PARSONS

Parsons Government Services
100 West Walnut Street • Pasadena, California 91124 • (626) 440-4000 • www.parsons.com

January 11, 2012

Paul Cho, P.G.
Water Resources Control Engineer
California Regional Water Quality Control Board, Site Cleanup Unit IV
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Subject: Remedial Action Plan Addendum Presenting Proposed Soil Cleanup Goals
Defense Fuel Support Point Norwalk
15306 Norwalk Boulevard, Norwalk, California
SCP NO. 0286A, Site No. 16638

Dear Mr. Cho:

Parsons has prepared this letter on behalf of the Defense Logistics Agency (DLA) Energy, to provide an addendum to the 2006 Revised Remedial Action Plan[1] for the Defense Fuel Support Point (DFSP) Norwalk Facility in Norwalk, California. This addendum letter only addresses soil and proposes soil cleanup goals for the site. Groundwater will be addressed at a later date.

The Remedial Action Plan (RAP) was submitted in 1995[2] by Groundwater Technology Government Services, Inc. and was revised in 2006 by Parsons[3]. In addition, Parsons submitted a revised RAP progress update in a letter to the Regional Water Control Board (RWQCB), Los Angeles Region on March 15, 2010[4].

IMPLEMENTATION AND CURRENT STATUS OF THE 2006 REVISED RAP

This section discusses any recommendations in the 2006 revised RAP, implementation, and current status.

---

[1] Parsons, 2006, *Revised Remedial Action Plan, Defense Fuel Support Point Norwalk*, 15306 Norwalk Boulevard, Norwalk, California, September 7.

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

[3] Parsons, 2006, *Revised Remedial Action Plan, Defense Fuel Support Point Norwalk*, 15306 Norwalk Boulevard, Norwalk, California, September 7.

[4] Parsons, 2010, *Revised Remedial Action Plan Progress Update, Defense Fuel Support Point Norwalk*, 15306 Norwalk Boulevard, Norwalk, California, SCP No. 0286A, Site No. 16638, March 15.

Soil Vapor Extraction System (SVES): Further SVES operation was recommended to reduce the total petroleum hydrocarbon (TPH) concentrations. The SVES was expanded in various areas, including the truck fueling station area and the north eastern area.

Baseline monitoring of the expanded/redesigned SVES began in January 2011 and continuous operation commenced on January 10, 2011. The SVES is currently operating continuously except for scheduled shut-downs or operation and maintenance (O&M) activities from the four horizontal wells that cover the entire former aboveground storage tank (AST) area and six extraction wells in the north eastern area.

Free Product Recovery System (FPRS): It was concluded that the FPRS using the total fluids wells had reached asymptotic levels and using this system was no longer economical for further product removal at this stage. Parsons recommended using absorbent socks to remove any residual free product remaining in any wells. Absorbent socks were installed in GMW-4 and MW-9 in October 2007 and in GMW-21, GMW-58, TF-9, TF-17, TF-18, TF-20, and PZ-3 during the second quarter of 2007. Currently there are only absorbent socks installed in GMW-21 and TF-17. Change-outs of the absorbent socks are conducted as-needed as part of the routine monitoring at the site. The October 2011 gauging data collected shows product thicknesses ranging between 0.02 and 0.94 feet.

Groundwater Treatment System (GWTS): It was concluded that the GWTS is not an effective treatment technology to reduce the TPH as fuel product concentrations or for mass removal; however, the system does work to maintain hydraulic control of the TPH plume. In the north eastern area it was concluded that additional groundwater extraction wells are needed to prevent off-site migration of the plume. In the north western boundary of the site it was concluded that the GWTS has not been effective in maintaining hydraulic control and additional wells may be needed in this area. In addition, operation of GWTS was recommended in areas where groundwater TPH concentrations exceeded 10,000 µg/L.

Four new groundwater extraction wells with 6-inch diameter casing and screen were installed throughout the site at the following locations: GW-13 in the northwest corner of the site near MW-14, GW-14 in the central tank farm area, GW-15 and GW-16 in the eastern area bordering Holifield Park. The GWTS was also upgraded and expanded to include adequate equipment to handle the additional flow capacity, including switching to GAC and taking the air stripper off-line. The GWTS is currently operating continuously except for schedule shut-downs or O&M activities from two wells in the north western area and two wells in the north eastern area.

Biosparge System: The biosparge system operated on-going before April 24, 2006 when the SVES was shut down. The system operated again between January 2007 and February 2008. In the tank farm area additional biosparge points were recommended near tanks 80006, 80007, and 55004. The biosparge system has been expanded and can begin operation once remedial action for groundwater has been fully assessed and implementation begins.

REMEDIATION PROGRESS AND PLANNED ACTION

Fuel thickness and extent of free product in wells have decreased as a result of the FPR/GWTS and absorbent sock installations. Based on evaluations of the rebound monitoring, some areas have shown decreases in soil gas concentrations while other areas still show high impacts. Groundwater extraction from the northwest corner (extraction wells GW-2 and GW-13) and north-eastern area (extraction wells GW-15 and GW-16) for containment has been effective. Off-site wells continue to show non-detect or decreasing trends in TPH and benzene, toluene, ethylbenezene, and xylenes (BTEX) concentrations. Although TPH concentrations in most wells throughout the site are lower and/or are declining, groundwater extraction has not been effective at mass removal at the site.

One off-site well in Holifield Park adjacent to the east site boundary (GMW-62) continues to contain light non-aqueous phase liquid (LNAPL). A product recovery baildown test was conducted at this well and it was determined that vacuum recovery is an appropriate technology at this well. Once the LNAPL thickness at GMW-62 reaches 1 foot, the LNAPL will be recovered and containerized and disposed of off-site.

Two respiration/rebound monitoring events of the SVES were completed as well as confirmation soil sampling at selected areas, including the containment berms and under concrete foundations (which has not been completed and will continue in the first quarter of 2012). Additional impacted areas were discovered, including the water tank, truck fill station, and the pump house to the south of the truck fill station. A cost analysis and technical evaluation for soil impacts will be conducted to determine the optimal remedial solution and technology to best achieve soil cleanup goals in a reasonable time frame at each area. As an interim remedial measure, SVES should be reactivated and operate for 6 to 9 months then shut down for respiration/rebound monitoring if applicable.

GWTS will be continued for containment of plume and prevent off-site migration in the northwest corner and the north-eastern boundary and will be evaluated after 9 months of operation. Biosparging operation should commence and after one year of biosparging operation, an assessment will be conducted to determine if dissolved groundwater concentrations have decreased. The groundwater remedial options will be assessed and a determination made if more aggressive solutions should be implemented.

PROPOSED SOIL REMEDIATION CLEANUP GOALS

Table 1 provides a summary of the proposed soil cleanup goals for the site for site contaminants of concern (COCs), specifically TPH, BTEX, and other detected volatile organic compounds (VOCs). The following paragraphs briefly summarize the attached tables and proposed soil cleanup goals. Attached to this letter is a detailed description of the calculation procedures, what reference documents were used, how the screening levels were calculated, and the proposed cleanup goals established for soil.

Following the RWQCB's Los Angeles Region 1996 Guidebook[1], Parsons calculated site-specific soil cleanup levels for TPH and BTEX compounds. These calculations were based specifically on the values provided on Table 4-1 of the guidebook, Maximum Soil Screening Levels for TPH and BTEX above Drinking Water Aquifers. A summary of the proposed soil cleanup levels for TPH and BTEX compounds is provided on Table 1 and a detailed breakdown on Table 2 of this report. These calculations are primarily based on average lithology types and thicknesses between the sampling depths and the underlying groundwater. The average depth to groundwater beneath the DLA Norwalk site is 26 feet below ground surface.

The RWQCB's Los Angeles Region 1996 Guidebook was also used to calculate soil cleanup levels for detected VOCs with established maximum contaminant levels (MCLs). These calculations were based specifically on the attenuation factors provided on Table 5-1 of the guidebook, Average Attenuation Factor for Different Distance above Groundwater and Lithology. A summary of the proposed soil cleanup levels for these COCs is provided on Table 1 and a detailed breakdown on Table 3 of this report. Similar to above, these calculations are based on average lithology types and thicknesses between the sampling depths and the underlying groundwater.

For other VOCs without MCLs, the proposed soil cleanup goals were established using regional screening levels (RSLs) for industrial settings following the November 2011 USEPA guidelines[5] and a summary is provided on Table 1. These VOCs and corresponding soil cleanup level are provided in detail on Table 4.

UPDATED REMEDIATION SCHEDULE

The revised RAP presented a general estimated project schedule for the soil and groundwater remediation efforts. The updated remediation schedule for soil is presented below and the groundwater remediation schedule will be provided at a later date once a complete assessment and evaluation has been done. The estimated projected schedule could change depending on various elements including site conditions, new technology availability and applicability, regulatory approvals, and subcontract availabilities. In addition, this schedule will be updated on-going as necessary based on observed remedial progress and new findings. However, we will strive to address the remediation as aggressively as possible, and keep the project team updated.

[1] California Regional Water Quality Control Board, Los Angeles Region, 1996, *Interim Site Assessment & Cleanup Guidebook,* May.

[5] USEPA 2011, Regional Screening Level (RSL) Summary Table, November.

Task:	Date Projected
Soil Remediation Technologies	
SVE &/or Bioventing Operation	January 2012 - May 2014
Conduct Additional Soil Investigation (under concrete foundations)	January 2012 - August 2012
Respiration Test, Soil Confirmation Sampling, and Reporting	May 2014 - December 2014
Potential New Remedial Solution	TBD

Groundwater and LNAPL Remediation Technologies

Groundwater extraction for containment will continue. An evaluation of groundwater remediation technologies will be conducted and remedial action will be proposed and implemented. At this time, the date projected for groundwater remedial implementation is the second half of 2012 through the end of 2014. We are anticipating reaching monitored natural attenuation by the end of 2014 and thereafter continue with a proposed groundwater monitoring plan and schedule.

We await your response to this letter confirming the proposed soil cleanup goals for the DFSP Norwalk site. If you have any questions, please call me at 602-734-1083.

Sincerely,

PARSONS

Redwan N Hassan, P.G.
Project Manager

Attachments:

Tables:
1 Summary of Proposed Cleanup Goals
2 Proposed Soil Cleanup Levels for TPH and BTEX by Depth
3 Proposed Soil Cleanup Levels for Other VOCs with Established MCLs by Depth
4 Proposed Soil Cleanup Levels for Other VOCs with No MCLS by Depth

Proposed Soil Cleanup Levels Detailed Calculation Description

Distribution:

Mr. Matthew Young, DLA-E
Lt. Col. Tam Gaffney, DLA-E
Mr. Tim Whyte, URS
Ms. Adriana Figueroa, City of Norwalk
Mr. Norman Dupont, City of Norwalk Attorney
Mr. Charles Emig, City of Cerritos
Ms. Mary Lucas, Parsons
Mr. Steve Defibaugh, KMEP
Mr. Mark Wuttig, CH2M Hill
Mr. Dan Jablonski, CH2M Hill
Office of Congresswoman Grace Napolitano
Mr. Gary Lynch, Park Water Company

<u>RAB Members:</u>
Ms. Mary Jane McIntosh
Dr. Eugene Garcia
Mr. Bob Hoskins
Ms. Tracy Winkler

Attachment -

Tables

Table 1
Summary of Proposed Soil Cleanup Levels
DFSP Norwalk, Norwalk, CA

Proposed Soil Cleanup Levels for:

Petroleum Hydrocarbons, BTEX, and detected VOCs with MCLs

Constituent	Proposed Soil Cleanup Level (µg/kg) by Depth					
	0.5 feet	5 feet	10 feet	15 feet	20 feet	25 feet
TPH as Gasoline (C4-C12)	500,000	500,000	100,000	100,000	100,000	100,000
TPH as JP-5 (C8-C17)	500,000	500,000	100,000	100,000	100,000	100,000
TPH as Diesel (C5-C25)	1,000,000	1,000,000	100,000	100,000	100,000	100,000
Benzene	15.18	12.61	12.09	12.59	11.42	11.66
Toluene	614	440	391	423	356	367
Ethylbenzene	2,072	1,435	1,190	1,329	1,067	1,100
Xylenes	5,553	3,768	3,090	3,472	2,755	2,844
1,2-Dichloroethane	1.20	0.99	0.76	0.68	0.52	0.51
Methylene Chloride	12	9.88	7.58	6.77	5.23	5.06
Methyl-t-Butyl Ether (MTBE)	31.21	25.68	19.71	17.59	13.6	13.16
Styrene	240	197.53	151.61	135.33	104.63	101.2
1,1,2,2-Tetrachloroethane	2.40	1.98	1.52	1.35	1.05	1.01
1,1,2-Trichloroethane	12.00	9.88	7.58	6.77	5.23	5.06
Trichloroethene	12.00	9.88	7.58	6.77	5.23	5.06
1,2,4-Trimethylbenzene	12.00	9.88	7.58	6.77	5.23	5.06

Detected VOCs without MCLs

Constituent	Proposed Soil Cleanup Level (µg/kg)
Acetone	630,000,000
Bromomethane	32,000
2-Butanone	200,000,000
n-Butylbenzene	51,000,000
sec-Butylbenzene	Not established
tert-Butylbenzene	Not established
Carbon disulfide	3,700,000
Chlorobenzene	1,400,000
Chloroethane	Not established
Chloroform	1,500
2-Chlorotoluene	Not established
4-Chlorotoluene	Not established
1,2-Dibromo-3-chloropropane	69
1,2-Dibromoethane	170
Dichlorodifluoromethane	400,000
Diisopropyl Ether (DIPE)	10,000
Ethanol	Not established
2-Hexanone	1,400,000
Isopropylbenzene	Not established
p-Isopropyltoluene	Not established
Naphthalene	18,000
n-Propylbenzene	Not established
Tert-Butyl Alcohol (TBA)	Not established
1,2,3-Trichlorobenzene	490,000
1,2,3-Trichloropropane	95
1,3,5-Trimethylbenzene	10,000,000

Table 2
Proposed Soil Cleanup Levels for TPH and BTEX by Depth
DFSP Norwalk, Norwalk, CA

Screening Levels for Soil at 0.5 feet Below Ground Surface (25.5 feet Above Groundwater)				
Soil Types (0.5 - 26 feet bgs)	**Sand**	**Silt**	**Clay**	
Average Soil Thickness	18.76	6.11	0.63	
Soil Type Percentage	0.74	0.24	0.02	
Constituent	**Sand Screening Level (µg/kg)**	**Silt Screening Level (µg/kg)**	**Clay Screening Level (µg/kg)**	**Proposed Cleanup Level (µg/kg)**
TPH as Gasoline (C4-C12)	500,000	500,000	500,000	**500,000**
TPH as JP-5 (C8-C17)	500,000	500,000	500,000	**500,000**
TPH as Diesel (C5-C25)	1,000,000	1,000,000	1,000,000	**1,000,000**
Benzene	13.02	16.04	71.13	**15.18**
Toluene	456	775	3,739	**614**
Ethylbenzene	1,278	3,192	14,867	**2,072**
Xylenes	3,423	8,481	40,588	**5,553**

Screening Levels for Soil at 5 feet Below Ground Surface (21 feet Above Groundwater)				
Soil Types (5 - 26 feet bgs)	**Sand**	**Silt**	**Clay**	
Average Soil Thickness	15.08	5.30	0.62	
Soil Type Percentage	0.72	0.25	0.03	
Constituent	**Sand Screening Level (µg/kg)**	**Silt Screening Level (µg/kg)**	**Clay Screening Level (µg/kg)**	**Proposed Cleanup Level (µg/kg)**
TPH as Gasoline (C4-C12)	500,000	500,000	500,000	**500,000**
TPH as JP-5 (C8-C17)	500,000	500,000	500,000	**500,000**
TPH as Diesel (C5-C25)	1,000,000	1,000,000	1,000,000	**1,000,000**
Benzene	11.37	11.92	48.93	**12.61**
Toluene	328	509	2,562	**440**
Ethylbenzene	805	2,217	10,067	**1,435**
Xylenes	2,054	5,878	27,425	**3,768**

Table 2
Proposed Soil Cleanup Levels for TPH and BTEX by Depth
DFSP Norwalk, Norwalk, CA

Screening Levels for Soil at 10 feet Below Ground Surface (16 feet Above Groundwater)				
Soil Types (10 - 26 feet bgs)	**Sand**	**Silt**	**Clay**	
Average Soil Thickness	12.81	2.65	0.53	
Soil Type Percentage	0.80	0.17	0.03	
Constituent	**Sand Screening Level (µg/kg)**	**Silt Screening Level (µg/kg)**	**Clay Screening Level (µg/kg)**	**Proposed Cleanup Level (µg/kg)**
TPH as Gasoline (C4-C12)	100,000	100,000	100,000	**100,000**
TPH as JP-5 (C8-C17)	100,000	100,000	100,000	**100,000**
TPH as Diesel (C5-C25)	100,000	100,000	100,000	**100,000**
Benzene	11.00	11.00	44.00	**12.09**
Toluene	300	450	2,300	**391**
Ethylbenzene	700	2,000	9,000	**1,190**
Xylenes	1,750	5,300	24,500	**3,090**

Screening Levels for Soil at 15 feet Below Ground Surface (11 feet Above Groundwater)				
Soil Types (15 - 26 feet bgs)	**Sand**	**Silt**	**Clay**	
Average Soil Thickness	8.53	1.94	0.53	
Soil Type Percentage	0.78	0.18	0.05	
Constituent	**Sand Screening Level (µg/kg)**	**Silt Screening Level (µg/kg)**	**Clay Screening Level (µg/kg)**	**Proposed Cleanup Level (µg/kg)**
TPH as Gasoline (C4-C12)	100,000	100,000	100,000	**100,000**
TPH as JP-5 (C8-C17)	100,000	100,000	100,000	**100,000**
TPH as Diesel (C5-C25)	100,000	100,000	100,000	**100,000**
Benzene	11.00	11.00	44.00	**12.59**
Toluene	300	450	2,300	**423**
Ethylbenzene	700	2,000	9,000	**1,329**
Xylenes	1,750	5,300	24,500	**3,472**

Table 2
Proposed Soil Cleanup Levels for TPH and BTEX by Depth
DFSP Norwalk, Norwalk, CA

Screening Levels for Soil at 20 feet Below Ground Surface (6 feet Above Groundwater)				
Soil Types (20 - 26 feet bgs)	**Sand**	**Silt**	**Clay**	
Average Soil Thickness	4.72	1.19	0.08	
Soil Type Percentage	0.79	0.20	0.01	
Constituent	**Sand Screening Level (µg/kg)**	**Silt Screening Level (µg/kg)**	**Clay Screening Level (µg/kg)**	**Proposed Cleanup Level (µg/kg)**
TPH as Gasoline (C4-C12)	100,000	100,000	100,000	**100,000**
TPH as JP-5 (C8-C17)	100,000	100,000	100,000	**100,000**
TPH as Diesel (C5-C25)	100,000	100,000	100,000	**100,000**
Benzene	11.00	11.00	44.00	**11.42**
Toluene	300	450	2,300	**356**
Ethylbenzene	700	2,000	9,000	**1,067**
Xylenes	1,750	5,300	24,500	**2,755**

Screening Levels for Soil at 25 feet Below Ground Surface (1 foot Above Groundwater)				
Soil Types (25 - 26 feet bgs)	**Sand**	**Silt**	**Clay**	
Average Soil Thickness	0.80	0.18	0.02	
Soil Type Percentage	0.80	0.18	0.02	
Constituent	**Sand Screening Level (µg/kg)**	**Silt Screening Level (µg/kg)**	**Clay Screening Level (µg/kg)**	**Proposed Cleanup Level (µg/kg)**
TPH as Gasoline (C4-C12)	100,000	100,000	100,000	**100,000**
TPH as JP-5 (C8-C17)	100,000	100,000	100,000	**100,000**
TPH as Diesel (C5-C25)	100,000	100,000	100,000	**100,000**
Benzene	11.00	11.00	44.00	**11.66**
Toluene	300	450	2,300	**367**
Ethylbenzene	700	2,000	9,000	**1,100**
Xylenes	1,750	5,300	24,500	**2,844**

Notes:
Screening level calculations based on Interim Site Assessment & Cleanup Guidebook (Table 4-1 and examples).
bgs = below ground surface
µg/kg = micrograms per kilogram

Table 3
Proposed Soil Cleanup Levels for Other VOCs
with Established MCLs by Depth
DFSP Norwalk, Norwalk, CA

Screening Levels for Soil at 0.5 feet Below Ground Surface (25.5 feet Above Groundwater)			
Soil Types (0.5 - 26 feet bgs)	**Sand**	**Silt**	**Clay**
Average Soil Thickness	18.76	6.11	0.63
Soil Type Percentage	0.74	0.24	0.02
Attenuation Factor	1.55	3.55	16.58
Constituent	**Maximum Contaminant Level (µg/kg)**	**Total Attenuation Factor (Af^t)**	**Proposed Cleanup Level (µg/kg)**
1,2-Dichloroethane	0.5	2.40	**1.20**
Methylene Chloride	5	2.40	**12.00**
Methyl-t-Butyl Ether (MTBE)	13	2.40	**31.21**
Styrene	100	2.40	**240.04**
1,1,2,2-Tetrachloroethane	1	2.40	**2.40**
1,1,2-Trichloroethane	5	2.40	**12.00**
Trichloroethene	5	2.40	**12.00**
1,2,4-Trimethylbenzene	5	2.40	**12.00**

Screening Levels for Soil at 5 feet Below Ground Surface (21 feet Above Groundwater)			
Soil Types (5 - 26 feet bgs)	**Sand**	**Silt**	**Clay**
Average Soil Thickness	15.08	5.30	0.62
Soil Type Percentage	0.72	0.25	0.03
Attenuation Factor	1.10	3.10	13.65
Constituent	**Maximum Contaminant Level (µg/kg)**	**Total Attenuation Factor (Af^t)**	**Proposed Cleanup Level (µg/kg)**
1,2-Dichloroethane	0.5	1.98	**0.99**
Methylene Chloride	5	1.98	**9.88**
Methyl-t-Butyl Ether (MTBE)	13	1.98	**25.68**
Styrene	100	1.98	**197.53**
1,1,2,2-Tetrachloroethane	1	1.98	**1.98**
1,1,2-Trichloroethane	5	1.98	**9.88**
Trichloroethene	5	1.98	**9.88**
1,2,4-Trimethylbenzene	5	1.98	**9.88**

Table 3
Proposed Soil Cleanup Levels for Other VOCs
with Established MCLs by Depth
DFSP Norwalk, Norwalk, CA

Screening Levels for Soil at 10 feet Below Ground Surface (16 feet Above Groundwater)			
Soil Types (10 - 26 feet bgs)	**Sand**	**Silt**	**Clay**
Average Soil Thickness	12.81	2.65	0.53
Soil Type Percentage	0.80	0.17	0.03
Attenuation Factor	1.00	2.20	10.60
Constituent	**Maximum Contaminant Level (µg/kg)**	**Total Attenuation Factor (Af^t)**	**Proposed Cleanup Level (µg/kg)**
1,2-Dichloroethane	0.5	1.52	**0.76**
Methylene Chloride	5	1.52	**7.58**
Methyl-t-Butyl Ether (MTBE)	13	1.52	**19.71**
Styrene	100	1.52	**151.61**
1,1,2,2-Tetrachloroethane	1	1.52	**1.52**
1,1,2-Trichloroethane	5	1.52	**7.58**
Trichloroethene	5	1.52	**7.58**
1,2,4-Trimethylbenzene	5	1.52	**7.58**

Screening Levels for Soil at 15 feet Below Ground Surface (11 feet Above Groundwater)			
Soil Types (15 - 26 feet bgs)	**Sand**	**Silt**	**Clay**
Average Soil Thickness	8.53	1.94	0.53
Soil Type Percentage	0.78	0.18	0.05
Attenuation Factor	1.00	1.20	7.60
Constituent	**Maximum Contaminant Level (µg/kg)**	**Total Attenuation Factor (Af^t)**	**Proposed Cleanup Level (µg/kg)**
1,2-Dichloroethane	0.5	1.35	**0.68**
Methylene Chloride	5	1.35	**6.77**
Methyl-t-Butyl Ether (MTBE)	13	1.35	**17.59**
Styrene	100	1.35	**135.33**
1,1,2,2-Tetrachloroethane	1	1.35	**1.35**
1,1,2-Trichloroethane	5	1.35	**6.77**
Trichloroethene	5	1.35	**6.77**
1,2,4-Trimethylbenzene	5	1.35	**6.77**

Table 3
Proposed Soil Cleanup Levels for Other VOCs
with Established MCLs by Depth
DFSP Norwalk, Norwalk, CA

Screening Levels for Soil at 20 feet Below Ground Surface (6 feet Above Groundwater)			
Soil Types (20 - 26 feet bgs)	**Sand**	**Silt**	**Clay**
Average Soil Thickness	4.72	1.19	0.08
Soil Type Percentage	0.79	0.20	0.01
Attenuation Factor	1.00	1.00	4.60
Constituent	**Maximum Contaminant Level (µg/kg)**	**Total Attenuation Factor (Af^t)**	**Proposed Cleanup Level (µg/kg)**
1,2-Dichloroethane	0.5	1.05	**0.52**
Methylene Chloride	5	1.05	**5.23**
Methyl-t-Butyl Ether (MTBE)	13	1.05	**13.60**
Styrene	100	1.05	**104.63**
1,1,2,2-Tetrachloroethane	1	1.05	**1.05**
1,1,2-Trichloroethane	5	1.05	**5.23**
Trichloroethene	5	1.05	**5.23**
1,2,4-Trimethylbenzene	5	1.05	**5.23**

Screening Levels for Soil at 25 feet Below Ground Surface (1 foot Above Groundwater)			
Soil Types (25 - 26 feet bgs)	**Sand**	**Silt**	**Clay**
Average Soil Thickness	0.80	0.18	0.02
Soil Type Percentage	0.80	0.18	0.02
Attenuation Factor	1.00	1.00	1.60
Constituent	**Maximum Contaminant Level (µg/kg)**	**Total Attenuation Factor (Af^t)**	**Proposed Cleanup Level (µg/kg)**
1,2-Dichloroethane	0.5	1.01	**0.51**
Methylene Chloride	5	1.01	**5.06**
Methyl-t-Butyl Ether (MTBE)	13	1.01	**13.16**
Styrene	100	1.01	**101.20**
1,1,2,2-Tetrachloroethane	1	1.01	**1.01**
1,1,2-Trichloroethane	5	1.01	**5.06**
Trichloroethene	5	1.01	**5.06**
1,2,4-Trimethylbenzene	5	1.01	**5.06**

Notes:

Screening level calculations based on Interim Site Assessment & Cleanup Guidebook (Table 5-1 and example) and MCLs.

bgs = below ground surface

µg/kg = micrograms per kilogram

Table 4

Proposed Soil Cleanup Levels for Other VOCs with No MCLs by Depth

DFSP Norwalk, Norwalk, CA

Other Detected VOCs	Highest Reported Concentration (µg/kg)	Proposed Cleanup Level* (µg/kg)
Acetone	160	630,000,000
Bromomethane	460j	32,000
2-Butanone	51	200,000,000
n-Butylbenzene	72,000	51,000,000
sec-Butylbenzene	22,000	Not established
tert-Butylbenzene	1,300j	Not established
Carbon disulfide	4.3j	3,700,000
Chlorobenzene	32j	1,400,000
Chloroethane	2.1	Not established
Chloroform	220	1,500
2-Chlorotoluene	310j	Not established
4-Chlorotoluene	110j	Not established
1,2-Dibromo-3-chloropropane	990j	69
1,2-Dibromoethane	8.5	170
Dichlorodifluoromethane	7.2	400,000
Diisopropyl Ether (DIPE)	0.46j	10,000
Ethanol	130j	Not established
2-Hexanone	46	1,400,000
Isopropylbenzene	39,000	Not established
p-Isopropyltoluene	25,000	Not established
Naphthalene	55,000	18,000
n-Propylbenzene	98,000	Not established
Tert-Butyl Alcohol (TBA)	420	Not established
1,2,3-Trichlorobenzene	220j	490,000
1,2,3-Trichloropropane	5,900	95
1,3,5-Trimethylbenzene	180,000	10,000,000

Notes:

* Cleanup levels obtained from the USEPA, November 2011 Regional Screening Level (RSL) Summary Table (industrial settings).

µg/kg = micrograms per kilogram

Attachment –

Proposed Soil Cleanup Levels
Detailed Calculation Description

Determination of Proposed Soil Cleanup Levels Overview

DFSP Norwalk Site, Norwalk, CA

The RWQCB's Interim Site Assessment & Cleanup Guidebook[1] (referred to herein as the "Guidebook") was used to determine proposed soil cleanup and screening levels for petroleum hydrocarbons, BTEX compounds, and selected VOCs detected in soil beneath the site. The following sections provide a brief review of the methods followed while utilizing this Guidebook to develop the soil screening levels.

<u>Determination of Proposed Soil Cleanup and Screening Levels for BTEX Compounds</u>

Establish Groundwater Depth - Table 4-1 of the Guidebook (*Maximum Soil Screening Levels for TPH and BTEX above Drinking Water Aquifers*) provides general soil screening levels for petroleum hydrocarbons and BTEX compounds. The soil screening levels on this table are based, in part, on the distance between impacted soil and the underlying drinking water aquifer. For this study, the first encountered groundwater beneath the site, at a depth of approximately 26 feet, is considered the drinking water aquifer. This groundwater depth was used while developing each proposed soil cleanup screening level for the site.

Establish Soil Screening Depths - As noted on Table 4-1 and example problems within the Guidebook (Pages 4-5 and 4-6), the soil screening levels are partially dependent on the vertical distance between impacted soil and the drinking water aquifer. The impacted soil depths used during the development of the screening levels for this study were based on the general sampling depths used during previous onsite investigations (0.5, 5, 10, 15, 20, and 25 feet below ground surface). The use of sampling depths is consistent with Example 1 on Page 4-5 of the Guidebook. Soil screening levels were developed for each of these depths, as described below.

Determine Soil Types and Thicknesses - Soil screening levels are also dependent on the soil types encountered between the impacted soil and drinking water aquifer. As noted during past site investigations, soil types between the ground surface and groundwater generally vary. Although these soil types and thicknesses can be generalized, for the purpose of this study they were calculated using the soil types recorded on boring logs for DPT-41 through DPT-102. Each of these borings was continuously logged, providing relatively high confidence level of the soil types at depth. As a conservative measure, the depths recorded with "no recovery" were assumed to be sand. Note that Borings DPT-65 was omitted due to a relatively short depth (16'), and Borings DPT-72 and DPT-73 were omitted due to overlying fill materials (12 feet thick).

[1] California Regional Water Quality Control Board, Los Angeles Region, 1996, *Interim Site Assessment & Cleanup Guidebook,* May.

The soil type thicknesses beneath the sampling depths are provided on the table referred to as *Soil Type Thicknesses*. The general procedure used in determining soil type thicknesses between the sampling depth and groundwater was to add the thickness (in feet) of sand, silt, and clay. For a sampling depth of 0.5 feet, for example, the total thicknesses of sand, silt, and clay were added between 0.5 and 26 feet. For Boring DPT-41, the thicknesses of sand, silt, and clay were measured to be approximately 16.5, 8, and 1 feet, respectively. This process of determining soil types between 0.5 and 26 feet was conducted for each boring, and inputted into an Excel spreadsheet. This process was repeated for the intervals between groundwater and sampling depths of 5, 10, 15, 20, and 25 feet.

The average thicknesses of sand, silt, and clay between each sampling depth and groundwater was calculated by adding the thicknesses of these soil types, and then dividing by the number of borings used. The average soil type thicknesses between the sampling depths and groundwater are shown at the bottom of the *Soil Type Thicknesses* table.

Determine Soil Types Percentages - Soil type percentages are required to revise the soil screening levels on Table 4-1 of the Guidebook. The soil type thicknesses are used to determine soil percentages by simply dividing the individual soil type thickness by the length of the soil column being assessed. For example, the percentages of sand, silt, and clay between the 0.5-foot sample and groundwater (using site-wide average values) are calculated as follows:

Sand	18.76’	18.76’ ÷ 25.5’ = 73.57%
Silt	6.11’	6.11’ ÷ 25.5’ = 23.96%
Clay	+ 0.63’	0.63’ ÷ 25.5’ = 2.47%
	25.5’	

As noted on Table 4-1 of the Guidebook, if only 20 feet of sand was located between the sampling depth and the drinking water aquifer, then the soil screening levels for each BTEX compound could simply be determined from the “sand” column, in the 20 foot row. The screening level for benzene using this example would be 11 µg/kg. The screening level for 20 feet of silt and clay would be 11 µg/kg and 44 µg/kg, respectively. Due to the varying soil types encountered beneath the site, only a percentage (based on soil-type percentages) of these screening levels can be used. The screening level for benzene using equal parts sand, silt, and clay (33.33 percent each) for a 20-foot distance above groundwater would be calculated using Table 4-1 as follows:

Sand	Silt	Clay
(0.3333*11)	+(0.3333*11)	+(0.3333*44)
= 3.67	+3.67	+14.66
= 22		

The soil screening level for benzene using this example would be 22 µg/kg.

Calculate Soil Screening Levels to Fit Site Sampling Depths and Lithology - Note on Table 4-1 of the Guidebook that the distances shown above groundwater do not correspond with the site's sample depths above groundwater. As such, revised soil screening levels have to be determined (proportionally) with the distance shown above groundwater. The calculation used, demonstrated in Example 1 on Page 4-5 of the Guidebook, is provided below. It describes the determination of a benzene screening level for a soil sample located 30 feet above groundwater, with an intervening lithology of 60 percent sand and 40 percent silt. Table 4-1 of the Guidebook shows that the benzene screening level is 11 µg/kg for 20 feet, and 33 µg/kg for 80 feet (both in sand). The benzene screening level at 30 feet is calculated as follows:

$$[(30-20)/(80-20)]*(33-11)+11 = 15\ \mu g/kg$$

In the same way, the screening level for silty soil is 20 µg/kg. Given that the soils are 60 percent sand and 40 percent silt, the final screening level for benzene at 30 feet above groundwater is as follows:

$$(15*0.6)+(20*0.4) = 17\ \mu g/kg.$$

The method described above was used to calculate the soil screening levels for each of the BTEX compounds. These proposed soil cleanup and screening levels are provided on Table 1 and Table 2.

<u>Determination of Proposed Soil Cleanup and Screening Levels for Petroleum Hydrocarbons</u>

The soil screening levels for petroleum hydrocarbons on Table 4-1 of the Guidebook do not take into account soil types. They simply provide soil screening levels for different carbon ranges for samples located at three different intervals above groundwater (greater than 150 feet, 20 to 150 feet, and less than 20 feet). These soil screening levels were used without modification, and are shown on Table 1 and Table 2. The soil screening levels for gasoline and JP-5 were both taken from the lower carbon chain range (C4-C12). The soil screening level for diesel was taken from the intermediate carbon chain range (C13-C22).

<u>Determination of Proposed Soil Cleanup and Screening Levels for VOCs with MCLs</u>

The RWQCB's Los Angeles Region 1996 Guidebook was also used to calculate soil screening levels for detected volatile organic compounds (VOCs) with established maximum contaminant levels (MCLs). These calculations were based specifically on the attenuation factors provided on Table 5-1 of the Guidebook, *Average Attenuation Factor for Different Distance above Groundwater and Lithology*. A summary of the calculated and proposed soil cleanup and screening levels for these COCs is provided on Table 1 and Table 2.

The calculations used to determine attenuation factors are based on average lithology types and thicknesses between the sampling depths and the underlying groundwater. This calculation process is similar to that described above for determining soil screening levels for BTEX compounds. The primary exception, however, is that soil screening levels are not provided. Instead, attenuation factors are provided in their place. Attenuation factors are a measure of the contaminant concentration that can be retained in soil above the water table as a function of both distance above the water and the composition of soils.

With attenuation factors, soil screening levels are determined by multiplying the VOC's MCL by the attenuation factor provided on Table 5-1 of the Guidebook that equates with the correct soil type and distance above groundwater. For example, to determine the soil cleanup level for styrene (MCL of 100 µg/kg) in soil at 80 feet above groundwater in sandy soil conditions (attenuation factor of 11), the calculation is simply:

100*11 = 1,100 µg/kg

In the example above, styrene's soil screening level is 1,100 µg/kg. When the exact distances are not provided on Table 5-1 of the Guidebook, attenuation factors must be revised proportionally. This process is similar to that described above for determining soil screening levels for BTEX compounds. Since the onsite soil types vary, the attenuation factors also have to be adjusted to take into account the varying soil types. This process is also similar to that described above for determining soil screening levels for BTEX compounds. Table 3 provides the calculated soil screening levels for each sampling depth interval, utilizing the proportionally determined attenuation factors that have been adjusted for the varying soil types.

Determination of Proposed Soil Cleanup and Screening Levels for VOCs without MCLs

For VOCs detected in soil beneath the site that have no MCLs, the regional screening levels (RSLs) for industrial settings were used following the November 2011 EPA guidelines[2]. These VOCs and corresponding RSLs are provided on Table 4.

[2] Environmental Protection Agency, 2011, Regional Screening Level (RSL) Summary Table; dated November 2011