to determine the horizontal extent of contamination in the shallow aquifer and to determine if the lower aquifer had been affected by the contaminants in the shallow aquifer. E/A&H collected soil samples from 17 borings and six hand augers, and groundwater samples from 26 existing monitoring wells and 17 new monitoring wells.

Six of the new monitoring wells were installed in the lower aquifer. Eleven wells were installed in the shallow aquifer, with three of those screened at the base of the aquifer to check for dense non-aqueous phase liquids (DNAPLs). Three of the shallow monitoring wells and the six hand augers were installed to investigate site 4, the firefighter training area (FFTA), which had not previously been a focus of investigation.

Two rounds of groundwater samples were collected, in June and in October 1993. The samples collected in October 1993 detected trichloroethylene and tetrachloroethylene in widely scattered wells, including some of the wells in the lower aquifer.

Groundwater Sampling – 1992 In April 1992, E/A&H conducted a sampling event:

- To measure water levels and sample the monitoring wells installed at Sites 1 and 3.
- To analyze groundwater samples from the wells for a more complete and current suite of groundwater contaminants, based on the large number of studies and site history.
- To evaluate the integrity and field dimensions of existing monitoring wells to determine those which are suitable or unsuitable for use in future investigations.
- To assess onsite conditions with respect to accessibility and health and safety considerations.
- To determine the extent of contamination at Sites 1 and 3.

Analytical results varied from well to well without an apparent pattern. For example, the center of Site 3 yielded some of the highest contaminant concentrations; however, MCC-4, located within the central well cluster, yielded low level concentrations. The floating hydrocarbon phase observed in REI-24 and MCC- 12 was not found in other adjacent wells.

Fugro-McClelland, Inc. – 1991 Fugro-McClelland prepared a report summarizing the data collected at Site 3 from December 1988 to December 1990. During quarterly and semi-annual sampling, groundwater samples were analyzed for priority pollutant volatile organic compounds, Base/Neutral and Acid extractable organic compounds (BNAs), pesticide/PCB, and metals. MCC-10, the recovery well, was analyzed for only indicator parameters including total organic carbon (TOC), pH, temperature, and specific conductance. All groundwater samples collected from Site 3 exhibited elevated TOCs (>50 ppm) during each field event with the exception of those from MCC-15. The MCC-15 TOC concentrations remained near background levels, ranging from 3 to 11 ppm. Groundwater pH values measured were not indicative of acidic or basic waste releases to groundwater beneath Site 3. The following VOCs were consistently identified during each sampling event: benzene, chlorobenzene, ethyl benzene, toluene, and vinyl chloride. These VOCs were detected in the ppb range, except for toluene, which was detected in the ppm range consistently in MCC-12 during the first five sampling events, before dropping to the ppb range in the last two events.

Other VOCs were identified in low concentrations with little or no consistency. Naphthalene was the only BNA identified during the three annual sampling events. Pesticides were also detected in low concentrations and low frequency indicating that they are not present in significant concentrations in Site 3 groundwater. PCBs were not identified in any Site 3 sample. In the metals analysis, only lead was detected at a level exceeding USEPA Interim Primary Drinking Water Standards of 0.05 ppm.

Based on the Pilot Recovery Program, Fugro-McClelland concluded that recovery of floating hydrocarbon via a pumping well was not efficient due to the low recovery well yield and recommended continued monitoring of the hydrocarbon thickness in wells REI-24, MCC-10 and MCC-12. The company also recommended equipping

these wells with intermittently operated oil skimming devices for hydrocarbon removal. On the basis of the contaminant concentrations found at Site 3, Fugro-McClelland recommended that the Navy further delineate the areal extent of the groundwater contamination beneath the site and consider conducting a risk assessment to determine if the identified contaminant concentrations pose a risk to human health and the environment.

Evaluation of Groundwater Sampling Data – 1990 Upon completion of the monitoring program at the DPDO Landfill (Site 1), Jones and Nuese, Inc. (JNI) evaluated the groundwater sampling data. Based on a statistical analysis of the data, JNI made the following conclusions:

- Monitoring wells REI-26 and REI-27 were found to be representative of "upgradient" or "background" conditions. However, both wells exhibited the conditions at different times.

- More data are needed to determine any correlation between tidal influences and groundwater flow.

- A pump and treat technology was recommended by JNI as a potential remediation alternative for Site 1.

McClelland Consultants – 1988 Upon completion of the Remedial Response Evaluation, McClelland installed one recovery well and seven monitoring wells in the Site 3 area. The 12-inch recovery well, MCC-10, was installed at 25 feet bgs. The seven monitoring wells, MCC-8, -9, and MCC-11 through MCC-15, were installed to 16 feet bgs.

Fugro-McClelland (formerly McClelland Consultants) ran a pilot recovery system in December 1988 for seven days, to determine groundwater flow characteristics in the area of MCC-10. During the pilot recovery operation, approximately 3,000 gallons of groundwater were removed from the aquifer. However, significant quantities of hydrocarbons were not recovered. Monitoring of the groundwater and the associated hydrocarbon layer continued monthly with annual reports.

In April 1989, McClelland wrote a chemical analysis report for Site 3. The results of the groundwater monitoring program indicated that the groundwater beneath Site 3 contained low concentrations of trace organic and inorganic chemical compounds. Benzene, 1,1-dichloroethane, 1,1-dichloroethene, vinyl chloride, and lead were identified at concentrations exceeding the USEPA Interim Primary Drinking Water Standards in some of the samples taken from the area.

Groundwater Sampling and Analysis of Site 1 – 1988 In 1988, BMW Engineering engaged Finch Energy and Environmental Services to perform scheduled sampling and analysis of groundwater wells at the DPDO Landfill (Site 1). The monitoring program began April 8, 1988 and sampled REI-26, REI-27, REI-28, and GM-21, twice a year for two years.

During the monitoring program, the following organic compounds were detected with a degree of consistency: chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, toluene, and naphthalene. The highest

concentrations of these compounds were found in wells REI-26 and REI-27; the lowest concentrations were found in REI-28.

Remedial Response Evaluation – 1987 In May 1987, McClelland Consultants, Inc. performed a remedial Response Evaluation of the CCAD Landfill (Site 3) to define the aerial extent of the hydrocarbon contamination discovered in the vicinity of REI-24. During the field investigation, McClelland installed four wells in the Site 3 area at a depth of 13.5 ft. bgs. Analysis of the groundwater from REI-24 showed high levels of volatile organics in the hydrocarbon layer with no contaminants detected in the groundwater. Results of the analysis indicated that organics found in the hydrocarbon layer had not dissolved in the groundwater. Notable concentrations detected in the hydrocarbon layer include: chlorobenzene (12.9 ppm), 1,4-dichlorobenzene (16.9 ppm), ethylbenzene (32.1 ppm), tetrachloroethylene (733 ppm), toluene (62.4 ppm), and trichloroethylene (28.7 ppm).

The McClelland field work also included a Vadose Zone Vapor (VZV) survey. The results of the VZV probe survey indicated oil contamination in several trenches near REI-24. These results were characteristic of a floating hydrocarbon layer with contaminant levels measured by the gas chromatograph increasing with depth to the water table.

The results of the groundwater evaluation led McClelland to the following conclusions:

- No volatile priority pollutants were detected in groundwater samples collected from REI-24 or a nearby well, MCC-5, believed to be screened in the same interval and downgradient from REI-24. Failure to detect pollutants suggested that no volatile priority pollutants from the oil had dissolved into the groundwater.

- A hydrocarbon layer was observed only in REI-24 and not in other nearby wells, suggesting that the hydrocarbon layer was not laterally extensive.

McClelland evaluated remedial options for Site 3, including pumping impacted groundwater, soil excavation, and slurry wall installation. Pumping and treating, combined with long-term monitoring of the site, was identified as the "most environmentally sound and cost effective remedial alternative" (McClelland, 1987).

Site Characterization Study – 1986 In 1986, Resource Engineering, Inc. (REI) of Houston, Texas, conducted a Site Characterization Study of Sites 1 and 3 which included the installation and sampling of seven groundwater monitoring wells and three soil borings. The deepest boring (B-29), was installed to a depth of 95 feet below ground surface (bgs) near monitoring well REI-29. The other borings, B-28 and B-30, were installed to depths of 28.0 and 28.5 ft. bgs, respectively.

Four of the seven wells were installed as leachate collection wells. In the Site 1 area, REI-26 and REI-27 were installed in the center of the former landfill. Analysis by REI indicated the presence of trace organic contamination; however, downgradient wells GM-21 and REI-28 did not indicate contaminant migration at that

time. The REI report could not determine a true "upgradient" and "downgradient", due to groundwater mounding. This report recommended further investigation to delineate contaminant and groundwater movement in the area.

In the Site 3 area, wells REI-24 and REI-25 were installed in the center of the former landfill. During REI's field work, a floating hydrocarbon layer was discovered in REI-24. The thickness of the hydrocarbon layer fluctuated between 6 and 30 inches at this time. Analysis of the hydrocarbon layer by the Texas Water Commission (TWC) showed the presence of polychlorinated biphenyl (PCB) aroclor-1260 at a concentration of 2.2 parts per million (ppm). REI stated that the data collected during the three field events was consistent enough to warrant discontinuing the monitoring well sampling program. REI believed the hydrocarbon layer was isolated within portions of Site 3, and recommended a dewatering process was recommended with recovered liquids treated via an oil/water separator.

Confirmation Study – 1984 In July 1984, Geraghty and Miller, Inc (GM) was retained by the Naval Facilities Engineering Command, Southern Division (SOUTHDIV) to provide hydrogeologic consulting at NAS Corpus Christi. GM assisted the Navy in performing the CS of the NACIP program, which was conducted in two phases: verification and characterization. The Verification Study consisted of the installation and subsequent sampling of six groundwater wells in the vicinity of Sites 1 and 3.

The data collected during the field investigation showed low concentrations of volatile organic compounds (VOCs) in the shallow groundwater system were migrating radially away from the Site 3 area at a rate less than 50 feet per year. VOCs were detected in each of the GM wells and ranged from a low of 7.7 ppb total VOCs (GM-21) to a high of 104.5 ppb (GM-17). The contaminants identified at levels above 10 ppb included bromodichloromethane (13 ppb), dibromochloromethane (22 ppb), bromoform (39 ppb), and chlorobenzene (63 ppb). GM recommended the installation of additional monitoring well pairs in the landfill areas. The wells were to be installed during the Site Characterization Study as a deep and shallow pair tapping both the shallow groundwater and deeper confined aquifer. These wells were designed to aid in defining horizontal and vertical hydraulic gradients and to delineate contaminant migration.

Initial Assessment Study - 1984 The IAS prepared by Harmon Engineering and Testing for Naval Energy and Environmental Support Activity (NEESA), focused on 15 sites located within NAS Corpus Christi. Harmon conducted initial onsite surveys at NAS Corpus Christi from April 18 - 22, 1983. The report documents past waste generation, handling, processing, and disposal. Information obtained during a records search and additional onsite surveys was used in the Confirmation Study Ranking System (CSRS). The CSRS score is used to determine the need for a Confirmation Study or for immediate mitigating action. At NAS Corpus Christi, two sites were recommended for Confirmation Studies - the Defense Property Disposal Office (DPDO) Landfill (Site 1) and the Corpus Christi Army Depot (CCAD) Liquid Waste Disposal Landfill (Site 3).

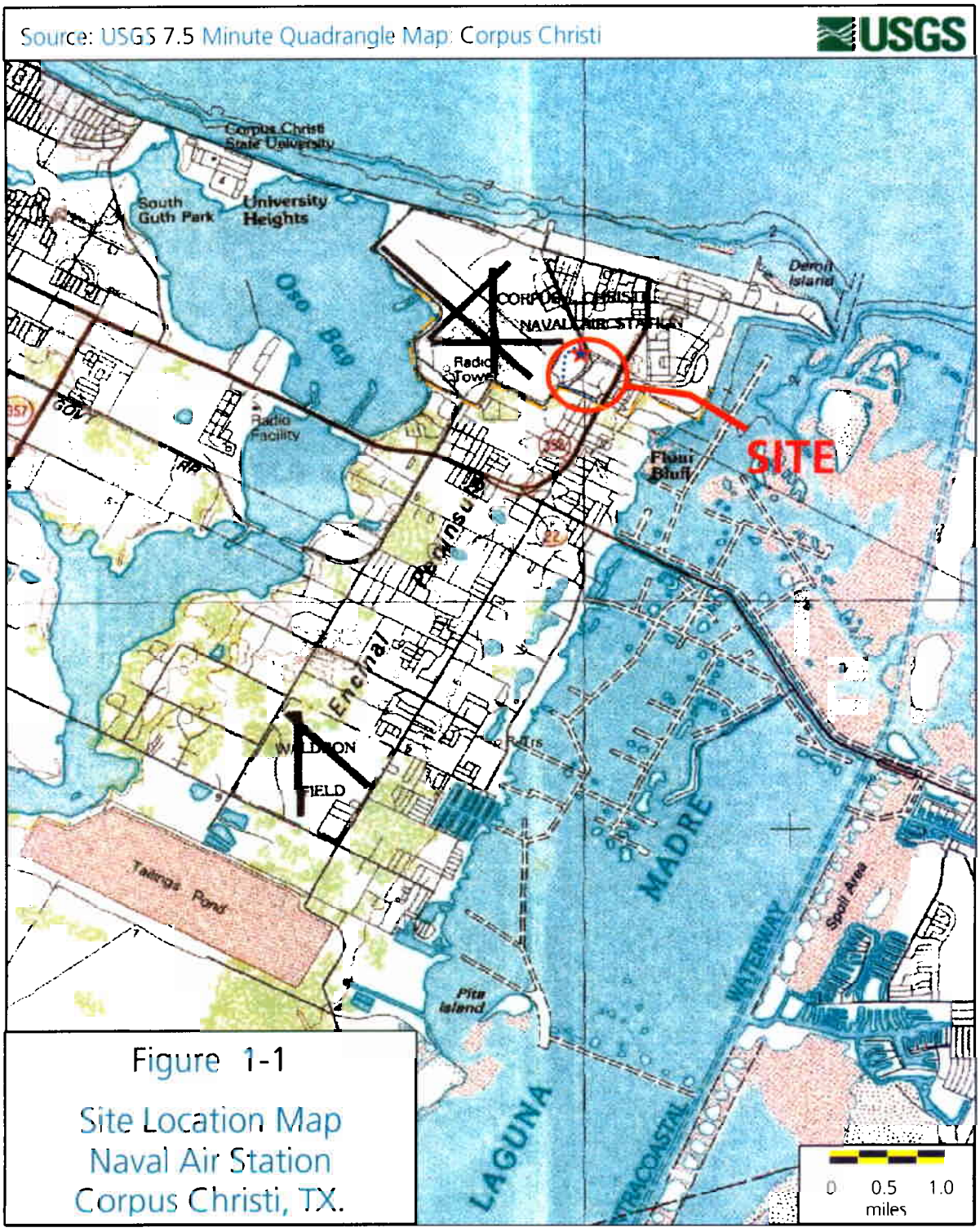


Figure 1-1

Site Location Map
Naval Air Station
Corpus Christi, TX.

1.3 Construction Objectives

Based on previous investigations, reports, and TNRCC/TCEQ correspondence, the Construction objectives for the project were defined by the Navy as follows:

- Install three French drains along the subject ditch to recover potentially-impacted groundwater prior to it entering the ditch
- Install a groundwater treatment system that will treat the groundwater recovered from the three trenches
- Manage storm water and excavation water to prevent excavation run-on and run-off
- Characterize the solid and liquid media prior to offsite transportation (if any)
- Dispose of the excavated soils and aqueous waste in accordance with applicable rules and regulations (if any)
- Operate the groundwater treatment system for 7 consecutive days upon start up

2.0 Significant Events

The following sections describe the major events for the construction at the CC-NAS project site. A summary of these events is presented in Table 2-1.

2.1 Chronology of Events

The chronology of events for the construction at the site is listed below. Specific details describing the construction activities are found in Section 4.0 of this report.

TABLE 2-1

Construction Sequence Summary

Event	Date
Request for Bids	January 13, 2003
Pre-Bid Meeting	January 22, 2003
Bids Received	February 19, 2003
Best and Final Offer-Bid	February 19, 2003
Subcontract Award	March 18, 2003
Pre-Built Topographic Survey	June 5, 2003
Plans/Drawings Submittal	May 23, 2003
Mobilization	December 22, 2003
French Drain and System Installations	Dec. 22, 2003 – Feb. 27, 2004
Initial System Startup	Feb. 27, 2004 – March 5, 2004

2.2 Problems Encountered

No significant problems were encountered during the construction activities at the CC-NAS Project Site. However, following construction of the French drain and treatment system, groundwater in the three French drains was pumped simultaneously to test the treatment system. The total combined flow rate resulting from the pumping exceeded the design flow rate of 47 gallons per minute (*Response Action Plan*, EnSafe, September 2002). The individual flow rate of each line ranged from 33 to 55 gallons per minute (gpm), with a total combined flow rate estimated between 75 and 85 gpm. The system design is currently being re-evaluated for accommodating the actual flow rate, or for reducing the influent flow rate.

Additionally, a dark algae-like material was observed in the groundwater treatment system filter-bag units that are located prior to the carbon adsorption units, or granular activated carbon (GAC) units. The system design is currently being re-evaluated for addressing the material forming/accumulating in the treatment system filters.

3.0 Performance Standards and Construction Quality Control

The following quality controls were implemented during the course of the project and are described in detail in this section:

- Field observation
- Excavation and construction control
- Surveying
- Site restoration
- Equipment decontamination

3.1 Field Observations

EAGLE provided oversight of all field operations throughout the course of the project. EAGLE field oversight staff included a project manager, site superintendent (including health and safety oversight), and a quality control (QC) manager. Detailed records of subcontractor activities were maintained in daily Production Reports and Quality Control Reports. Photographs of all site activities were collected throughout the project (Appendix A).

3.2 Surveying

Shiner Moseley and Associates, Inc. (SMA) surveyed the French drains and treatment system bounds prior to, and upon completion of the installation of the French drain systems. Survey coordinates were translated to North American datum (NAD) 1988 and North American Vertical Datum (NAVD) 1983 coordinates after collecting data in land based measurements. The data (coordinates) were imported into AutoCAD drawings that were provided to the Navy as Construction Plans and As-Built Drawings (Appendix B).

3.3 Site Restoration

Backfill and site restoration were conducted by EAGLE following installation of the three French drains and treatment system. All soil excavated during installation of the French drains, treatment system and associated conduit trenches and roads were reused as backfill material or for re-grading the ground surface in the area of the French drains. The ground surface of the Site was restored to its approximate pre-existing condition, and was seeded to promote the growth of a vegetative cover (grass), thus reducing the potential for surface erosion.

3.4 Excavation Contact Water (Groundwater)

Excavation and contact water (groundwater) was not collected during the course of this construction project. All construction activities were conducted with excavation contact water remaining inplace.

3.5 Equipment Decontamination

All equipment was decontaminated prior to removal from the site. All wastewater generated by the decontamination activities was containerized and subsequently processed/treated through the groundwater treatment system. Upon completion of decontamination, the site QC staff inspected all equipment prior to demobilization.

4.0 Construction Activities

4.1 Construction Participants

The Construction participants and their respective responsibilities for the project are detailed in this section. Construction activities/participants are shown below in Figure 4-1.

FIGURE 4-1

Organization of Construction Participants

4.2 Summary of Construction Activities

The following sections describe the construction activities and schedule, surveying, and site restoration activities associated with the subject Site.

4.2.1 Excavation and Construction Activities

The site was segregated into three areas based on the locations of waste management units (SWMUs) No. 1, 2, and 4. Each area is adjacent to the other, and conforms to the areas mentioned in Section 1.0. The French drain system that was installed adjacent and parallel to the ditch that runs around the three areas was divided into three Sections referenced as Trench 1, Trench 2 and Trench 3. Trench 1 is located adjacent to Site 1, and Trenches 2 and 3 are located adjacent to Site 4 (Site 3 is located behind, or on the opposite side of Site 4). Drawings 1 through 5 located in Appendix B show the location and layout of the site.

On December 22, 2003, excavation activities began on Trench 3, which is downstream of the other two trenches. Installation of French drain (perforated) piping was accomplished by excavating and shoring small sections of the trench, followed by the laying of the pipe through the section. A sock, or filter, was placed around the perforated pipe to prevent sediment from entering the drainage system. During installation of each small section, the drainpipe was surveyed to confirm depth placement, at which time it was then covered with pea-gravel to a level consistent with the proposed and approved engineering plans. The perforated pipe was installed on an approximate 0.08% slope throughout the length of the three French drains (Drawing 6). Excavated material was used to backfill the remaining section of the trench to grade level. Excavation activities continued in this process until each trench was completed.

Two monitoring points were installed in each French drain. Staff gauges were subsequently installed in the ditch adjacent to each monitoring point for measuring and comparing surface water elevations in the ditch to groundwater elevations in the adjacent French drain.

During installation of the three French drain sections, a sump was installed in the downstream end of each trench for placement of a sump pump, and a cleanout port was installed in the upstream end (Drawing 8). The downstream end of the perforated drainpipe was connected to the sump to allow groundwater to gravity flow into the sump. The discharge lines and electrical lines for each pump were then routed through the upper section of each French drain trench toward the groundwater treatment system (Drawing 7). Shallow conduit trenches were excavated between the three French drain sections to accommodate the three discharge lines and three electrical conduits. Electrical junction boxes were located above-grade throughout the length of each electrical conduit for future access to the lines. The three electrical conduits were routed to an electrical control panel located in the treatment building. Power to the panel is supplied by a subsurface electrical line that was installed between the treatment building and a transformer located south of the treatment building. The transformer is located on a utility pole near the southeast corner of the DRMO scrap yard.

The three groundwater-discharge lines were also routed to the treatment building along side the electrical conduits. The three discharge lines were manifolded into one line on the west outer wall of the treatment building (Drawing 7). Each line, just prior to the manifold, was equipped with a flow meter, sample port and flow-regulating valve. One valve was also installed in the single line

immediately following the manifold. The single (manifolded) line enters the building just above the manifold, at which point it discharges groundwater into an approximate 1,000-gallon batch tank.

Following installation of the three French drains, the groundwater treatment system was constructed. The walls of the building were constructed with concrete masonry units (CMUs, or cinder blocks) and the roof system was covered with sheet metal. The system building design and layout (as-built) plans are provided as Drawings 9, 10 and 11. The treatment system, as shown in Drawing 9, consists of one 1,000-gallon polyethylene storage (batch) tank for temporary storage of recovered groundwater prior to treatment. The groundwater from the batch tank is routed through a basket strainer, a transfer pump, two bag-filter units, a flow meter, a flow regulator and finally two granular activated carbon (GAC) filter units. The treated water from the GAC units discharges into the sanitary sewer system. Sample ports for collecting groundwater samples throughout the system were installed inside the treatment building between the basket strainer and transfer pump, between the bag-filter units and GAC units, between the two GAC units, and after the GAC units (prior to exiting the building and discharging to the sanitary sewer). A flow meter was also installed between the bag-filter units and the GAC units.

Safety features installed on the system include a high-high float switch in the batch tank with a high-level alarm, a high-pressure relief valve after the transfer pump, a high-pressure cutoff switch on the bag-filter units, an anti-siphon vent on the final discharge line and pressure gauges located throughout the process equipment. Both the high-high float switch and the high-pressure switch will automatically turn the system off in the event that one or both of them trip. The high-pressure relief valve is located between the transfer pump and the bag-filter units and will automatically route (cycle) water back into the batch tank in the event that blockage occurs in the lines or equipment "downstream" from the relief valve. In this event, as water fills the batch tank, the high-high float switch will be activated and turn the system off. The anti-siphon vent is located on a raised portion of the final discharge pipe and prevents water from being "pulled" through the system due to a suction or vacuum created once the system is turned off. The pressure gauges are for personal observation (and manual control) and are located between the basket strainer and transfer pump, on each bag-filter unit, and on each GAC unit.

4.2.2 Excavated Media Management

According to the *Response Action Plan - Installation Restoration Site 1, 3 and 4* (EnSafe Inc., September 10, 2002), concentrations of chemicals of concern (COCs) in subsurface soils at the site do not exceed protective concentration levels (PCLs). Soils that were excavated during the installation of the French drains were temporarily stockpiled adjacent to the trench and then used to backfill the remaining portion of the trench above the pea-gravel backfill. All soils not used as trench backfill (cap) material were used as fill material to raise the ground surface in low areas around the French drains, conduit trenches and treatment building. No excavated soils remained at the site following surface re-grading of the French drains, conduit trenches and areas.

4.2.3 Waste Characterization and Disposal

Since concentrations of chemicals of concern (COCs) in subsurface soils at the trench excavation locations do not exceed PCLs, and all excavated soils were placed back into excavations or used for re-grading the site, no soil waste was generated during construction activities.

As discussed in Sections 3.4 and 3.5 of this report, no groundwater waste was generated during the construction effort. All water that was used for decontamination activities was treated through the groundwater treatment system and discharged to the sanitary sewer system.

4.2.4 Surveying

The final topographic survey for the Subject Site was conducted in general conformance with the Navy-required Tri-Service Spatial Data Standards (TSSDS). Data collected for the site was converted to NAD 83 and NAVD 88 datum. The survey data was used to generate site completion (as-built) diagrams, which are provided as Drawings 2 through 5.

4.3 Confirmation Sampling

No confirmation sampling was required for the activities described above.

5.0 Final Inspection and Site Status Summary

On March 5, 2004 (and subsequent dates), the Navy Resident Officer in Charge of Construction (ROICC) inspected the site for compliance and acceptance. The participants and results of the inspections are presented below.

5.1 Participants

The following individuals participated in the inspections:

- Derek Senter
- Bill Martin
- Greg Miller
- Ken Brandner
- Mike Hilger
- Mark Henderson
- Jorge Valdez

5.2 Deficiencies

During the inspection, the following items were noted for correction or for addressing/revising:

- Address the operation of the pumps (due to high flow rates)
- Address the material accumulating in the filter-bag units

5.3 Resolution of Deficiencies

ECESI and ARCADIS are currently researching the most cost-effective and efficient methods for addressing the accumulation of material in the filter-bag units.

5.4 Site Status Summary

As outlined in the project scope and in Section 1.3, Construction Objectives, ECESI has conducted the following activities at Naval Air Station in Corpus Christi, Texas:

- Installed three French drains along the subject ditch to recover potentially-impacted groundwater prior to it entering the ditch
- Installed a groundwater treatment system that will treat the groundwater recovered from the three trenches
- Managed storm water and excavation water to prevent excavation run-on and run-off
- Operated the groundwater treatment system for 7 consecutive days upon start up

6.0 References

ECESI, *Health and Safety Plan, CC-NAS, Corpus Christi*, Texas, May 16, 2003.

ECESI, *Quality Control Plan, CC-NAS, Corpus Christi*, Texas, May 19, 2003.

ECESI, *Work Plan for Cut-Off Trench Installation, CC-NAS, Corpus Christi*, Texas, May 23, 2003.

NAVFAC Southern Division, *Environmental Multiple Award Contracts (EMAC) Scope of Work #3 for Cutoff Trench, SWMU's 1, 2 and 4* (Solicitation No. N62467-03-R-X003).

NAVFAC Southern Division, *Amendment of Solicitation/Modification of Contract - No.s 1, 2 and 3* (Solicitation No. N62467-03-R-X003); January 30, 2003 (No. 1), February 12, 2003 (No. 2) and February 14, 2003 (No. 3).

EnSafe Inc., *Response Action Plan Installation Restoration Site 1, 3 and 4;* September 10, 2002.

EnSafe Inc., *Affected Property Assessment Report;* August 2001

APPENDIX A

Photographic Documentation

FRENCH DRAIN AND GROUNDWATER TREATMENT SYSTEM INSTALLATION
CORPUS CHRISTI NAVAL AIR STATION

Photo A-1 (General)
Dump truck unloading gravel for backfilling trenches

Photo A-2 (General)
Stockpiles of gravel used for backfilling trenches

Photo A-3 (General)
Trench box placed in excavation for shoring walls during backfilling

Photo A-4 (General)
Trench box placed in excavation for shoring walls during backfilling

Photo A-5 (General)
Typical French drain cleanout manway

Photo A-6 (General)
Typical staff gauge installed in drainage ditch adjacent to French drain monitoring points

Photo A-7 (General)
Typical flowing sands in excavations

Photo A-8 (General)
Typical flowing sands in excavations

Photo A-9 (Trench 1)
Installation of pump discharge piping and electrical conduits through Trench Section No. 1

Photo A-10 (Trench 1)
Installation and surveying of French drain piping in Trench Section No. 1

Photo A-11 (Trench 1)
Installation of French drain sump in Trench Section No. 1

Photo A-12 (Trench 1)
Installation of French drain sump in Trench Section No. 1

Photo A-13 (Trench 1)
Surface re-grading in area of French drain Section No. 1

Photo A-14 (Trench 1)
Surface re-grading in area of French drain Section No. 1

Photo A-15 (Trench 2)
Installation of French drain in Trench Section No. 2

Photo A-16 (Trench 2)
Surveying French drain pipe during installation in Trench Section No. 2

Photo A-17 (Trench 2)
Installation of French drain in Trench Section No. 2

Photo A-18 (Trench 2)
Installation of French drain in Trench Section No. 2

Photo A-19 (Trench 2)
Surface re-grading in area of French drain Section No. 2

Photo A-20 (Trench 2)
Surface re-grading in area of French drain Section No. 2

Photo A-21 (Trench 2)
Sump located in Trech 2 with electrical conduit and discharge piping from Trench 3 (water is discharging from Trench 3 sump)

Photo A-22 (Trench 2)
Sump located in Trech 2 with electrical conduit and discharge piping from Trench 3 (water is discharging from Trench 3 sump)

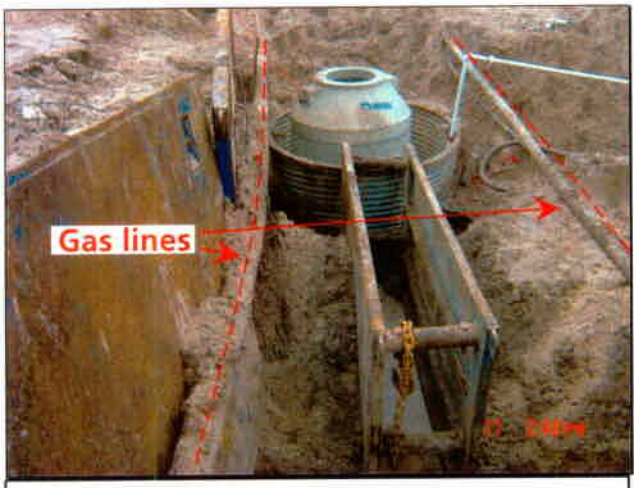


Photo A-23 (Trench 3)
Installation of sump and French drain in Trench Section No. 3. Subsurface natural gas lines running parallel to the trench are exposed on the left and right sides of the trench

Photo A-24 (Trench 3)
Installation of sump and French drain in Trench Section No. 3. Subsurface natural gas lines running parallel to the trench are exposed on the left and right sides of the trench

Photo A-25 (Trench 3)
Installation of sump and French drain in Trench Section No. 3

Photo A-26 (Trench 3)
Installation of sump in Trench Section No. 3

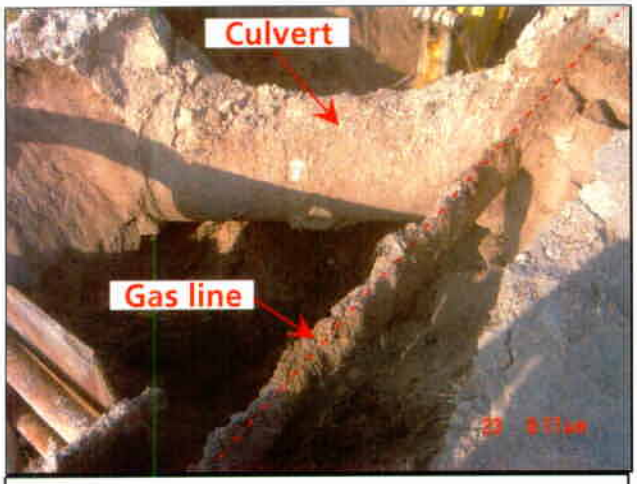


Photo A-27 (Trench 3)
Concrete culvert/pipe crossing French drain Trench Section No. 3

Photo A-28 (Trench 3)
Concrete culvert/pipe crossing French drain Trench Section No. 3

Photo A-29 (Electrical)
Installation of electrical line/conduit trench starting at utility pole with transformer (center of photo) adjacent to the DRMO scrap yard

Photo A-30 (Electrical)
Installation of electrical line/conduit trench next to paved driveway/parking area at the DRMO scrap yard

Photo A-31 (Electrical)
Installation of electrical line/conduit trench through paved driveway/parking area at the DRMO scrap yard

Photo A-32 (Electrical)
Installation of electrical line/conduit trench through paved driveway/parking area at the DRMO scrap yard

Photo A-33 (Electrical)
Installation of electrical line/conduit trench through paved driveway/parking area at the DRMO scrap yard

Photo A-34 (Electrical)
Existing utility lines crossing the electrical line/conduit trench adjacent to the DRMO scrap yard

Photo A-35 (Electrical)
Resurfacing of the electrical line conduit trench through paved driveway/parking area at the DRMO scrap yard

Photo A-36 (Electrical)
Resurfacing of the electrical line conduit trench through paved driveway/parking area at the DRMO scrap yard

Photo A-37 (Electrical)
Installation of pump discharge piping and electrical conduits from Trench Section No. 1 to the west side of the treatment building

Photo A-38 (Electrical)
Installation of treated water discharge line along the north side of the treatment building

Photos A-39 & A-40 (Electrical)
Installation of electrical conduits and pump discharge piping in conduit trench (above) and electrical panel box inside system building (right) →

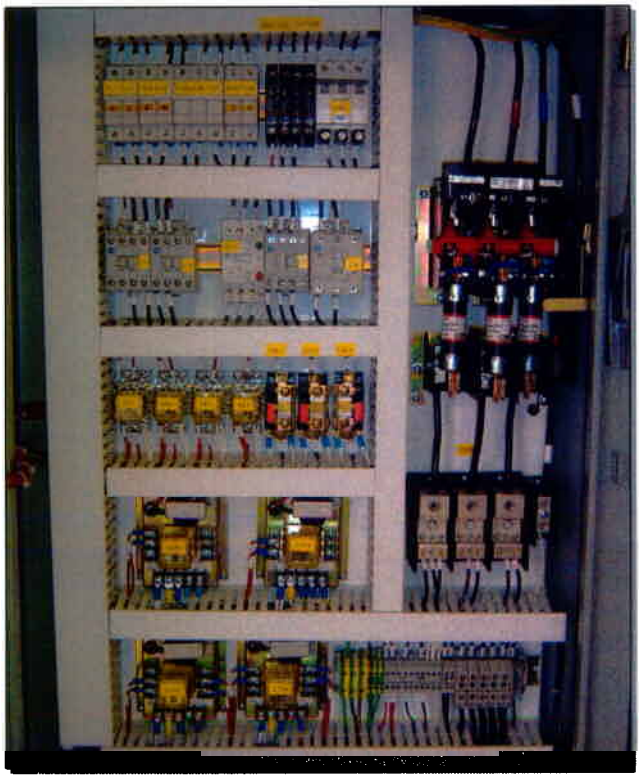


Photo A-41 (Treatment Building)
Area of groundwater treatment building prior to construction

Photo A-42 (Treatment Building)
Construction/grading of gravel road between the DRMO scrap yard parking area and the treatment building

Photo A-43 (Treatment Building)
Construction of the groundwater treatment building

Photo A-44 (Treatment Building)
Construction of the groundwater treatment building

Photo A-45 (Treatment Building)
Construction of the groundwater treatment building

Photo A-46 (Treatment Building)
Construction of the groundwater treatment building

Photo A-47 (Treatment Building)
Construction of the groundwater treatment building

Photo A-48 (Treatment Building)
Groundwater treatment building following construction (south and east sides in view)

Photo A-49 (Treatment Building)
Groundwater treatment building following construction (west and south sides in view)

Photo A-50 (Treatment Equipment)
Manifold of 3 sump-pump discharge lines on west side of building. Each line contains a flow meter, sample port and valve.

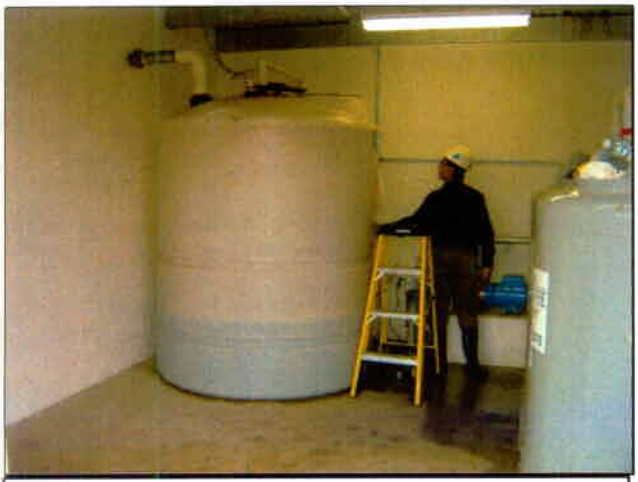


Photo A-51 (Treatment Equipment)
Water treatment system equipment (from left to right: white batch tank, blue transfer pump and gray carbon filter unit)

Photo A-52 (Treatment Equipment)
Water treatment system equipment (from left to right: white batch tank, blue transfer pump and gray carbon filter units)

Photo A-53 (Treatment Equipment)
Water treatment system equipment (from left to right: white batch tank, blue transfer pump, two stainless-steel bag filter units and gray carbon filter unit)

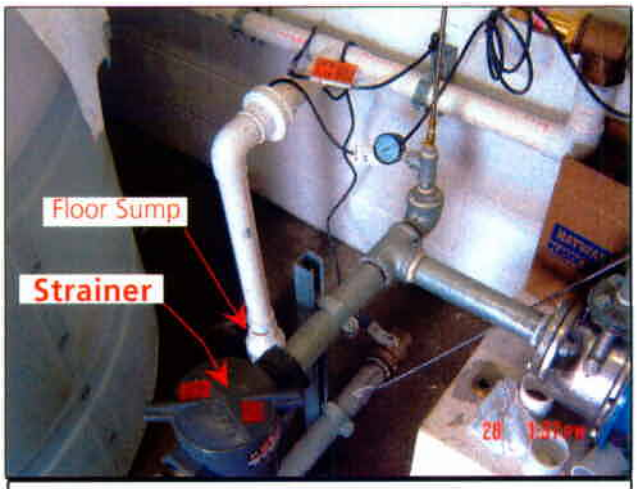


Photo A-54 (Treatment Equipment)
Water treatment system equipment (gray top to strainer located between batch tank and transfer pump). Floor sump pump is connected to the bottom of the white PVC pipe that leads back to the top of the batch tank

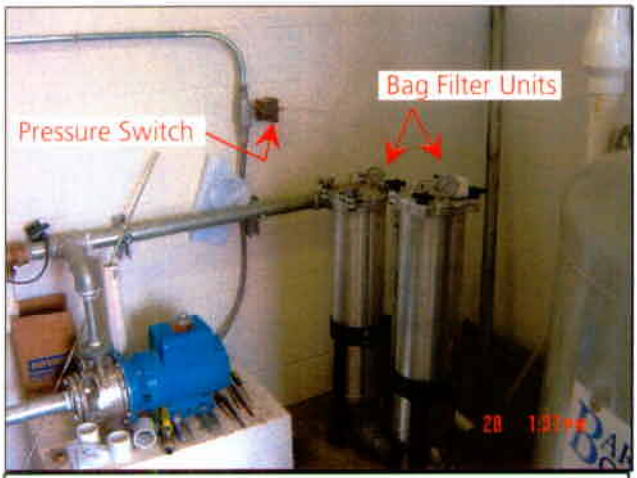


Photo A-55 (Treatment Equipment)
Water treatment system equipment (from left to right: blue transfer pump, two stainless-steel bag filter units and gray carbon filter unit). High-pressure switch is shown on wall above filter units

Photo A-56 (Treatment Equipment)
Water treatment system equipment (from left to right: two stainless-steel bag filter units, sample port, flow meter, flow regulator and gray carbon filter unit)

Photo A-57 (Treatment Equipment)
Water treatment system equipment (gray carbon filter units and associated piping and valves). Water enters each unit from the top

Photo A-58 (Treatment Equipment)
Water treatment system equipment (gray carbon filter units and associated piping and valves). Water enters each unit from the top

Photo A-59 (Treatment Equipment)
Water treatment system equipment (gray carbon filter units and associated piping and valves). Water exits each unit from the bottom. Piping along base of wall exits the building to the left side of photo

Photo A-60 (Treatment Equipment)
Water treatment system equipment (anti-siphon valve located on top of treated water discharge pipe prior to exiting building). Wall vent to building is shown on right side of photo

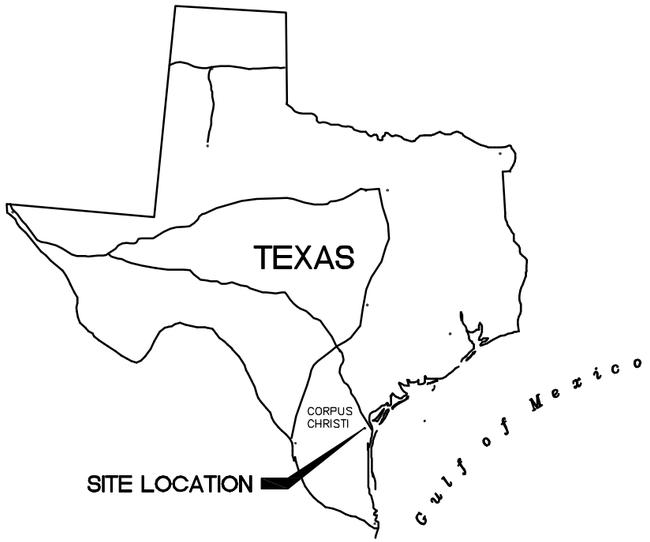
APPENDIX B

Construction Drawings

CONSTRUCTION DRAWINGS OF:

CUTOFF TRENCHES
SWMU'S 1, 2, AND 4

NAVAL AIR STATION
CORPUS CHRISTI, TEXAS



LEGEND

~8~	EXISTING CONTOUR
x 15.16	EXISTING SPOT ELEVATION
≈≈≈	EXISTING SITE TOPOGRAPHY
#####	RAILROAD TRACK
—x—x—	FENCE LINE

DRAWING NUMBER	TITLE
1	TITLE SHEET
2	TRENCH LOCATION MAP
3	TRENCH No. 1
4	TRENCH No. 2
5	TRENCH No. 3
6	TRENCH PROFILES
7	DETAILS
8	DETAILS
9	TREATMENT SYSTEM PROCESS DESIGN
10	TREATMENT BUILDING PLAN, SECTIONS & DETAILS
11	TREATMENT BUILDING ELEVATIONS

NO.	DATE	REVISION DESCRIPTION	BY CKD

TITLE SHEET

NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2900 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70827
Tel: 225-292-1004 Fax: 225-292-5210

PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
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DRAWN BY: SMEN	DATE: 7/21/03
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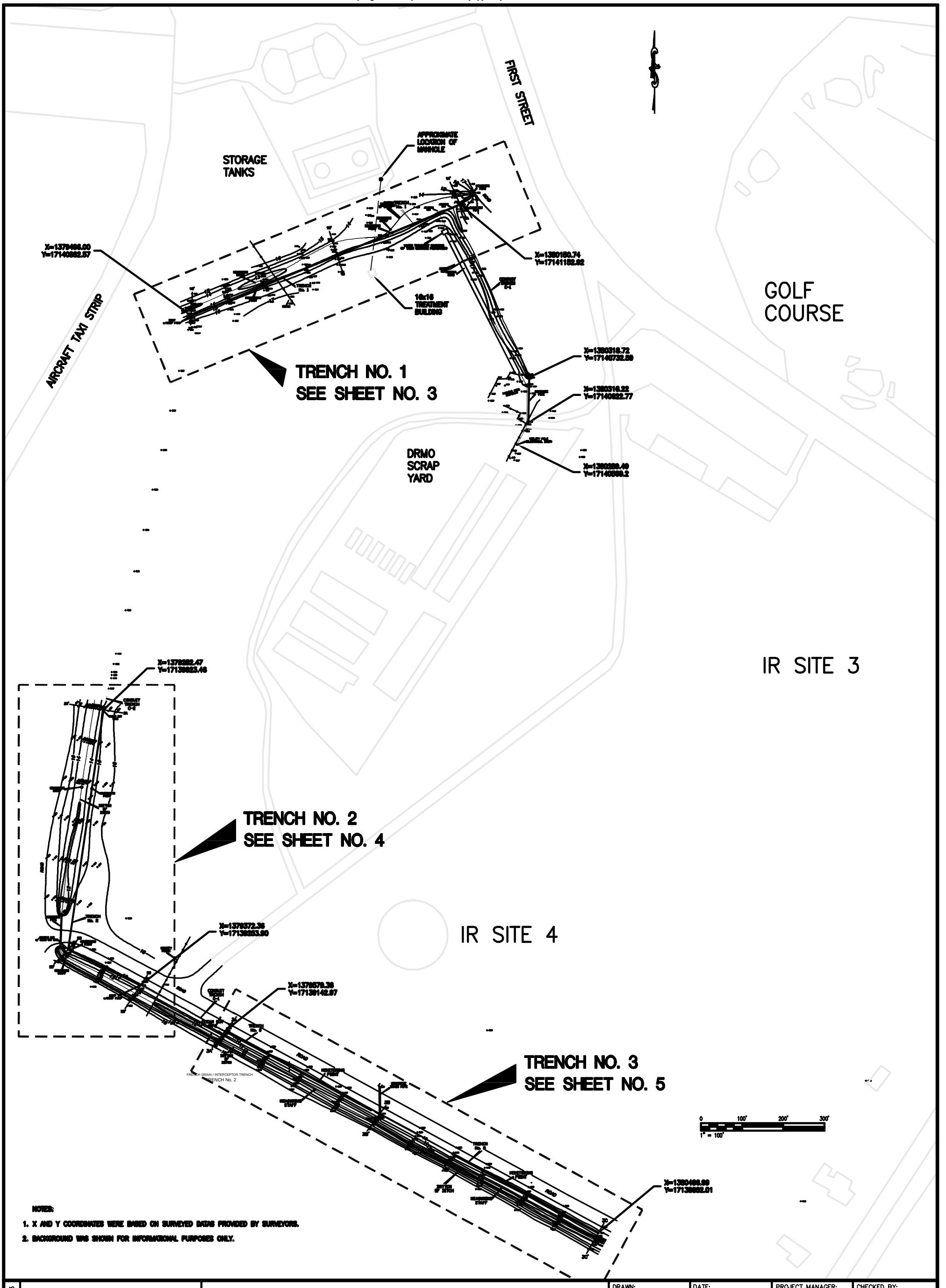


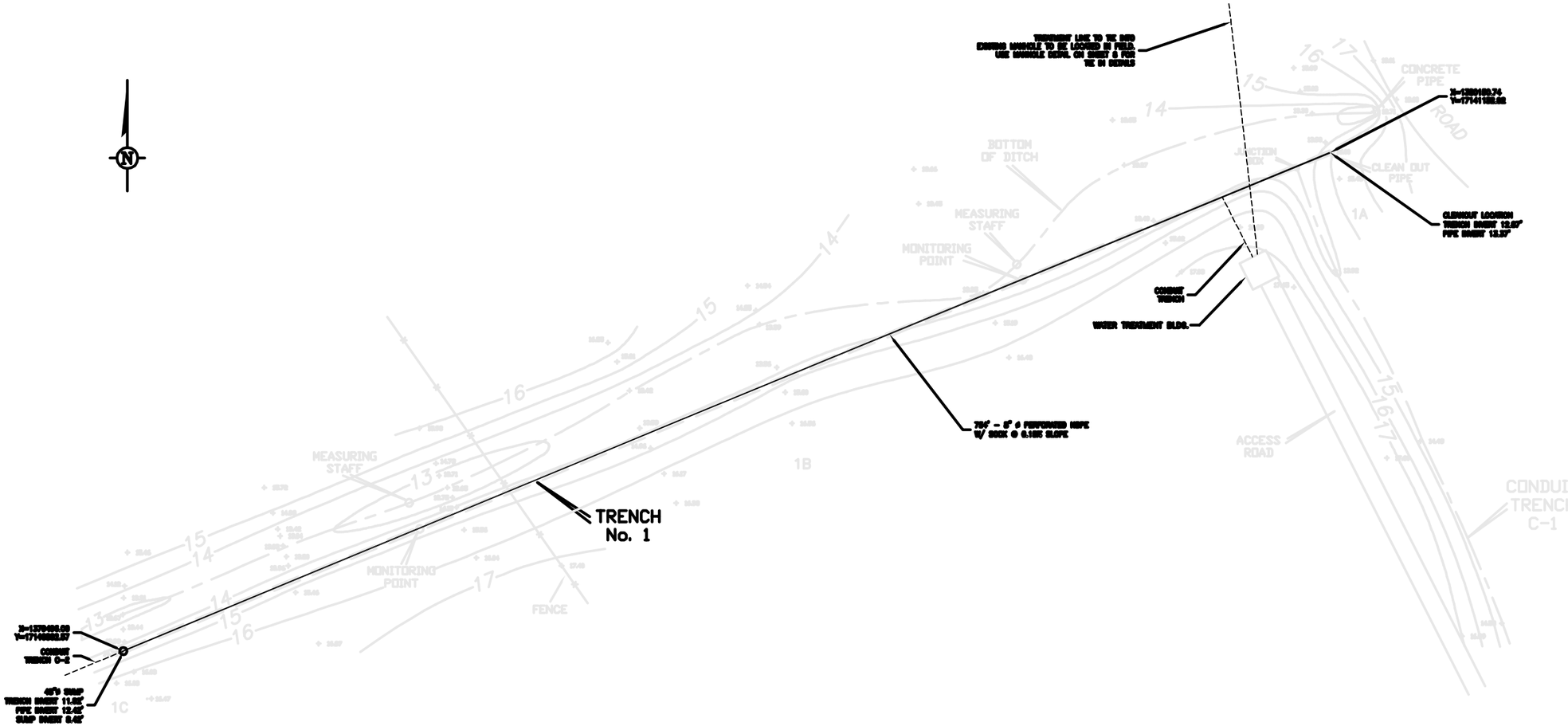
NOTES:

1. X AND Y COORDINATES WERE BASED ON SURVEYED DATAS PROVIDED BY SURVEYORS.
2. BACKGROUND WAS SHOWN FOR INFORMATIONAL PURPOSES ONLY.

ARCADIS
2900 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70827
Tel: 225-292-1004 Fax: 225-292-5210

TRENCH LOCATION MAP

DRAWN:	DATE:	PROJECT MANAGER:	CHECKED BY:
SMEN	7-18-03	DRE	DRE
		DRAWING NAME: 02	CAD-FILE: 02
NAVAL AIR STATION Corpus Christi, Texas		PROJECT NUMBER: LA001100.0001	DRAWING NUMBER: 2



NOTE:

LOCATION OF SUMPS AND SLOPE OF COLLECTION TRENCH SHOWN ARE PER RAP DESIGN.

LEGEND

+	SURVEYED POINT (GROUND SURFACE)
16.33	ELEVATION OF SURVEYED POINT
—16—	ELEVATION CONTOUR
A ——— A'	LINE OF SECTION

0 30' 60' 90'
1" = 30'

NO.	DATE	REVISION DESCRIPTION	BY CKD

TRENCH No. 1

NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2900 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70827
Tel: 225-293-1004 Fax: 225-293-0210

PROJECT MANAGER: DME	DEPARTMENT MANAGER: DME
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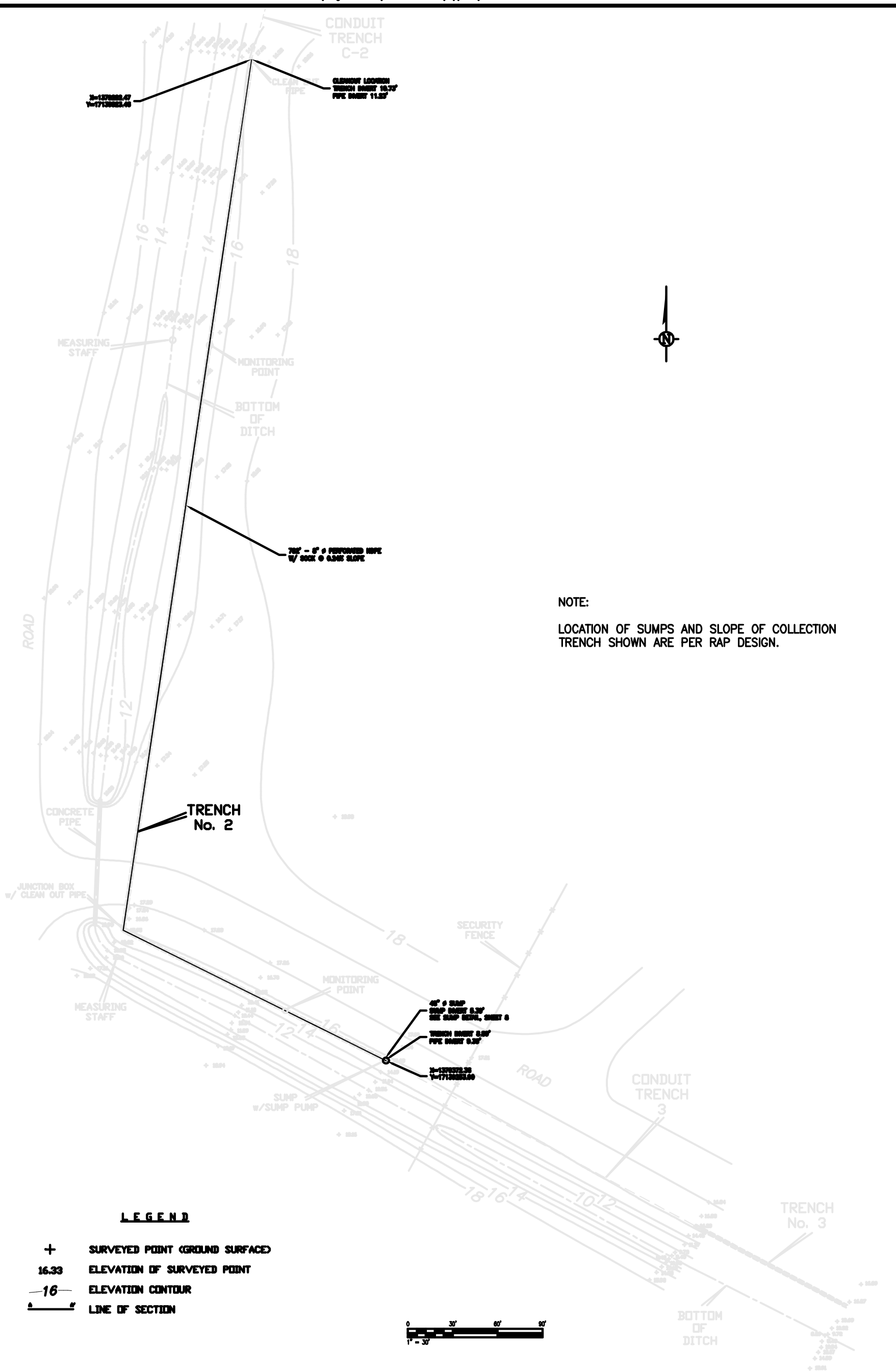
DRAWN BY: SMEN	DATE: 7/21/03
PROJECT NUMBER: CC000831.0001	DRAWING NUMBER: 3



NOTE:

LOCATION OF SUMPS AND SLOPE OF COLLECTION TRENCH SHOWN ARE PER RAP DESIGN.

LEGEND

+	SURVEYED POINT (GROUND SURFACE)
16.33	ELEVATION OF SURVEYED POINT
16	ELEVATION CONTOUR
A ——— A'	LINE OF SECTION

0 30' 60' 90'
1" = 30'

ARCADIS
2900 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70827
Tel: 225-292-1004 Fax: 225-292-8210

TRENCH No. 2

NAVAL AIR STATION
Corpus Christi, Texas

DRAWN:	DATE:	PROJECT MANAGER:	CHECKED BY:
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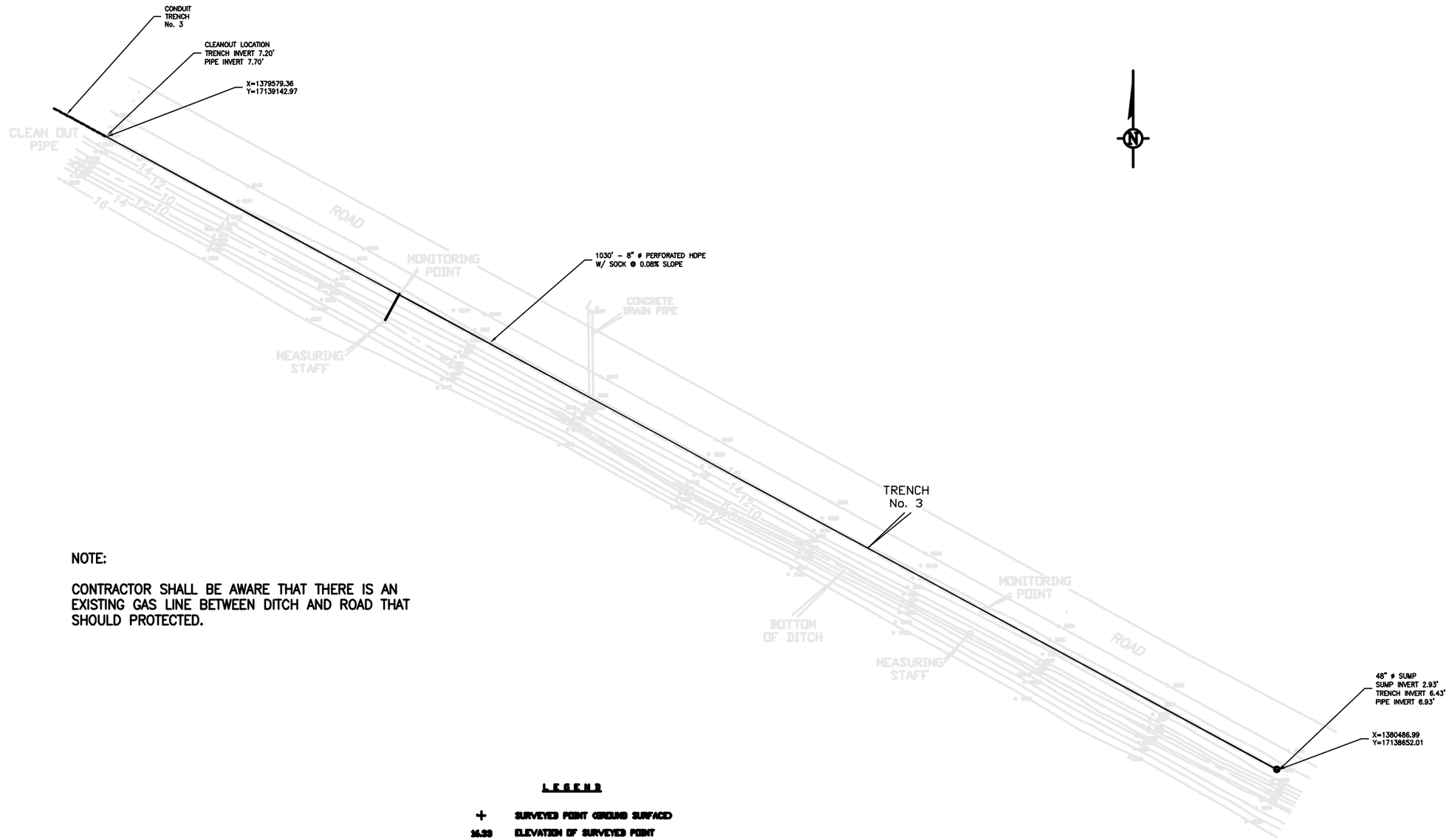

NOTE:

CONTRACTOR SHALL BE AWARE THAT THERE IS AN EXISTING GAS LINE BETWEEN DITCH AND ROAD THAT SHOULD PROTECTED.

NOTE:

LOCATION OF SUMPS AND SLOPE OF COLLECTION TRENCH SHOWN ARE PER RAP DESIGN.

LEGEND

+	SURVEYED POINT (GROUND SURFACE)
16.39	ELEVATION OF SURVEYED POINT
—16—	ELEVATION CONTOUR
A ——— A'	LINE OF SECTION

NO.	DATE	REVISION DESCRIPTION	BY / CHD

TRENCH No. 3

NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2900 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70827
Tel: 225-292-1004 Fax: 225-292-5210

PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
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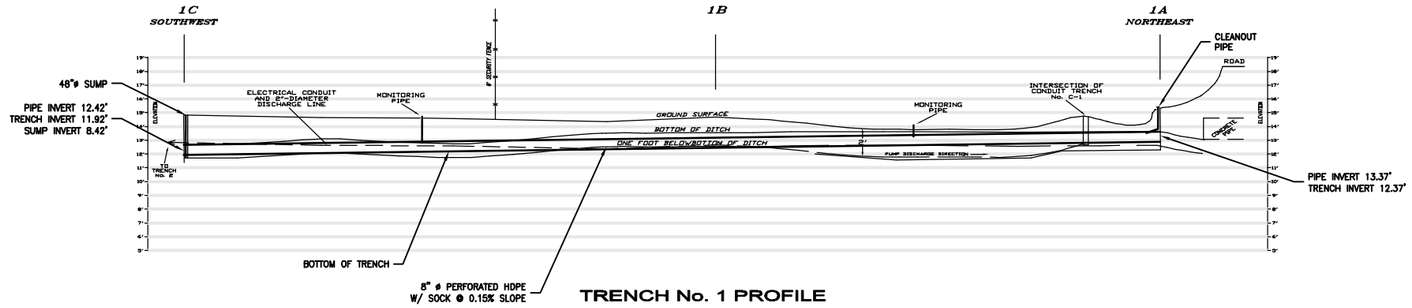
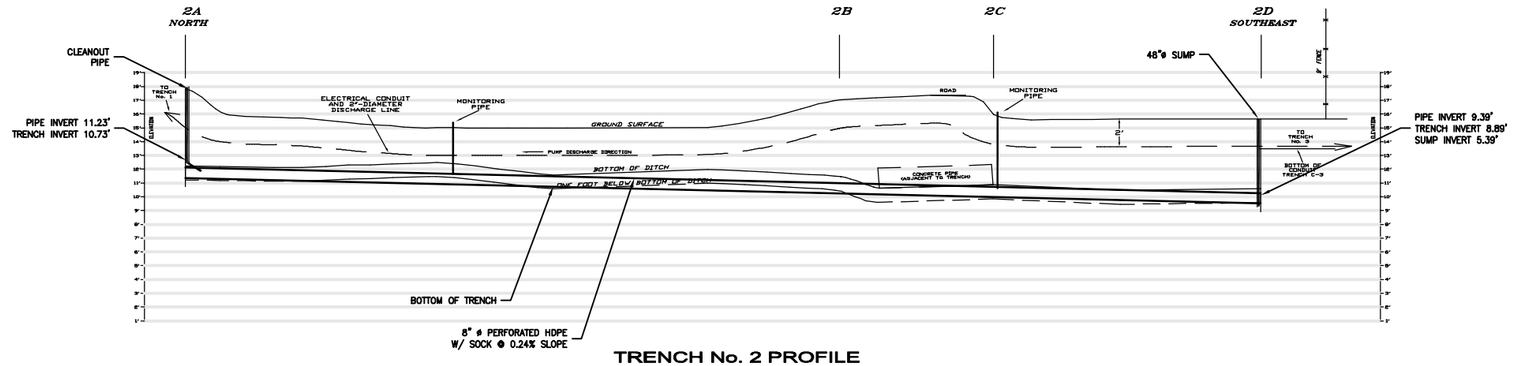
DRAWN BY: SMEN	DATE: 7/21/03
PROJECT NUMBER: CC000831.0001	DRAWING NUMBER: 5



TRENCH No. 1 PROFILE



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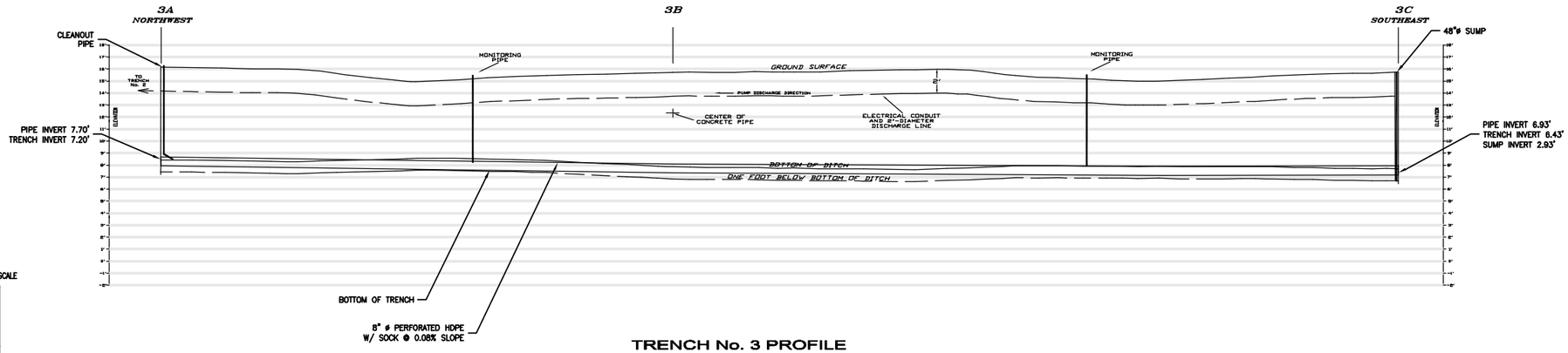

TRENCH No. 3 PROFILE

VERTICAL SCALE
15'
10'
5'
0
1" = 5'

HORIZONTAL SCALE
0 50' 100' 150'
1" = 50'

NO.	DATE	REVISION DESCRIPTION	BY CKD

TRENCH PROFILES

NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2929 WEST FORK DRIVE, SUITE 640
BATON ROUGE, LA 70827
Tel: 225-293-1004 Fax: 225-293-0210

PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
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DRAWN BY: SMEN	DATE: 7/23/03
PROJECT NUMBER: CC000831.0001	DRAWING NUMBER: 6

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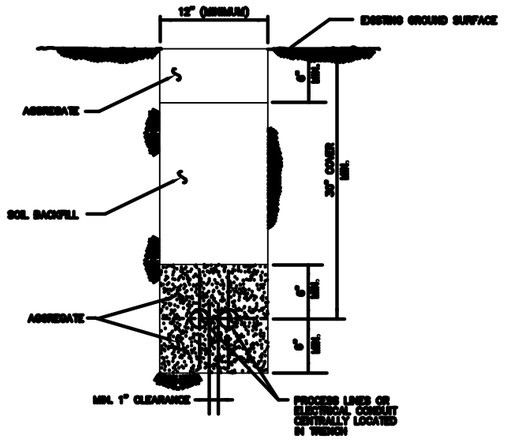
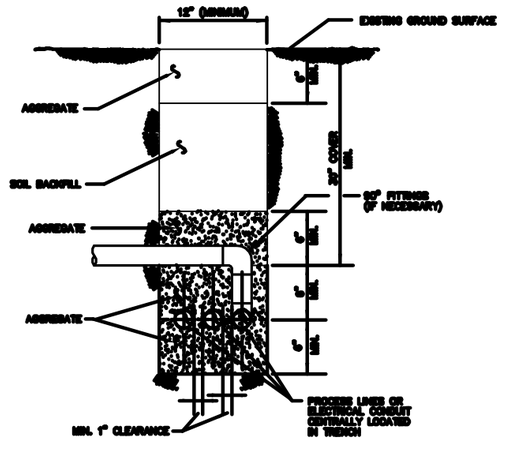
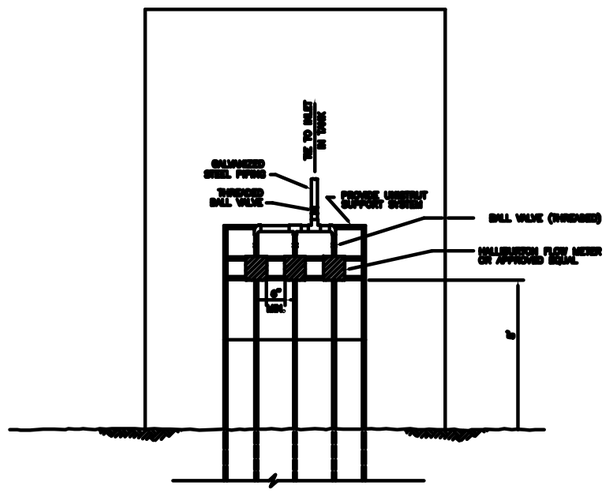


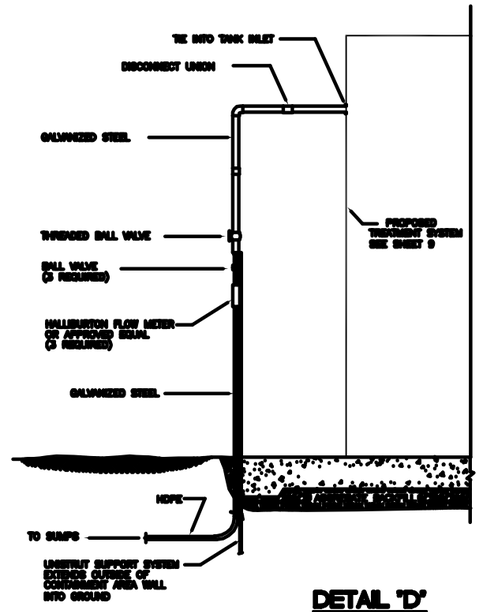
DETAIL "A"
TYPICAL PIPING TRENCH DETAIL
NOT TO SCALE



DETAIL "B"
TYPICAL CROSSING OF PROCESS PIPING WITHIN TRENCH
NOT TO SCALE



DETAIL "C"
HEADER SYSTEM FRONT VIEW
NOT TO SCALE



DETAIL "D"
HEADER SYSTEM SIDE VIEW
NOT TO SCALE

NO.	DATE	REVISION DESCRIPTION	BY CKD

DETAILS

NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2929 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70817
Tel: 225-292-1004 Fax: 225-292-0210

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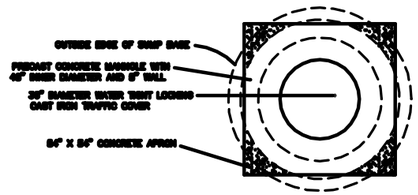
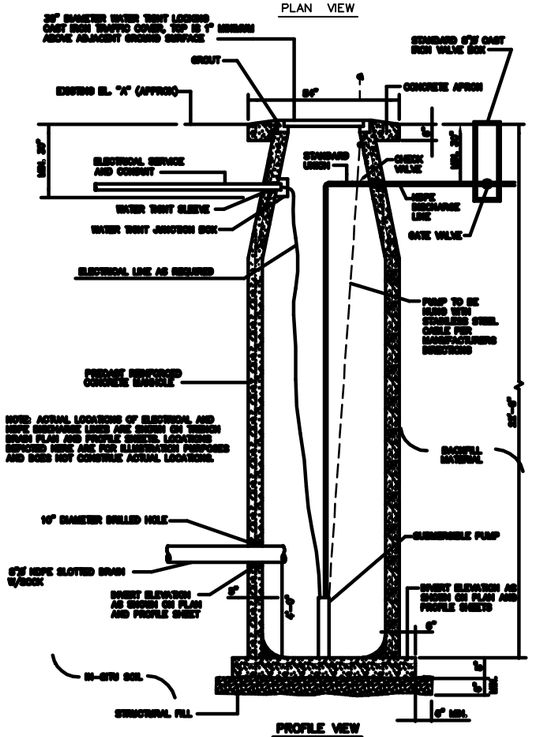
COLLECTION SUMP AND MANHOLE NOTES:

1. INSIDE AND OUTSIDE SURFACES OF SUMP AND MANHOLE TO BE PAINTED WITH EPOXY-AMIDO SEALER.
2. ELEVATIONS AND DIMENSIONAL LOCATIONS OF EXISTING PIPING ARE APPROXIMATE. CONTRACTOR TO FIELD VERIFY.
3. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND VERIFYING LOCATION OF ALL EXISTING SUBSURFACE UTILITIES PRIOR TO THE START OF EXCAVATION AND CONSTRUCTION.
4. ALL PAVEMENT/CONCRETE AND GRASS AREAS DISTURBED BY EXCAVATION SHALL BE REPLACED IN KIND BY ASPHALT CONCRETE PAVEMENT, CONCRETE OR SOD.
5. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL FIELD INFORMATION REQUIRED FOR PREPARATION OF RECORD DRAWINGS BY MAINTAINING IN THE FIELD A SET OF DRAWINGS CURRENT WITH DAILY PROGRESS OF WORK.

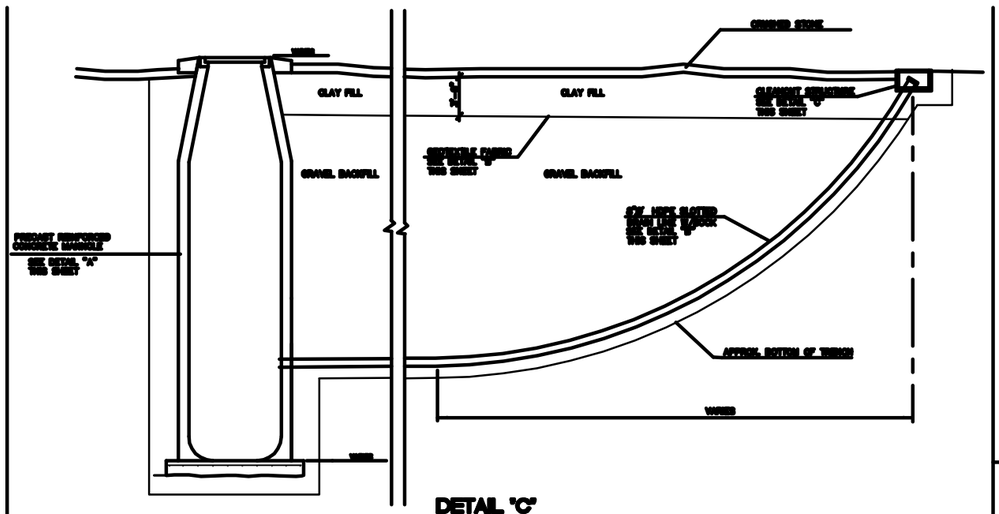


PLAN VIEW

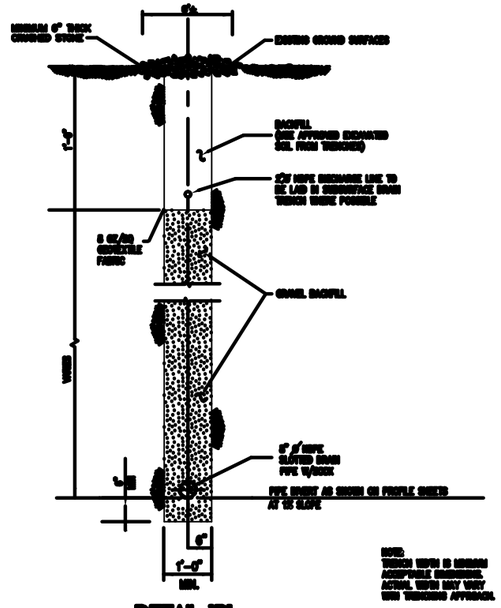


PROFILE VIEW

DETAIL "A"
COLLECTION SUMP AND MANHOLE DETAIL
SCALE: NTS

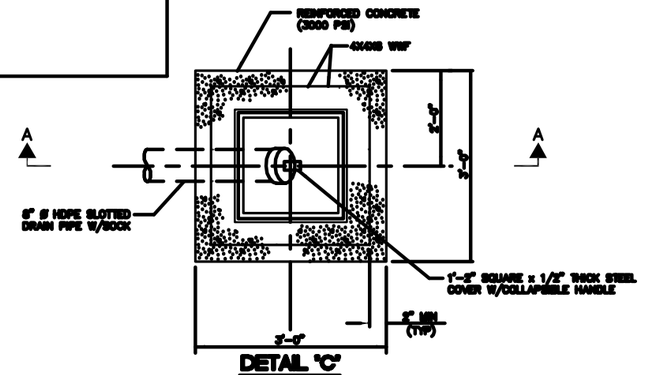


DETAIL "C"
SUBSURFACE DRAIN SYSTEM PROFILE
SCALE: NTS

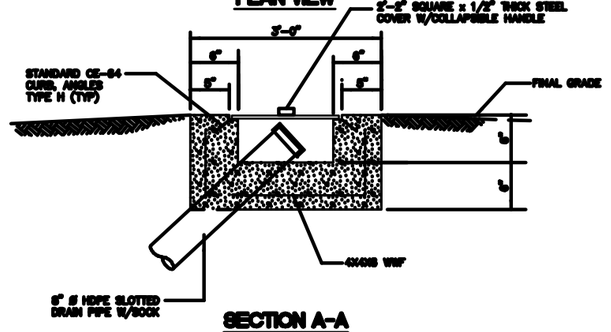


NOTE:
TRENCH WIDTH IS MINIMUM ACCEPTABLE DIMENSION. ACTUAL WIDTH MAY VARY WITH TRENCHING APPROACH.

DETAIL "B"
CROSS SECTION OF SUBSURFACE DRAIN
SCALE: NTS



DETAIL "C"
PLAN VIEW



SECTION A-A
PREFABRICATED CLEANOUT STRUCTURE
SCALE: NTS

NO.	DATE	REVISION DESCRIPTION	BY
			GSD

DETAILS

NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2929 WEST FORK DRIVE, SUITE 540
BATON ROUGE, LA 70827
Tel: 225-292-1004 Fax: 225-292-0210

PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DRAWING NAME: 01	CHECKED BY: MBJ
DRAWN BY: SMEN	DATE: 7/21/03
PROJECT NUMBER: CC000831.0001	DRAWING NUMBER: 8

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Username = smen
07-23-2003
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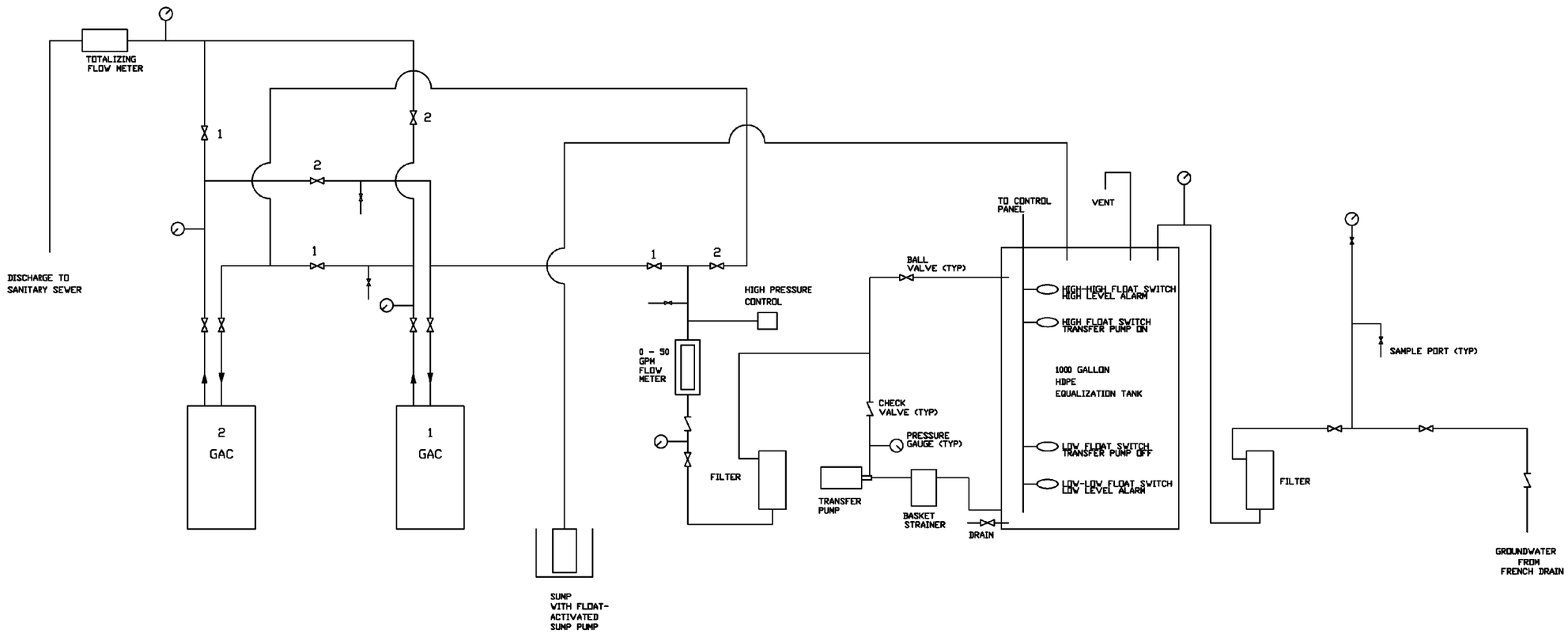


NOTE: WHEN BALL VALVES LABELED 1 ARE OPEN AND THOSE LABELED 2 ARE CLOSED, THE GAC CANNISTER LABELED 1 IS THE PRIMARY AND 2 IS SECONDARY. THE POSITIONS OF THESE VALVES CAN BE REVERSED TO MAKE THE CANNISTER LABELED 2 PRIMARY AND 1 SECONDARY.

REFERENCE: FIGURE 2-5

RESPONSE ACTION PLAN (INSTALLATION RESTORATION) SITES 1, 3, AND 4 PREPARED FOR DEPARTMENT OF NAVY SOUTHERN DIVISION, PREPARED BY ENSAFE SEPTEMBER 2002.

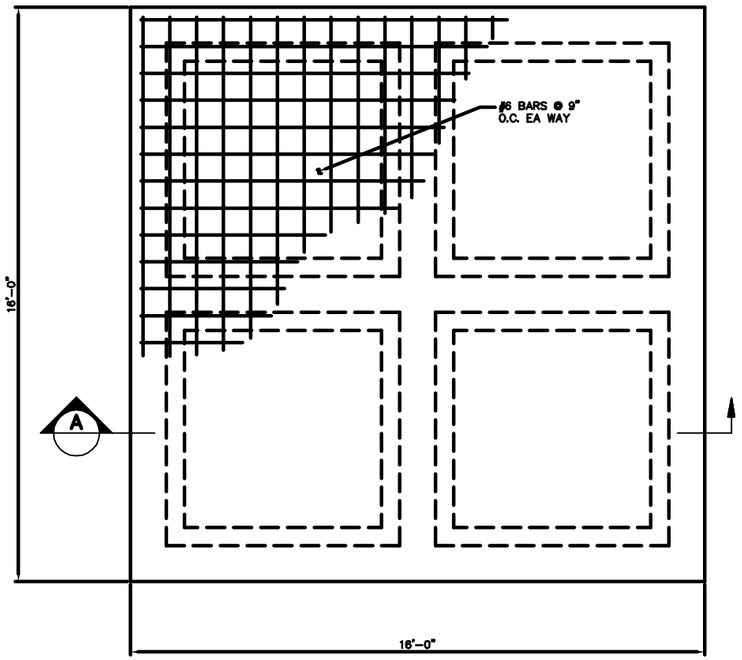
NO.	DATE	REVISION DESCRIPTION	BY CKD

TREATMENT SYSTEM PROCESS DIAGRAM

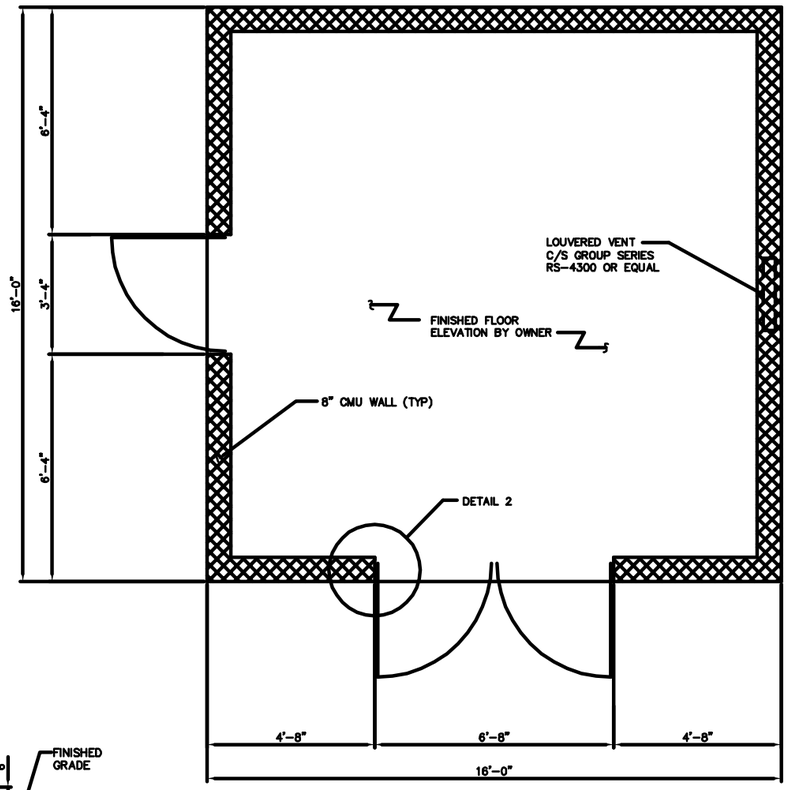
NAVAL AIR STATION
Corpus Christi, Texas

ARCADIS
2900 WEST FORK DRIVE, SUITE 640
BATON ROUGE, LA 70827
Tel: 225-292-1004 Fax: 225-292-0210

PROJECT MANAGER: DRE	DEPARTMENT MANAGER: DRE
DRAWING NAME: 01	CHECKED BY: WDJ
DRAWN BY: SMEN	DATE: 7/21/03
PROJECT NUMBER: CC000831.0001	DRAWING NUMBER: 9



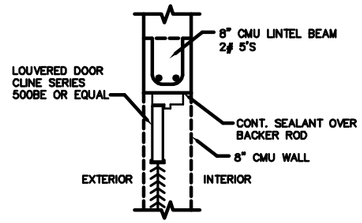
SLAB PLAN
SCALE: 1/2" = 1'-0"



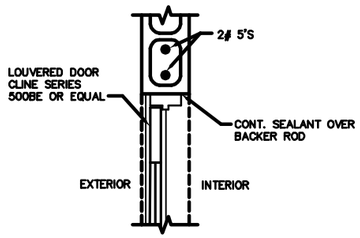
BUILDING PLAN
SCALE: 1/2" = 1'-0"

STRUCTURAL NOTES:

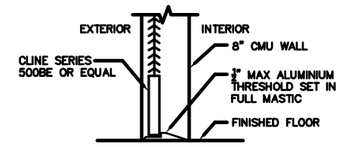
1. ALL ITEMS SHOWN HEREON SHALL CONFORM TO PROJECT SPECIFICATIONS.
2. MECHANICAL, ELECTRICAL AND PLUMBING BY OTHERS.
3. PAINT AND FINISHES BY OTHERS.
4. LIGHTING, STORAGE CABINET, EQUIPMENT & RELATED HARDWARE BY OTHERS.
5. FOUNDATION DESIGN IS BASED SOLELY ON THE "BUILDING CODE FOR WINDSTORM RESISTANT CONSTRUCTION". DUE TO INSUFFICIENT GEOTECHNICAL INFORMATION, REQUIREMENTS DUE TO GEOTECHNICAL ISSUES ARE THE RESPONSIBILITY OF THE OWNER.
6. ALL CONCRETE TO HAVE MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000PSI.
7. ALL REINFORCING STEEL SHALL COMPLY WITH ASTM A615 GRADE 60.
8. BUILDING DESIGNED IN ACCORDANCE WITH "BUILDING CODE FOR WINDSTORM RESISTANT CONSTRUCTION" BY TEXAS WINDSTORM INSURANCE ASSOCIATION, JUNE 1, 2002.
9. PRESTRESSED CONCRETE PANELS 4 GC 065X BY GATE CONCRETE PRODUCTS 281-485-3273 OR EQUAL.
10. LOUVERED DOORS SERIES 500BE BY CLINE ALUMINIUM DOORS 941-746-4104 OR EQUAL.
11. LOUVERED VENT SERIES RS-4300 BY C/S GROUP 512-339-7836 OR EQUAL.
12. BUILT-UP ROOFING BLACK ARMOR SYSTEM RP-41-3 BY HONEYWELL OR EQUAL.



DOOR HEAD DETAIL
SCALE: 1" = 1'-0"

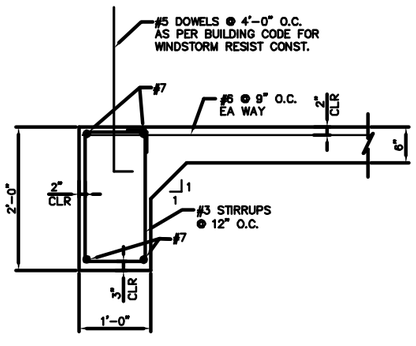


DOOR JAMB DETAIL
SCALE: 1" = 1'-0"

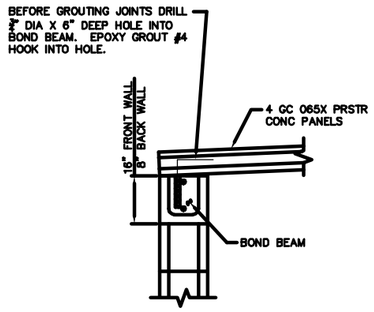


DOOR SILL DETAIL
SCALE: 1" = 1'-0"

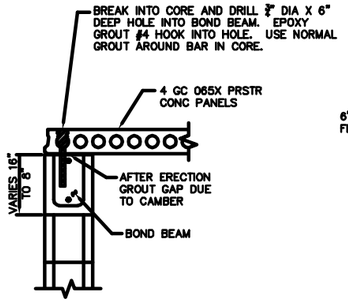
SECTION A
SCALE: 1/2" = 1'-0"



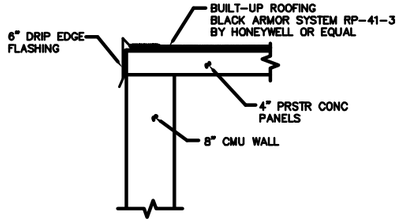
DETAIL 1
SCALE: 1" = 1'-0"



END PANEL HOLD DOWN DETAIL
SCALE: 1" = 1'-0"



SIDE PANEL HOLD DOWN DETAIL
SCALE: 1" = 1'-0"



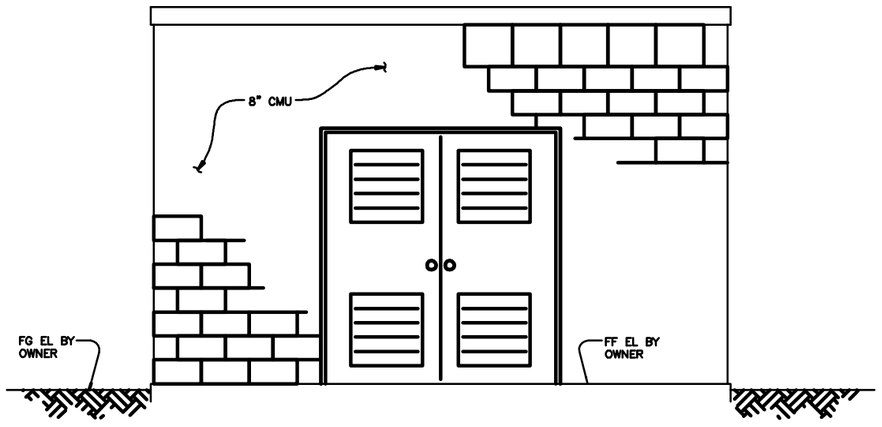
DRIP EDGE FLASHING DETAIL
SCALE: 1" = 1'-0"

TREATMENT BUILDING PLAN, SECTIONS & DETAILS

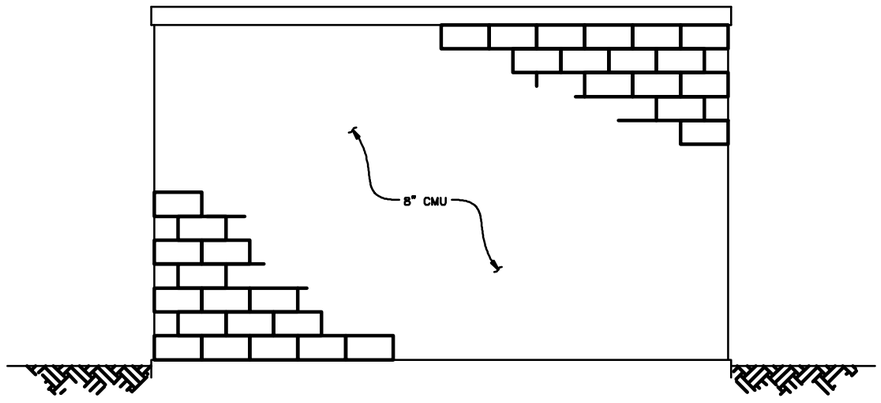
GM	DJC
10	JBV
AXD	09/03/03

CC000831.0001 10

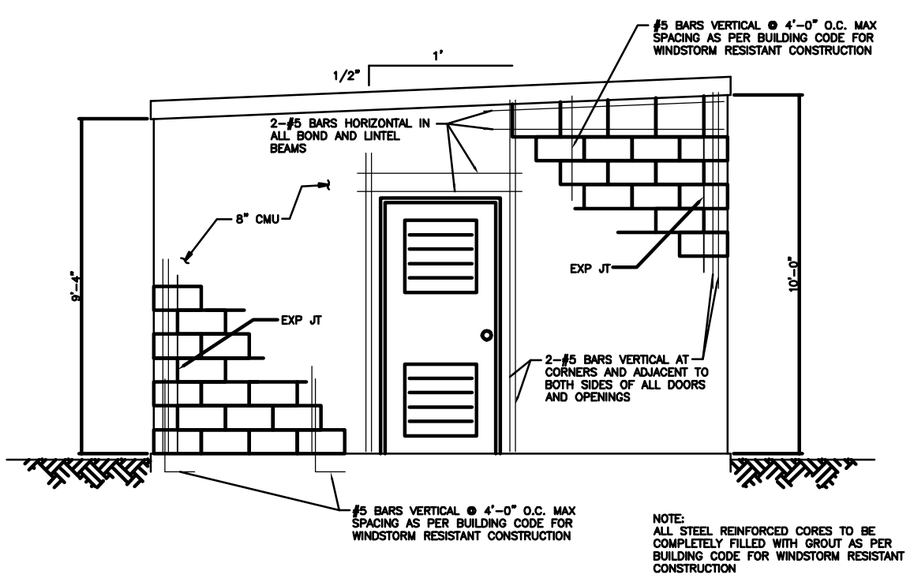
J:\AHS\Bor_v8\Eagle_Pass\dgn



FRONT ELEVATION
SCALE: 1/2" = 1'-0"

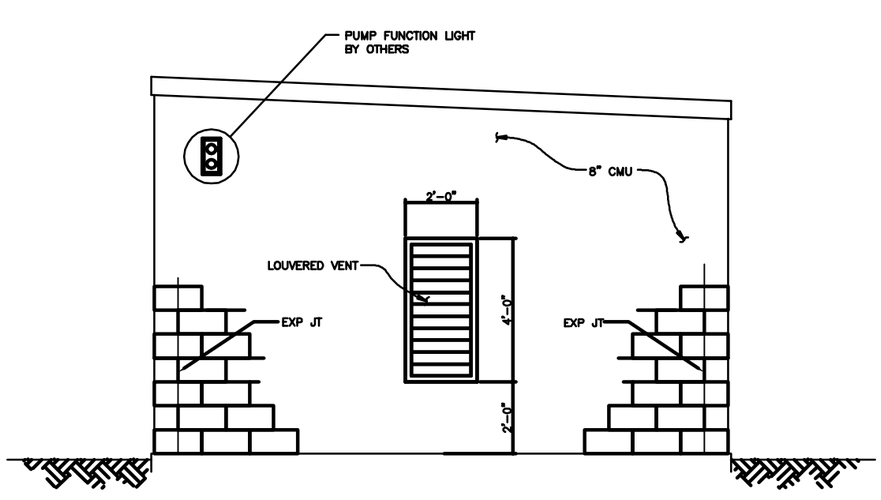


BACK ELEVATION
SCALE: 1/2" = 1'-0"



NOTE:
ALL STEEL REINFORCED CORES TO BE COMPLETELY FILLED WITH GROUT AS PER BUILDING CODE FOR WINDSTORM RESISTANT CONSTRUCTION

LEFT ELEVATION & TYPICAL REINFORCING
SCALE: 1/2" = 1'-0"



RIGHT ELEVATION
SCALE: 1/2" = 1'-0"

TREATMENT BUILDING ELEVATIONS

STATE OF TEXAS
DANIEL J.C. COPPS III
64481
REGISTERED
PROFESSIONAL ENGINEER

GM	DJC
11	JBV
AXD	09/03/03

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