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TECHNICAL MEMORANDUM POST-CONSTRUCTION SURFACE WATER MONITORING AT
SITE 28 NSWC INDIAN HEAD MD
03/18/2011
CH2M HILL

Post-Construction Surface Water Monitoring at Site 28, Naval Support Facility Indian Head, Indian Head, Maryland

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Introduction

This technical memorandum presents the surface water sampling activities and results for Site 28, Original Burning Ground, at the Naval Support Facility Indian Head (NSF-IH), Indian Head, Maryland (Figure 1). Following completion of a non-time critical removal action (NTCRA) in December 2008 to mitigate risks associated with soil and sediment, three rounds of surface water samples were collected to assess post-source control ecological risk associated with the water in Swale 4 and assess whether further monitoring or risk assessment activities are warranted. Field activities were conducted in accordance with the *Final Post-Construction Surface Water Monitoring at Site 28* (CH2M HILL, 2009; herein referred to as work plan). The work plan presents the rationale for the investigation.

Field Activities

Three rounds of surface water sampling were conducted to assess temporal and seasonal variations in water quality, and identify potential upgradient sources of contamination in Swale 4. Round 1 was conducted on December 18, 2009, one year after completion of the NTCRA. Round 2 was conducted on June 17, 2010, 18 months after the NTCRA. Round 3 was conducted on November 4, 2010, 23 months after the NTCRA. Figure 2 shows the sampling locations.

For Round 1, surface water samples were collected from three locations (IS28SW04, IS28SW05, and IS28SW06); one from within the upgradient portion of the channel of Swale 4 (IS28SW04), one from the terminus of Swale 4 where it discharges to Mattawoman Creek (IS28SW05), and one from along the shoreline adjacent to the site (IS28SW06) (Figure 2). To minimize sample disturbance, the samples were collected in a downgradient to upgradient direction. At each location, water quality parameters (temperature, pH, conductivity, turbidity, and dissolved oxygen) were measured using a Horiba U-22 water quality meter and recorded in the field log book before collecting the sample. Surface water samples were collected through the use of a peristaltic pump and disposable tubing. The samples were field filtered using a 45-micrometer in-line disposable filter and were collected directly from

the pump tubing in laboratory supplied bottleware. Associated quality assurance/quality control samples, including a field blank, equipment blank, field duplicate, and matrix spike/matrix spike were collected. All sampling equipment were decontaminated prior to and after sampling, as well as between samples. After collection, each sample container was placed in a cooler with ice and stored at ≤ 4 degrees Celsius ($^{\circ}\text{C}$) for shipment to Empirical Laboratories, LLC of Nashville, Tennessee for dissolved cadmium, dissolved zinc, hardness, pH, and total organic carbon (TOC) analyses. Samples were analyzed on a standard 28 calendar-day turnaround time. The data were validated by DataQual Environmental Services, LLC of St. Louis, Missouri using Region III Modifications to the *Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses*. The horizontal locations (northing and easting coordinates) of the surface water sample locations were surveyed with a portable global positioning system unit. The horizontal locations were referenced to the 1983 North American datum.

The results were presented to the Indian Head Installation Restoration Team (IHIRT) at the April 2010 partnering meeting. The analytical results were compared to Region 3 Biological Technical Assistance Group (BTAG) Freshwater screening values (SVs) for both cadmium and zinc in surface water. The Team discussed the cadmium and zinc exceedances of the screening values, and the need to identify the potential source of the contamination. The IHIRT agreed that surface water samples should be collected from four additional locations – upgradient of the site at the 60-foot contour line from the inlet of each culvert as well as from the terminus of each culvert. It was also proposed that samples be collected after a rain event to ensure that water was flowing out of the culverts.

During Round 2, surface water samples were collected from the same three locations (IS28SW04, IS28SW05, and IS28SW06) as Round 1. Surface water samples were proposed to be collected from an additional four locations (IS28SW07 through IS28SW10), but they were not collected because the locations were dry. These locations consisted of one upgradient location at the inlet of each of the two culverts which drain into Swale 4 as well as one sampling location at the downgradient outlet of each of the culverts. The sampling protocol was the same as Round 1.

During Round 3, surface water samples were collected from six locations (IS28SW04, IS28SW05, IS28SW06, IS28SW07, IS28SW08, and IS28SW10) after a rain event to ensure that water would be flowing through the drainage culverts which flow into Swale 4. Locations IS28SW07 and IS28SW08 are upgradient at the inlet of each of the culverts. Location IS28SW10 is at the terminus of the corrugated metal culvert (Figure 2). A sample was not collected from location IS28SW09, the terminus of the HDPE culvert, because there was no water flowing from the culvert. The sampling protocol was the same as Round 1 and Round 2.

Analytical Results

Tables 1, 2, and 3 present the analytical results for Rounds 1, 2, and 3, respectively. The tables present the raw and detected constituents, adjusted ecological screening values, and exceedances of the screening values. The ecological screening values were Region 3 Biological Technical Assistance Group (BTAG) Freshwater screening values, but were adjusted based on the site-specific hardness of each sample. The analytical results were

compared to the adjusted ecological screening values to assess the potential risk to aquatic organisms. Figure 3 shows the analytical results of dissolved cadmium and dissolved zinc at each location, and screening value exceedances.

Overall, the analytical results show that dissolved cadmium and dissolved zinc concentrations have decreased both within and downgradient of the swale. Therefore, the NTCRA has effectively reduced the ecological risk at Site 28. Dissolved cadmium did not exceed the screening value at any location in Round 3. Dissolved zinc exceeded the screening criteria at three locations (IS28SW05 through IS28SW07) in Round 3 indicating that the potential for ecological risks remains in the swale and shoreline of Mattawoman Creek.

Conclusions

The surface water results show that over a 2-year period since the NTCRA, dissolved cadmium and dissolved zinc concentrations have decreased indicating that the NTCRA has effectively reduced the ecological risk at Site 28. However, the data show that the potential for ecological risks remains at the site.

On February 15, 2010, these results were discussed with the IHIRT. Furthermore, the geologic cross-sections and potentiometric surface maps in the *Final Remedial Investigation Report, Site 28, Naval District Washington, Indian Head, Indian Head, Maryland* (CH2M HILL, 2005) indicated that a portion of the groundwater beneath the site contributes to the surface water in Swale 4. Consequently, the potential risks from zinc identified for surface water are linked directly to the shallow groundwater contamination. The IHIRT agreed that zinc concentration in the water within the swale should be monitored in conjunction with the groundwater at the site.

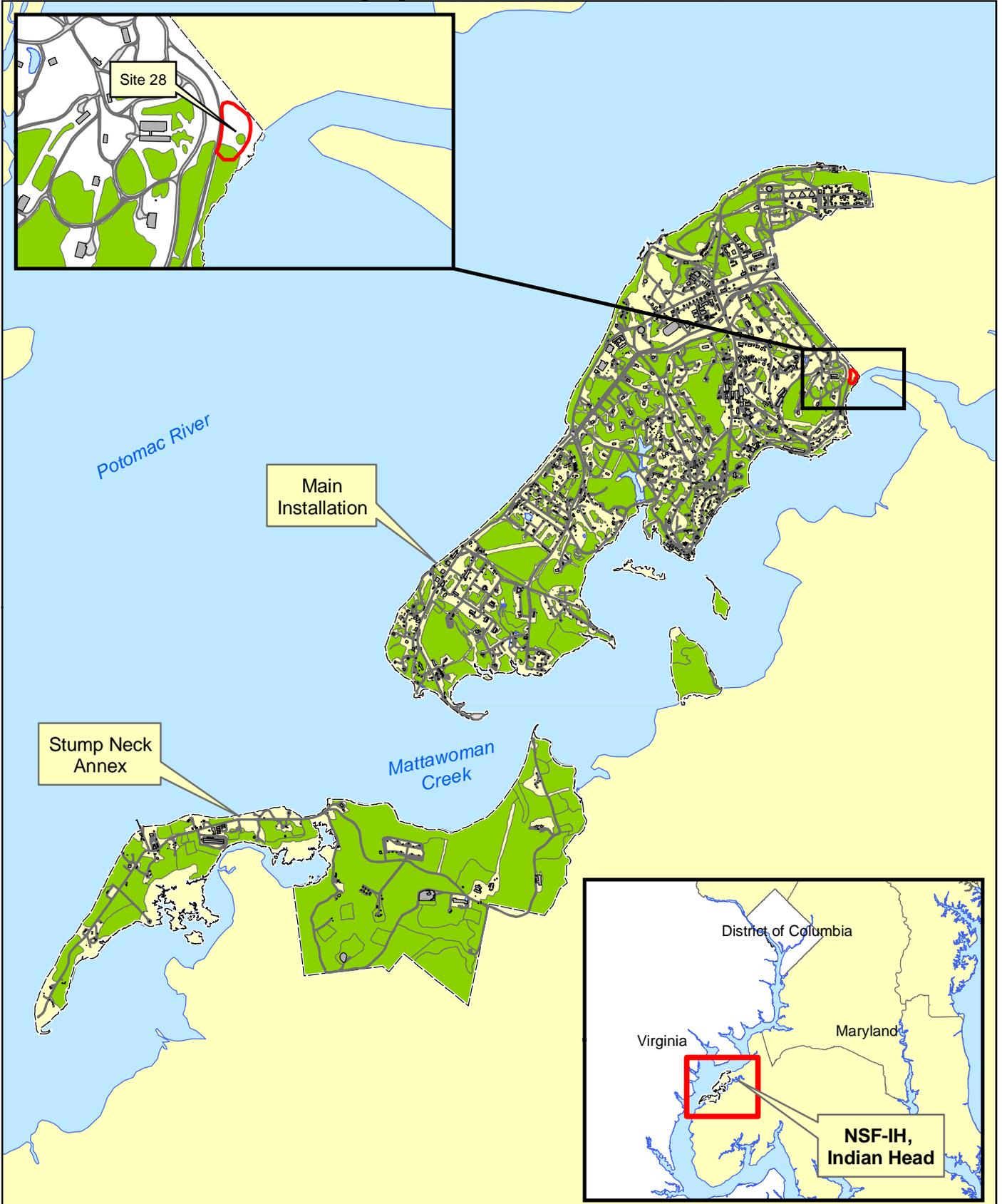


Figure 1
NSF-IH Location Map
Post Construction Surface Water Monitoring at Site 28
NSF-IH, Indian Head, Maryland



Legend

- | | |
|---------------------------------------|---------------------------|
| Surface Water Sample Location | Approximate Site Boundary |
| Approximate Observation Well Location | Installation Boundary |
| Fence Line | Buildings |
| 24in CMP | Road Area |
| 24in HDPE | Limits of Removal Action |
| Swale 4 | Wooded Area |
| Post Excavation Contours | |

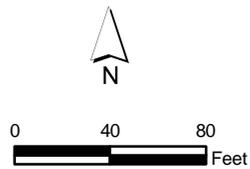
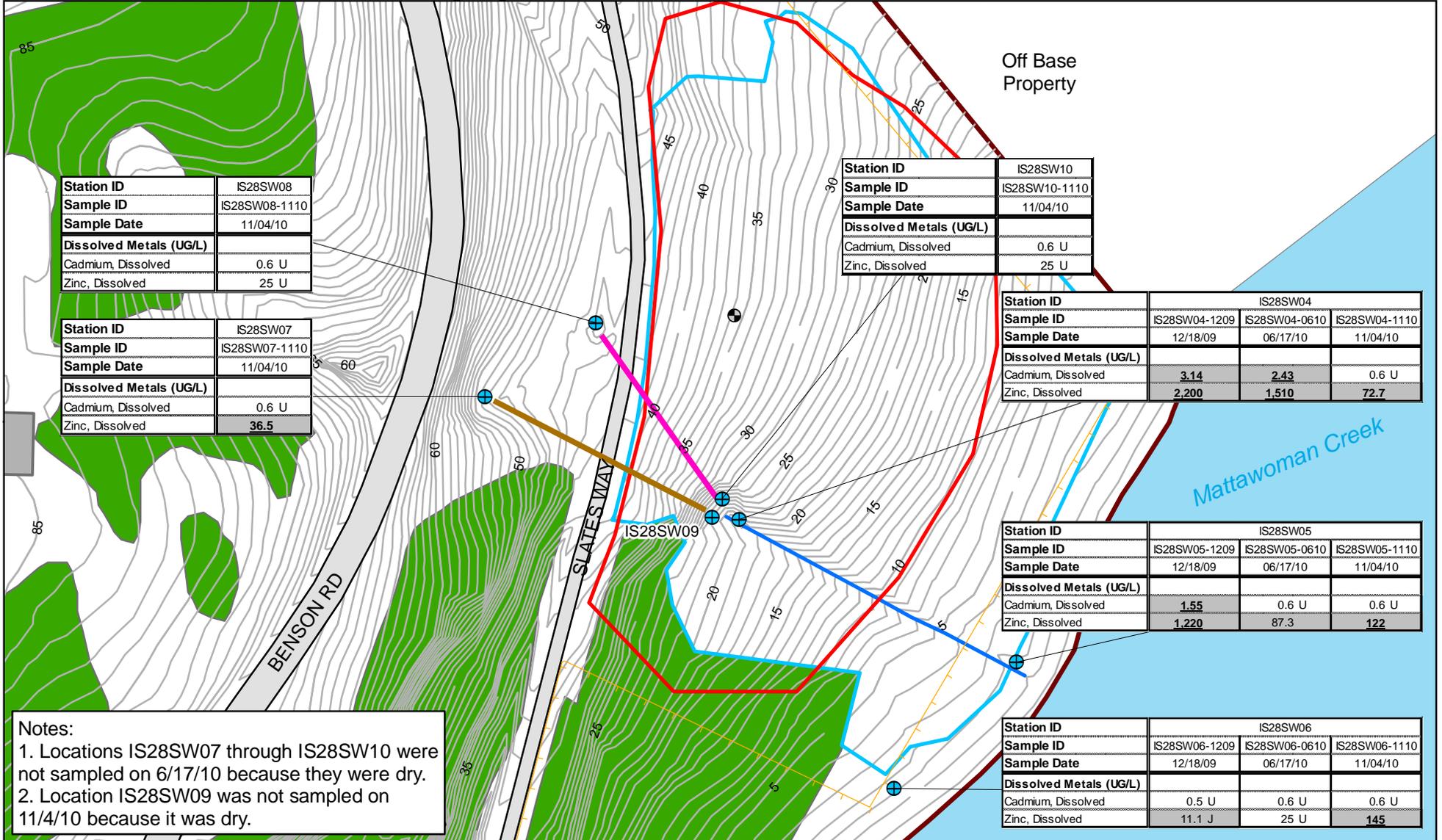


Figure 2
 Site 28 Location Map
 Post Construction Surface Water Monitoring at Site 28
 NSF-IH, Indian Head, Maryland



Notes:
 1. Locations IS28SW07 through IS28SW10 were not sampled on 6/17/10 because they were dry.
 2. Location IS28SW09 was not sampled on 11/4/10 because it was dry.

Legend

- ⊕ Surface Water Sample Location
- ⊙ Approximate Observation Well Location
- Fence Line
- 24in CMP
- 24in HDPE
- Swale 4
- Post Excavation Contours
- Approximate Site Boundary
- Installation Boundary
- Buildings
- Road Area
- Limits of Removal Action
- Wooded Area

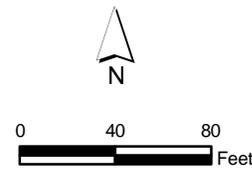


Figure 3
 Surface Water Analytical Results
 Post Construction Surface Water Monitoring at Site 28
 NSF-IH, Indian Head, Maryland

Table 1
Round 1 Raw and Detected Constituents in Surface Water (December 18, 2009)
Post-Construction Surface Water Monitoring at Site 28
NSF-IH, Indian Head, Maryland

Station ID	Hardness-adjusted Ecological Screening Value ¹			IS28SW04	IS28SW05		IS28SW06
	IS28SW04	IS28SW05	IS28SW06		IS28SW04-1209	IS28SW05-1209	
Sample ID				IS28SW04-1209	IS28SW05-1209	IS28SW05P-1209	IS28SW06-1209
Sample Date				12/18/09	12/18/09	12/18/09	12/18/09
Chemical Name							
Dissolved Metals (µg/L)							
Cadmium, Dissolved	0.13	0.13	0.09	<u>3.14</u>	<u>1.39</u>	<u>1.55</u>	0.5 U
Zinc, Dissolved	54.24	52.5	35.01	<u>2.200</u>	<u>1.100</u>	<u>1.220</u>	11.1 J
Wet Chemistry							
Hardness (mg/L)				39.9	38.4	NA	23.8
pH				6.18 J	6.83 J	NA	6.64 J
Dissolved Wet Chemistry (mg/L)							
Dissolved organic carbon				1.5 U	2.37	NA	4.69

Notes

Shading indicates detect

Bold and underline result indicate exceedance of the screening value

ID - Identification

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - Constituent was analyzed for, but not detected

mg/L - milligrams per liter

µg/L - micrograms per liter

Sample nomenclature incorporates base/site ID (IS28), sample type (SW for surface water), last 2 digits of station ID, month (2 digits) and year (2 digits).

A field duplicate has a "P" following the 2-digit station number. One field duplicate sample was collected from station IS28SW05.

¹Region 3 Biological Technical Assistance Group Freshwater screening values were adjusted based on the site-specific hardness of each sample.

Table 2
Round 2 Raw and Detected Constituents in Surface Water (June 17, 2010)
Post-Construction Surface Water Monitoring at Site 28
NSF-IH, Indian Head, Maryland

Station ID	Hardness-adjusted Ecological Screening Value ¹			IS28SW04	IS28SW05		IS28SW06
	IS28SW04	IS28SW05	IS28SW06		IS28SW04-0610	IS28SW05-0610	
Sample ID							
Sample Date				06/17/10	06/17/10	06/17/10	06/17/10
Chemical Name							
Dissolved Metals (µg/L)							
Cadmium, Dissolved	0.16	0.22	0.22	<u>2.43</u>	0.6 U	0.6 U	0.6 U
Zinc, Dissolved	68.44	100.47	101.3	<u>1,510</u>	87	68	25 U
Wet Chemistry							
Hardness (mg/L)				52.5	82.6	NA	83.4
pH				5.56 J	6.98 J	NA	5.7 J
Dissolved Wet Chemistry (mg/L)							
Dissolved organic carbon				0.607 J	3.67	NA	3.7

Notes

Shading indicates detect

Bold and underline result indicate exceedance of the screening value

ID - Identification

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - Constituent was analyzed for, but not detected

mg/L - milligrams per liter

µg/L - micrograms per liter

Sample nomenclature incorporates base/site ID (IS28), sample type (SW for surface water), last 2 digits of station ID, month (2 digits) and year (2 digits).

A field duplicate has a "P" following the 2-digit station number. One field duplicate sample was collected from station IS28SW05.

¹Region 3 Biological Technical Assistance Group Freshwater screening values were adjusted based on the site-specific hardness of each sample.

Table 3
Round 3 Raw and Detected Constituents in Surface Water (November 4, 2010)
Post-Construction Surface Water Monitoring at Site 28
NSF-IH, Indian Head, Maryland

Station ID	Hardness-adjusted Ecological Screening Value ¹						IS28SW04	IS28SW05	IS28SW06	IS28SW07	IS28SW08	IS28SW10	
	IS28SW04	IS28SW05	IS28SW06	IS28SW07	IS28SW08	IS28SW10							
Sample ID							IS28SW04-0610	IS28SW05-0610	IS28SW05P-0610	IS28SW06-1209	IS28SW07-1110	IS28SW08-1110	IS28SW10-1110
Sample Date							06/17/10	06/17/10	06/17/10	06/17/10	11/04/10	11/04/10	11/04/10
Chemical Name													
Dissolved Metals (µg/L)													
Cadmium, Dissolved	0.11	0.10	0.23	0.08	0.11	0.11	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Zinc, Dissolved	42.59	38.59	106.62	29.57	44.99	42.35	72.7	122	121	145.0	36.5	25.0 U	25.0 U
Wet Chemistry													
Hardness (mg/L)							30.0 K	26.7 K	NA	88.6 K	19.5 K	32.0 K	29.8 K
pH							7.25 J	7.38 J	NA	6.39 J	6.36 J	7.42 J	7.48 J
Dissolved Wet Chemistry (mg/L)													
Dissolved organic carbon							3.47	3.59	NA	5	8.22	3.57	3.57

Notes

Shading indicates detect

Bold and underline result indicate exceedance of the screening value

ID - Identification

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - Constituent was analyzed for, but not detected

mg/L - milligrams per liter

µg/L - micrograms per liter

Sample nomenclature incorporates base/site ID (IS28), sample type (SW for surface water), last 2 digits of station ID, month (2 digits) and year (2 digits).

A field duplicate has a "P" following the 2-digit station number. One field duplicate sample was collected from station IS28SW05.

¹Region 3 Biological Technical Assistance Group Freshwater screening values were adjusted based on the site-specific hardness of each sample.