ABBREVIATED WORK PLAN – APRIL **25**, 2017
SFWD/NYAW CAPTURE ZONE ANALYSIS
OPERABLE UNIT 2 GROUNDWATER
NAVAL WEAPONS INDUSTRIAL RESERVE PLAN (NWIRP), BETHPAGE, NEW YORK

This abbreviated work plan has been prepared for the Mid-Atlantic Division of the Naval Facilities Engineering Command (NAVFAC) pursuant to Contract Task Order (CTO) WE69, issued under Comprehensive Long-term Environmental Action (CLEAN) contract number N62470-11-D-8013. This abbreviated work plan will follow the requirements, where applicable, for collecting water levels and analytical groundwater samples from monitoring wells within Operable Unit (OU) 2 in accordance with the current *Abbreviated Quarterly Groundwater Sampling and Analysis Plan* (Resolution Consultants, December 2014), the *United Federal Program Sampling and Analysis Plan (UFP SAP) Addendum, and the Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, November 2013). This investigation is being conducted to investigate aquifer properties and to estimate the hydraulic influence of supply wells operated by South Farmingdale Water District (SFWD) Plant 6 and New York American Water (NYAW) located in Nassau County, Long Island, New York (Figure 1). Regional groundwater in this area flows south-southeast but is locally affected by the operation of public water supply wells and recharge basins.

Scope and Objective

Resolution Consultants will provide overall project management for the Navy scope of work (SOW) addressed in this work plan. The objective of this study is to conduct a short-term analysis of groundwater levels around SFWD Plant 6 and NYAW supply wells in order to:

- Evaluate Magothy Aquifer parameters south of Hempstead Turnpike;
- Evaluate the capture zone of wells operating for SFWD Plant 6; and,
- Evaluate the capture zone of water supply wells operating for NYAW.

Previous work under WE69 demonstrated the potential capture zone of Bethpage Water District Well 6-2 for the portion of the plume north of Hempstead Turnpike. This additional effort will be conducted south of the Hempstead Turnpike to help understand the potential for capture of the downgradient plume by SFWD Plant 6 (including wells SFWD N-8664 and SFWD N-8665) and NYAW supply wells (including wells ANY-9338 and ANY-8480).

It is anticipated that well pumping information and water quality data for influent and effluent water will be provided by SFWD and NYAW per their normal data recording and sampling schedule. These data will be used along with water levels recorded by Resolution Consultants in surrounding wells to evaluate hydrogeologic parameters of the Magothy Aquifer south of the

Hempstead Turnpike and to deduce the capture zone of wells operating for SFWD Plant 6 and NYAW.

Data Collection Locations

SFWD Plant 6, NYAW supply wells, and existing monitoring well locations where water levels will be monitored by data loggers are identified on Figure 2. Table 1 provides pertinent well construction information for wells with data loggers south of Hempstead Turnpike. Table 2 provides well depth data for SWFD Plant 6 wells and NYAW supply wells. Electronic data loggers will be used to monitor groundwater levels in 19 monitoring wells and barometric pressure will be monitored in one location south of Hempstead Turnpike.

Groundwater quality in the same monitoring wells where data loggers will be deployed will be presented using the results of the regularly scheduled quarterly sampling that is conducted under WE15. The notes in Table 1 outline the sampling schedule.

Site History

NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1). NWIRP Bethpage is in the Hamlet of Bethpage, Town of Oyster Bay, New York. Since its inception in 1941, the primary mission of the plant was the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The facilities at NWIRP included four plants used for assembly and prototype testing, a group of quality control laboratories, two warehouse complexes, a salvage storage area, water recharge basins, an Industrial Wastewater Treatment Plant, and several smaller support buildings.

The Navy's property originally totaled 109.5 acres and was formerly a Government-Owned Contractor-Operated (GOCO) facility operated by Northrop Grumman (NG) until September 1998. Prior to 2002, the NWIRP property was bordered on the north, west, and south by current or former NG facilities and on the east by a residential neighborhood. By March 2008, approximately 100 acres of NWIRP property were transferred to Nassau County. The remaining 9 acres and access easements were retained by the Navy to continue remedial efforts at Installation Restoration (IR) Site 1 – Former Drum Marshalling Area and Site 4 – Former Underground Storage Tanks (Area of Concern 22). Currently, the 9-acre parcel of NWIRP is bordered on the east by a residential neighborhood and on the north, south, and west by Steel Equities property; however, a portion near Sites 2 and 3 is still owned by Nassau County. Access to the NWIRP is from South Oyster Bay Road.

Field Investigation Task Plan

Details of the field investigation are provided below. Table 3 provides a list of the tasks to be completed, their duration, and anticipated completion dates. All applicable aspects of the field investigation will be conducted in accordance with the *Abbreviated Quarterly Groundwater Sampling and Analysis Plan* (Resolution Consultants, December 2014) and *UFP SAP for Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, November 2013).

Water Level Monitoring and Capture Zone Analysis

It is anticipated that water level monitoring will occur over a three month period. During that time, electronic water level data loggers will be deployed in 17 existing Navy-owned wells in the vicinity of SFWD Plant 6 and NYAW supply wells (see Figure 2). The manufacturer, model, and serial numbers for each set of equipment will be recorded for each monitoring location. The data loggers will be decontaminated prior to use, hung from a lockable well cap, and lowered into the well per the manufacturer's specifications. The data loggers will be placed sufficiently below typical well water level to allow for fluctuation of the water level above the data logger (i.e. the data logger will remain submerged). Pressure will automatically be recorded at 5-minute intervals and stored by the data logger. These data will be retrieved from each data logger, downloaded, and evaluated monthly to ensure proper operation of the equipment. One additional data logger will be installed in well RE117D1 above the well water level to record the barometric pressure of the site for the duration of the water level monitoring.

Assuming that significant pumping cycle change effects are reflected by water levels recorded by the data loggers in the monitored wells, Resolution Consultants will calculate aquifer parameters such as hydraulic conductivity, transmissivity, and storativity using specialized software or traditional analytical methods (e.g. distance-drawdown, type curve matching). It is noted that daily operation typically consists of multiple pump operation cycles at one or more of the SFWD and NYAW wells, and the potential for hydraulic interference exists due to proximity of the four supply wells. In addition, it is not certain if water level changes in the pumping wells are recorded by SFWD and NYAW, or if they can be monitored, and there are no existing monitoring wells in close proximity (i.e., less than 800 feet). As a result, analysis and deduction of aquifer parameters will be complex and results will likely represent bulk aquifer properties. The aquifer parameters will in turn be used to estimate the capture zones of SFWD Plant 6 and NYAW supply wells at variable pumping rates using analytical or numerical solutions. As noted above, due to variable pumping cycles, potential hydraulic interference, and lack of near-field monitoring locations, real-time capture zones may not be directly observed, or may be representative of cumulative pumping from both SFWD and NYAW wells.

Monitoring Well Groundwater Sample Collection and Analysis

Collection of groundwater samples is not specifically included in this work plan. However, quarterly groundwater sampling of nearby wells will be conducted in accordance with the *UFP SAP Addendum, Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, 2013) during the field data collection period. Table 1 outlines the wells that will be sampled.

All groundwater and quality assurance/quality control (QA/QC) samples will be analyzed by a New York State and Navy-Approved Laboratory for the chemicals of interest using EPA Methods 8260C (volatile organic compounds [VOCs]) and 8270 SIM (semivolatile organic compounds [SVOCs]). The results of these data will be summarized and presented, where applicable, in the report that documents the water level and capture zone analysis described herein.

SFWD Plant 6 and NYAW Supply Wells

Resolution Consultants will attempt to obtain pumping information, water levels, and water quality data from SFWD Plant 6 and NYAW supply wells. These data will be analyzed in coordination with water level data from the data loggers deployed in nearby wells to establish Magothy Aquifer parameters and to estimate supply well capture zones.

For the duration of this investigation, SFWD Plant 6 and NYAW supply wells are anticipated to continue to operate normally.

Task Hazard Analysis

Prior to initiating field activities at the site, Resolution Consultants will prepare a Task Hazard Analysis (THA) that outlines hazards specific to the field work and identifies controls in place that minimize risks.

IDW

Investigative Derived Waste (IDW) accumulated during task activities will be collected, containerized, accumulated at NWIRP Bethpage, and disposed off-site. All IDW activities will be consistent with the *UFP SAP Addendum, Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, November 2013).

Decontamination

Decontamination of the data loggers will be performed when the equipment is removed from a well at the completion of the monitoring or when equipment is moved to another location. Equipment will be decontaminated and IDW waste will be brought to a central area at NWIRP Bethpage. All decontamination fluids will be collected and staged for characterization and

subsequent disposal. All decontamination activities will be consistent with the *UFP SAP Addendum, Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, November 2013).

Data Validation

Resolution Consultants shall perform field investigations as necessary and evaluate all data from groundwater samples and data loggers. All data validation activities will be consistent with the *UFP SAP Addendum, Groundwater Sampling Using Low Stress (Low Flow) Purging and Sampling Protocol* (Resolution Consultants, November 2013).

Reporting

A final report will be developed to provide documentation of this additional effort. See Table 3 for a schedule of tasks to be completed. Documentation required to support this investigation will consist of the following items:

- Data logger records on disc in tabular format;
- Data sheets or files submitted by SFWD/NYAW documenting supply well operation information along with data on the water treatment system;
- Calculation sheets and figures for aquifer parameters and/or output from specialized software programs;
- Calculation sheets and figures for determination of well capture zones and/or output from specialized software programs;
- Tabular results of quarterly groundwater samples, if applicable; laboratory reports provided under separate cover in quarterly groundwater sample reports are not included;
- Draft (D1), Draft Final (D2), and Final SFWD Plant 6/NYAW Capture Zone Analysis Report.

Tables

Table 1
Construction Details of Wells Containing Data Loggers

Well ID	Ground Elevation (famsl)	Top Casing Elevation (famsl)	Top of Screen (Depth)	Bottom of Screen (Depth)	Total Depth (ft)
RE114D1‡	74.59	74.04	535	555	560
RE114D2‡	74.48	73.96	610	630	635
RE114D3‡	74.59	74.17	700	720	725
BPOW3-3‡	61.57	60.64	580	620	625
BPOW3-4‡	62.89	62.44	640	690	695
BPOW5-1†	56.76	56.12	480	510	515
BPOW5-2†	56.81	56.32	540	580	585
BPOW5-3†	56.45	56.04	620	660	665
BPOW5-5†	57.97	57.58	515	540	545
BPOW5-6†	58.21	57.72	585	610	615
BPOW5-7†	56.20	55.92	525	550	555
RE130D1‡	not yet surveyed	not yet surveyed	555	575	580
RE130D2‡	not yet surveyed	not yet surveyed	640	660	665
BPOW5-4†	54.49	53.88	545	570	575
RE117D1*Δ	54.24	53.81	545	570	575
RE129D1	54.09	53.63	690	710	715
RE129D2	53.96	53.52	805	825	830
TT102D‡	47.27	49.96	560	600	605
TT102D2‡	45.29	44.12	740	770	775

Bold – survey data from previous reports
famsl – feet above mean sea level
Depths in feet below ground surface
* – well also contains barometric level logger
† – wells to be sampled by ARCADIS in Q1 (February-March) of 2017
‡ – wells to be sampled by ARCADIS in Q2 (May-June) of 2017
Δ – wells to be sampled by Resolution Consultants in Q1 of 2017

Table 2
Well Depths for SFWD Plant 6 and NYAW Supply Wells

Well ID	Total depth (ft)
ANY-8480	680
ANY-9338	650
SFWD N-8664	610
SFWD N-8665	560

Depths in feet below ground surface

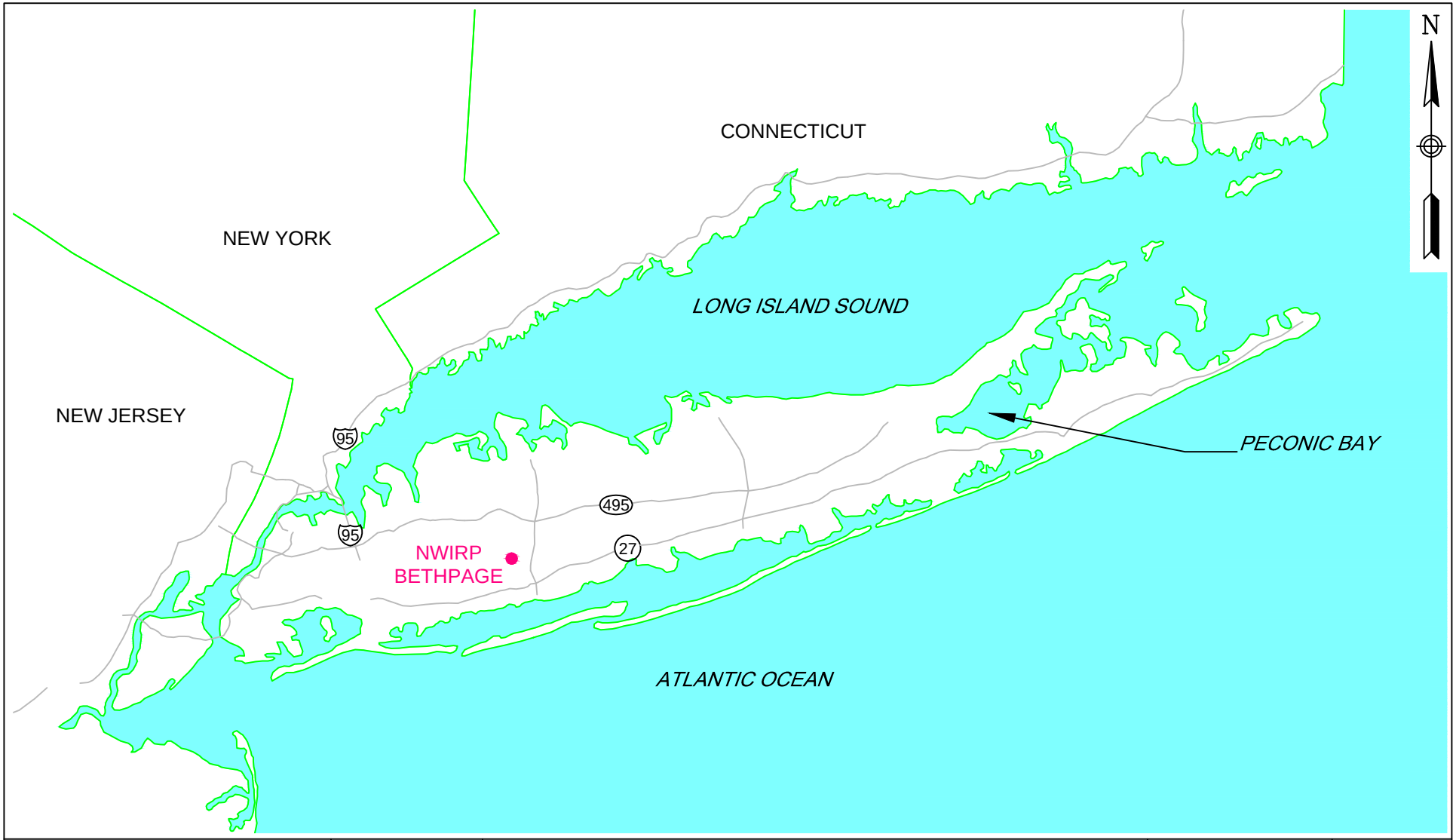
Table 3
Schedule of Tasks

Item	Duration	Dates
Work Plan Submitted	1 Month	February 9, 2017
**Datalogger Monitoring Period	3 Months	February 2, 2017 – May 9, 2017
Resolution Consultants Quarterly Groundwater Sampling	1 Week	March, 2017*
ARCADIS Groundwater Sampling	1 Week	Feb, 2017*
Data Evaluation	2 Months	May 9, 2017 – July 9, 2017
Reporting	1 Month	July 9, 2017 – August 9, 2017

**Dates not finalized*

***Monthly reporting of Data logger Data provided to the Navy*

Figures



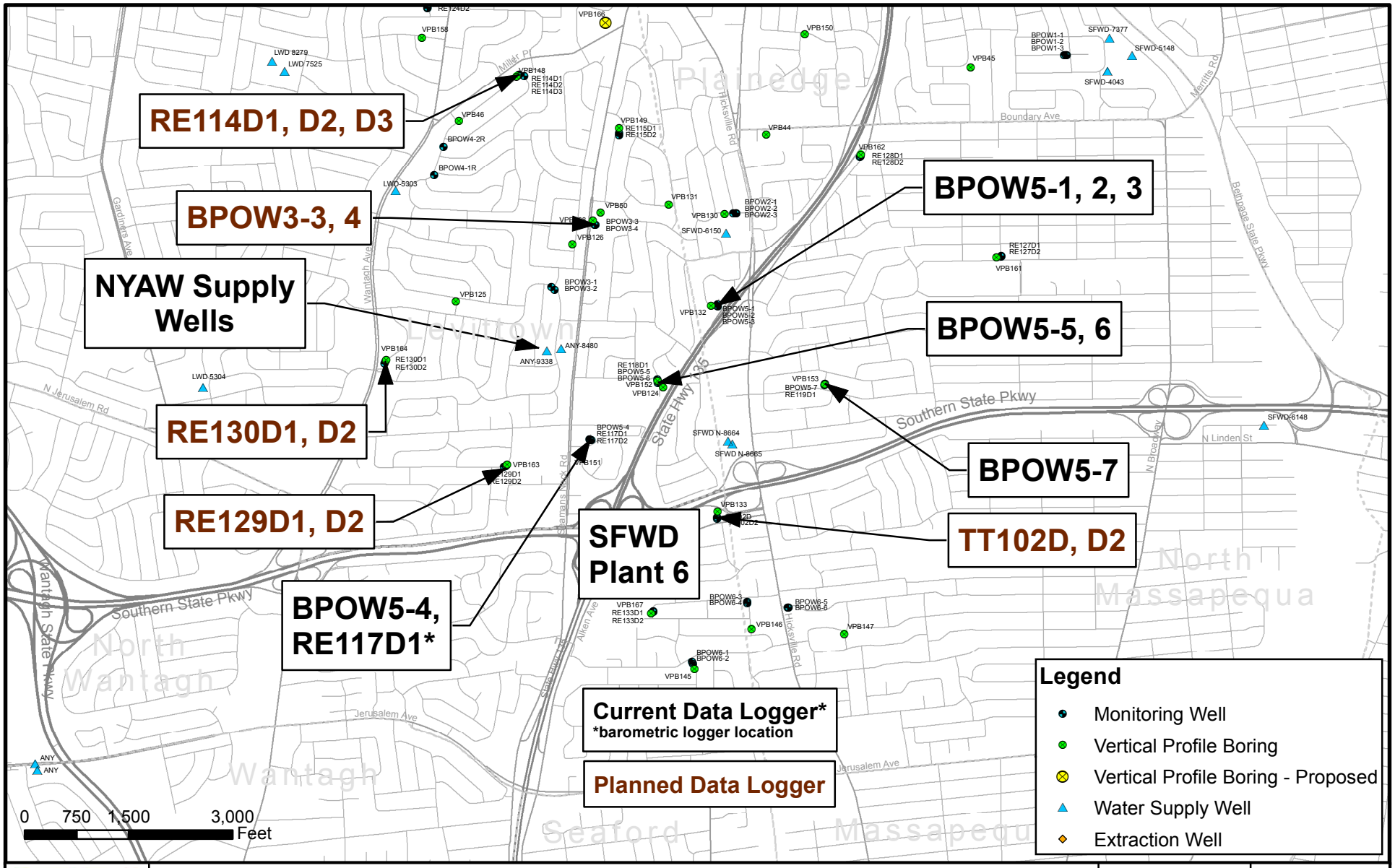
0 15 30

SCALE IN MILES

NAVFAC

GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

N62470-11-D-8015	WE69
APPROVED BY AJ	DATE 1/30/17
APPROVED BY --	DATE --
1	0



DATA LOGGER LOCATIONS AS OF MARCH 2017
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

CONTRACT NUMBER	CTO NUMBER
N62470-11-D8013	WE15
APPROVED BY: EV	DATE: 4/4/2017
APPROVED BY: —	DATE: —
FIGURE NO.: 1	REV: 0