

**CERCLA LETTER WORK PLAN
RECOVERY WELL (RW6) INSTALLATION
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP)
BETHPAGE, NEW YORK
JANUARY 2020**

1.0 INTRODUCTION

The Department of Navy (Navy) is constructing the groundwater extraction system for the RE108 Area Hotspot Phase II Treatment System (Phase II System) associated with the former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage New York facility (Figure 1-1). This work plan specifically addresses the installation and initial development of recovery wells RW6A and RW6B (herein referred to as RW6A and RW6B) which are being installed to extract groundwater from the RE108 Hotspot area for treatment by the Phase II System.

In 2011, the RE108 Hotspot Area was identified 1.5 miles south of the former NWIRP Bethpage, when trichloroethene (TCE) was detected in Operable Unit 2 (OU2) groundwater at concentrations greater than 1,000 micrograms per liter ($\mu\text{g/L}$) in the Bethpage Water District Plant 6 wells. Subsequent OU2 groundwater investigations in this area identified and delineated the RE108 Area Hotspot (Figure 1-2). The hotspot is estimated to be approximately 195 acres and is present at depths of approximately 520 to 720 feet below ground surface (bgs). This hotspot is predominately TCE, with lower concentrations of other volatile organic compounds (VOCs). VOC concentrations range between 1,000 to 8,200 $\mu\text{g/L}$ (Tetra Tech, 2019). Regional groundwater flow is generally from north/northwest to south/southeast but is locally affected by the operation of the stormwater basins and public water supply wells.

The 2013 Five-Year Review recommended that “a mass removal system” be implemented in the RE108 Hotspot area (Navy, 2014). To facilitate and expedite implementation of the RE108 Area Hotspot remedy, the remedy was divided into two phases (Phase I and II). The Phase I RE108 Area Hotspot Treatment System (Phase I System) is being installed to intercept and treat the northern portion of the RE108 Area Hotspot.

The Phase II System is being installed in the southern portion of the hotspot. The objective of the Phase II System is to extract groundwater contaminated with chlorinated VOCs at concentrations greater than 1,000 $\mu\text{g/L}$ for treatment using recovery wells located near the leading edge of the hotspot. The extraction system will also be used, as practical, to control migration of groundwater contaminated with chlorinated VOCs at concentrations greater than 500 $\mu\text{g/L}$ and which is in close proximity to the hotspot groundwater.

This work plan addresses the drilling of vertical profile boring (VPB) VPB-RW6 which supports drilling and installation of recovery wells RW6A and RW6B. The proposed locations of the VPB and recovery wells are two miles south of the NWIRP Bethpage and Northrop Grumman Corporation (NG) parcels and approximately 2,500 feet south of the RE108 Area Hotspot. The worksite will be along the northern portion of Patricia Court, just west of its intersection with Hicksville Road (Figure 1-3). Drilling of the VPB described in this work plan will follow the general procedures described in the Final December 2018 On-Property Letter Work Plan, Vertical Profile Boring and Monitoring Well Installation Program (Tetra Tech, 2018).

In addition to this work plan, the Navy is currently preparing a separate detailed design that identifies all the elements of the Phase II extraction, treatment, and discharge system. Other elements associated with extraction wells RW6A and RW6B will include well pumps, protective well vaults, pipeline and routing, controls, and power which are being detailed in this separate design. This design is currently at the 90 percent level and will be shared with the appropriate stakeholders, including the Town of Oyster Bay (TOB).

The Navy undertakes and documents its environmental remedial activities with respect to releases/suspected releases from the former NWRIP through Navy Work Plans. These documents outline technical requirements for conducting these activities and include provisions to protect health and safety and to minimize impact to the local community. These provisions include restricting impacts to noise, dust, work hours, and site maintenance (e.g., cleanliness).

This work plan has been prepared by Tetra Tech for the Mid-Atlantic Division of the Naval Facilities Engineering Systems Command (NAVFAC) pursuant to Contract Task Order (CTO) WE13, issued under Comprehensive Long-term Environmental Action Navy (CLEAN) Contract Number N6247016D9008.

This document is provided for review and comment in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements for notice of environmental restoration activities. The Department of Navy will address reviewer's comments prior to finalization of the document.

2.0 SCOPE AND OBJECTIVE

Installation of the RW6A and RW6B will be initiated with the installation of VPB-RW6. VPB-RW6 is being drilled to verify lithology and targeted screen intervals for RW6A and RW6B.

The well construction will consist of the following tasks:

- Mobilization of drilling equipment and preparation of the drilling location includes:
 - Installation of temporary perimeter fence surrounding the drill rig, equipment and materials and waste receptacle(s). The fence will be equipped with a lockable gate.
 - Prior to the onset of drilling, sound barriers will be installed around the engine of the drill rig, and
 - Utility clearance.
- Drilling of a single VPB (VPB-RW6) using mud rotary drilling techniques.
- Installation of two recovery wells RW6A and RW6B using reverse circulation drilling techniques.
- Recovery well development and sampling.
- Demobilization - Upon completion of drilling and well development, paved surface, road curb and landscaping impacted by the drilling will be restored.
- Site Survey.

The anticipated locations of the features listed above are shown on Figure 1-3. The location of these features may be adjusted during the design phase. Full descriptions and the final details of these items will be included in the Final Phase II Design. Future operations and maintenance of the system components located within recovery well and control vaults will also be addressed in subsequent operation and maintenance document(s). The requirements of the aquifer test will also be described in a separate, subsequent work document.

3.0 PROTECTION OF THE COMMUNITY

The drilling site will be maintained in a manner to protect the health and safety of the surrounding community. This protection will be achieved through implementation of best operational practices and controls applicable to drilling activities in residential areas. This section provides a summary of these practices and controls. Drilling at the site is expected to have a duration of approximately six months.

3.1 Notification of Drilling Activities

Prior to mobilization of equipment, drilling notifications will be distributed to residents located near the drilling site to inform the residents of the Navy's intent and plans. Notifications will be hand-delivered a minimum of one week prior to mobilization to residents in the vicinity of a drill site. The notifications will include points of contact for the Navy, the Navy's prime contractor (Tetra Tech), New York State Department of Environmental Conservation (NYSDEC), and New York State Department of Health

(NYSDOH). An example notification letter is provided in Attachment 1. Tailored letters are to be provided to residents at addresses located immediately adjacent to drilling site. The NYSDEC and TOB will be notified at least 48-hours prior to the distribution of residential drilling notifications.

3.2 Drilling Controls

VPB drilling will be conducted using mud rotary drilling techniques. Installation of recovery wells will be accomplished using reverse circulation techniques. General work hours for active operation of the drill rig will typically be weekdays from 8:00 am – 4:30 pm. The work site will be maintained to ensure cleanliness both inside and outside of the drill site. Trash will be maintained in an acceptable receptacle and be removed on a regular basis from the site as to not allow for excessive accumulation. The Navy's contractor will provide a field operations manager to visit the site and inspect for cleanliness and safety.

Although work is not routinely conducted on weekends or holidays, there may be instances where work will be required outside of the general work hours. For example, over a weekend or holiday, an active borehole may require inspection or the addition of drilling mud to ensure the integrity of the hole. Site workers will minimize their time at the drill site during non-routine work hour visits.

3.3 Site Controls

A perimeter security fence equipped with a lockable gate will surround the drill rig, equipment and materials, and waste receptacle(s). The gate will be secured with a lock at the end of each workday. All work will be confined to Town property. A sound barrier will be installed to mitigate excessive noise from the drill site prior to the onset of drilling.

3.4 Traffic Control

Caution will be exercised when entering/exiting the site. Temporary traffic control devices shall be utilized, to provide adequate warning of conditions created by work vehicles entering and exiting the site. Temporary traffic control devices which may be used are as follows:

- Signage shall be used as necessary to warn and direct traffic;
- Channelizing devices such as traffic cones shall be used as necessary, to warn road users of the temporary disruption caused by equipment/vehicles entering and exiting the site; and
- Flaggers may be used if alternate traffic management systems are not feasible.

All workers involved in traffic management activities shall wear high visibility vests. Temporary traffic control measures shall be removed as soon as practical when they are no longer needed.

The perimeter security fence will be positioned in a manner which will not restrict residents of Patricia Court from accessing their driveways. During drilling, temporary restriction on curb side parking will be required along the south side of Patricia Court, directly across from the perimeter security fence. This is to ensure vehicular traffic (including emergency and municipal waste services) can pass through. As necessary, temporary signs will be used to indicate no curbside parking along the south side of Patricia Court during drilling and construction. All workers will park their vehicles along Hicksville Road and not use Patricia Court for parking.

Currently, the Plainedge School District does not have a school bus stop at the intersection of Patricia Court and Hicksville Road. Should this change during drilling, appropriate measures will be taken to prevent the work from impacting school children at the bus stop before and after school.

In the event snow clearing is required, the Navy's contractor will be responsible for snow clearing inside the drilling site (within the perimeter security fence). The snow will be removed and piled in a manner as to not restrict vehicular traveling through Patricia Court between the perimeter security fence and street curb to the south.

A figure presenting the traffic management and control plan for the Patricia Court drilling site is provided in Attachment 2. Signage will be installed prior to mobilization of drilling equipment to Patricia Court and will be removed as soon as practical upon completion of the drilling and demobilization of the drilling equipment.

3.5 Monitoring for Airborne Matter

Excessive airborne matter and VOCs are not expected to be generated during drilling of VPBs and installation of the recovery wells; however, to ensure safety to workers and the surrounding community, air monitoring will be conducted during these operations. The Navy's plan closely follows procedures outlined in NYSDEC's guidance for community air monitoring during restoration activities.

The constituents of concern in the OU2 plume area are VOCs. VOCs will be monitored during drilling activities using a photo-ionization detector (PID) equipped with a 10.2 eV or 10.6 eV lamp. Drilling activities will not likely result in the generation of particulate matter which would trigger particulate monitoring; however, to ensure the safety of the workers and community, particulate monitoring will be conducted during drilling.

Particulates will be monitored using a particulate air monitor equipped with a micro-processor to perform real-time measurement of airborne concentrations in microgram per cubic meter ($\mu\text{g}/\text{m}^3$).

Both the PID and particulate monitoring equipment will be calibrated on a daily basis when they are used. The PID will be calibrated using a 100 parts per million (ppm) isobutylene air standard. The particulate air monitoring equipment will be calibrated using the appropriate air standard as specified in the equipment manufacturer's instructions. Calibration records will be maintained in the field log/notes.

Both VOCs and particulate monitoring will be conducted at the upwind and downwind perimeter of the drill site. The location of the monitoring equipment may be adjusted as necessary based on wind shifts. Real-time air monitoring field logs/data will be maintained to allow for interpretation of the data when necessary and will be available for review. Site conditions, weather conditions, work activities, and, implemented engineering controls will be documented in field logs/notes.

VOC and particulate monitoring recordings will be maintained in the project files. These records will be made available for NYSDEC, NYSDOH, and TOB personnel to review upon request. Any exceedances of the action levels will be reported to NYSDEC and NYSDOH personnel.

In addition to real time air monitoring, during drilling activities, two air samples per boring (one VPB and two recovery wells) will be collected and analyzed for VOCs using United States Environmental Protection Agency (EPA) Method TO-15. Collection of air samples will be conducted at the onset of each boring. Air samples will be collected using SUMMA canisters over an approximate 8-hour period. One air sample will be collected near/downwind of the drill rig and one air sample will be collected upwind of the drill rig.

4.0 FIELD ACTIVITIES

The following section provides a description of site work and drilling field activities. Figure 1-3 provides the site layout and location of VPB-RW6, recovery wells RW6A and RW6B, and approximate location of planned piping runs, valve control vaults and electrical panel. The overall project is anticipated to have a duration of approximately six months.

4.1 Utility Clearance

Prior to the initiation of intrusive fieldwork, the drilling subcontractor will contact Dig Safely New York to arrange for the location and marking of all underground utilities in the vicinity of the proposed soil boring and recovery well locations, as required by the New York Code of Rules and Regulations (NYCRR) Part 753. The drilling subcontractor will make the one call ticket available for review. In addition to the one call ticket, a third party independent utility company will be contracted to confirm utility locations.

During drilling, the first five feet of borehole will be cleared in a safe manner, to locate/avoid any utilities that may have not been identified during utility clearance.

Alteration of utilities is to be avoided and not anticipated. However, if alteration of utilities are required to perform this work, the Navy will coordinate potential disruptions with the affected residents.

4.2 Vertical Profile Boring

VPB-RW6 will be drilled to the Raritan Clay layer which is anticipated to be encountered at approximately 900 to 1,000 feet bgs. The VPB will provide in situ data through visual logging of lithology, down hole geophysical logging, collection of split spoon samples for grain size analysis, and VOC data via collection and analysis of groundwater grab samples. Although the primary purpose for data collected from this VPB will be used to confirm recovery well screen interval and design, this data will also be incorporated into the Navy's groundwater model to improve understanding of groundwater flow and plume migration.

During the VPB installation, groundwater grab samples will be collected via a hydropunch-type sampler. The VPB sampling program is summarized in Table 1 and is discussed below. In addition to VOCs the groundwater samples will be tested for pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen, and turbidity as volume permits. Soil and groundwater samples will be collected from the VPB at the following depths:

- Discrete groundwater samples will be collected from the VPB at 50-foot intervals from 50 to 200 feet bgs for a total of four samples. Groundwater samples collected from this interval will be analyzed for VOCs via Method SW846-8260B. If adequate sample volume is available, groundwater samples will also be analyzed for 1,4-dioxane via Method SW846-8270 SIM.
- Discrete groundwater samples will be collected from the VPB at 20-foot intervals from 220 feet bgs to the bottom of the boring (approximately 800 feet bgs).

Groundwater samples collected from this interval will be analyzed for VOCs via Method SW846-8260B. At every other sample interval (every 40 feet), if adequate sample volume is available, groundwater samples will also be analyzed for 1,4-dioxane via Method SW846-8270 SIM.

- All groundwater samples will be analyzed by a NYSDEC certified and Department of Defense (DoD) approved laboratory.
- Split spoon soil samples will be periodically collected during the drilling to observe and record subsurface lithologies. It is estimated that up to five split spoon samples through the anticipated recovery well screen intervals of 550 to 650 and 650 to 750 feet bgs. Samples collected in the anticipated screen zones will be submitted for grain-size analysis to aid in screen slot size design.
- Once the boring completion depth is reached, a natural gamma geophysical log will be performed from the ground surface to the bottom of the boring. This log will be used in combination with the split spoon sample and drilling mud observations to determine subsurface lithology. The boring will then be abandoned using a cement/bentonite grout.

Additional down-hole geophysical surveys may be conducted in the VPB to evaluate the effectiveness of alternative techniques in helping describe lithology and contaminant flow.

4.3 Recovery Wells

Two recovery wells (RW6A and RW6B) will be drilled at Patricia Court. Each recovery well be constructed as a 12-inch diameter well with a nested one-inch diameter piezometer. The easternmost well (RW6A) is anticipated be drilled to a depth of approximately 650 feet bgs and screened at approximately 550 to 650 bgs. The westernmost well (RW6B) will be drilled to a depth of approximately 750 feet bgs screened at approximately 650 to 750 bgs. The final recovery well depth, slot size, and screen interval will be selected by the Navy based upon evaluation of the VPB-specific data, such as the presence of VOCs and their concentrations and information from nearby wells.

To prevent sloughing of the upper borehole, an auger rig will be used to over-drill the borehole and a 20-inch steel surface casing will be installed. The well borehole will be drilled using reverse circulation drilling techniques with the casings installed plumb and true to line.

During drilling of the recovery wells samples of the drill cuttings will be logged by the geologist to construct a descriptive lithologic log of each borehole. Prior to finalizing the

well construction design (i.e. well depth, well screen length and well screen slot size), the Navy will discuss the results of the groundwater, soil, and geophysical data from VPB-RW6 and nearby wells with NYSDEC.

The wells will be installed in an 18-inch diameter borehole and consist of 12-inch Schedule 40 black steel casing, 100 feet (screen length assumed) of stainless steel well screen, and threaded bottom cap with filter pack, sand and bentonite seals, and cement seal. A 5-foot sump will be installed immediately below the well screen. Well centralizers will be welded to the casing at 40 foot intervals. An accompanying 1-inch ID stainless steel piezometer will be installed in the annulus between the 12-inch casing and the wall of the 18-inch borehole. The piezometer will have the same screened interval as the recovery well.

A permanent 20-inch steel surface casing (approximately 60 feet in depth) set in concrete will be used to support the upper borehole walls. In the future, a submersible or turbine pump with a pumping capacity of 200 to 700 gallons per minute is planned to be installed in the well. The details of a typical recovery well construction are provided in Attachment 3. Well construction details will be finalized after VPB-RW6 is completed.

- The filter pack sand size will be selected based on the results of grain size analyses performed on VPB-RW6 soil samples collected from the anticipated screened zones of the recovery wells. Filter pack sand will be installed using the gravity method through a tremie pipe. The filter pack sand will be placed a minimum of 25 feet above the top of the screen.
- A fine transition sand layer (finer than the filter pack sand) will be placed in the annulus on top of the filter pack in the same manner as the filter pack. The transition sand layer will be approximately 5 feet thick.
- A 5-foot thick bentonite seal will be installed above the fine transition sand layer. The bentonite seal will be installed using a tremie pipe.
- The annulus above the bentonite seal will be grouted with a cement bentonite seal. The cement bentonite seal will be installed using a tremie pipe. The cement seal will be grouted to a depth of 8 feet below the top of the permanent 20-inch diameter surface steel casing.
- The annulus above the cement seal will consist of sand that is tremied into the annulus, to the top of the permanent 20-inch diameter surface steel casing. Placing sand in this zone will easily allow accommodations for the future connection of the recovery wells to the Phase II System as compared to having the cement seal installed to the top of recovery well/surface casing.

- The well will be temporarily finished flush to the ground surface with a Prefab 24-inch H Concrete Collar with a 24-inch traffic-rated manhole cover, and an inner 20-inch surface casing that is capped/sealed with a 12-inch blind flange/gasket assembly. The top of the well riser will be set approximately 6 to 12 inches below grade. The blind flange on top of the riser pipe will be lockable. The 1-inch piezometer will also be accessible within the manhole assembly and be covered with a clean well cap. This configuration will protect the recovery wells until incorporation into the Phase II System in the future.
- The final design will include a concrete vault completed flush to the ground surface. The anticipated location and configuration of the vault is provided in Attachment 4.
- The future piping connected to the recovery wells will be double walled equipped with leak detection capable of shutting down operation of the recovery wells in the event there is a failure in the pipe system. Operation of the pumps in the recovery wells is not expected to result in significant impacts to the community, including audible impacts.

4.4 Recovery Well Development

Following installation, recovery wells RW6A and RW6B will be developed to evacuate drilling mud, silts and other fine-grained sediments which may have accumulated within the wells during their installation. Well development will not commence until at least five days after well installation. Due to the depth of the wells, it is anticipated development will be conducted using air lift methods and over pumping using a submersible pump. Field parameters (pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen, and turbidity) will be monitored and recorded throughout well development.

In compliance with NYSDEC policy, well development will continue until turbidity has stabilized (to a target turbidity of less than 50 nephelometric turbidity units [NTUs], if possible). Special care will be taken to develop the recovery wells properly in order to ensure adequate hydraulic connection between the wells and the aquifer.

During development, the specific capacity of the wells (discharge rate/feet of drawdown) will be measured manually; drawdown will also be measured during and following equilibration after development. Development water will be discharged directly to tanker trucks and it will be transported to frac tanks located at the investigation derived waste (IDW) staging area at the former NWIRP facility. Groundwater from the recovery wells will be sampled at the end of development and analyzed for the parameters below via a NYSDEC certified and DoD approved laboratory. This data will be used to support design of the Phase II Treatment System.

| Analytes | EPA Method of |
|-----------------------------------|----------------------|
| Volatile Organic Compounds (VOCs) | 8260B |
| Semi Volatile Organic Compounds | 8270D |
| Total Suspended Solids (TSS) | 2540D |
| pH | 4500_H+B |
| Biological Oxygen Demand (BOD) | 5210B |
| Total Dissolved Solids (TDS) | 2540C |
| Total Kjeldahl Nitrogen (TKN) | 351.2 |
| Ammonia | 350.1 |
| Total Organic Carbon | E 415.1 |
| Chemical Oxygen Demand | E 410.1 |
| 1,4-Dioxane | 8270D SIM |
| Total Metals/Dissolved Metals | 6020A/7470A |

4.5 DEMOBILIZATION AND SITE RESTORATION

Upon completion of drilling, the temporary fencing will be removed and site restoration will be conducted. Paved surface, road curb, and landscaping impacted by the construction/drilling will be restored.

5.0 INVESTIGATION DERIVED WASTE

IDW generated during this program will include soil cuttings, groundwater, well development water, and decontamination fluids. It is anticipated all IDW will be non-hazardous. All IDW will be containerized and properly labelled, characterized, and disposed of properly based on waste characterization results. Soil cuttings generated from VPB installation and groundwater generated from recovery well development will be transported to and temporarily stored at a central staging area located at NWIRP Bethpage. However, soil cuttings generated during installation of the recovery wells may require temporary storage at the drilling site due to the speed and volume of cuttings generated on a daily basis. In the event soil cuttings require temporary storage at the drilling site, efforts will be made to expedite removal from the site for proper disposal. IDW containers stored at the drill site will be properly labelled and secured within the fence and lockable gate.

IDW generated during this investigation will follow procedures outlined in Tetra Tech Standard Operating Procedure (SOP) SA-7.1 Decontamination of Field Equipment and Management of Investigation Derived Waste (Tetra Tech, 2016) and United States EPA Guide to Management of Investigation-Derived Wastes (OSWER, 1992).

6.0 DECONTAMINATION

A centrally-located decontamination pad at NWIRP Bethpage will be used to decontaminate drilling equipment and tooling. All decontamination fluids will be collected from the pad and managed as IDW. As necessary a decontamination pad may be required to be constructed at the drill site within the secured fence and lockable gate. Decontamination activities conducted during this investigation will follow procedures outlined in Tetra Tech SOP SA-7.1 Decontamination of Field Equipment and Management of Investigation Derived Waste (Tetra Tech, 2016).

7.0 SITE SURVEY

The location of the vertical profile boring and the two newly installed recovery wells and associated piezometers, will be surveyed by a New York State licensed surveyor.

8.0 REPORTING

8.1 Field Documentation

Field documentation required to support this project will consist of the following items:

- Field notebook.
- Boring log for each boring.
- Groundwater and soil sample log sheets.
- Chain of custody forms documenting shipment of sample to a fixed based analytical laboratory.
- Well completion form for each well.
- Well development record.
- Survey map identifying newly installed recovery well.
- Analytical data summary.

8.2 DATA VALIDATION

Groundwater analytical data collected from the VPBs and recovery wells will undergo full data validation in accordance with EPA data validation guidelines (EPA, 2017).

8.3 Data Summary Report

A data summary report will be developed summarizing field activities and validated analytical results from VPB-RW6 and Recovery Wells RW6A and RW6B. Figures and

tables will be used to present analytical and lithology data. The report will include log sheets documenting VPB and recovery well drilling, gamma logs, well construction details and development logs, and groundwater sampling results. The data validation reports and a summary of air monitoring data will also be included in the report.

The Navy will provide reports to the NYSDEC for review and concurrence. This report may be provided to the local municipalities as requested, concurrent with issuance of the final document to the NYSDEC.

9.0 REFERENCES

EPA, 2017. USEPA National Functional Guidelines for Organic Superfund Methods Data Review. EPA-540-R-2017-002, January.

Office of Solid Waste and Emergency Response (OSWER), 1992. Guide to Management of Investigation-Derived Wastes, April.

Navy, 2014. Five Year Review Operable Unit 1 Sites 1, 2, 3 and Operable Unit 2 Groundwater NWIRP Bethpage, New York. December.

Tetra Tech, 2016. Standard Operating Procedure SA-7.1 Decontamination of Field Equipment and Management of Investigation Derived Waste, July.

Tetra Tech, 2018. December 2018 On-Property Letter Work Plan, Vertical Profile Boring and Monitoring Well Installation Program, December.

Tetra Tech, 2019. 2019 Annual Report for Groundwater Impacts at Naval Weapons Industrial Reserve Plant, Bethpage, New York. June.

TABLE

**TABLE 1
VERTICAL PROFILE BORING AND RECOVERY WELL SAMPLING PROGRAM
FOR RW6
NWIRP BETHPAGE**

| Matrix | Station Identification | Sample Identification | Depth/ Sampling Interval |
|---------------|-------------------------------|------------------------------|---|
| Groundwater | VPB-RW6 | BP-VPB-RW6-GW-XXX-XXX | 50-foot intervals from 50 to 200 feet bgs; 20-foot interval greater than 200 feet bgs. |
| Air | | BP-VPB-RW6-AIR-DW-YYYYMMDD | Breathing zone |
| Air | | BP-VPB-RW6-AIR-UW-YYYYMMDD | Breathing zone |
| Soil | | BP-VPB-RW6-SO-XXX-XXX | Grain Size Analyses within the two proposed screened intervals. |
| Groundwater | RW6A | BP-RW6A-GW-XXX-XXX | Groundwater sample collected at the end of well development. |
| Air | | BP-RW6A-AIR-DW-YYYYMMDD | Breathing zone |
| Air | | BP-RW6A-AIR-UW-YYYYMMDD | Breathing zone |
| Groundwater | RW6B | BP-RW6B-GW-XXX-XXX | Groundwater sample collected at the end of well development. |
| Air | | BP-RW6B-AIR-DW-YYYYMMDD | Breathing zone |
| Air | | BP-RW6B-AIR-UW-YYYYMMDD | Breathing zone |

Groundwater duplicates of 1 in 10 samples. Matrix spike/matrix spike duplicates of 1 in 20 samples.

Trip blank of one per cooler. Equipment blank of one per piece of decontaminated equipment per week.

VPB - vertical profile boring. RW - recovery wells. SO - soil. GW - groundwater. DW - down wind. UP - up wind.

YYYYMMDD - year, month, day XXX - XXX top and bottom of sample interval in feet bgs.

bgs - below ground surface.

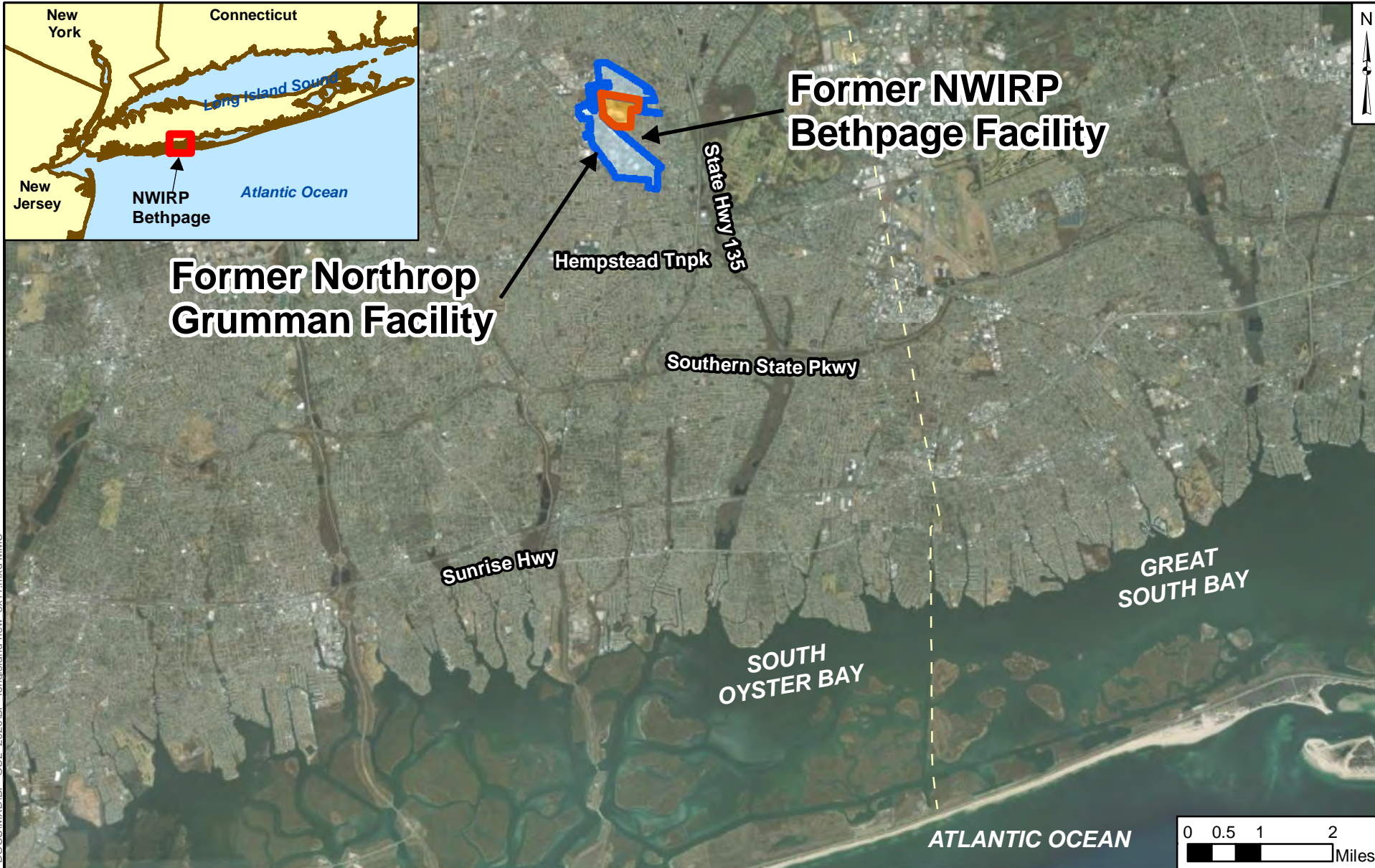
Groundwater samples for VPBs are to be analyzed via SW846-8260B.

Groundwater samples for RWs are to be analyzed for analyte list specified in the Recovery Well Development section of this report.

Soil samples are to be collected for grain size analysis.

Air samples are to be analyzed via TO-15.

FIGURES



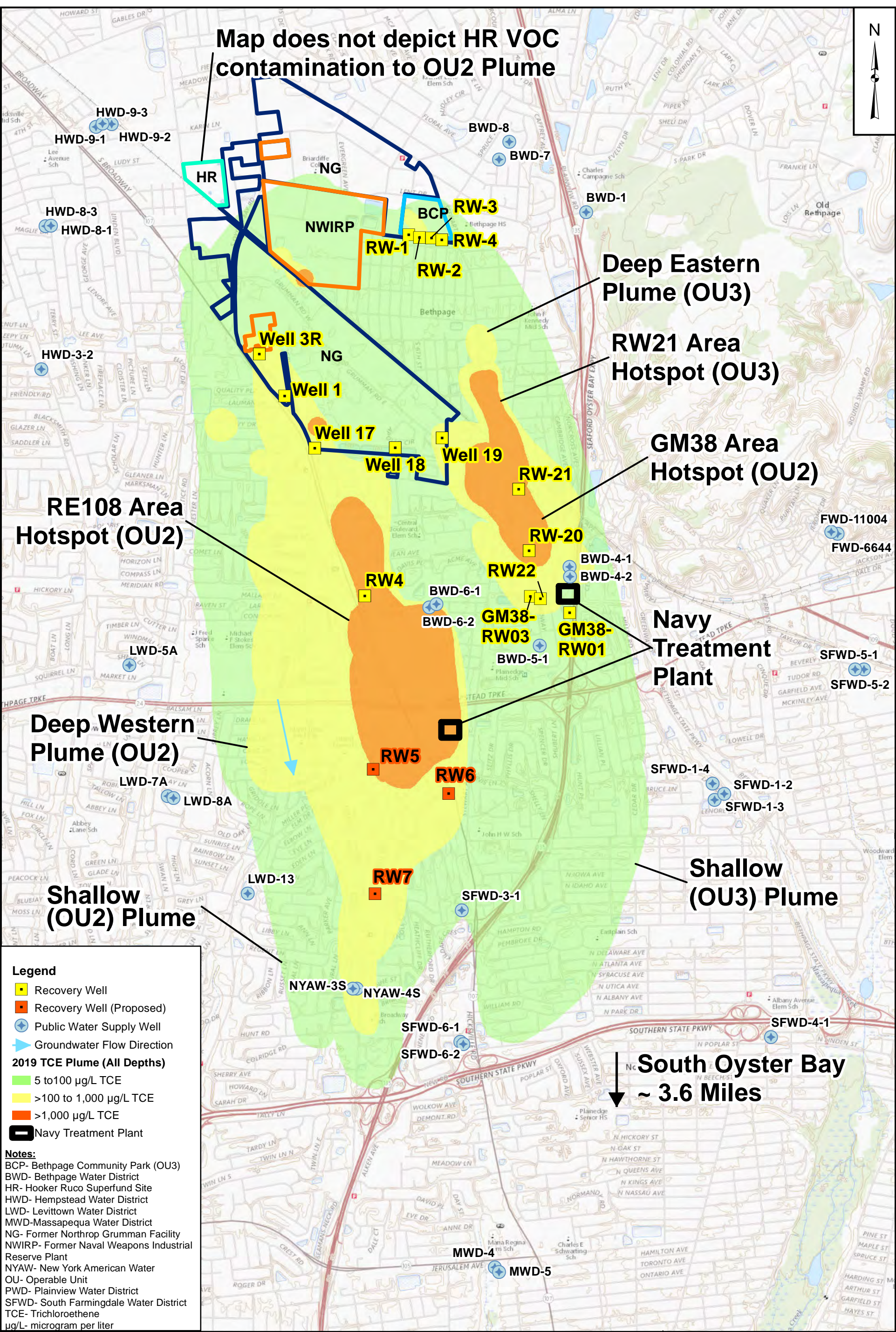
**GENERAL LOCATION MAP
NWIRP BETHPAGE, NEW YORK**



| | | |
|------------------|------------------|-----------------------------|
| DRAWN BY MC | DATE 12/09/20 | CTO WE13 |
| CHECKED BY EW | DATE 12/09/20 | FIGURE NUMBER 1-1 |

NOR P:\GIS\files\Bethpage\MAP.DOCS\MXD\BSP_OU2_2020\BSP_LongIsland-new_8x11.mxd\MVC

Map does not depict HR VOC contamination to OU2 Plume



Legend

- Recovery Well
- Recovery Well (Proposed)
- ⊕ Public Water Supply Well
- ➔ Groundwater Flow Direction

2019 TCE Plume (All Depths)

- 5 to 100 µg/L TCE
- >100 to 1,000 µg/L TCE
- >1,000 µg/L TCE

 Navy Treatment Plant

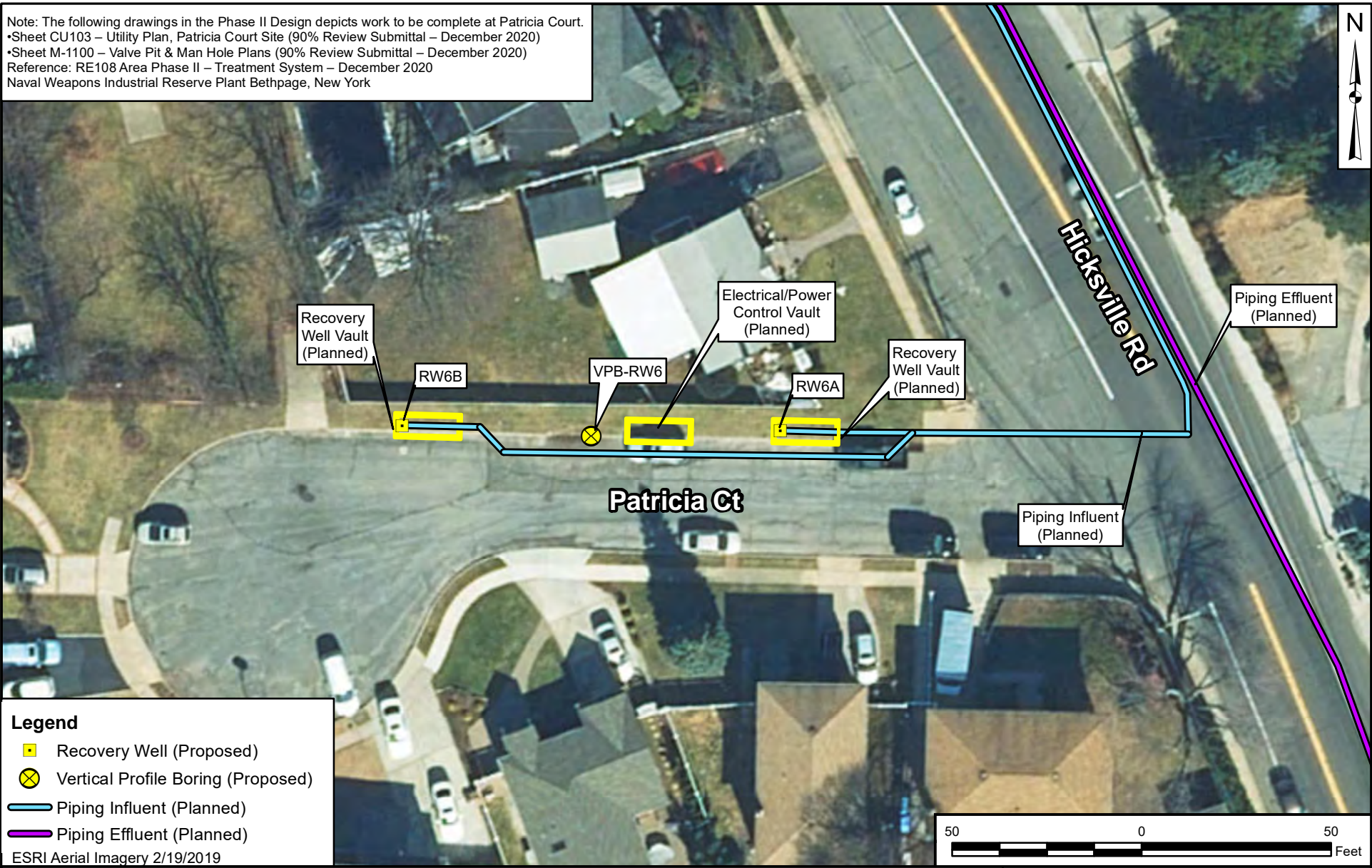
Notes:
 BCP- Bethpage Community Park (OU3)
 BWD- Bethpage Water District
 HR- Hooker Ruco Superfund Site
 HWD- Hempstead Water District
 LWD- Levittown Water District
 MWD- Massapequa Water District
 NG- Former Northrop Grumman Facility
 NWIRP- Former Naval Weapons Industrial Reserve Plant
 NYAW- New York American Water
 OU- Operable Unit
 PWD- Plainview Water District
 SFWD- South Farmingdale Water District
 TCE- Trichloroethene
 µg/L- microgram per liter

**OU2 AND OU3
GROUNDWATER PLUME LAYOUT
NWIRP BETHPAGE, NEW YORK**



| | | |
|------------------|------------------|------------------------------|
| DRAWN BY MC | DATE 12/09/20 | CTO N62470-16-D-9008-WE13 |
| CHECKED BY EW | DATE 12/09/20 | FIGURE NUMBER 1-2 |

Note: The following drawings in the Phase II Design depicts work to be complete at Patricia Court.
 •Sheet CU103 – Utility Plan, Patricia Court Site (90% Review Submittal – December 2020)
 •Sheet M-1100 – Valve Pit & Man Hole Plans (90% Review Submittal – December 2020)
 Reference: RE108 Area Phase II – Treatment System – December 2020
 Naval Weapons Industrial Reserve Plant Bethpage, New York



Legend

- Recovery Well (Proposed)
- Vertical Profile Boring (Proposed)
- Piping Influent (Planned)
- Piping Effluent (Planned)

ESRI Aerial Imagery 2/19/2019

**VPB-RW6 AND RECOVERY WELLS RW6A, RW6B
 SITE LAYOUT
 NWIRP BETHPAGE, NEW YORK**



| | | |
|------------------|------------------|-----------------------------|
| DRAWN BY MC | DATE 12/15/20 | CTO WE13 |
| CHECKED BY EW | DATE 12/15/20 | FIGURE NUMBER 1-3 |

NOR: P:\GIS\files\Bethpage\MAP_DOCS\IMXD\BIP_OU2_2020\RW6_SiteDetail.mxd

ATTACHMENT 1
COMMUNITY DRILLING NOTIFICATION



Department of
Environmental
Conservation

DRILLING NOTICE

Patricia Court, Bethpage, NY

December 28, 2020

Please be advised that the U.S. Navy, in conjunction with the New York State Department of Environmental Conservation, will be conducting drilling activities in your area. This work is being conducted to support the Navy's RE108 Area Hotspot Treatment System – Phase II. Volatile organic compounds (VOCs), including the solvents trichloroethylene (TCE) and perchloroethylene (PCE), have been detected in groundwater in the general area as a result of historic operations at the Grumman plant to the north. Upon completion of the treatment system, these recovery wells (RW6A/6B) will be used to extract groundwater impacted by VOCs which will be conveyed via an underground pipeline to a treatment plant. The impacted groundwater will be treated to drinking water standards then infiltrated back to the aquifer at nearby Nassau County stormwater basins. This drilling is part of the initial construction of the RE108 Area Hotspot Treatment System – Phase II. Construction of the pipeline connecting the wells to the treatment plant will be completed at a later date. *Additional information on the Navy's environmental cleanup program and the groundwater investigation is available at <https://go.usa.gov/DyXF>.*

The work will involve installation of a vertical profile boring (VPB) that will be drilled to a depth of up to 1,000 feet. Following completion of the VPB, two recovery wells will be drilled to depths of approximately 650 to 750 feet. Access to the VPB and recovery wells during the drilling operation will be secured with fencing surrounding the drilling equipment. Any soil and groundwater removed from the borings will be containerized in drums and covered roll offs. These materials will be tested, removed and disposed of properly on a regular basis.

Because of the depth of the drilling work, the drill rig and support vehicles will be present at this specific location for approximately 24 to 28 weeks. The fencing surrounding the drill site will reduce the vehicular travel lane at Patricia to a single lane and will not accommodate curbside parking in the construction area. No Parking signs will be posted along this section of Patricia Court. Upon completion of drilling, site restoration will be conducted. Paved surfaces, road curb, and landscaping impacted by drilling will be restored.

Work hours will be Monday through Friday, from 8:00 AM to 4:30 PM (no machinery will operate before 8:00 AM). However, periodically during drilling operations, extended work hours and weekend activities may be required. If it is necessary to visit the site during other hours or on the weekends, activities will be kept to a minimum. Drilling will start on or about the third week of January 2021.

Onsite contractors for the Navy will be Delta Drilling, who will be conducting the drilling operations, and Tetra Tech, who will provide oversight. Inquiries may be directed to Mr. Vincent Varricchio, the Onsite Field Manager, or other contacts as listed below.

If you require additional information, please contact:

Vincent Varricchio
Tetra Tech
Onsite Field Manager
(631) 962-0812

Ernie Wu
Tetra Tech
Project Manager
(757) 466-4901

Brian Murray
Navy
Remedial Project Manager
(757) 341-0491

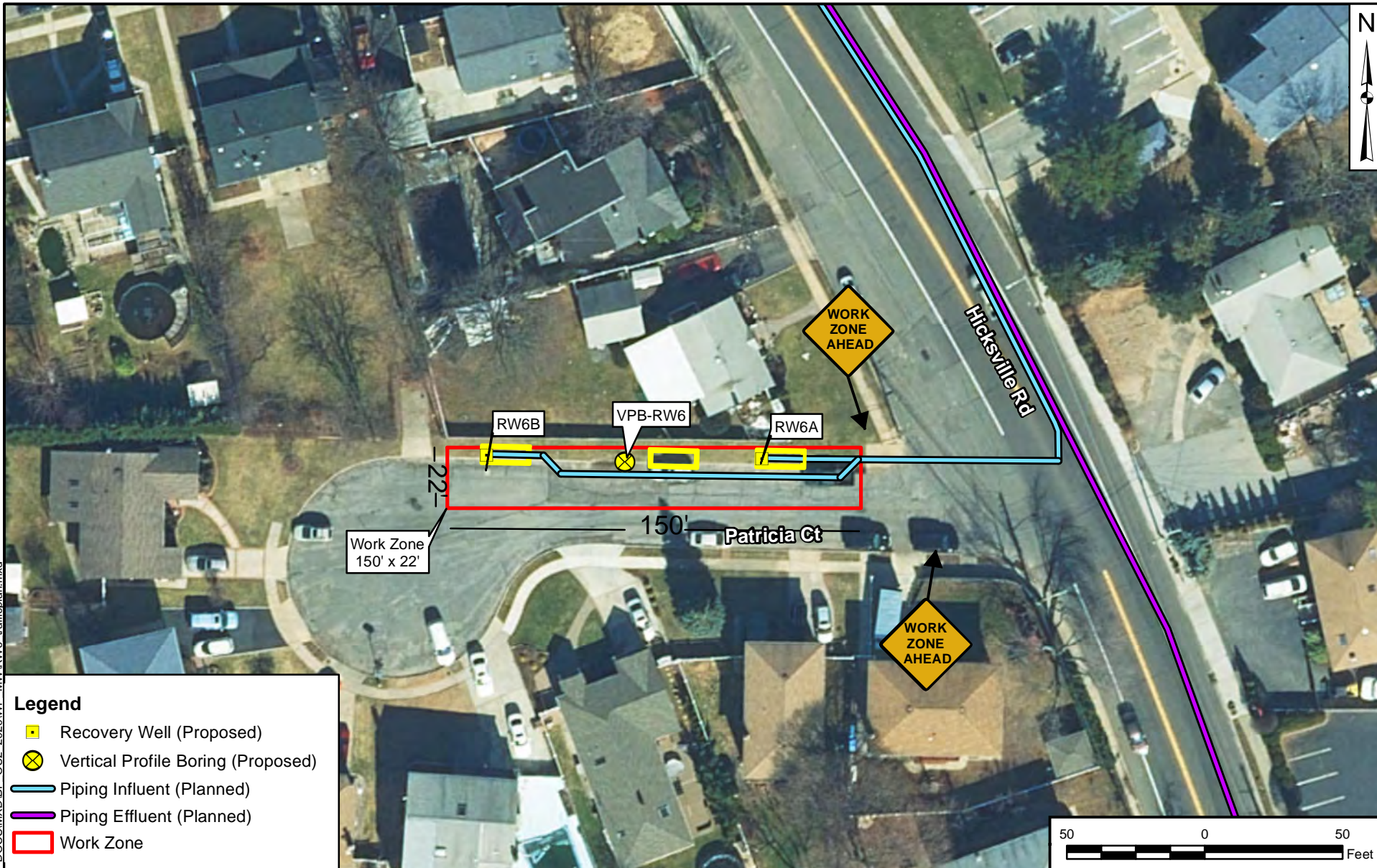
Jason Pelton
NYSDEC
Project Manager
(518) 402-9478
Jason.Pelton@dec.ny.gov

Bill Fonda
NYSDEC
Regional Citizen Participation
Specialist
(631) 444-0350
bill.fonda@dec.ny.gov

Jim Sullivan
NYSDOH
Project Manager
(518) 402-7860
James.Sullivan@health.ny.gov

ATTACHMENT 2
TRAFFIC CONTROL PLAN FIGURE

NOR: P:\GIS_files\BathpageMAP.DOC\SIMXD\BP_OU2_2020\WP_MW\RW6_trafficplan.mxd



Legend

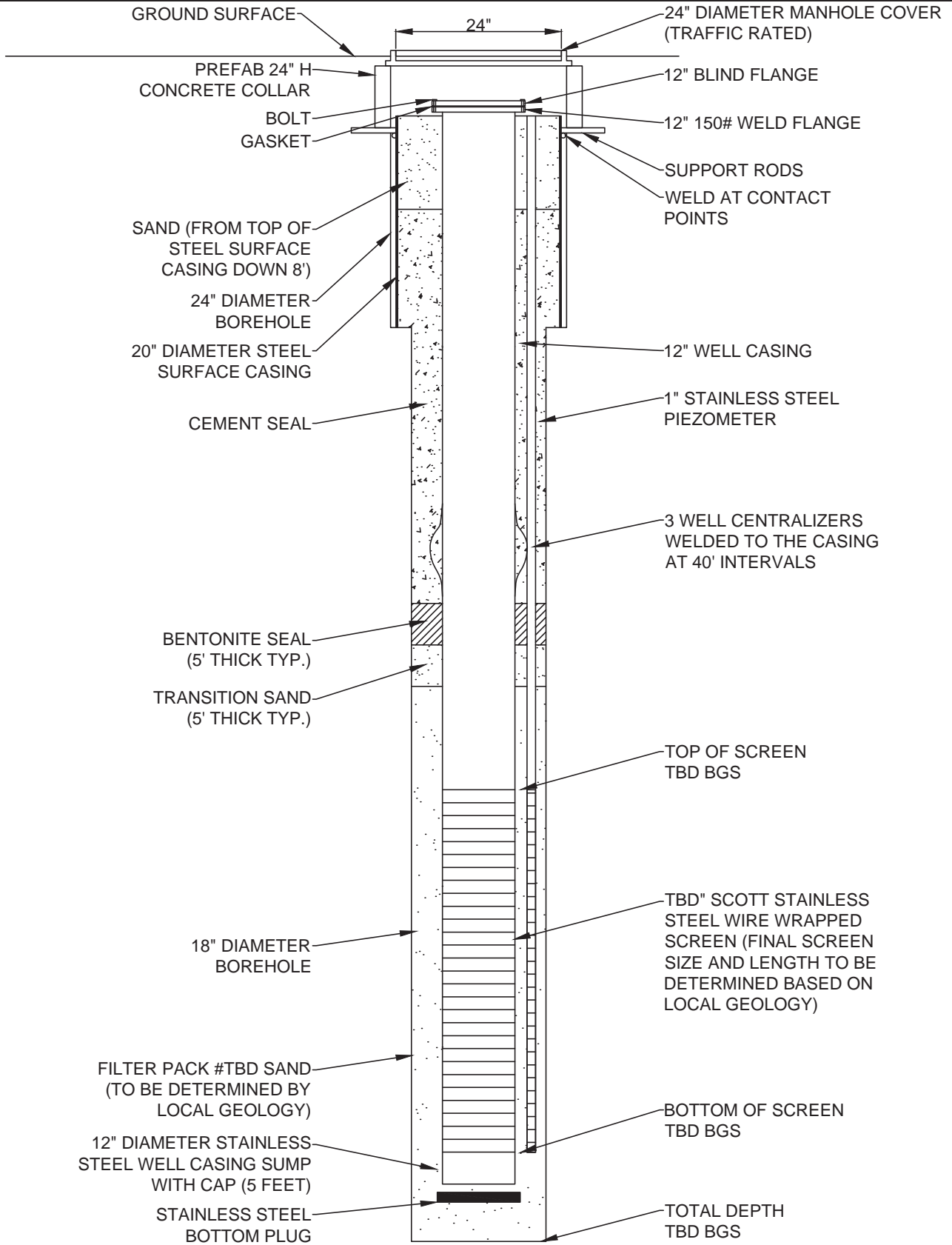
- Recovery Well (Proposed)
- X Vertical Profile Boring (Proposed)
- Piping Influent (Planned)
- Piping Effluent (Planned)
- Work Zone

VPB-RW6 AND RECOVERY WELLS RW6A, RW6B
TRAFFIC CONTROL PLAN
NWIRP BETHPAGE, NEW YORK



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| CHECKED BY EW | DATE 12/09/20 | FIGURE NUMBER |

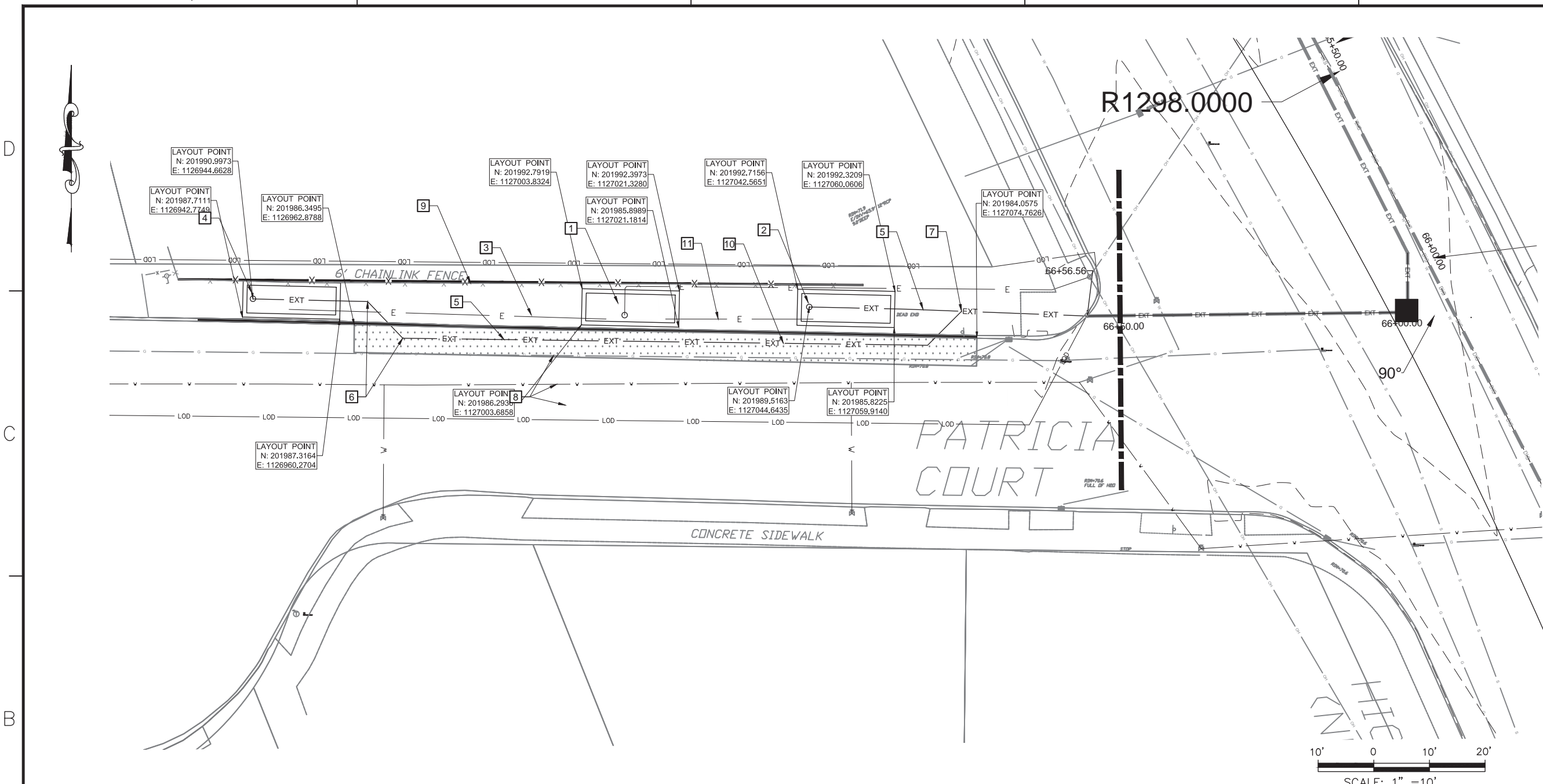
ATTACHMENT 3
RECOVERY WELL CONSTRUCTION DETAIL (TYPICAL)



TYPICAL WELL CONSTRUCTION DETAIL

| | |
|---------------------------|-----------------|
| SCALE N. T. S. | |
| FILE | |
| REV 0 | DATE 5/13/20 |
| FIGURE NUMBER FIGURE 4 | |

ATTACHMENT 4
RECOVERY WELL VAULT COMPLETION
(90 Percent Design – December 2020)



PLAN VIEW: WELLS 6A & 6B
SCALE: 1"=10'

NEW WORK KEYNOTES:

1. 5' X 12' VAULT FOR ELECTRICAL EQUIPMENT. SEE ELECTRICAL PLANS FOR DETAILS ON MCC-RW6
2. RW 6A EXTRACTION WELL LOCATION IN 5' X 16' VALVE VAULT. SEE PROCESSES PLANS FOR VAULT DETAILS.
3. VPB- RW6.
4. RW 6B EXTRACTION WELL LOCATION IN 5' X 16' VALVE VAULT. SEE PROCESSES PLANS FOR VAULT DETAILS.
5. 6" EXTRACTION LINE SEE PROCESS DRAWINGS FOR DETAILS.
6. 45° HORIZONTAL BEND TYPICAL
7. CONNECT 6" EXTRACTION LINES AND COMBINE INTO 8" EXTRACTION LINE FOR ROUTING TO TREATMENT PLANT.
8. PROTECT EXISTING UTILITIES IN PATRICIA COURT. (GAS, WATER AND STORM)
9. EXISTING CHAIN LINK FENCE TO BE REMOVED FOR CONSTRUCTION AND REPLACED AT COMPLETION OF CONSTRUCTION.
10. CONTROL LINE FOR THE DISCHARGE TO BOUNDARY BASIN
11. ELECTRIC LINE

SHEET NOTES:

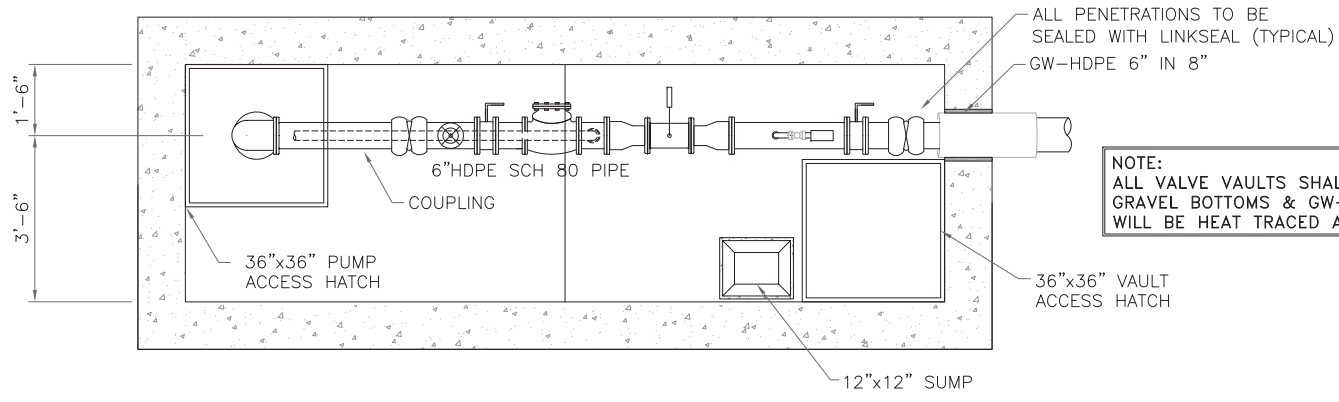
1. SEE SHEET C-601 FOR DISCHARGE SYSTEM SCHEDULE
2. SEE SHEET C-501 FOR TRENCH DETAILS AND BEDDING

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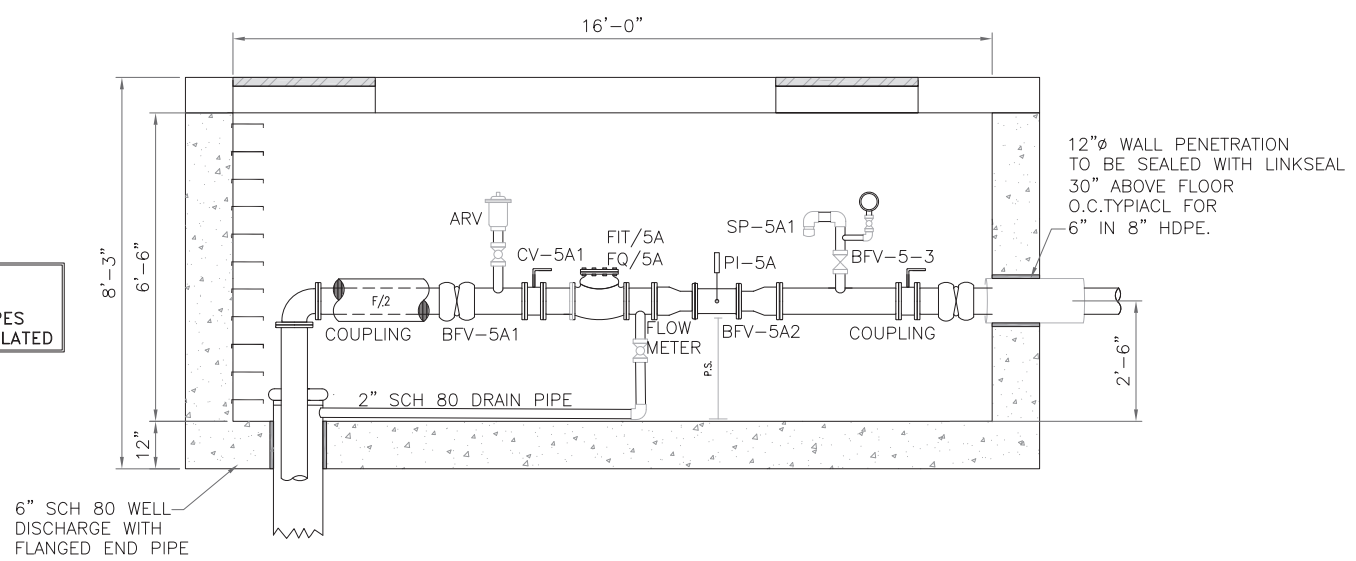
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| FIRE PROTECTION | | | | |
| NAVAL FACILITIES ENGINEERING COMMAND | | | | |
| NAVAL FACILITIES ENGINEERING COMMAND - MID-ATLANTIC | | | | |
| NAVAL INDUSTRIAL RESERVE GROUNDWATER PLANT | | | | |
| RE-108 AREA BETHPAGE, NEW YORK | | | | |
| GROUNDWATER TREATMENT PLANT | | | | |
| UTILITY PLAN | | | | |
| PATRICIA COURT SITE | | | | |
| DEPARTMENT OF THE NAVY | | | | |
| NAVFAC DRAWING NO. | | | | |
| PROJECT NO. N62472-99-D-0032 | | | | |
| CONSTR. CONTR. NO. | | | | |
| SHEET ## OF | | | | |
| CU103 | | | | |
| DRAWING REVISION: 07 AUG 2018 | | | | |

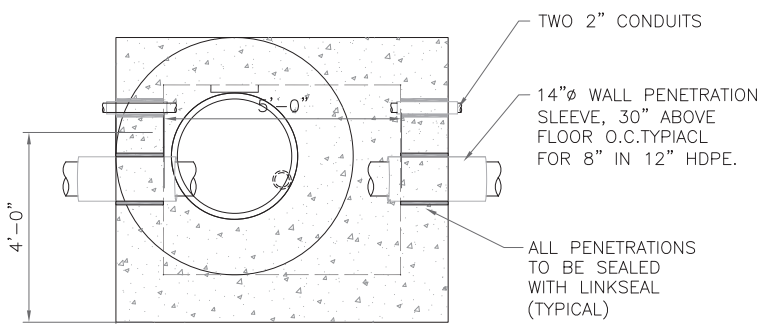


1 TYPICAL PLAN FOR VALVE VAULTS 5A/B-7A/B
M-1100 SCALE: 1/2" = 1'-0"

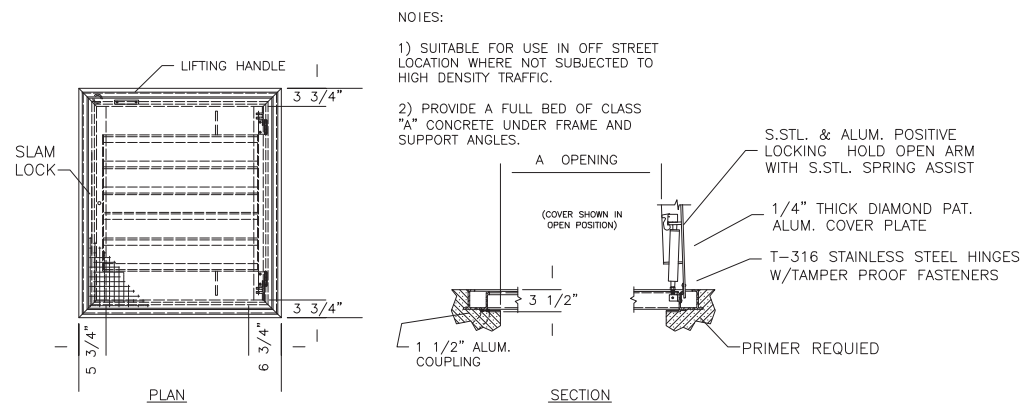
NOTE:
ALL VALVE VAULTS SHALL HAVE GRAVEL BOTTOMS & GW-PVC PIPES WILL BE HEAT TRACED AND INSULATED



2 TYPICAL SECTION FOR VALVE VAULTS 5A/B-7A/B
M-1100 SCALE: 1/2" = 1'-0"

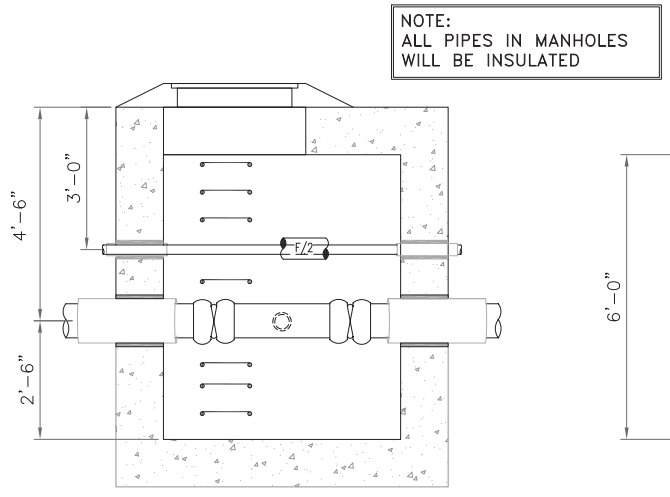


3 TYPICAL PLAN FOR MH 5-1 THRU MH 7-6
M-1100 SCALE: 1/2" = 1'-0"

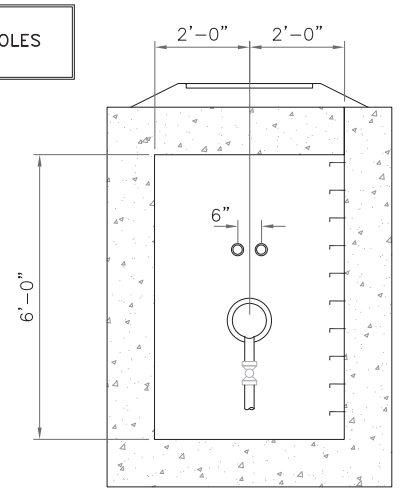


4 36 x 36 ALUMINUM HATCH
M-1100 SCALE: NTS

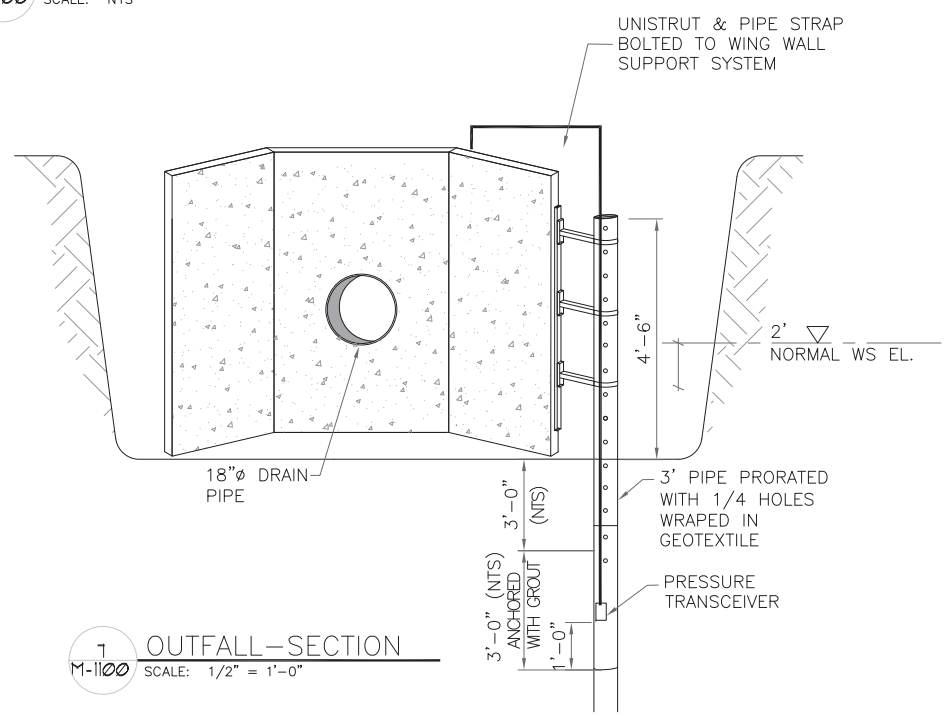
- NOIES:
- 1) SUITABLE FOR USE IN OFF STREET LOCATION WHERE NOT SUBJECTED TO HIGH DENSITY TRAFFIC.
 - 2) PROVIDE A FULL BED OF CLASS "A" CONCRETE UNDER FRAME AND SUPPORT ANGLES.



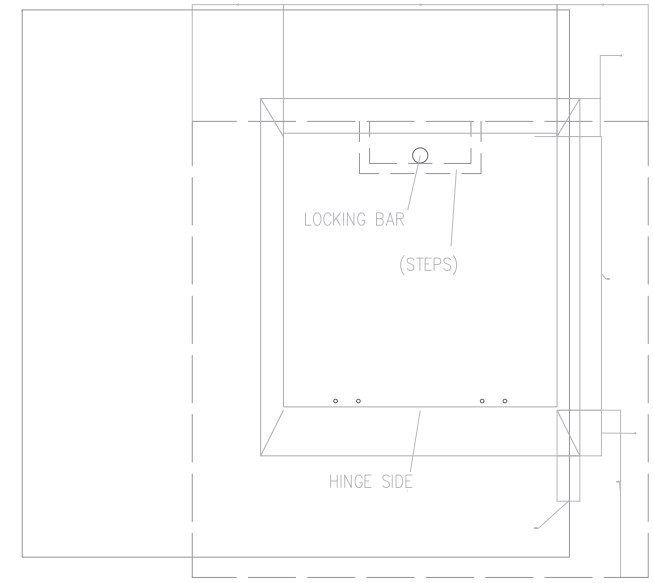
5 MANHOLE-SECTION
M-1100 SCALE: 1/2" = 1'-0"



6 MANHOLE-SECTION
M-1100 SCALE: 1/2" = 1'-0"



7 OUTFALL-SECTION
M-1100 SCALE: 1/2" = 1'-0"



SPECIFICATION FOR VAULT ACCESS COVER

PROVIDE H1W3636 (SINGLE LEAF) ACCESS FRAME AND COVER AS MANUFACTURED BY HALLIDAY PRODUCTS, INC. OF ORLANDO, FLORIDA OR APPROVED EQUAL. COVER SHALL HAVE A 1/4" THICK, MILL FINISH, EXTRUDED ALUMINUM FRAME, INCORPORATING EMBED ANCHOR PLATES. THE DOOR PANEL SHALL BE 1/4" ALUMINUM DIAMOND PLATE, REINFORCED TO ACHIEVE AN H20 LOAD RATING. DOOR SHALL OPEN TO 90° AND AUTOMATICALLY LOCK WITH A STAINLESS STEEL HOLD OPEN ARM WITH ALUMINUM RELEASE HANDLE. DOOR SHALL CLOSE FLUSH WITH THE FRAME. DOOR SHALL PROVIDE SPRING ASSIST FOR OPENING. HINGES AND ALL FASTENING HARDWARE SHALL BE STAINLESS STEEL. UNIT SHALL LOCK WITH A NON-CORROSIVE LOCKING BAR AND HAVE A NON-CORROSIVE HANDLE. UNIT SHALL INCLUDE OPTIONAL SLAM LOCK WITH KEY AND PLUG. UNIT SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND/OR WORKMANSHIP FOR A PERIOD OF 10 YEARS.

8 ACCESS COVER PLAN TYPICAL (U.N.)
M-1100 SCALE: (NTS)

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| FIRE PROTECTION | | |
| DEPARTMENT OF THE NAVY | | |
| NAVAL FACILITIES ENGINEERING COMMAND | | |
| NAVAL FACILITIES ENGINEERING COMMAND - MID - ATLANTIC | | |
| NAVAL INDUSTRIAL RESERVE PLANT | | |
| NAVAL WEAPONS INDUSTRIAL RESERVE PLANT | BETHPAGE, NEW YORK | |
| RE-108 AREA | | |
| GROUNDWATER TREATMENT PLANT | | |
| VALVE PIT & MAN HOLE PLANS | | |
| SCALE: | | NTS |
| PROJECT NO.: | | |
| CONSTR. CONTR. NO.: | | N62472-99-D-0032 |
| NAVFAC DRAWING NO.: | | |
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