REVISED GROUNDWATER SAMPLING AND ANALYSIS PLAN

DEFENSE FUEL SUPPORT POINT NORWALK
15306 NORWALK BOULEVARD
NORWALK, CALIFORNIA

Prepared for

Defense Logistics Agency Energy
8725 John J. Kingman Road
Fort Belvoir, Virginia 22060-6222

September 17, 2013

Prepared by

PARSONS

100 WEST WALNUT STREET • PASADENA • CALIFORNIA 91124

REVISED GROUNDWATER SAMPLING AND ANALYSIS PLAN

DEFENSE FUEL SUPPORT POINT NORWALK
15306 NORWALK BOULEVARD
NORWALK, CALIFORNIA

Prepared for

Defense Logistics Agency Energy
8725 John J. Kingman Road
Fort Belvoir, Virginia 22060-6222

September 17, 2013

Prepared by

PARSONS
100 West Walnut Street
Pasadena, California 91124

Mary Lucas
Senior Project Engineer

Redwan Hassan, P.G.
Senior Project Manager

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIX

ACRONYMS AND ABBREVIATIONS

1,2-DCA	1,2-dichloroethane
Blaine Tech	Blaine Tech Services, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CSM	conceptual site model
DFSP	Defense Fuel Support Point
DI	deionized
DIPE	di-isopropyl ether
DLA	Defense Logistics Agency
DOT	Department of Transportation
ELAP	Environmental Laboratory Accreditation Program
ETBE	ethyl tertiary butyl ether
GAC	granular activated carbon
GWE	groundwater extraction
JP	jet propellant
LNAPL	light nonaqueous phase liquid
MRP	monitoring and reporting program
msl	mean sea level
MTBE	methyl tertiary butyl ether
NPDES	National Pollutant Discharge Elimination System
ORP	oxidation-reduction potential
PPE	personal protection equipment
QA	quality assurance
QC	quality control
RWQCB	Regional Water Quality Control Board, Los Angeles
SAP	sampling and analysis
SCAQMD	South Coast Air Quality Management District
SFPP	Santa Fe Pacific Pipeline, L. P.
SVE	soil vapor extraction
TAME	tertiary amyl methyl ether
TBA	tertiary butyl alcohol
TFE	total fluids extraction
TPH	total petroleum hydrocarbons
TPHd	total petroleum hydrocarbons as diesel
TPHg	total petroleum hydrocarbons as gasoline
TPHjf	total petroleum hydrocarbons as jet fuel
USEPA	U.S. Environmental Protection Agency
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION AND BACKGROUND

This revised groundwater sampling and analysis plan (SAP) documents the updated scope of work for the groundwater monitoring and reporting program (MRP) for the Defense Fuel Support Point (DFSP) Norwalk site in California located at 15306 Norwalk Boulevard, Norwalk, California (Figure 1). This revised SAP has been prepared by Parsons on behalf of the Defense Logistics Agency (DLA) Energy at the request of the California Regional Water Quality Control Board, Los Angeles (RWQCB) region.

Groundwater monitoring is conducted in accordance with the current MRP for the site, which was approved by the RWQCB in May 2002. As described in the March 6, 1995 *Groundwater Sampling and Analysis Plan, DFSP Norwalk/SFPP Norwalk Pump Station*[1] (the sampling plan), Santa Fe Pacific Pipeline, L. P. (SFPP) and DLA Energy jointly conduct groundwater monitoring events at the site. SFPP contracted CH2MHILL and DLA Energy contracted Parsons to perform project oversight. Both SFPP and Parsons have subcontracted Blaine Tech Services, Inc. (Blaine Tech) to perform low-flow groundwater monitoring services at the site.

A Groundwater Monitoring Program Evaluation Report, dated March 5, 2013, and an Updated Proposed Groundwater Monitoring Program, dated July 23, 2013 were prepared by Parsons in response to a letter from the RWQCB dated December 20, 2012. In that letter, the RWQCB requested an evaluation be conducted to enhance the current groundwater monitoring network and program in order to evaluate the dissolved plume behavior over time. The RWQCB provided concurrence with the proposed changes to the groundwater monitoring program in a letter to DLA Energy, dated August 16, 2013, with three conditions: (1) monitor five of the proposed wells semiannually instead of annually, (2) re-evaluate the groundwater monitoring program after three years, and (3) maintain existing groundwater monitoring wells onsite and offsite for potential future use. This revised groundwater SAP updates the previous SAP prepared by Geomatrix in 1995 and incorporates the RWQCB's approved changes to the MRP.

1.1 Background and Site Description

The DFSP Norwalk facility is a 50-acre facility which consisted of 12 aboveground fuel storage tanks and associated piping and facilities. The DFSP is owned by the Air Force and managed by DLA Energy. The tanks, which have been removed, had a total maximum capacity of 35 million gallons that previously stored jet propellant (JP)-

[1] Geomatrix Consultants, Inc. (Geomatrix), 1995, *Groundwater Sampling and Analysis Plan, DFSP Norwalk/SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California*, March 6.

5 and JP-8 and reportedly also aviation gasoline and JP-4. There were also tanker truck fueling stations and various fuel transfer systems that have all been removed. The facility was decommissioned in 2001 and is no longer used to handle fuel.

SFPP currently leases a 2-acre easement along the southern and eastern boundaries of DFSP for operation of its pipelines, which convey gasoline, diesel, and jet fuel. Within the southern easement lie three active pipelines, one of which is 16-inch diameter (designated LS-1) that bends at the southeastern corner of the facility and continues northward within the eastern easement adjacent to Holifield Park. An abandoned pipeline, likely owned or formerly operated by Golden West Pipeline, also runs along the eastern boundary of the DFSP Norwalk facility. DLA Energy has decommissioned the site, but SFPP continues to operate their pipelines.

Since 1986, environmental assessments have been performed at the DFSP Norwalk tank farm facility (both onsite and offsite) by several consultants. During these investigations, wells were installed for monitoring and as components of soil and groundwater remediation activities. Table 1 presents a summary of groundwater monitoring and remediation wells associated with the site. These investigations evaluated and defined the extent of light nonaqueous phase liquid (LNAPL)-phase, adsorbed-phase, and dissolved-phase hydrocarbons in soil and groundwater beneath the site and some offsite portions.

1.2 Site Setting

The ground surface elevation is approximately 75 feet above mean sea level (msl). Land use in the immediate vicinity of the site is primarily residential to the north, west, and south. Holifield Park, a City recreational facility, is located adjacent to and east of the site. Dolland Elementary School is located east of Holifield Park and approximately 500 feet east of the site.

1.2.1 Geology

DFSP Norwalk is located between the Montebello Forebay and the Downey Plain in the Central Basin pressure area. Approximately 50 to 60 feet of alluvium (primarily sand, gravel, silt, and clay) cover the underlying Lakewood Formation in this area. Alluvial sediments exposed in the area of the site include mixtures and layers of sand, gravel, silt, and clay. The underlying Lakewood Formation consists of marine and continental gravel, sand, silt, and clay deposits. The San Pedro Formation underlies the area, approximately 300 feet below grade, and consists of marine and continental gravel, sandy silt, silt, and clay deposits[2].

---

[2] California Department of Water Resources (CDWR), 1961, Bulletin No. 104 – *Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County* (Appendix A – Ground water Geology). June (reprinted May 1991).

Lithologic logs of borings drilled during previous investigations indicate that sediments beneath the site consist of clayey silt, sandy silt, silty sand, fine to coarse-grained sand, and deeper coarse-grained sand with granitic cobbles. The top of a clay layer, preliminarily identified as the uppermost sediment layer of the Bellflower Aquitard, was encountered at a depth of approximately 55 to 65 feet during previous investigations[3].

1.2.2 Hydrogeology

A shallow semiperched unconfined aquifer, consisting of silt and fine to coarse sand, is encountered at a depth of approximately 25 to 50 feet below ground surface (bgs). The water level data indicate that groundwater flow direction within this aquifer is generally toward the north. The shallow aquifer is approximately 30 to 35 feet thick, based on the inferred presence of a clay layer (aquitard) at approximately 55 to 65 feet below grade[4]. This uppermost groundwater zone overlies the Bellflower aquitard of the Lakewood Formation which lies between depths of approximately 50 and 80 feet bgs beneath the site and consists of predominantly clay, silty clay, and sandy clay with some interbedded sand with silt.

The Exposition aquifer underlies the Bellflower aquitard between depths of approximately 80 and 220 feet bgs. The potentiometric surface in the Exposition aquifer is approximately 20 feet lower than that in the semiperched uppermost groundwater zone. The Bellflower aquitard inhibits the vertical movement of groundwater in the site area. The groundwater flow direction is generally southeastward, which is roughly opposite the flow in the uppermost groundwater zone.

1.3 Chemicals of Concern

Soil and groundwater at the DFSP Norwalk facility were found to be impacted with various volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPH). The primary chemicals of concern within this facility are TPH as jet fuel (TPHjf), TPH as gasoline (TPHg), TPH as diesel (TPHd), benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds, methyl tertiary butyl ether (MTBE), 1, 2-dichloroethane (1,2-DCA), and tertiary butyl alcohol (TBA). These constituents have been found in soil and groundwater underlying various portions of the DFSP Norwalk facility. In each area, the constituents were attributed to one or more sources and were encountered in free phase, dissolved phase, adsorbed phase, or vapor phase in soil and/or groundwater. DLA Energy and SFPP are currently conducting extensive

---

3 Groundwater Technology Government Services, Inc. (GSI), 1995, *Final Remedial Action Plan Report Defense Fuel Supply Point Tank Farm Area, Norwalk, California,* September 14.

4 GSI, 1995.

remediation and monitoring programs for the impacted soil, soil gas, and groundwater underlying the DFSP Norwalk facility. MTBE and TBA are groundwater impacts that have resulted from SFPP operations and remediation of these impacts is being addressed by SFPP.

1.4 DLA Energy Remediation Systems

DLA Energy operates remediation systems to treat the hydrocarbon impacts in soil and groundwater. The purposes of these remediation systems are to reduce hydrocarbon concentrations to cleanup goals, to prevent offsite migration and contaminant mass containment, and ultimately achieve site closure within a reasonable timeframe.

The impacted DLA Energy areas of concern consist of the north-central former tank farm, the north-eastern property boundary and a portion of which extends offsite under Holifield Park in the northern/western park area, the north-west corner of the site, and the water tank and truck fueling areas.

The remediation systems consist of soil vapor extraction (SVE), groundwater extraction (GWE), treatment of extracted soil vapors and groundwater, biosparging, free product extraction via vacuum-truck recovery, and absorbent sock installations for passive recovery of free product.

The SVE well network for hydrocarbon extraction from vadose zone subsurface impacts is installed in the following areas: the central tank farm area, northwestern AST 80001 area, AST 80006 area, central AST 80008 area, AST 55004 area, north-east area, water tank area, and truck fueling area. SVE is performed using a blower to remove soil vapors from the subsurface. The extracted vapors are conveyed to a knock-out tank that separates entrained moisture from the soil vapors. Accumulated moisture in the knock-out tank is treated by the main groundwater treatment system described below. The soil vapors are then treated through four granular activated carbon (GAC) vessels where VOCs are absorbed onto the GAC beds and entrapped in the vessels. Operation of the SVE and treatment system is conducted in accordance with Permit to Operate No. G6961 A/N 501179 issued by the South Coast Air Quality Management District (SCAQMD).

The GWE wells for hydrocarbon extraction from dissolved-phase subsurface impacts are installed in the northwestern area, central tank farm area, and northeastern boundary area. The GWE systems consists of five vertical extraction wells of which four are 6-inch diameter wells and one is a 4-inch diameter well; and exsitu-treatment system consisting of a surge tank; pump; three bag filter vessels; two MYCELX vessels; three GAC vessels; two ion exchange vessels; discharge flow meter; and level/pump control instrumentation. Operation of the GWE and treatment system is conducted in accordance with a National Pollutant Discharge Elimination System (NPDES) permit (NPDES No. CAG994004, CI No. 7585).

The biosparge wells for hydrocarbon removal from dissolved-phase subsurface impacts are located from areas throughout the tank farm area and eastern boundary area. The biosparging wells are tied into the former total fluids extraction system. Under the optimized remedial system, biosparging is currently offline.

Vacuum-truck free product recovery is conducted on an as-needed basis at wells where measurable product thickness is greater than 1 foot. Wells are gauged bimonthly and vacuum-truck recovery is conducted when necessary. Absorbent socks are installed in wells that have historically contained measureable free product and changed-out as needed.

1.5 SFPP Remediation Systems

SFPP operates remediation systems consisting of SVE, total fluids extraction (TFE), GWE, and treatment of extracted soil vapors and groundwater to address the south-central, southeastern, and western areas both on- and off-site. These areas and SFPP's system is discussed in a separate SAP[5] prepared by CH2MHILL, dated May 30, 2013.

1.6 SAP Objective

The purpose of this revised SAP is to provide a comprehensive groundwater sampling and monitoring plan to evaluate and monitor the dissolved phase hydrocarbon plume(s) at the site. The plan calls for sampling of selected monitoring wells on a semiannual basis. This plan will be reviewed and updated as needed to reflect changing site conditions and to assess which wells, if any, require sampling and/or monitoring during the following year.

Groundwater monitoring and sampling activities are being conducted to:

- Assess groundwater flow conditions and monitor the extent and composition of the fuel hydrocarbon plume(s) in the uppermost groundwater zone as well as changes over time beneath the north-central, north-eastern onsite and offsite, north-west corner, and in the water tank/truck fueling areas of the site;
- Monitor the effectiveness of the remediation systems that are addressing the fuel hydrocarbon constituents in the vadose zone and the uppermost groundwater zone;
- Monitor potential impacts to the Exposition aquifer, which underlies the uppermost groundwater zone; and

[5] CH2MHILL, 2013, *Revised Groundwater Sampling and Analysis Plan, SFPP Norwalk Pump Station, 15306 Norwalk Boulevard, Norwalk, California*, May 30.

- Document findings in semiannual groundwater monitoring reports that are submitted to RWQCB.

These objectives will be accomplished by gauging, sampling, and analyzing groundwater samples from a network of monitoring wells that are located within the DLA Energy conceptual site model (CSM) boundaries. The wells will be monitored on a semiannual basis to account for seasonal and long-term variations in the concentrations of the fuel hydrocarbon constituents in groundwater.

2.0 GROUNDWATER MONITORING PROGRAM

This section discusses DLA Energy's monitoring program and well network for semiannual groundwater monitoring.

2.1 Monitoring Well Network

There are currently approximately 250 groundwater monitoring wells installed on or near the site by DLA Energy and/or SFPP. Wells proposed for inclusion in the monitoring program were selected because they met one of more of the following criteria:

- Provide information on the limits of the dissolved phase plumes to the northwest, north, and northeast areas of the site;
- Provide information on the extent of the LNAPL and dissolved-phase plumes in the north-central, northeastern, northwestern, water tank and truck fueling areas of the site;
- Provide information on the LNAPL and constituents of the dissolved-phase plumes in the DLA Energy's areas of concern;
- Provide information on the potential comingling of the water tank and truck fueling areas with the south-central plume;
- Provide information useful to monitoring remediation system operations; and
- Provide limited information regarding the possible presence of dissolved-phase plumes in deeper aquifers beneath the site.

Existing wells at the site not included in the monitoring program were excluded because the information obtained from those wells would not contribute appreciably to the overall understanding of site groundwater conditions or the effects of DLA Energy's remediation system.

Following review using the above criteria, three Exposition aquifer and 60 uppermost groundwater zone monitoring wells were selected for inclusion in this monitoring plan. Of the 60 uppermost wells, 23 are located in the north-central area, 30 are located in the eastern area (including Holifield Park), and 7 are located in the north-western area. Also, of the 60 uppermost wells to be gauged and sampled, 9 wells will only be gauged semiannually; of which, one is located in the eastern area, 5 in the north-central area, and 3 in the north-western area. It is DLA Energy's understanding that SFPP will continue to monitor, gauge, and sample the western offsite wells WCW-1 through WCW-14; south-central wells GMW-10, HL-3, MW-21 (MID), PZ-2, MW-12;

and truck fueling area wells GMW-1, GMW-3, GMW-4, MW-9, MW-15, GMW-13, and GMW-14 as indicated in their revised groundwater monitoring program and SAP[6]. In addition, DLA Energy and SFPP may elect to sample Exposition aquifer wells EXP-1, EXP-2, and EXP-3 concurrently as split samples to ensure quality control in these key monitoring wells.

The wells selected for DLA Energy's monitoring program for each area are summarized in Table 1. Details of MRP are presented in Table 2. Figure 2 presents a location map for the sitewide monitoring and remediation wells at the site. Wells that are highlighted in blue in Figure 2 will be gauged and sampled by DLA on a semiannual basis; wells that are highlighted in orange will be gauged and sampled annually; wells highlighted in green will be gauged but not sampled semiannually; and wells highlighted in yellow are the Exposition aquifer wells to be sampled semiannually by both DLA Energy and SFPP. Construction details for all sitewide wells are included in Appendix A. Additional wells not included in this monitoring plan may be gauged periodically in order to optimize the operation of DLA Energy's remediation systems.

2.2 Monitoring Objectives

The objectives of the groundwater monitoring program and well network are as follows, consistent with the requirements stated in the RWQCB's letter dated December 20, 2012:

- Monitor the nature and extent of past releases, including the plume behavior over time.

  The wells located within the plume and at the plume edge will be used to track the nature and extent of the past releases, including the plume behavior over time. The location of wells and density of the well network in these areas are sufficient to assess the behavior of the plume throughout each of the areas of concern (northwest, north-central, northeast, and water tank/truck fueling area).

- Monitor the effectiveness of the existing remediation system.

  The monitoring well network will be used to monitor the effectiveness of the existing remediation system; verify that the plume is contained; monitor the presence and thickness of LNAPL; and assess whether the concentrations are stable, decreasing, or increasing. The location of the wells and density of the well network are sufficient to assess the effectiveness of the remediation system throughout each plume area.

---

[6] CH2MHILL, 2013.

- Monitor for potential new releases.

  There are no active DLA Energy fuel storage or transfer systems and there are no activities that would cause potential new releases. However, the results from the semiannual monitoring will be assessed to ensure that they do not show any signs of new sources.

The monitoring well program summarized in Table 2 and the well network shown on Figure 2 meet these objectives. The wells are located either upgradient, within one of the hydrocarbon plumes, at the edge of the plumes, cross-gradient of the plumes, or downgradient of the plumes as listed in Table 1 and summarized in Table 2.

3.0 SAMPLING METHODS AND LABORATORY PROCEDURES

The following procedures will be followed during groundwater level measurements, LNAPL measurements, and collection of groundwater samples for laboratory chemical analysis from the groundwater monitoring wells.

3.1 Health and Safety

All field work conducted as part of this monitoring and SAP will be conducted in accordance with applicable health and safety regulations. All contractors selected to perform field activities will be required to prepare, and operate in accordance with, a health and safety plan describing methods and equipment to be used to ensure that adequate health and safety protection is provided for field personnel.

3.2 Groundwater and LNAPL Measurement

Prior to commencement of purging and sampling activities, measurements will be taken at all DLA Energy monitoring wells in the MRP using an electronic water level meter or an electronic oil-water interface probe. Wells with historically low concentrations or with no detectable hydrocarbon constituents will be measured using an electronic water level meter. Wells with higher concentrations of hydrocarbon constituents and with historical presence of LNAPL will be measured using an interface probe. Field measurements will be referenced to the top of casing at each wellhead and measured to the nearest 0.01 foot. Depth to water and LNAPL will be measured and recorded in the field logbook or field data sheets.

If pressure is suspected or has developed inside the well casing prior to water level measurements, the well will be allowed to stand without a cap to allow water levels to stabilize under atmospheric conditions before taking the water level measurement.

3.3 Low-Flow Purging Procedures

Purging and sampling will be conducted using low-flow methods, consistent with United States Environmental Protection Agency (EPA) guidance in "Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures"[7]. Low-flow purging and sampling requires the use of a down-hole pump (bladder pump or electric), a flow-through cell, a calibrated cylinder or measuring cup to monitor flow rates, and water-quality parameter calibration liquids. An electronic submersible pump or positive displacement bladder pump will be placed at or near the midpoint of the saturated

[7] USEPA, 1996. "Low-Flow (Minimal Drawdown) Ground-water Sampling Procedures." *Ground Water Issue*. Prepared by Robert W. Puls and Michael J. Barcelona. EPA/540/S-95/504. April.

well screen. The well will be pumped at a flow rate to maintain minimal drawdown of the water level during pumping; it is estimated that the flow rate will be approximately 0.1 to 0.5 liter per minute. The water levels in the well will be monitored during pumping to monitor the drawdown during purging. The purging equipment will be decontaminated before and after well purging at each well.

During purging, the groundwater will be monitored for conductivity, pH, temperature, turbidity, oxidation-reduction potential (ORP), and dissolved oxygen. Accurate measurement of the field parameters will require a flow-through cell to ensure that the purge water is continuously monitored. Each well will be pumped until the measured field parameters have stabilized within 10 percent over three successive readings prior to collecting samples. The water level and water quality parameter measurements will be recorded on the well monitoring field forms, along with the primary and/or duplicate sample identification number, depth to groundwater, and volume of water removed from the well.

Field instruments used to measure groundwater parameters will be calibrated before purging begins at the site to ensure the acquisition of accurate field data. Calibration methodology for each instrument will be consistent with the manufactures' recommended calibration procedures. Water level meters and interface probes will be checked prior to each use to ensure that measurements made with the probes are accurate. The pH meter and YSI will be calibrated at the beginning of each sampling event and at least once during each sampling day and whenever appropriate in accordance with the equipment manufacturer's specifications. Calibration results will be recorded on a field Calibration Log.

3.4 Groundwater Sample Collection and Analysis

Groundwater samples will be collected from all selected wells in the MRP which do not contain a measured thickness of LNAPL and from which purged water does not exhibit a hydrocarbon sheen. Wells with a measured LNAPL layer or noticeable hydrocarbon sheen on purge water will not be sampled. The down-well instruments used in the wells will be cleaned with a non-detergent cleaner, then rinsed successively with tap water and distilled water before and after each use. Sampling will be performed using low-flow procedures. Wells shall be sampled in a progression from the least contaminated to the most contaminated based on the most recent groundwater monitoring event results.

Immediately after purging activities are complete, a groundwater sample will be collected. The flow-through cell will be disconnected from the pump, and water samples will be collected directly from the discharge line. Upon their collection, water samples will be labeled, recorded on a chain-of-custody document, and placed in a cooler for cold storage pending delivery to a State-certified laboratory for analysis.

Samples to be analyzed for VOCs and TPH will be collected in five 40-milliliter glass volatile organic analysis (VOA) vials. The vials will be filled so that no headspace is present after sample collection. Field containers will be checked by inverting the vial and tapping to reveal any air bubbles. If air bubbles are present, containers will be emptied, re-acidified, and refilled. If, after several attempts at sample collection, air bubbles remain, the sample will be described in the field notebook as an "aerated sample."

All groundwater samples will be cooled to 4 degrees Celsius and stored away from sunlight prior to shipping by immediately placing the full sample bottle into an iced cooler.

3.4.1 Sample Labeling

Sample containers will be labeled with self-adhesive tags having the following information written in waterproof ink: project name and number, sample number, date and time of sample collection, and initials of sample collector.

3.4.2 Sample Containers and Preservation

Sample containers with the proper preservatives will be supplied by the laboratory. Samples will be preserved in accordance with EPA requirements of the laboratory methods. Samples sealed in glass containers will be bubble-wrapped and placed in individual zip-close-style bags labeled with the sample number. Samples will be packed inside the ice cooler with sufficient cushioning material to prevent glass containers from breaking. Ice, double-sealed in resealable plastic bags, will be added to the cooler. A chain-of-custody form will be completed, sealed in a zip-close-style bag, and taped to the inside of the cooler lid. The cooler will be taped shut and chain-of-custody seals will be taped across the cooler lid. The samples then will be delivered to an analytical laboratory certified by the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP).

3.4.3 Laboratory Analysis

Groundwater samples will be submitted to an ELAP-approved laboratory for the following analysis:

- TPH using EPA Method 8015 modified following both the purge and trap preparation technique, and the extraction sample preparation technique; and
- VOCs including fuel oxygenates (TBA, MTBE, di-isopropyl ether [DIPE], ethyl tertiary butyl ether [ETBE], and tertiary amyl methyl ether [TAME]) using EPA Method 8260B.

Results for TPH analysis will be quantified and reported against a commercial gasoline standard and is abbreviated as TPHg or diesel standard as TPHd.

3.5 Equipment Decontamination Procedures

All sampling and monitoring equipment will be decontaminated prior to sampling each well. The down-hole pump, interface probe and electronic water-level meter will be washed with a non-phosphate-containing detergent rinsed in tap water followed by deionized (DI) water. The water level meter will be wiped down with disposable paper towels, rinsing probe with a solution of laboratory-grade detergent and potable water, rinsing with potable water followed by rinsing with DI water, and drying with a clean paper towel or air drying. All water quality meters will be cleaned by rinsing the probe portions in DI water and allowing to air-dry. The flow-through cell will be double rinsed, first in tap water followed by DI water. Purge pumps will be decontaminated using a laboratory-grade detergent wash followed by potable and DI water rinses.

3.6 Investigative Derived Waste

Spent personal protective equipment (PPE), purged groundwater, decontaminated rinsate water, and other wastes derived from activities will be collected and staged near DLA Energy's remediation pad in the north-central area. PPE will be stored in 55-gallon Department of Transportation (DOT)-approved drums, sealed and labeled as non-hazardous waste. Purge and rinsate water generated during monitoring events will be treated on-site in the remediation systems operated by the DLA Energy located in the northern part of the site to be discharged under the NPDES permit.

3.7 Quality Assurance/Quality Control

A field quality control (QC) program will be implemented to help maintain the required level of confidence in the field data and to provide cross-checks on the laboratory performing the analysis. QC samples collected in the field during this project will include trip blanks, equipment blanks, and duplicate samples. The purpose of a trip blank is to evaluate potential cross contamination during storage and transportation of samples in the cooler. At least one trip blank will be included with each sample shipment container (ice chest). A trip blank consists of laboratory-supplied 40-ml VOA vials filled by the laboratory with the de-ionized water. Trip blank will included in each cooler used to store water samples for VOC analysis. The purpose of the equipment blank is to evaluate equipment decontamination procedures. An equipment blank will be collected from the sample pump after initial decontamination each day of field activities. Upon completion of pump decontamination efforts, the pump will be placed in an appropriately sized container containing de-ionized water. The water will be collected in three 40-ml VOAs and analyzed using the same methods as the primary sample. Field duplicate samples will be collected to evaluate the precision of analytical procedures. Field duplicate samples will be collected at a frequency of 10 percent, following collection of primary water samples, in similar sample containers. Field duplicate samples will be analyzed using the same method as the primary sample.

QC samples and identification will consist of the following:

Sample Origination	Sample Identification	Remarks
Primary water sample (Well)	Well ID	---
Duplicate water sample	Well ID - "Dup"	One duplicate for every 10 primary samples
Equipment Blank	ED-mm/dd/yy	Pump (not including flow-through cell) and DI water. One per day.
Trip Blank	TB-mm/dd/yy	One sample per cooler containing VOC samples

Laboratory quality assurance (QA)/QC will consist of matrix and matrix spike duplicates, percent recoveries, spiking concentrations, method blanks, and calibration check standards.

3.8 Field Documentation

Water quality parameters will be recorded on well monitoring field forms, along with the primary or duplicate sample identification name/number, date and time sampled, name of sample collector, well designation, well diameter, purging and sampling methods, total well depth, depth to groundwater, depth from which sample was obtained, results of instrument calibration, volume of water removed from each well, sample matrix, analysis requested, sample container preservative, and project name and number.

The condition of each well and well vault will be documented on a wellhead inspection form for each sampling event. The inspection form will include comments on the following elements:

- Well aboveground or flush-mount completion
- Visibility of well or well vault
- Well identification tag present or not present
- Physical damage to well, well vault, and cover
- Well pad condition (cracked or broken, etc.)
- Concrete or steel bollards present or not present
- Functioning lock present or not present
- Watertight cap present or not present
- Well vault condition (dry or free of debris)
- Measured depth of well
- Corrective actions completed in field
- Recommended corrective actions

After samples have been collected and labeled, they will be maintained under chain-of-custody procedures. These procedures document the transfer of custody of samples from the field to a designated laboratory. Each sample will be entered on the chain-of-custody form after it is collected and labeled. Information contained on the chain-of-custody form will include the following:

- Name of sampler
- Date and time sampled
- Sample identification
- Number of sample bottles
- Sample matrix
- Analysis requested
- Remarks, including any preservatives, special conditions, or specific quality control measures
- Turnaround time and person to receive laboratory report
- Project name and number
- Signature of all people assuming custody
- Signature of field sampler at top of chain-of-custody
- Condition of samples when received by laboratory.

Blank spaces on the chain-of-custody will be crossed out between last sample number listed and signatures at the bottom of the sheet. A representative of the laboratory will pick up the samples in the field or will be dropped off at the laboratory. Strict chain-of-custody procedures will be followed during sample transfer.

3.9 Data Quality

Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. Definitions of these terms, the applicable procedures, and level of effort are described below. The applicable QC procedure, quantitative target limits, and level of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical methods. The following is a description of the data quality assessment criteria.

Representativeness is a measure of how closely the results reflect the actual concentration or distribution of the analysis in the matrix samples. Sampling plan design, sampling techniques, and sample handling protocols have been developed. The proposed documentation will establish that protocols have been followed and sample identification and integrity assured. Equipment rinsate blanks and field duplicate samples will be used to assess field and transport contamination and method variation. To assess laboratory contamination, laboratory method blanks will be run at a minimum frequency of 5 percent of the samples.

Comparability expresses the confidence with which one data set can be compared to another. Data comparability will be maintained using standard procedures where available and the use of consistent methods and consistent units. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

Accuracy is an assessment of the closeness of the measured value to the true value. For samples, accuracy of analytical test results is assessed by spiking samples with known standards and establishing the average recovery. For a matrix spike, known amounts of a standard compound identical to the compounds being measured are added to the sample. Target accuracy goals for the analytical methods proposed, expressed as percent recovery of spiked sample, are 75 to 125 percent. Percent recoveries outside these goals will be qualified as appropriate.

Precision of the data is a measure of the data spread when more than one measurement has been taken on the same sample. Precision can be expressed as the relative percent difference. The target precision goal for the analytical methods proposed, expressed as relative percent difference between duplicate samples, is ±25 percent. A relative percent difference outside this goal will be qualified as appropriate.

4.0 REPORTING AND SCHEDULE

Semiannual reports will be prepared that document the results and findings from each semiannual sampling event. Groundwater monitoring and sampling results for the second quarter conducted in April and fourth quarter conducted in October will be presented in semiannual monitoring reports submitted to the RWQCB. A joint report presenting sample data collected by DLA Energy and SFPP will be prepared after each semiannual event. For the first semiannual period, the report will be prepared by SFPP and is due on August 15th and for the second semiannual period, the report will be prepared by DLA Energy and is due on February 15th. The report content will consist of the following:

- Description of field and laboratory methods;
- Tables of current and historical groundwater level and quality data;
- Groundwater contour maps and interpreted direction of groundwater flow for the uppermost groundwater zone and Exposition aquifer;
- Figures of the site base map showing the estimated extent of LNAPL and dissolved-phase plumes based on the current sampling round analytical results (specifically for TPH, benzene, MTBE, TBA, and 1,2-DCA);
- Brief discussions of groundwater elevations, gradients, water quality analytical results, and a comparison to the previous semiannual event;
- Discussion of groundwater quality data, dissolved-plume containment, and effectiveness of the remedial measures;
- Recommendation for next steps in areas with increases in groundwater contamination and expansion of dissolved plumes;
- Time series charts for select monitoring wells presented in an appendix; and
- Field sampling forms, laboratory analytical reports, and chain-of-custody documentation will be submitted as appendices to the report, which will be provided electronically on compact disk rather than hardcopy form.

This report will be prepared under the supervision of a California Registered Geologist or Professional Engineer and will be submitted to the RWQCB.

TABLES

Table 1
Well Location Summary
Defense Fuel Support Point Norwalk, Norwalk California

Area	Upgradient	Plume Center	Plume Edge	Cross-Gradient	Downgradient
Exposition Aquifer	EXP-2				EXP-1, EXP-3
Eastern Area (Holifield Park)	GMW-63, GMW-64	GMW-62		GMW-65	
Eastern Area (Onsite)	MW-17	GMW-48, GMW-58, GMW-59, GMW-60, GMW-61, GW-15	GMW-47, GMW-57		GMW-66, GW-16, MW-13
North-Central/ Northeastern Area		GMW-35, GW-14, TF-17, TF-20, TF-21, TF-23			GMW-45, GMW-56
North-Central/ Southeastern Area	MW-16	TF-18	GMW-32, GMW-33, TF-19, GMW-12	MW-29	
North - Central Area	GMW-20, GMW-40, GMW-41, GMW-54	GMW-7, GMW-17, GMW-18, GMW-21, GMW-31, GMW-42, GMW-43, GMW-44, GW-7, GW-8, MW-28, PZ-3, TF-8, TF-9, TF-15, TF-16			GMW-5, GMW-6, GMW-15, GMW-16, GMW-19, GW-5, GW-6, TF-24
North-Central/ Western Area (Onsite)					GW-1, GW-2, GW-3, GW-4, GW-13, MW-14, MW-22 MID, MW-24, MW-25, MW-26, MW-27

Table 2

DLA Energy Groundwater Monitoring and Reporting Program

Defense Fuel Support Point Norwalk, Norwalk California

Area	Well Position[1]	Well ID	Location	Well Position[2]	Zone Monitored	Well Use	Monitoring Plan Gauge	Monitoring Plan Sample	Monitor By
Exposition Aquifer	Downgradient	EXP-1	North-central	Downgradient	Exposition	Monitoring	Semiannual	Semiannual	SFPP/DLA
		EXP-3	Southeastern	Downgradient	Exposition	Monitoring	Semiannual	Semiannual	SFPP/DLA
	Upgradient	EXP-2	Western	Upgradient	Exposition	Monitoring	Semiannual	Semiannual	SFPP/DLA
Eastern Area (Holifield Park)	Cross-gradient	GMW-65	Eastern (Holifield Park)	Cross-gradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Plume Center	GMW-62	Eastern (Holifield Park)	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Upgradient	GMW-63	Eastern (Holifield Park)	Upgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-64	Eastern (Holifield Park)	Upgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
Eastern Area (Onsite)	Downgradient	GMW-66	Eastern	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GW-16	Eastern	Downgradient	Uppermost	Remediation	Semiannual	Semiannual	DLA
		MW-13	Eastern	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Plume Center	GMW-48	Eastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-58	Eastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-59	Eastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-60	Eastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-61	Eastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GW-15	Eastern	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
	Plume Edge	GMW-47	Eastern	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-57	Eastern	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Upgradient	MW-17	Eastern	Upgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
North-Central/ Northeastern Area	Downgradient	GMW-45	Northeastern	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-56	Northeastern	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Plume Center	GMW-35	Northeastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GW-14	Northeastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		TF-17	Northeastern	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
		TF-20	Northeastern	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
		TF-21	Northeastern	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
		TF-23	Northeastern	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
North-Central/ Southeastern Area	Cross-gradient	MW-29	Southeastern	Cross-gradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Plume Center	TF-18	Southeastern	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Plume Edge	GMW-32	Southeastern	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-33	Southeastern	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		TF-19	Southeastern	Plume Edge	Uppermost	Remediation	Semiannual	---	DLA
		GMW-12	South-central	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Upgradient	MW-16	Southeastern	Upgradient	Uppermost	Monitoring	Semiannual	Annual	DLA

Table 2
DLA Energy Groundwater Monitoring and Reporting Program
Defense Fuel Support Point Norwalk, Norwalk California

Area	Well Position[1]	Well ID	Location	Well Position[2]	Zone Monitored	Well Use	Monitoring Plan Gauge	Monitoring Plan Sample	Monitor By
North - Central Area	Downgradient	GMW-5	North - Central	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-6	North - Central	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GW-5	North - Central	Downgradient	Uppermost	Monitoring	Semiannual	---	DLA
		GW-6	North - Central	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		TF-24	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-15	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-16	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-19	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
	Plume Center	GMW-17	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-18	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-21	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-31	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-42	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-43	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-44	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-7	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GW-7	North - Central	Plume Center	Uppermost	Remediation	Semiannual	---	DLA
		GW-8	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		MW-28	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	---	DLA
		PZ-3	North - Central	Plume Center	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		TF-15	North - Central	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
		TF-16	North - Central	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
		TF-8	North - Central	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
		TF-9	North - Central	Plume Center	Uppermost	Remediation	Semiannual	Semiannual	DLA
	Upgradient	GMW-20	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	---	DLA
		GMW-41	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-40	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GMW-54	North - Central	Plume Edge	Uppermost	Monitoring	Semiannual	---	DLA
North-Central/ Western Area (Onsite)	Downgradient	GW-1	Western	Downgradient	Uppermost	Monitoring	Semiannual	---	DLA
		GW-13	Western	Downgradient	Uppermost	Remediation	Semiannual	Semiannual	DLA
		GW-2	Western	Downgradient	Uppermost	Remediation	Semiannual	Semiannual	DLA
		GW-3	Western	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		GW-4	Western	Downgradient	Uppermost	Remediation	Semiannual	---	DLA
		MW-14	Western	Downgradient	Uppermost	Monitoring	Semiannual	---	DLA
		MW-22 MID	Western	Downgradient	Uppermost (deep)	Monitoring	Semiannual	Semiannual	DLA
		MW-24	Western	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		MW-26	Western	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
		MW-27	Western	Downgradient	Uppermost	Monitoring	Semiannual	Semiannual	DLA
							72	63	

Notes:
[1] Well position in relation to the interpreted TPH plume
[2] Secondary well position associated with individual plume

Abbreviations
DLA = Defense Logistics Agency Energy
SFPP = Santa Fe Pacific Pipelines, L.P.

FIGURES

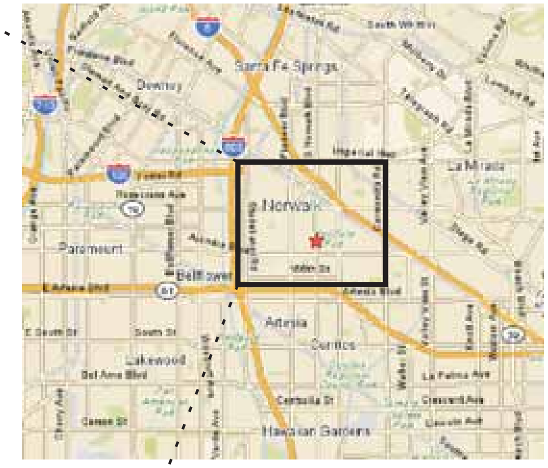

Figure 1

SITE LOCATION MAP

DFSP NORWALK
15306 Norwalk Blvd.
Norwalk, California

PARSONS

Pasadena, California

k:\depts\dept48\desc\norwalk\Sumeet\Figure 1 Site Location Map.cdr


EXCELSIOR DRIVE
HIGHDALE ST
FERINA ST
HOPLAND ST
MOLETTE ST
BARNWALL ST
CHESHIRE STREET
GRAYLAND AVE
IBEX AVE
NORWALK BLVD
HORST AVE
THORNLAKE AVE.
BELSHIRE AVE
MADRIS AVE
CLARETTA AVE
CAMEO AVE
SEAFORTH AVE
Holifield Park
TANK 80001
TANK 80002
TANK 80004
TANK 80005
TANK 80006
TANK 80007
TANK 80008
TANK 80009
TANK 80013
TANK 55003
TANK 55004
TANK 80017
OIL-WATER SEPARATOR
ADMINISTRATION BUILDING
LABORATORY BUILDING
LEGEND
MW-16 Uppermost monitoring well sampled annually by DLA Energy
MW-17 Uppermost monitoring well sampled semiannually by DLA Energy
TF-19 Uppermost monitoring well gauged semiannually by DLA Energy
EXP-1 Exposition aquifer monitoring well sampled semiannually by DLA Energy/split sample by SFPP
N
0 60 120 240 Feet
Scale
FIGURE 2
Groundwater Monitoring Well Location Map
DFSP Norwalk
Norwalk, CA
PARSONS
Pasadena, California

APPENDIX A
Sitewide Monitoring Well Construction Summary

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
BW-1	05/16/96	GMX[3]	55	5	31.9 - 51.4	0.01	73.17
BW-2	05/20/96	GMX	53.5	5	27 - 46.5	0.01	73.57
BW-3	05/17/96	GMX	55.5	5	30.6 - 50	0.01	74.16
BW-4	05/20/96	GMX	53.1	5	28.2 - 47	0.01	74.61
BW-5	05/23/96	GMX	52.5	5	27 - 45.5	0.01	73.59
BW-6	05/22/96	GMX	52.4	5	27.6 - 46.9	0.01	73.48
BW-7	05/22/96	GMX	52	5	27.1 - 46.3	0.01	74.65
BW-8	05/21/96	GMX	51.5	5	27 - 46.4	0.01	75.08
BW-9	05/21/96	GMX	52.5	5	26.9 - 46.4	0.01	76.19
EXP-1	03/06/92	WC[4]	128.5	4	82 - 122	0.01	78.44
EXP-2	10/15/92	WC	149	4	90 - 120	0.02	79.43
EXP-3	10/20/92	WC	150	4	85 - 115	0.01	77.58
EXP-4	07/07/98	GMX	118	4	96.1 - 115.2	0.02	79.81
EXP-5	07/08/98	GMX	120	4	94.4 - 113.4	0.02	72.41
GMW-1	05/16/91	GTI[5]	50	4	20 - 50	0.01	74.77
GMW-2	05/16/91	GTI	50	4	20 - 50	0.01	73.57
GMW-3	05/17/91	GTI	50	4	20 - 50	0.01	75.10
GMW-4	05/21/91	GTI	50	4	20 - 50	0.01	75.45
GMW-5	05/21/91	GTI	50	4	20 - 50	0.01	77.61
GMW-6	07/09/91	GTI	50	4	25 - 50	0.01	77.31
GMW-7	07/09/91	GTI	50	4	25 - 50	0.01	75.84
GMW-8	07/10/91	GTI	50	4	25 - 50	0.01	73.20
GMW-9	07/08/91	GTI	50	4	20 - 50	0.01	77.16
GMW-10	07/08/91	GTI	50	4	25 - 50	0.01	74.67
GMW-11	07/09/91	GTI	50	4	20 - 50	0.01	72.90
GMW-12	07/09/91	GTI	50	4	25 - 50	0.01	75.21
GMW-13	07/08/91	GTI	50	4	25 - 50	0.01	74.17
GMW-14	07/10/91	GTI	50	4	25 - 50	0.01	74.72
GMW-15	07/30/91	GTI	50	4	25 - 50	0.01	76.21
GMW-16	08/01/91	GTI	50	4	25 - 50	0.01	77.00
GMW-17	08/01/91	GTI	50	4	25 - 50	0.01	74.66
GMW-18	07/31/91	GTI	50	4	25 - 50	0.01	75.36
GMW-19	07/31/91	GTI	50	4	25 - 50	0.01	76.83
GMW-20	08/01/91	GTI	50	4	25 - 50	0.01	75.10
GMW-21[6]	08/02/91	GTI	50	4	25 - 50	0.01	76.23
GMW-22	08/02/91	GTI	61	4	25 - 60	0.01	77.24
GMW-23	08/02/91	GTI	60	4	25 - 60	0.01	74.85
GMW-24	08/05/91	GTI	60	4	25 - 60	0.01	77.48
GMW-25	01/10/92	GTI	50	6	20 - 50	0.01	78.14
GMW-26	01/07/92	GTI	51.5	4	20 - 50	0.01	74.52
GMW-27	01/10/92	GTI	50	4	20 - 50	0.01	74.41

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
GMW-28	01/07/92	GTI	50	4	20 - 50	0.01	74.68
GMW-29	01/09/92	GTI	50	4	20 - 50	0.01	77.57
GMW-30	01/09/92	GTI	51.5	6	20 - 50	0.01	74.91
GMW-31	06/02/93	GTI	65	4	25 - 65	0.01	76.50
GMW-32	06/01/93	GTI	50	4	20 - 50	0.02	74.62
GMW-33	06/01/93	GTI	50	4	20 - 50	0.02	74.88
GMW-34	06/03/93	GTI	50	4	20 - 50	0.02	75.25
GMW-35	06/04/93	GTI	50	4	20 - 50	0.02	76.12
GMW-36	04/11/94	GTI	50	4	20 - 50	0.01	76.66
GMW-37	04/11/94	GTI	50	4	20 - 50	0.01	77.32
GMW-38	04/12/94	GTI	50	4	20 - 50	0.01	75.47
GMW-39	0'4/12/94	GTI	50	4	20 - 50	0.01	75.05
GMW-40	06/29/94	GTI	50.5	4	20 - 50	0.01	73.13
GMW-41	06/30/94	GTI	50.5	4	20 - 50	0.01	74.46
GMW-42	06/30/94	GTI	50.5	4	20 - 50	0.01	75.50
GMW-43	07/01/94	GTI	50.5	4	20 - 50	0.01	74.44
GMW-44	07/01/94	GTI	50.5	4	20 - 50	0.01	74.45
GMW-45	07/01/94	GTI	50.5	4	20 - 50	0.01	75.67
GMW-46	07/05/94	GTI	50.5	4	20 - 50	0.01	76.10
GMW-47	07/05/94	GTI	50.5	4	20 - 50	0.01	75.98
GMW-48	07/05/94	GTI	50.5	4	20 - 50	0.01	75.03
GMW-49	07/06/94	GTI	50.5	4	20 - 50	0.01	74.75
GMW-50	12/19/94	GTI	46.5	4	15 - 45	0.01	75.51
GMW-51	12/19/94	GTI	41.5	4	15 - 40	0.01	75.93
GMW-52	12/19/94	GTI	41.5	4	15 - 40	0.01	75.03
GMW-53	12/19/94	GTI	46.5	4	15 - 45	0.01	74.90
GMW-54	12/20/94	GTI	46.5	4	15 - 45	0.01	75.16
GMW-55	12/20/94	GTI	41.5	4	15 - 40	0.01	74.60
GMW-56	08/12/98	FDGTI[7]	55	2	20 - 55	0.02	76.50
GMW-56	08/12/98	FDGTI	55	4	20 - 55	0.02	76.52
GMW-57	08/13/98	FDGTI	55	2	19 - 54	0.02	76.66
GMW-57	08/13/98	FDGTI	55	4	19 - 54	0.02	76.66
GMW-58	08/14/98	FDGTI	55	2	20 - 55	0.02	75.46
GMW-58	08/14/98	FDGTI	55	4	20 - 55	0.02	75.48
GMW-59	08/14/98	FDGTI	55	2	20 - 55	0.02	75.28
GMW-59	08/14/98	FDGTI	55	4	20 - 55	0.02	75.28
GMW-60	04/14/04	Parsons	50	4	25 - 40	0.01	76.24
GMW-61	04/14/04	Parsons	50	4	30 - 40	0.01	75.60
GMW-62	07/02/07	Parsons	40.5	4	20 - 40	0.01	76.34
GMW-63	09/29/08	Parsons	41	4	20 - 40	0.02	77.32
GMW-64	09/29/08	Parsons	41	4	19.5 - 39.5	0.02	75.84

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
GMW-65	07/06/09	Parsons	41.5	4	21 - 41	0.02	76.78
GMW-66	09/08/09	Parsons	40.5	4	20 - 40	0.02	77.00
GMW-O-1	03/04/92	GTI	51.5	4	19 - 49.5	0.01	71.45
GMW-O-2	03/02/92	GTI	51.5	4	20 - 50	0.01	72.54
GMW-O-3	03/02/92	GTI	51.5	4	20 - 50	0.01	72.19
GMW-O-4	03/03/92	GTI	51.5	4	20 - 50	0.01	71.95
GMW-O-4 (MID)	03/03/92	GTI	66.5	4	54.5 - 64.5	0.01	72.24
GMW-O-5	03/04/92	GTI	51.5	4	20 - 50	0.01	72.36
GMW-O-6	05/18/92	GTI	51.5	4	20 - 50	0.01	71.41
GMW-O-7	05/19/92	GTI	51.5	4	20 - 50	0.01	70.98
GMW-O-8	05/18/92	GTI	51	4	19.5 - 49.5	0.01	70.91
GMW-O-9	07/29/92	GTI	51.5	4	20 - 50	0.01	73.50
GMW-O-10	07/29/92	GTI	51.5	4	20 - 50	0.01	73.98
GMW-O-11	05/20/92	GTI	51.5	4	20 - 50	0.01	74.17
GMW-O-12	05/21/92	GTI	51.5	4	20 - 50	0.01	73.49
GMW-O-14	05/20/92	GTI	51.5	4	20 - 50	0.01	74.08
GMW-O-15	04/19/94	GTI	50	4	20 - 50	0.02	74.23
GMW-O-16	04/19/94	GTI	50	4	20 - 50	0.02	74.10
GMW-O-17	07/26/94	GMX	41	4	20.4 - 39.5	0.01	73.78
GMW-O-18	07/25/94	GMX	41	4	20.8 - 40.4	0.01	74.36
GMW-O-19	07/29/94	GMX	41.5	4	20.2 - 39.9	0.01	74.46
GMW-O-20	06/15/95	GMX	45.9	4	---[8]	---	73.32
GMW-O-21	06/19/97	GMX	45.9	4	25.5 - 45.5	0.01	71.43
GMW-O-22	---	GMX	41	4	---	---	74.36
GMW-O-23	06/25/07	GMX	44	4	20 - 40	0.02	73.63
GMW-O-24	09/24/12	CH2MHill	45	4	20 - 40	0.01	74.39
GMW-SF-7	07/27/94	GMX	41	4	20.1 - 39.9	0.01	75.26
GMW-SF-8	07/28/94	GMX	41	4	19.5 - 39.5	0.01	76.75
GMW-SF-9	04/01/03	GMX	47	4	36.6 - 46.2	0.02	73.05
GMW-SF-10	04/02/03	GMX	47	4	36.7 – 46.4	0.02	75.77
GW-1	06/12/95	GTI	63	1	25 - 60	0.02	75.46
GW-1	06/12/95	GTI	63	4	25 - 60	0.02	75.97
GW-2	06/12/95	GTI	63	1	25 - 60	0.02	76.39
GW-2	06/12/95	GTI	63	4	25 - 60	0.02	75.78
GW-3	06/13/95	GTI	63	1	25 - 60	0.02	76.56
GW-3	06/13/95	GTI	63	4	25 - 60	0.02	75.79
GW-4	06/13/95	GTI	63	1	24 - 59	0.02	74.77
GW-4	06/13/95	GTI	63	4	24 - 59	0.02	73.86
GW-5	06/15/95	GTI	63	1	25.5 - 60.5	0.02	77.09
GW-5	06/15/95	GTI	63	4	25.5 - 60.5	0.02	76.99
GW-6	06/15/95	GTI	63	1	25 - 60	0.02	77.41

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
GW-6	06/15/95	GTI	63	4	25 - 60	0.02	76.38
GW-7	06/16/95	GTI	63	1	25 - 60	0.02	76.76
GW-7	06/16/95	GTI	63	4	25 - 60	0.02	75.02
GW-8	06/14/95	GTI	63	1	24 - 59	0.02	76.88
GW-8	06/14/95	GTI	63	4	24 - 59	0.02	76.15
GW-13	04/26/07	Parsons	65	1	25 - 65	0.02	77.00
GW-13	04/26/07	Parsons	67	6	25 - 65	0.02	76.85
GW-14	04/26/07	Parsons	65	1	25 - 65	0.02	76.55
GW-14	04/26/07	Parsons	67	6	25 - 65	0.02	76.54
GW-15	04/26/07	Parsons	62.5	1	20.5 - 60.5	0.02	75.36
GW-15	04/26/07	Parsons	60.5	6	20.5 - 60.6	0.02	74.94
GW-16p	07/07/09	Parsons	61.3	1	21 - 61	0.02	76.55
GW-16	07/07/09	Parsons	63	6	20.5 - 60.5	0.02	76.33
GWR-1	07/11/91	GTI	50	4	25 - 50	0.01	77.40
GWR-2	07/12/91	GTI	50	4	25 - 50	0.01	73.66
GWR-3	01/10/92	GTI	50	6	20 - 50	0.01	77.60
HL-1	10/14/86	HLA[9]	39	4	18 - 38	0.01	75.83
HL-2	10/13/86	HLA	39	4	16.5 - 36.5	0.01	76.94
HL-3	10/15/86	HLA	44	4	19 - 39	0.01	76.86
HL-4	10/16/86	HLA	39	4	18 - 38.5	0.01	75.75
HL-5	10/16/86	HLA	39.5	4	18.5 - 39	0.01	76.13
MW-6	08/09/90	WC	50	4	18 - 48	0.01	77.20
MW-7	08/27/90	WC	50	4	19 - 48	0.01	78.13
MW-8	08/24/90	WC	51	4	18 - 48	0.01	76.06
MW-9	08/08/90	WC	50	4	18 - 48	0.01	77.11
MW-10	08/24/90	WC	51	4	18 - 48	0.01	79.12
MW-11	08/09/90	WC	50	4	18 - 48	0.01	78.17
MW-12	08/27/90	WC	50	4	18 - 48	0.01	75.76
MW-13	08/23/90	WC	50	4	18 - 48	0.01	78.25
MW-14	08/07/90	WC	50	4	18 - 48	0.01	78.60
MW-15	08/07/90	WC	50	4	18 - 48	0.01	76.99
MW-16	08/08/90	WC	50	4	18 - 48	0.01	76.87
MW-17	08/06/90	WC	50	4	18 - 48	0.01	77.86
MW-18 (MID)	06/10/91	WC	62.2	4	50 - 60	0.01	75.67
MW-19 (MID)	06/11/91	WC	62.2	4	49.5 - 59.5	0.01	78.14
MW-20 (MID)	06/12/91	WC	65.7	4	43 - 53	0.01	77.19
MW-21 (MID)	06/12/91	WC	62.4	4	47 - 57	0.01	77.55
MW-22 (MID)	06/13/91	WC	57.9	4	42 - 52	0.01	79.57
MW-23 (MID)	06/14/91	WC	57.1	4	42 - 52	0.01	79.59
MW-24	06/14/91	WC	47	4	14 - 44	0.01	78.51
MW-25	06/17/91	WC	47.2	4	22.5 - 42.5	0.01	79.15

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
MW-26	06/17/91	WC	47.3	4	23.5 - 43.5	0.01	77.40
MW-27	06/17/91	WC	52.3	4	18 - 48	0.01	78.46
MW-28	6/19/91	WC	51.5	4	16.5 - 46.5	0.01	78.53
MW-29	06/19/91	WC	52.4	4	17.5 - 47.5	0.01	79.13
MW-O-1	01/22/91	GMX	40	2	25 - 40	0.02	75.48
MW-O-2	01/23/91	GMX	40	2	25 - 40	0.02	71.90
MW-O-3	10/25/91	GMX	41	6	20.5 - 41	0.01	74.53
MW-O-4	10/25/91	GMX	41	4	20.5 - 41	0.01	75.00
MW-SF-1	06/18/90	GMX	40	4	25 - 40	0.02	78.93
MW-SF-2	06/18/90	GMX	40	4	25 - 40	0.02	78.53
MW-SF-3	06/18/90	GMX	40	4	25 - 40	0.02	78.12
MW-SF-4	06/19/90	GMX	40	4	25 - 40	0.02	79.38
MW-SF-5	09/19/90	GMX	40	4	23 - 38	0.02	79.74
MW-SF-6	09/19/90	GMX	40	4	24 - 39	0.02	76.80
MW-SF-9	06/15/95	GMX	40	4	---	---	74.10
MW-SF-10	09/23/03	GMX	30.5	4	10.3 - 29.9	0.02	76.53
MW-SF-11	06/19/07	GMX	44	4	20 - 40	0.02	78.56
MW-SF-12	06/18/07	GMX	44	4	20 - 40	0.02	78.07
MW-SF-13	06/19/07	GMX	44	4	20 - 40	0.02	73.40
MW-SF-14	06/21/07	GMX	44	4	20 - 40	0.02	78.16
MW-SF-15	06/21/07	GMX	44	4	20 - 40	0.02	78.27
MW-SF-16	06/20/07	GMX	44	4	20 - 40	0.02	78.21
PO-7	05/01/89	GW[10]	56	4	29 - 49	0.02	80.26
PW-1	01/06/92	GTI	51.5	4	20 - 50	0.01	75.52
PW-2	01/06/92	GTI	50	4	20 - 50	0.01	74.71
PW-3	01/06/92	GTI	50	4	20 - 50	0.01	73.71
PZ-1	07/12/91	GTI	50	2	25 - 50	0.01	73.74
PZ-2	07/12/91	GTI	50	2	25 - 50	0.01	73.96
PZ-3	06/03/93	GTI	65	2	25 - 65	0.02	76.17
PZ-4	06/02/93	GTI	60	2	25 - 60	0.02	76.13
PZ-5	09/26/00	GMX	40.3	4	20.6 - 39.4	0.01	73.97
PZ-6	09/26/00	GMX	37.5	4	22.8 - 37.8	0.01	73.91
PZ-7A	04/07/03	GMX	32	2	21.5 - 31.2	0.01	73.87
PZ-7B	04/07/03	GMX	47.5	2	42 - 46.7	0.01	73.79
PZ-8A	04/08/03	GMX	31.5	2	21.2 - 31	0.01	75.81
PZ-8B	04/08/03	GMX	47	2	41.4 - 46.2	0.01	75.69
PZ-9A	04/09/03	GMX	32	2	21.6 - 30.9	0.01	76.14
PZ-9B	04/09/03	GMX	47	2	41.5 - 46.2	0.01	76.26
PZ-10	04/10/03	GMX	38.5	2	23.2 - 37.9	0.02	74.34
TF-8	09/22/95	GTI	63	1.5	25 - 60	0.02	75.60
TF-8	09/22/95	GTI	63	4	25 - 60	0.02	74.86

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
TF-9	09/22/95	GTI	63	1.5	25 - 60	0.02	75.27
TF-9	09/22/95	GTI	63	4	25 - 60	0.02	74.47
TF-10	09/25/95	GTI	63	1.5	25 - 60	0.02	74.19
TF-10	09/25/95	GTI	63	4	25 - 60	0.02	73.61
TF-11	09/25/95	GTI	63	1.5	25 - 60	0.02	74.95
TF-11	09/25/95	GTI	63	4	25 - 60	0.02	74.40
TF-13	09/26/95	GTI	63	1.5	25 - 60	0.02	75.90
TF-13	09/26/95	GTI	63	4	25 - 60	0.02	75.47
TF-14	09/27/95	GTI	63	1.5	25 - 60	0.02	74.78
TF-14	09/27/95	GTI	63	4	25 - 60	0.02	74.35
TF-15	09/28/95	GTI	63	1.5	25 - 60	0.02	75.40
TF-15	09/28/95	GTI	63	4	25 - 60	0.02	74.78
TF-16	09/28/95	GTI	63	1.5	25 - 60	0.02	76.48
TF-16	09/28/95	GTI	63	4	25 - 60	0.02	75.89
TF-17	09/29/95	GTI	63	1.5	25 - 60	0.02	75.26
TF-17	09/29/95	GTI	63	4	25 - 60	0.02	74.88
TF-18	07/06/94	GTI	50.5	4	20 - 50	0.02	73.94
TF-19	10/03/95	GTI	63	1.5	25 - 60	0.02	75.61
TF-19	10/03/95	GTI	63	4	25 - 60	0.02	75.07
TF-20	10/03/95	GTI	63	1.5	25 - 60	0.02	75.59
TF-20	10/03/95	GTI	63	4	25 - 60	0.02	75.08
TF-21	09/29/95	GTI	63	1.5	25 - 60	0.02	75.60
TF-21	09/29/95	GTI	63	4	25 - 60	0.02	74.96
TF-22	10/02/95	GTI	63	1.5	25 - 60	0.02	74.95
TF-22	10/02/95	GTI	63	4	25 - 60	0.02	74.76
TF-23	07/05/94	GTI	50.5	4	20 - 50	0.02	75.31
TF-24[11]	09/26/95	GTI	63	1.5	25 - 60	0.02	76.35
TF-24[11]	09/26/95	GTI	63	4	25 - 60	0.02	76.43
TF-25	04/04/01	GTI	47	1.5	41 - 46	0.02	---
TF-25	04/04/01	GTI	47	4	26 - 36	0.02	74.85
TF-26	04/03/01	GTI	47	1.5	41 - 46	0.02	---
TF-26	04/03/01	GTI	47	4	26 - 36	0.02	75.85
WCW-1	02/18/92	WC	52	4	20 - 50	0.01	72.86
WCW-2	02/21/92	WC	52	4	20 - 50	0.01	75.34
WCW-3	02/19/92	WC	56.5	4	19 - 49	0.01	76.16
WCW-4	02/20/92	WC	56.5	4	20 - 50	0.01	78.05
WCW-5	04/30/92	WC	52	4	19 - 49	0.01	73.49
WCW-6	04/20/92	WC	53.5	4	20 - 50	0.01	75.52
WCW-7	04/29/92	WC	53	4	20 - 50	0.01	76.44
WCW-8	04/21/92	WC	53.5	4	20 - 50	0.01	77.34
WCW-9	04/28/92	WC	53.5	4	20 - 50	0.01	77.74

APPENDIX A
MONITORING WELL SUMMARY
Defense Fuel Support Point, Norwalk, California

Well	Installation Date	Installed By	Total Depth (ft bgs)[1]	Casing Diameter (inches)	Screen Interval (ft bgs)	Slot Size (inches)	Casing Elevation (ft msl)[2]
WCW-10	09/11/92	WC	56.5	4	25 - 55	0.01	74.06
WCW-11	09/09/92	WC	61.5	4	30 - 60	0.01	75.29
WCW-12	09/08/92	WC	61.5	4	30 - 60	0.01	76.27
WCW-13	09/10/92	WC	61.5	4	30 - 60	0.01	77.70
WCW-14	08/12/98	FDGTI	59	4	24 - 59	0.01	78.81

Notes
1. ft bgs = feet below ground surface.
2. ft msl = feet above mean sea level.
3. GMX = Geomatrix Consultants.
4. WC = Woodward-Clyde.
5. GTI = Groundwater Technology/Groundwater Technology Government Services.
6. GMW-21 is also referred to as TF-24.
7. FDGTI - Fluor Daniel GTI.
8. --- = information not available.
9. HLA = Harding Lawson Associates.
10. GW = Golden West
11. TF-24 is also referred to as "old TF-24" or "former TF-24". See also Note 6.
12. Biosparge and additional soil vapor extraction wells used for remediation purposes only are not listed here.