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SUMMARY REPORT FOR 2011 GROUNDWATER INVESTIGATION ACTIVITIES AT SITE 2,
SITE 6A, SITE 10B AND SOUTHERN AREA NWIRP CALVERTON NY
5/7/2012
RESTORATION ADVISORY BOARD ADVISOR

**Memorandum For: Bill Gunther, Community Co-Chair
Calverton NWIRP Restoration Advisory Board**

**From: Frank Anastasi
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Date: May 7, 2012

**Subject: Review of Data Summary Report for 2011 Groundwater
Investigation Activities at Site 2, Site 6A, Site 10B, and
Southern Area. By Tetra Tech for NAVFAC, April 2012**

Introduction and Background

The Engineering Field Activity Northeast of the Naval Facilities Engineering Command retained SCA Associates in September 2002 to provide Technical Assistance to its Restoration Advisory Board (RAB) for the closed Calverton Naval Weapons Industrial Reserve Plant (NWIRP) in Calverton, New York. Since then, I have reviewed and evaluated investigations and cleanup plans related to Sites 2 (Fire Training Area), 6A (Fuel Calibration Area) and 10B (Engine Test House), and the Southern Area, including the Peconic River, that were conducted through 2010; offered recommendations for further study and observed field work performed in 2010 (groundwater investigations, aquifer testing, and bioremediation pilot study); and helped the RAB understand technical details about these efforts and their results at RAB meetings.

The Navy's contractor Tetra Tech NUS, Inc. (TT) has prepared the 2011 Groundwater Report for work to document the results of additional field work focused on refining delineation of ground water contamination, both on-site and off-site. Activities further refined delineation of the Southern Area (SA) Plume, from source area (Site 6A) to the Peconic River, and expanded investigations in the vicinity of Site 2.

Recent progress towards remedy selection for the SA ground water plume has put the Navy on the path to publish a Record of Decision (ROD) in the coming months, complete design, and install and begin operating the fence-line ground water extraction and treatment system before the end of 2012. This remedial action is expected to eliminate further releases of contaminated ground water from the site and ultimately improve off-site ground water quality.

The 2011 report represents a milestone in my opinion, especially as we are on the verge of installing the fence line extraction system that should eliminate further releases of contaminants to the Off-site SA. Much has been accomplished in the past two years. The 2009 Ground Water Report conclusions included "Comparable concentrations and/or general decreasing contaminant concentrations were observed in the Southern Area monitor wells." Such conclusions were not supported, however, by available data. Key data gaps needed to be filled.

After review of the 2009 Ground Water Investigation Activities report, multiple-well aquifer pumping tests were recommended to characterize hydraulic conditions where remedial actions might be needed (at the fence line area). With the 2010 and 2011 efforts, we now have a good understanding of the hydraulic properties of the aquifer. We also have a much better ground water quality database, and the ability to obtain reproducible data from permanent monitor wells at critical locations. Findings and conclusions can be reached now with more confidence as we have multiple years of data all along the plume's path, from the source area more than a mile of downgradient, all the way to and including the Peconic River.

“Decreasing trends” are no longer being suggested; monitored natural attenuation has been ruled out as not protective; and an active ground remediation system is being designed on an expedited track. The Navy should be commended for following through on essential aspects of the SA Plume studies, building an extensive site-wide database, and performing a definitive aquifer testing program (without which the fence line extraction system could not even have been conceptualized with any confidence). Implementation of the remediation system, anticipated by the end of this year, will be the culmination of this comprehensive program, and a major milestone for Calverton.

Summary Description of the Southern Area Plume

The primary contaminants of the SA plume are the chlorinated hydrocarbon, volatile organic compounds (VOCs) 1,1-dichloroethane (DCA), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene (DCE), and chloroethane (CA). The plume extends generally from Site 6A, the former Fuel Calibration Area, southeast across River Road and beneath the Peconic River Sportsmen's Club (PRSC) property, to the Peconic River, about one mile away. The attached Figure 4-10 from the TT 2011 report shows the overall plume; Figures 4-1 through 4-9 detail conditions in various portions of the plume.

On-site, the plume is concentrated in a narrow (up to 200 feet wide), linear path oriented northeast/southwest from Site 6A to approximately River Rd. South of the road, the plume becomes dispersed and broadens across an area about 2000 wide from west to east. North of the road, contaminants are concentrated in a thin (5 to 10 feet thick) horizon of ground water at approximately 30 to 40 feet below ground surface (bgs). South of the road, the contaminated ground water zone ranges up to 40 feet in thickness. It discharges into the Peconic River, based on four years of Navy and SCDHS sampling results.

Site 2 Contamination

Petroleum releases at Site 2 have been documented, investigated, and partially remediated. A large area of shallow, petroleum-contaminated soil was excavated from Site 2 and disposed off-site in a 2008-2009 Removal Action. Additional petroleum-contaminated soil remains beneath the ground water table.

Chlorinated hydrocarbons also are present in the ground water at Site 2; their nature and extent was investigated in 2011 by the Navy and by the SCDHS (at nearby off-site locations). The RAB informed the Navy that this contamination was documented as far back as 1977 in an investigation report prepared by Geraghty & Miller for Grumman, who operated the plant. That investigation identified waste storage and disposal areas located north and west of the fire training ring at Site 2 as likely sources of VOCs, including 1,1,1-TCA, that had migrated as far as River Rd./Grumman Blvd. and caused Grumman to close down its original Plant 8 production well.

Previous Reviews/ Reference Documents

SCA Associates prepared a December 2006 review memorandum on Sites 6A and 10B, the suspected on-site sources of the ground water contaminant plume, where previous industrial activities related to aircraft engine testing and maintenance and releases of chemicals occurred. In April, 2007, we prepared a similar memorandum focused on ground water investigations conducted in the fall of 2006 in the Off-Site Southern Area (OSSA), located southeast of Sites 6A and 10B. In 2008, we prepared review memoranda for subsequent ground water data and investigation results and plans for remediation at Site 2. Summary memos providing updates as new Navy and SCDHS ground water data became available in 2008, 2009 and 2010 were also prepared for the RAB in March and November 2009, March 2010, and February 2011.

The reader is referred to the documents noted above for more background information on the history of operations at these sites, and the nature and extent of contamination. In 2011, the Navy evaluated options for SA plume remedial actions, ultimately proposing the extraction and treatment at the fence line combined with land use controls and monitoring for the off-site plume. SCA's September 30 and December 12, 2011 and January 17, 2012 memoranda reviewed the remedy deliberations and selection.

Summary of Hydrogeology of the Study Area

The Calverton NWIRP is underlain by approximately 1,300 feet of unconsolidated sediments. The Upper Glacial Formation is at or near the surface, and consists mainly of fine to coarse-grained sands, with some silty strata and some pebbles. The Magothy Formation underlies the Upper Glacial, and ranges from silty clay strata to coarse sands and gravels. Both formations are important regional aquifers. At Calverton, these two formations are hydraulically connected and function as one unconfined aquifer. Ground water beneath Sites 2, 6A, 10B, and the Southern Area flows to the southeast toward the Peconic River.

The results of the extensive field investigations conducted since 2009 confirm that there is a well-defined pathway through which the contaminants are migrating from the on-site source area at Site 6A across downgradient, off-site properties to the Peconic River (more than one mile away). At the November 2009 RAB meeting, an estimated ground water flow rate of about 640 feet per year was reported for the upgradient, on-site area of the plume. This compared to an estimated 190 feet per year flow rate for the downgradient,

off-site area of the plume. The sediments are very permeable, and allow relatively rapid ground water flow, especially through the identified preferential migration pathway. Relatively slower flow is observed in the discharge zone (along the river).

The silty-clay aquitard found in the study area at about 60 feet bgs appears to have effectively prevented VOCs from migrating into underlying the water-bearing zone. The multi-level ground water sampling conducted during the investigations found VOCs generally present within a relatively thin horizon at depths of about 25 to 40 feet bgs on-site, but getting deeper as it moves downgradient and off-site. The testing across the preferential migration pathway defined the lateral extent of the plume as it leaves the source area to be between about 100 and 200 feet wide. The plume widens to about 2,000 feet and thickens to up to 40 feet in the downgradient, off-site SA.

Attached copies of TT Figures 2-2 and 2-3 show sampling locations and depicts subsurface hydrogeology along the long axis (oriented NW-SE) of the plume. Also attached is a copy of TT Figure 2-6, a September, 2011 shallow ground water flow contour map.

2011 Site Investigations

The ground water, sediment and surface soil sampling efforts documented in the report were conducted from November 2010 through November 2011. These activities consisted of the following:

- Two ground water monitoring events (March and September) at all of the sites;
- Installing and sampling new temporary and permanent wells at the sites during several phases of field work (both on-site and off-site);
- Semi-annual sampling at the Peconic River (surface water and sediment); and
- Quarterly sampling of private wells at the Peconic River Sportsmen's Club.

This sampling work is summarized below. Full details of the sampling locations and results of chemical analyses are illustrated by the numerous figures and tables contained in the 2011 Report (many of which are specifically referenced in this memorandum).

Ground Water, Surface Water and Sediment Sampling

Temporary Wells – 31 temporary wells (TWs) were installed and sampled at the site. 101 ground water samples were obtained from these wells (from multiple depths in each well, all above the clay strata that appears to be continuous at about 60 feet bgs across the study area).

Permanent Wells - Four new permanent piezometers were installed and sampled in 2010 across the study area to depths of up to 48.5 feet bgs.

Ground Water Monitoring – 69 permanent monitor wells and piezometers were sampled in March, and eighty permanent wells were sampled in September. Four private wells at

the PRSC were also sampled on a quarterly basis (November 2010 and February, April and June 2011).

Peconic River Surface Water and Sediment - Eight surface water and eight sediment samples were collected from the Peconic River (four each in March and in September) at the previously established locations along a 2100-foot stretch of river downstream of Connecticut Ave.

All samples were analyzed for VOCs. Quality Assurance/Quality Control (QA/QC) samples were prepared and analyzed for VOCs also. SCDHS analyzed some of their split samples for additional parameters (metals, perchlorate, and inorganics).

Other Activities

Other activities were completed in 2011 include:

- Surveying of all new temporary and permanent well locations and elevations;
- Measuring ground water levels and constructing ground water flow maps;
- Measuring water levels at staff gauges at the river on the PRSC property;
- Completing a pilot study for ethyl lactate injection to enhance biodegradation of VOCs at the on-site fence line area.

Analytical Results Summary

Site 2 – VOCs were detected in six of the 13 monitor wells sampled at Site 2, and about 0.04 foot of petroleum was observed floating on the water surface in one of those wells (FT-MW-02S). Concentrations of TCE and xylenes exceeded New York State maximum contaminant levels (MCLs) of 5 ug/L in one monitor well sampled in March (11-12 ug/L TCE and 24 ug/L xylenes at FT-MW-02S). The xylenes and associated petroleum-hydrocarbon VOCs found at Site 2 originated from known petroleum releases there.

TCE was also found in nine temporary well samples collected in December 2011 downgradient (southeast) of Site 2. These samples are not documented in the 2011 Report. They were briefly mentioned, however, at the April 5 RAB meeting (Groundwater Investigation Summary briefing slides 6 and 7 show the temporary well sample locations and results), and will be the subject of a future report.

Based on Ground Water Investigation Summary briefing slides 6 and 7 distributed at the RAB meeting, TCE was found at levels ranging from 1.3 to 49 u/L at five of the December 2011 temporary well samples collected about 150 ft. south of Site 2. TCE was found at levels of 0.7 to 5.2 ug/L in three additional temporary well samples collected about 300 ft. further southeast, just north of Grumman Blvd. Finally, TCE was found at 24 ug/L in a temporary well sample collected by SCDHS about 1400 ft. southeast of Site 2, on the golf course at the edge of the wetlands that surrounds the large lake. The source of TCE and the other VOC detected here is under study.

Low concentrations of DCA and other chlorinated VOCs associated with the SA plume were also reported in samples collected at eight of the temporary wells shown on the briefing slides, including those sampled by SCDHS on the golf course. DCA ranged from 0.5 ug/L to 7.1 ug/L in those samples. The source of the VOCs detected here and/or their connection with the SA plume is under study.

Site 6A – Ground water sampling from temporary wells at this site refined the extent of the SA plume at its source area. In the core of the plume, ground water sampled from temporary well SA-TW349, located just southeast of 6A, contained up to 1200 ug/L TCA and 1300 ug/L of DCA in December 2010. About 200 ft. downgradient at TW402, June 2011 maximum detections included TCA at 270 ug/L, DCA at 660 ug/L, DCE at 49 ug/L, and CA at 160 ug/L. Permanent well FC-PZ05I1 was installed in this area to provide reproducible ground water data in future monitoring events. It is located in the core of the plume and screened from 20 to 30 ft. below ground surface. In September 2011, this new monitor well contained up to 360 ug/L TCA, 830 ug/L DCA, 60 ug/L DCE, and 250 ug/L CA.

Sampling at other temporary wells near Site 6A bracketed the width of the plume near the source area. A VOC rarely seen at Calverton, PCE, was detected in two of those wells that flank the western edge of the plume (at 8.9 ug/l in TW404 and at 180 ug/L in TW406). The results of temporary well sampling are shown on TT Figure 4-4.

Site 10B – Only one VOC (chloromethane) was detected in two of the three wells sample at 10B. Both detections were less than the MCL of 5 ug/L.

Southern Area – Beginning with this report, the SA has been divided into the following four areas for reporting and evaluation purposes.

- The Fence Line Area is shown on TT Figure 4-3. Well PZ138I1 located about 400 ft. north of the actual fence line is in the core of the plume and is screened at 27 to 42 ft. below ground surface. In March, June and September 2011, detections included TCA ranging from 250 to 340 ug/L; DCA from 1100 to 1500 ug/L; DCE from 65 to 100 ug/L; and CA from 150 to 280 ug/L. The other wells refined the width of the plume near the fence line, providing useful information for the remedial design.
- The Offsite High Concentration Area (greater than 500 ug/L DCA) is shown on TT Figure 4-7. All wells sampled in 2011 in this area had primary contaminants above MCLs. Well PZ143I in September 2011 contained the highest levels of TCA (84 ug/L), DCA (530 ug/L), DCE (36) ug/L, and CA (40 ug/L). New temporary well TW367 expanded the known area of offsite high-concentration ground water about 200 ft. to the southeast. Sampled in November 2011, it contained TCA (43 ug/L), DCA (420ug/L), DCE (24 ug/L) and CA (44 ug/L). Two additional new wells (PZ171 and PZ172) were installed in this area to better define the downgradient extent of this portion of the plume, but results of their sampling were not available for inclusion in this report.

- The Offsite Low Concentration Area (less than 500 ug/L DCA) is shown on TT Figure 4-6. Eleven wells in this portion of the plume had VOCs at levels above the MCLs in 2011. Well PZ123I1, screened at 32 to 42 ft. bgs, had the highest concentrations: TCA at 9.3 ug/L; DCA at 85 ug/L; and DCE at 7.8 ug/L. This well is located about 300 ft. downgradient (east-southeast) from the inferred 50 ug/L contour line and about 700 ft. northwest of the Peconic River (where the 5 ug/L contour line has been inferred). Based on the 2011 results for PZ123I1, the inferred 50 ug/L contour line would need to be extended to and beyond PZ123I1.

TCA, DCA and DCE have historically been detected at the co-located, deeper well PZ123I, screened at 70 to 80 ft. bgs, since 2005. Concentrations have declined significantly in that well, however, with no TCA, 37 ug/L DCA, and 4.7 ug/L DCE being reported for September 2011.

- Peconic River Area is shown on TT Figure 4-8. SA Plume VOCs were detected in the ground water samples collected from piezometers PZ118S, PZ124, PZ147, and PZ148. The highest levels were found in both the March and September samples collected at PZ124 (DCA at 54 to 79 ug/L; DCE at 4.7 to 6.5 ug/L; CA at 2.2 to 2.7ug/L; TCA at 2.6 to 3.8 ug/L; and TCE at 0.94 ug/L).

Two surface water samples contained SA Plume contaminants. SW124 had 1.8 ug/L DCA, 1.2 ug/L DCE, and 6.2 ug/L TCE in September. 0.84 ug/L of TCA was reported in SW201 in September.

Two sediment samples contained SA Plume contaminants. 1,2,4-trichlorobenzene was detected at 3.3 ug/L at SD124. 30 ug/L of tetrachloroethene (PCE) was found at SD204.

Based on the March and September 2011 results for PZ124 (which are consistent with, although increasing compared to, previous sampling events), the inferred 50 ug/L contour line would need to be extended to PZ124 (i.e., to the Peconic River).

Peconic River Sportsmen's Club – VOCs were detected in one of the PRSC wells, at the Activity Center, where VOCs have consistently been detected; it is equipped with a carbon filter unit. DCA, DCE, and other associated VOCs have been present in this well (CA-PRSC-02) since 2008 when regular sampling was begun. In 2011, DCA ranged from 10 to 12 ug/L. Testing after each stage of the carbon filtration system indicates that VOCs are either below MCLs or not detected. The municipal water supply line was extended to the Sportsmen's Club property in 2011; it is being connected to the facilities at the club this year.

Data Evaluation and Presentation

The 2011 report contains a vast quantity of analytical data, both depicted on many figures and tabulated in many tables (some as long as 15 pages each). In the past, it was suggested that it would be helpful to the reader if the significant data could be presented in a more easily understandable format. The 2010 report did include summary data tables within the text of Section 4, along with the discussion of the sampling results, for one area at a time. That improved the report significantly by facilitating comprehension of the analytical results and their significance. The 2011 report, however, again lacks such in-text summary tables.

The VOC detections are presented in Section 4 of the 2011 report in an organized manner, broken down by the newly categorized portions of the SA Plume. Various sets of data are referred to in text and depicted on various figures to describe the corresponding portions of the plume. In some cases, however, not all data pertinent to a given portion of the plume are included on a single figure (e.g., temporary well sample data may not be included with permanent monitor well sample data from the same area on one figure). This complicates one's comprehension of the significance of the investigations results.

In my review and analysis that follows, I have attempted to note the most significant data that I believe characterize the various portions of the SA Plume. I have created several tables (Tables 1, 2, and 3) to provide ready access and reference to those data.

Source Area to Fence Line Area

The highest levels of the primary SA Plume contaminants were found by the Navy in 2010 in ground water samples northwest of the on-site "runway ponds", in the vicinity of Site 6A. Temporary wells SA-TW-335, -343, -348 and -349 showed levels of DCA from 1,200 to 2,100 ug/L.

In 2011, the highly contaminated core of the plume was shown to extend more than 2000 ft. downgradient. About 500 ft. downgradient from the source areas, well FCPZ05I1 exhibited TCA as high as 530 ug/L; DCA as high as 1,000 ug/L; DCE as high as 75 ug/L; and CA as high as 220 ug/L. Much farther away to the southeast, approaching the fence line, well SAPZ138I1 showed TCA as high as 340 ug/L; DCA as high as 1,200 ug/L; DCE as high as 86 ug/L; and CA as high as 240 ug/L. At the fence line, well TW414 at 47 ft. bgs showed TCA at 150 ug/L; DCA at 580 ug/L; DCE at 34 ug/L; and CA at 88 ug/L.

The SA plume is now well understood as continuous and originating from the on-site, highly contaminated source area at 6A. The observed distribution of contaminants reflects the controls of geology and ground water flow conditions on the plume. Contaminants are migrating relatively rapidly along a narrow, preferential pathway from Site 6A to the southeast, and leaving the Navy property at the fence line area, just north

of River Rd. Off-site to the southeast, it spreads across the broad off-site SA where ground water flow is slower.

The set of significant data culled from the 2011 TT report and referenced above can be used to characterize the on-site portion of the plume, from source area to property boundary. The data are presented in the following Table 1; the plume is illustrated on the attached TT Figure 4-10.

Table 1. Summary of 2011 On-Site Maximum Primary Contaminant Data from Source Area to Fence Line - On-Site Southern Area Plume

Well ID	Approximate Distance Downgradient from Source Area (ft.)	1,1-DCA (ug/L)	1-1-DCE (ug/L)	1,1,1-TCA (ug/L)	Chloroethane (ug/L)
SATW349 35 ft. bgs	200 ft.	1300	76	1200	250
SATW402 25 ft. bgs	450 ft.	660	49	270	160
SATW402 35 ft. bgs	450 ft.	280	17	110	79
FCPZ05I1 20-30 ft. bgs	500 ft.	1000	75	530	220
SAPZ138I1 37-42 ft. bgs	2300 ft.	1200	86	340	240
SATW414 47 ft. bgs	2700 ft.	580	34	150	88

Off-Site Southern Area

The next table (Table 2) summarizes contaminant data from sampling locations within the plume, along the downgradient (southeast) direction, from the fence line area to the Peconic River. I consider these data, including the most-recently obtained data in the lower reaches of the plume, to be particularly noteworthy. Relatively high concentrations of DCA were reported farther downgradient in 2011 than previously observed (i.e., from the southwestern portion of the “high-concentration area,” through the location of well SAPZ123I1. The reader is referred to Figure 4-7 from the 2011 report and Figure 4-6 of the handouts provided by the Navy at the April 5 RAB meeting for locations of sampling points and the noted contaminant concentrations. Tables 4-4 and 4-5 of the 2011 TT report contain the primary data for all sampling locations.

Based on these data, the graphical depiction of the downgradient portion of the SA plume on the 2011 TT report figures does not appear to accurately represent the 2011 data. Based on the data collected in 2011, the 50 ug/L DCA contour line shown on TT Figure 4-10 in the report would extend through SAPZ123I1.

Table 2. Summary of 2011 Off-Site Maximum Primary Contaminant Data from Fence Line to Peconic River - Off-Site Southern Area Plume

Well ID	Approximate Distance Downgradient from Source Area (ft.)	1,1-DCA (ug/L)	1-1-DCE (ug/L)	1,1,1-TCA (ug/L)	Chloroethane (ug/L)
SAPZ142I 40-45 ft. bgs	3700 ft.	210	17	40	28
SAPZ143I 41-46 ft. bgs	3900 ft.	530	36	84	47
SATW367 46 ft. bgs	4300 ft.	500	26	43	47
SAMW131D 60-70 ft. bgs	4700 ft.	20	--	--	--
SAPZ123I1 32-42 ft. bgs	5500 ft.	85	7.8	9.3	2
SAPZ123I 70-80 ft. bgs	5500 ft.	37	4.9	--	0.83
SAPZ124 3-6 ft. bgs	6300 ft. (at Peconic River)	79	6.5	3.8	2.7

Peconic River

Navy and SCDHS sampling in 2009 and 2010 at the Peconic River demonstrated that the plume had reached the Peconic River and was discharging into it. SCDHS's pore water sampling from the base of the riverbed in August and December 2009 found DCA where it had been found in a Navy sediment sample collected in March 2009. Plume contaminants were found also in shallow ground water sampled from piezometers installed just north of the river in 2008 (17 ug/L in Navy well SAPZ118; 4 ug/L in SAPZ124). DCE and chloroethane also were detected in the 2008 SAPZ118 sample.

Concentrations have increased in shallow ground water at sampling location SAPZ124 at the river over the past three years. SAPZ124 is clearly located at an area of relatively high ground-water discharge into the river. DCA has been detected there steadily since that piezometer was installed and first sampled in August 2008. The initial DCA concentration was 4 ug/L. In 2010, up to 22 ug/L of DCA was reported there. By March 2011, DCA was as high as 58 ug/L; in September 2011, DCA had climbed as high as 79 ug/L at SAPZ124 (with DCE as high as 6.5 ug/L).

The significant data for the Peconic River portion of the plume is presented below in Table 3. Figure 4-8 from the 2011 report and Figure 4-8 of the April 5 RAB meeting

handouts show sampling locations and the noted contaminant concentrations. Tables 4-6, 4-7 and 4-8 of the 2011 TT report contain the primary data for all sampling locations.

Table 3. Summary of 2008-2011 Data at Peconic River Sampling Stations

Location and Sample Type	Date	DCA (ppb)	DCE (ppb)	1,1,1-TCA (ppb)
SA-PZ124 ground water	August 2008	4	--	--
SA-PZ118S ground water	August 2008	17	4	--
SA-SD124 sediment	March 2009	7.5	--	--
prwp-1 pore water beneath river bed	August 2009	40	6.5	--
prwp-4 pore water beneath river bed	August 2009	30	5	--
prwp-5 pore water beneath river bed	August 2009	57	11	--
prwp-17 pore water beneath river bed	September 2009	42	6.4	--
SA-PZ124 ground water	September 2009	17	1.7	--
SA-PZ118S ground water	September 2009	2.1; 2.5	--	--
SA-SD124 sediment	July 2010	8.8	--	--
SA-PZ124 ground water	July 2010	15	2.1	--
SA-SD124 sediment	September 2010	7.6	--	--
SA-PZ124 ground water	September 2010	22	5.2	--
SA-PZ147 ground water	September 2010	4.4	--	--
SA-PZ124 ground water	March 2011	54; 58	4.7; 4.8	3.6; 3.8
SA-PZ118S ground water	March 2011	5.8; 6.1	1.1	--
SA-PZ147 ground water	March 2011	17	3	--
SA-PZ147 ground water	September 2011	0.77	--	--
SA-PZ124 ground water	September 2011	67; 79	5; 6.5	2.6

Note: two values (54; 58) indicates primary and duplicate sample results; “prwp” Samples collected by Suffolk County Department of Health Services

Plume discharge into the river is further demonstrated by the pore-water samples collected by SCDHS in 2009 in close proximity to SAPZ124. As shown above, and detailed in my review memorandum of the 2009 ground water report, SCDHS samples prpw-1, prpw-4, prpw-5, and prpw-17 contained DCA at up to 57 ug/L (Review of 2009 Groundwater Investigation Activities Report, Memorandum for Bill Gunther from Frank Anastasi, March 26, 2010).

Recognizing the western-to-eastern fluctuation of the plume in this region, DCA concentrations around 50 ug/L could be expected northeast and/or southwest of SAPZ124 along the river, and between SAPZ123 and the river, where data are sparse. The yet-unreported results of sampling new wells SAPZ171 and SAPZ172 may help refine the depiction of the 50 ug/L DCA contour on revised SA Plume maps for future reports.

Based on these data, the graphical depiction of the downgradient portion of the SA plume on the 2011 TT report figures does not appear to be accurately drawn. Based on the 2010-2011 data, the 50 ug/L DCA contour line shown on TT Figure 4-10 in the report would extend through SAPZ123I1, all the way to the Peconic River and include SAPZ124. The 2009 SCDHS pore-water sample results recalled above further support this interpretation.

Comments and Observations

- The Navy completed the field work in accordance with the approved work plan and using appropriate techniques. The report is a thorough presentation of the work accomplished and the results of analyses performed. The QA/QC evaluations indicate that the data is valid (although some minor problems were noted). The extensive effort the Navy expended in 2010-2011 has clearly defined the nature and extent of the contamination, and delineated the plume, both on-site and off-site.
- As more and more data have been collected, the need for a more coherent method of presenting the most significant data has become even more obvious. This is now of paramount importance as the effectiveness of the soon-to-be operational fence line remediation system will need to be demonstrated by ground water monitoring results and trends. Reporting key data in a clear and concise manner will be essential.
- A well (SAPZ166I) is shown on figures in a key location, between well SAPZ123I1 and SAPZ124. This well has been sampled only once, in 2010. Well construction data are not reported (“NA” appears in the well-detail table in the report). Sampling of this well could provide useful information, especially with regard to helping to understand the distribution of the portion of the plume with DCA concentrations above 50 ug/L near the Peconic River.
- There still appears to be some uncertainty about the level of contamination in the far-downgradient portion of the plume – the “Peconic River Area” as it is now categorized. Additional data up- and down-stream from PZ124 and back to the

northwest would help resolve the uncertainty and will prove useful in monitoring the impact that we hope the fence line extraction system will have down near the river.

- Although access in this area is difficult, the extent of the ground water having 50 ug/L DCA and greater needs to be resolved, especially with recent data showing it extends to the river. New data showing the relatively high levels of DCA at the river and at relatively deep depths not too far upgradient heightens concern that this portion of the plume be fully understood. The 2009 SCDHS pore-water sample data underscore the interaction between the plume and the river near SAPZ124. In light of these data, it may be prudent also to revisit the basis for the assumption that the plume does not flow under the river.
- Use of a pore-water sampling device to obtain water from just beneath the river bed along the river, as SCDHS did in 2009, may provide useful information for understanding the interaction of ground water and surface water at the area where plume discharge to the river appears concentrated. In the past, pore water samples in general were found to contain higher levels of SA Plume contaminants than co-located, or nearby, Navy surface water samples (surface water collected from within the river). It may be prudent to consider using the pore-water sampling device in a future monitoring event in light of the increased levels of DCA observed at the river in SAPZ124.

Future Activities

The Navy is planning some additional field work to delineate the nature and extent of ground water contamination downgradient of Site 2; designing the fence line extraction and treatment system; connecting the facilities at the Sportsman's Club to the new water supply line; and beginning the munitions response/debris and contaminated soil removal action at Site 2. A Site 2 Remedial Investigation will ultimately be prepared (date uncertain but not likely before 2013).

At the April 5, 2011 RAB meeting, the Navy indicated that a Technical Meeting could be held with SCDHS and NYSDEC over the summer to work on development of the remediation monitoring program and establishing trigger levels for off-site portions of the plume. I anticipate participating in such a meeting if it is held.

I trust you and the RAB will find this memorandum helpful. If you have any questions or require any additional information feel free to contact me at (301) 309-0061 or by email.

cc: Lora Fly, Navy