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TRANSMITTAL LETTER FOR REPLACEMENT PAGES FOR REVISED FINAL 2 SUMMARY
REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC
COMPOUNDS NAVAL ACTIVITY PUERTO RICO
7/30/2010
BAKER ENVIRONMENTAL, INC.

001590



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Letter of Transmittal

To:	U.S. Environmental Protection Agency – Region II	S.O. No.:	119197
	290 Broadway – 22 nd Floor	Project:	Revised Final II – Summary Report for Environmental Background Concentrations of Inorganic Compounds
	New York, NY 10007-1866		
Attn:	Mr. Adolf Everett, P.E. Chief, RCRA Programs Branch	Date:	August 4, 2010

We are forwarding the following: Attached Under Separate Cover Other

DWG. NO.	NO. COPIES	TITLE OR DESCRIPTION	COMMENTS
	1	Inside Cover	Please replace this item with the one submitted to you on August 3, 2010
	1	Set of replacement text (pages C-1 through C-6)	Please replace these items with those that were submitted to you on July 30, 2010.
	1	Set of replacement tables (pages C-1 though C-7)	

THESE ARE TRANSMITTED as checked below:

- | | | |
|--|---|---|
| <input type="checkbox"/> As requested | <input type="checkbox"/> No exception taken | <input type="checkbox"/> Revise and resubmit |
| <input checked="" type="checkbox"/> For review and comment | <input type="checkbox"/> Rejected - See remarks | <input type="checkbox"/> Submit specified items |
| <input type="checkbox"/> For your information | <input type="checkbox"/> Proceed subject to corrections noted | <input type="checkbox"/> Other |

GENERAL COMMENTS:

cc: Mr. Mark E. Davidson, BRAC PMO SE – 1 hard copy
Ms. Bonnie Capito, NAVFAC Atlantic-Code EV42 – 1 hard copy
Mr. Tim Gordon, USEPA Region II – 1 hard copy
Ms. Gloria Toro, PREQB – 1 hard copy

By: Mark E. Kimes, P.E.

Title: Project Manager

Page: 1 of 1

DIRECTIONS FOR REPLACEMENT PAGES

**REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND
CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO
CEIBA, PUERTO RICO**

Please substitute the enclosed inside cover, text, and tables in your copies of the Addendum C of the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds at Naval Activity Puerto Rico, dated February 29, 2008.

<u>Description</u>	<u>Remove Old</u>	<u>Insert New</u>
Inside Cover	Inside Cover	Inside Cover
Addendum C		
Text	Text (Pages C-1 through C-4)	Text (Pages C-1 through C-6)
Tables	Tables C-1 through C-4	Tables C-1 through C-7

REVISED FINAL II
SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND
CONCENTRATIONS OF INORGANIC COMPOUNDS

NAVAL ACTIVITY PUERTO RICO
RCRA/HSWA PERMIT NO. PR2170027203
CEIBA, PUERTO RICO

CONTRACT TASK ORDER 121

JULY 30, 2010

Prepared for:

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
Norfolk, Virginia

Under the:

LANTDIV CLEAN PROGRAM
Contract N62470-02-D-3052

Prepared by:

CH2M Hill
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TABLE C-7
DESCRIPTIVE STATISTICS FOR NON-AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	FOD	n	W-Test Results			Arithmetic Mean ⁽¹⁾ (\bar{x})	Standard Deviation ⁽¹⁾ (s)	Coefficient of Variation (CV)	Upper Limit of means ($\bar{x} + 2s$)
			Normal Distribution	Lognormal Distribution	Assumed Distribution				
Metals (mg/kg)									
Antimony	C	7	NO	NO	NORMAL	1.99	4.51	2.268	11.01
Arsenic	D	7	NO	YES	NORMAL	1.41	1.15	0.818	3.71
Barium	D	7	YES	YES	NORMAL	95.84	58.60	0.611	213.04
Beryllium	C	7	YES	YES	NORMAL	0.24	0.02	0.099	0.29
Cadmium	C	7	YES	YES	NORMAL	0.11	0.12	1.051	0.35
Chromium	D	7	NO	YES	NORMAL	37.67	14.54	0.386	66.75
Cobalt	D	7	NO	YES	NORMAL	30.96	16.73	0.540	64.42
Copper	D	7	NO	NO	NORMAL	86.99	26.28	0.302	139.55
Lead	D	7	NO	YES	NORMAL	9.69	2.46	0.254	14.62
Mercury	D	7	YES	YES	NORMAL	0.09	0.04	0.424	0.17
Nickel	D	7	YES	YES	NORMAL	12.54	3.32	0.265	19.19
Selenium	D	7	NO	YES	NORMAL	1.55	1.26	0.811	4.07
Thallium	B	7	--	--	--	--	--	--	--
Tin	D	7	YES	YES	NORMAL	4.86	1.40	0.287	7.66
Vanadium	D	7	YES	YES	NORMAL	191.29	34.54	0.181	260.37
Zinc	D	7	YES	YES	NORMAL	66.41	21.71	0.327	109.83

Notes:

FOD = Frequency of Detection

C = Frequency of detection \leq 50 percent with more than one detection

D = Frequency of detection $>$ 50 percent

n = Total number of data points

mg/kg = milligram per kilogram

⁽¹⁾ For metals with non-detected results (i.e., antimony, arsenic, beryllium, cadmium, mercury, thallium, and tin), the value was derived using one-half the reporting limit for non-detected values.

ADDENDUM C

FRESHWATER DRAINAGE DITCH SEDIMENT

This addendum to the *Revised Final II Summary Report for Environmental Background Concentrations for Inorganic Compounds, Naval Activity Puerto Rico (Background Summary Report)*, (Baker, 2008) dated February 29, 2008, presents two background freshwater drainage ditch sediment data sets for use in Resource Conservation Recovery Act (RCRA) Facility Investigations (RFIs), including Phase I and Full RFIs, and Corrective Measures Study (CMS) investigations conducted in the vicinity of the airfield, as well as base-wide, at Naval Activity Puerto Rico (NAPR).

C.1 History

The need for a background freshwater drainage ditch sediment data set for use in SWMU investigations at the airfield at NAPR was discussed and agreed upon during a meeting attended by the United States Environmental Protection Agency (USEPA), Puerto Rico Environmental Quality Board (PREQB), Navy, TechLaw, Inc. (consultant for EPA), TRC (consultant for PREQB), Baker Environmental, Inc. (consultant for the Navy), and Right Way Environmental Contractors, Inc. (remediation contractor for the Navy) on October 30, 2008 at the USEPA Region 2 Offices in New York, New York. In response to the agreement and upon receipt of funding for implementation of field work, Baker, on behalf of the Navy, prepared a figure showing the proposed background drainage ditch sampling locations and a sample matrix outlining the samples to be collected. The figure and sample matrix were provided to the USEPA and PREQB for review and comment on May 20, 2009. PREQB approved the proposed sampling locations without comment on May 26, 2009. However, USEPA's consultant (TechLaw, Inc.) submitted comments on May 27, 2007. Baker, on behalf of the Navy, prepared responses to the USEPA comments. These responses, as well as a revised figure were submitted to the USEPA on May 28, 2009. USEPA gave their approval of the Navy responses and revisions to the proposed sample locations on June 3, 2009. USEPA- and PREQB-approved sample locations are depicted on Figure C-1. All correspondence between Baker and the USEPA and PREQB (conducted using electronic mail) is included as Attachment A.

C.2 Field Activities

Field sampling activities associated with the background freshwater drainage ditch sediment sampling effort were conducted by Baker personnel from June 24, 2009 to June 27, 2009 in accordance with the *Final Corrective Measures Study Work Plan for SWMU 56* (Baker, 2007). PREQB personnel accompanied Baker personnel during sampling activities conducted on June 25, 2009. A total of eighteen sediment samples, designated FWDBKG-SD01 through FWDBKG-SD18, were collected from the 0.0 to 4.0-inch depth interval using dedicated sampling equipment (stainless steel spoons and aluminum pans). Two field duplicates (FWDBKG-SD01D and FWDBKG-SD11D) and one matrix spike/matrix spike duplicate (MS/MSD) also were collected. In addition to the background drainage ditch and field Quality Assurance/Quality Control (QA/QC) sediment samples identified above, one field blank (JUN09-FB02) and four equipment rinsate blanks (JUN09-ER02 through JUN09-ER05) were collected during drainage ditch sampling activities. The JUN09-ER02 and JUN09-ER04 equipment rinsate blanks were collected by passing laboratory-grade deionized water over unused stainless steel spoons (stainless steel spoons were used to collect sediment from the drainage ditches), while the JUN09-ER03 and JUN09-ER05 equipment rinsate blanks were collected by passing laboratory-grade deionized water over unused aluminum pans (aluminum pans were used to composite

sediment samples prior to their distribution to sample containers). Each sediment sample and field blank was analyzed for Appendix IX metals by Compuchem (Cary, North Carolina) using SW-846 methodology (SW-846 6020). The analytical data were certified by a Puerto Rico certified chemist and validated by DataQual Environmental Services, LLC. (St. Louis, Missouri) in accordance with USEPA Region II Data Validation Standard Operating Procedures (USEPA Region II SOP HW-2, Revision 13 [USEPA, 2005]).

With the exception of FWDBKG-SD03, the background freshwater drainage ditch sediment samples were collected at the USEPA- and PREQB-approved locations depicted on Figure C-1. The proposed location for FWDBKG-SD03 was established west of Guadalcanal Road, within a drainage ditch that flows through a wetland unit designated PEM1 (Palustrine, Emergent, Persistent) by the Cowardin Wetland Classification System (Cowardin et al., 1979). Although a Global Positioning System (GPS) was used to pinpoint the proposed sample location, the drainage ditch could not be located in the field. As such, FWDBKG-SD03 was re-located east of Guadalcanal Road, within a drainage ditch upgradient of sample location FWDBKG-SD04. The new location was georeferenced in the field using a GPS and is shown on Figure C-2. The figure includes two locations (56SD06 and 56SD07) sampled on September 25, 2008 during a field investigation associated with SWMU 56. This field investigation was designed, in part, to establish a site-specific background drainage ditch data set for SWMU 56. As specified by the Navy responses to USEPA comments on the proposed background sediment sampling locations (see Attachment A), analytical data for drainage ditch sediment samples collected at these two locations were used to supplement the analytical data generated as part of the background freshwater drainage ditch sampling event.

C.3 Analytical Data

C.3.1 Airfield Freshwater Drainage Ditch Sediment Background

The analytical data for the airfield background freshwater drainage ditch sediment samples FWDBKG-SD01 through FWDBKG-SD18, 56SD06, and 56SD07 are presented in Table C-1, while analytical data for the field blank and equipment rinsate blanks are presented in Table C-2. A summary of the airfield background freshwater drainage ditch sediment analytical data is presented in Table C-3, including minimum and maximum detected concentrations, minimum and maximum non-detected concentrations, location of maximum detected concentration, and frequency of detection. Finally, a statistical summary of the airfield background freshwater drainage ditch sediment analytical data is presented in Table C-4 (descriptive statistics were not calculated for those metals with less than two detections [i.e., silver]). Box and whisker plots for each metal within the airfield data set with a frequency of detection greater than fifty percent are included as Attachment B (for data sets with non-detects, one-half non-detected results were used to construct the plots).

With one exception, the descriptive statistics presented in Table C-4 were derived in accordance with the methodology contained within the *Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Chemicals* (Baker, 2008). The exception is associated with the handling of outliers. The Revised Final II Summary Report (Baker, 2008) ran two outlier tests on data sets with a frequency of detection greater than 50 percent (Discordance test and the Dixon test). A sample result was removed from a given data set prior to calculating the descriptive statistics if (1) the data set had twenty or more data points and either test identified the sample result as an outlier, or (2) the data set had fifteen to twenty data points and both tests identified the sample result as an outlier. Although outlier tests were conducted on the

background freshwater drainage ditch sediment data sets presented in Table C-1, outliers were not removed prior to calculating the descriptive statistics for the reasons listed below.

- The data sets summarized in the Revised Final II Summary Report (Baker, 2008) were populated, in part, with analytical data from samples collected at Solid Waste Management Units (SWMUs) and Environmental Condition of Property (ECP) sites. As such, the outlier tests served as a tool to identify data points within a particular data set that may represent site activities involving a chemical release. Because the background freshwater drainage ditch sediment data set was populated with analytical data from samples collected at locations with no apparent influence from a SWMU- or ECP-related chemical release, the data set is assumed to contain data points which represent naturally occurring and anthropogenic levels. Therefore, removal of outliers is not deemed appropriate. It is acknowledged that four background locations (FWDBKG-SD17, FWDBKG-SD18, 56SD06, and 56SD07) were established within a drainage ditch downgradient from SWMU 66 (i.e., ECP Site 12 [Former UST No. 209]). However, no impact to the environment was indicated by subsurface soil samples collected during the Phase II ECP field investigation (NAVFAC Atlantic, 2005). The RCRA 7003 Administrative Order on Consent (USEPA Docket No. RCRA-02-2007-7301) also concluded that ECP Site 12 has not been impacted by past or present operations (USEPA proposed Corrective Action Complete without Controls).
- Sediment quality within drainage ditches downgradient from several SWMUs (i.e., SWMUs 14, 56, and 69) are influenced by drainage from the town of Ceiba. Navy Policy on the use of Background Chemical Levels (available at <http://web.ead.anl.gov/ecorisk/policy/>) states that, “*To fully understand the nature of the site it is necessary to distinguish between releases caused by Navy operations and those chemicals caused by non-site related sources (background).*” Outlier tests conducted on the background freshwater drainage ditch sediment data set presented in Table C-1 indicated that the copper detection in FWDBKG-SD02 (183 mg/kg) and the lead and zinc detection in FWDBKG-SD13 (29.9J mg/kg and 203J mg/kg, respectively) are outliers (these sampling points are located within drainage ditches downgradient from the town of Ceiba). As evidenced by Figure C-2, FWDBKG-SD02 and FWDBKG-SD13 were established within drainage ditches downgradient from the town of Ceiba, but upgradient of any possible influence from SWMUs 56 and 69 (in the case of FWDBKG-SD02) or SWMU 14 (in the case of FWDBKG-SD13). Removal of these data points is deemed inappropriate since Navy policy requires that chemical levels caused by releases due to Navy operations must be distinguished from chemical levels caused by anthropogenic inputs (such as inputs from Ceiba).
- No specific reason for the outliers identified within the background drainage ditch data set can be determined. Arsenic, cobalt, copper, lead, and zinc (metals with data points identified as outliers) were not detected in the field blank and equipment rinsate blanks associated with the background drainage ditch sediment samples (see Table C-2). Therefore, contaminated sampling equipment cannot explain the unexpected values. Laboratory and validation narratives also do not indicate that malfunctioning equipment and/or laboratory errors can explain the unexpected values. Finally, the spatial context of data points identified as outliers indicates that these sporadic, unexpected values may simply represent a feature of the areas sampled. As evidenced by Figure C-2, data points identified as outliers are distributed among four widely spaced sample locations (arsenic

detection in 56SD06 [3.8 mg/kg], cobalt detection in FWDBKG-SD09 [65.8 mg/kg], copper detection in FWDBKG-SD02 [183 mg/kg], and lead and zinc detections in FWDBKG-SD13 [29.9J mg/kg and 203J mg/kg, respectively]). Sampling locations containing outliers also are located near sampling points with low concentrations. In summary, no plausible reason can be found for removing these outliers.

C.3.2 Non-Airfield Freshwater Drainage Ditch Sediment Background

The need for a background freshwater drainage ditch sediment data set for use base-wide (i.e., at non-airfield SWMUs) was also discussed at the October 30, 2008 meeting. However, at that time a decision was not made as to whether the airfield background freshwater drainage ditch sediment data could be applied site-wide, or whether the data could be used in part to establish a site-wide background freshwater drainage ditch sediment data set. In a comment letter dated May 21, 2010, TechLaw, on behalf of USEPA, requested clarification and justification for the use of the airfield background freshwater drainage ditch sediment data for site-wide investigations. To address this request, a conference call was held on July 1, 2010 between the USEPA, TechLaw, the Navy, and Baker. The outcome of the discussion was that all parties agreed that a portion of the freshwater drainage ditch sediment data would be suitable for use as a base-wide background drainage ditch sediment data set. Specifically, 56SD06, 56SD07, FWDBKG-03, FWDBKG-SD08, FWDBKG-SD09, FWDBKG-SD17, and FWDBKG-SD18 were selected as freshwater drainage ditch sediment samples representative of background conditions base-wide. The justification for selecting these samples is as follows. The samples were collected from drainage ditches that originate outside of the airfield fence line (i.e., 56SD06, 56SD07, FWDBKG-03, FWDBKG-SD17, FWDBKG-SD18) or at locations within a drainage ditch that are not influenced by off-base or on-base anthropogenic sources (FWDBKG-SD08 and FWDBKG-SD09). Further, it is intended that these samples will provide the foundation for a freshwater drainage ditch data set that will be enhanced with additional background sediment samples collected from freshwater drainage ditches outside the airfield. That is, as field investigations are conducted at SWMUs located outside the airfield, SWMU-specific sediment reference samples collected from freshwater drainage ditches (as applicable to each SWMU) will be incorporated with the original seven samples to supplement the base-wide background freshwater drainage ditch sediment data set.

Analytical data for 7 of the 22 freshwater drainage ditch sediment samples used to create the initial non-airfield freshwater drainage ditch sediment background data set (56SD06, 56SD07, FWDBKG-03, FWDBKG-SD08, FWDBKG-SD09, FWDBKG-SD17, and FWDBKG-SD18) are presented in Table C-5. A summary of the non-airfield background freshwater drainage ditch sediment analytical data (i.e., minimum and maximum detected concentrations, minimum and maximum non-detected concentrations, location of maximum detected concentration, and frequency of detection) is presented in Table C-6. A statistical summary of the non-airfield background freshwater drainage ditch sediment analytical data is presented in Table C-7. As previously discussed, descriptive statistics were not calculated for those metals with less than two detections.

As with the airfield freshwater drainage ditch, the descriptive statistics presented in Table C-7 were derived in accordance with the methodology contained within the *Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Chemicals* (Baker, 2008). Outliers were handled in the same manner as those in the airfield freshwater drainage ditch sediment data set. The Discordance and the Dixon outlier tests were conducted on the non-

airfield background freshwater drainage ditch sediment data presented in Table C-5. Outliers were not removed prior to calculating the descriptive statistics based on the following rationale:

- There are less than 20 samples in the data set.
- The data points are from samples collected at locations with no apparent influence from a SWMU- or ECP-related chemical release and as such, represent naturally occurring levels not impacted by off-base or on-base anthropogenic sources (refer to section C.3.1 for more detail).
- Field and equipment rinsate blanks or laboratory equipment malfunction cannot explain unexpected values. Arsenic, chromium, cobalt, lead, and selenium (metals with data points identified as outliers) were not detected in field and equipment rinsate blanks (see Table C-2).

C.4 Recommended Use of Data Set

It is expected that upper limit of the mean (ULM) concentrations presented in Table C-4 will be used as background screening criteria for Phase I RFIs and full RFIs conducted at SWMUs in the vicinity of the airfield. The airfield background freshwater drainage ditch sediment data set presented in Table C-1 also will be used in CMS investigations for statistical comparisons to SWMU-specific data to determine if site concentrations are related to Navy operations. Statistical comparisons will be conducted in accordance with Navy guidance for environmental background analysis (guidance documents for soil, groundwater, and sediment are available at <http://web.ead.anl.gov/ecorisk/related/>).

The ULM concentrations presented in Table C-7 will be used as background screening criteria for RFIs conducted at non-airfield SWMUs until such time that additional sediment reference samples can be added to the existing data set. As previously discussed, the data set will continue to evolve as more data are collected and incorporated. The ULM concentrations for the non-airfield background freshwater drainage ditch sediment will be recalculated as additional data from SWMU-specific reference samples are incorporated. The updated non-airfield background freshwater drainage ditch sediment data set and ULM concentrations will be presented in the corresponding SWMU-specific RFIs. Once additional data has been incorporated into the non-airfield background freshwater drainage ditch sediment data set presented in Table C-5 thereby increasing the power of any potential statistical comparisons, these data will be used in CMS investigations outside of the airfield to determine if site concentrations are related to Navy operations. These statistical comparisons will be conducted as described in the previous paragraph.

C.5 References

Baker Environmental, Inc. (Baker). 2008a. *Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico*. Coraopolis, Pennsylvania. February 29, 2008.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79-31. Office of Biological Services, Fish and Wildlife Service, U.S. Department of the Interior, Washington, DC.

Baker. December 2007. *Final Corrective Measures Study Work Plan for SWMU 56*. Naval Activity Puerto Rico, Ceiba, Puerto Rico. December 6, 2007.

Naval Facilities Engineering Command Atlantic (NAVFAC Atlantic). 2005. *Final Phase III Environmental Condition of Property, Former U.S. Naval Station Roosevelt Roads, Ceiba, Puerto Rico*. Norfolk, Virginia.

United States Environmental Protection Agency (USEPA). 2005. *Evaluation of Metals Data for the Contract Laboratory Program (CLP)*. SOP HW-2, Revision 13. September 2005.

TABLE C-1
ANALYTICAL DATA FOR AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	FWDBKG-SD01	FWDBKG-SD01	FWDBKG-SD02	FWDBKG-SD03	FWDBKG-SD04	FWDBKG-SD05	FWDBKG-SD06	FWDBKG-SD07
Sample ID	FWDBKG-SD01	FWDBKG-SD01D	FWDBKG-SD02	FWDBKG-SD03	FWDBKG-SD04	FWDBKG-SD05	FWDBKG-SD06	FWDBKG-SD07
Date	6/27/2009	6/27/2009	6/25/2009	6/27/2009	6/27/2009	6/25/2009	6/25/2009	6/25/2009
Depth Range (in. bgs)	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0
Metals (mg/kg)								
Antimony	3.4 J	3.5 J	0.35 UJ	12.2 J	3.4 J	0.3 UJ	0.38 UJ	0.31 UJ
Arsenic	2.2	1.7	0.47 U	1.9 UJ	1.2 J	0.61 J	0.55 J	0.41 U
Barium	58.6	59	204	62.7 J	115	108	91.6 J	113
Beryllium	0.1 U	0.1 U	0.58 U	0.47 UJ	0.1 U	0.4 U	0.4 UJ	0.51 U
Cadmium	0.1 U	0.1 U	0.05 U	0.46 UJ	0.1 U	0.05 U	0.06 UJ	0.05 U
Chromium	23.2	25.1	40.7	39.2 J	59.8	20	17 J	31
Cobalt	14.2	16.5	25.4	17.9 J	17.5	12.6	12 J	24.9
Copper	63.1	67.5	183	111 J	53.2	60.4	42.1 J	103
Lead	6.9	7	4.4	8 J	3.8	7	6.5 J	8
Mercury	0.11	0.11	0.083 J	0.14 UJ	0.06	0.054 J	0.06 J	0.081
Nickel	7.2	7.6	16.3	17.7 J	7.4	8.3	6.2 J	15.9
Selenium	2.4	2.7	0.57 UJ	4.3 J	2	1.1	0.61 UJ	0.5 U
Silver	0.1 U	0.1 U	0.06 U	0.64 UJ	0.11 U	0.05 U	0.07 UJ	0.06 U
Thallium	0.6 J	0.77 J	0.73 U	2.7 UJ	1 J	0.62 U	0.78 UJ	0.63 U
Tin	2.9 U	2.8 U	6.1 J	12.6 UJ	2.1 U	4.6 J	5.4 J	4.9 J
Vanadium	151	161	163	196 J	171	91.1	77 J	140
Zinc	71.8	73.6	83.3	88.9 J	52.1	65.6	56.4 J	72.4

TABLE C-1
ANALYTICAL DATA FOR AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	FWDBKG-SD08	FWDBKG-SD09	FWDBKG-SD10	FWDBKG-SD11	FWDBKG-SD11	FWDBKG-SD12	FWDBKG-SD13
Sample ID	FWDBKG-SD08	FWDBKG-SD09	FWDBKG-SD10	FWDBKG-SD11	FWDBKG-SD11D	FWDBKG-SD12	FWDBKG-SD13
Date	6/25/2009	6/25/2009	6/26/2009	6/26/2009	6/26/2009	6/26/2009	6/27/2009
Depth Range	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0
Metals (mg/kg)							
Antimony	0.33 UJ	0.32 UJ	0.32 UJ	0.31 UJ	2.5 J	0.36 UJ	9.7 J
Arsenic	1.2 J	0.76 J	2.3	0.67 J	1.1 J	0.47 U	1.2 J
Barium	105	82.1	77.6	89.9	86.5	111	126 J
Beryllium	0.45 U	0.48 U	0.49 U	0.28 J	0.11 U	0.44 U	0.21 UJ
Cadmium	0.05 U	0.05 U	0.05 UJ	0.05 U	0.11 U	0.05 U	0.2 UJ
Chromium	26.6	30.1	35	29.4	29.2	29	68.8 J
Cobalt	32.4	65.8	19.4 J	14	12.8	15.4	14.4 J
Copper	53.8	45.1	57.3 J	73.2	75.6	82.9	102 J
Lead	9.2	9.3	6.4	7.4	7.5	5.8	29.9 J
Mercury	0.11	0.097	0.11	0.029 U	0.059	0.17 J	0.062 J
Nickel	13.7	13.4	8.7	11.5	11.6	13.9	11.3 J
Selenium	0.76 J	0.72 J	1.6 J	1.7	1.6	1	3.2 J
Silver	0.06 U	0.06 U	0.06 U	0.06 U	0.13 U	0.07 U	0.21 UJ
Thallium	0.68 U	0.66 U	0.65 U	0.91 J	0.62 U	0.73 U	1.6 J
Tin	5.2 J	4.3 J	4.7 J	5.1 J	3.5 U	5.2 J	5.3 UJ
Vanadium	143	159	153	87.2	86.5	101	137 J
Zinc	53.2	47.3	52.3 J	87.5	100	71.3	203 J

TABLE C-1
ANALYTICAL DATA FOR AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	FWDBKG-SD14	FWDBKG-SD15	FWDBKG-SD16	FWDBKG-SD17	FWDBKG-SD18	56SD06	56SD07
Sample ID	FWDBKG-SD14	FWDBKG-SD15	FWDBKG-SD16	FWDBKG-SD17	FWDBKG-SD18	56SD06	56SD07
Date	6/27/2009	6/26/2009	6/26/2009	6/24/2009	6/25/2009	9/25/2008	9/25/2008
Depth Range	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0	0-4.0
Metals (mg/kg)							
Antimony	4.1 J	0.53 J	4.2 J	0.62 UJ	0.28 UJ	0.84	0.21 U
Arsenic	1.3 J	1.1 J	1.1 J	0.83 UJ	0.83 J	3.8	1.9
Barium	61.8 J	130	227 J	37.1 J	123	51	210
Beryllium	0.16 UJ	0.45 U	0.2 UJ	0.43 UJ	0.54 U	0.28	0.23
Cadmium	0.15 UJ	0.05 U	0.2 UJ	0.09 UJ	0.04 U	0.32	0.13 J
Chromium	28.8 J	41.3	38.5 J	27.4 J	44.4	67	29
Cobalt	8.3 J	13.8	23.4 J	14.3 J	29.3	29	28
Copper	90.1 J	88.6	174 J	94 J	105	100	100
Lead	10.3 J	10.5	5.4 J	8.9 J	9.8	15	7.6
Mercury	0.16 J	0.055 J	0.054 J	0.096 J	0.092	0.16	0.029
Nickel	7.5 J	12	14.9 J	7 J	11	14	11
Selenium	3.3 J	0.87 J	1.5 J	1.6 J	1.5	1	0.98
Silver	0.15 UJ	0.06 U	0.29 UJ	0.11 UJ	0.05 U	0.055 U	0.043 U
Thallium	0.9 UJ	0.69 U	1.2 UJ	1.3 UJ	0.57 U	0.19 U	0.19 J
Tin	4 UJ	6.7 J	4.9 UJ	6.7 J	5.2 J	6.5 U	6.2 U
Vanadium	152 J	82.8	181 J	169 J	222	220	230
Zinc	74.1 J	112	117 J	41.2 J	61.3	74	99

Notes:

Shaded value was identified as an outlier by the Discordance test and the Dixon test

J = The analyte was positively identified; however, the concentration value is an estimate; Also used if a result was measured at a concentration below the Contract Required Quantitation Limit or Contract Required Detection Limit

U = The analyte was analyzed for, but not detected at the reported sample quantitation limit

UJ = The analyte was analyzed for, but not detected at the reported sample quantitation limit; The reported sample quantitation limit is qualified as estimated

mg/kg = milligram per kilogram

in. bgs = inches below ground surface

TABLE C-2
ANALYTICAL DATA FOR FIELD AND EQUIPMENT RINSATE BLANKS
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS
OF INORGANIC CHEMICALS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	JUNE09-FB02 ⁽¹⁾	JUNE09-ER02 ⁽²⁾	JUNE09-ER03 ⁽³⁾	JUNE09-ER04 ⁽²⁾	JUNE09-ER05 ⁽³⁾
Date	6/24/2009	6/24/2009	6/25/2009	6/26/2009	6/27/2009
Metals (ug/L)					
Antimony	1.8 U				
Arsenic	2.4 U				
Barium	0.38 U				
Beryllium	0.35 U				
Cadmium	0.27 U				
Chromium	0.64 U				
Cobalt	0.58 U				
Copper	0.88 U				
Lead	1.8 U				
Mercury	0.1 U				
Nickel	1.1 U				
Selenium	2.9 U				
Silver	0.33 U				
Thallium	3.7 U	3.7 U	4 J	3.7 U	3.7 U
Tin	4.8 U				
Vanadium	0.46 U				
Zinc	1.1 U				

Notes:

J = The analyte was positively identified; however, the concentration value is an estimate; Also used if a result was measured at a concentration below the Contract Required Quantitation Limit or Contract Required Detection Limit

U = The analyte was analyzed for, but not detected at the reported sample quantitation limit

ug/L = microgram per liter

⁽¹⁾ The field blank was collected using laboratory-grade deionized water.

⁽²⁾ The equipment rinsate blank was collected by passing laboratory-grade deionized water over an unused stainless steel spoon.

⁽³⁾ The equipment rinsate blank was collected by passing laboratory-grade deionized water over an unused aluminum pan.

TABLE C-3
ANALYTICAL DATA SUMMARY FOR AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Range of Detection Limits	Number of Samples	Number Detected
Metals (mg/kg)									
Antimony	0.21 U	0.62 UJ	0.53 J	12.2 J	FWDBKG-SD03	10/22	0.21U - 0.62UJ	22	10
Arsenic	0.41 U	1.9 UJ	0.55 J	3.8	56SD06	17/22	0.41U - 1.9UJ	22	17
Barium	ND	ND	37.1 J	227 J	FWDBKG-SD16	22/22	NA	22	22
Beryllium	0.1 U	0.58 U	0.23	0.28	FWDBKG-SD11, 56SD06	3/22	0.1U - 0.58U	22	3
Cadmium	0.04 U	0.46 UJ	0.13 J	0.32	56SD06	2/22	0.04U - 0.46UJ	22	2
Chromium	ND	ND	17 J	68.8 J	FWDBKG-SD13	22/22	NA	22	22
Cobalt	ND	ND	8.3 J	65.8	FWDBKG-SD09	22/22	NA	22	22
Copper	ND	ND	42.1 J	183	FWDBKG-SD02	22/22	NA	22	22
Lead	ND	ND	3.8	29.9 J	FWDBKG-SD13	22/22	NA	22	22
Mercury	0.029 U	0.14 UJ	0.029	0.17 J	FWDBKG-SD12	20/22	0.029U - 0.14UJ	22	20
Nickel	ND	ND	6.2 J	17.7 J	FWDBKG-SD03	22/22	NA	22	22
Selenium	0.5 U	0.61 UJ	0.72 J	4.3 J	FWDBKG-SD03	19/22	0.5U - 0.61UJ	22	19
Thallium	0.19 U	2.7 UJ	0.19 J	1.6 J	FWDBKG-SD13	6/22	0.19U - 2.7UJ	22	6
Tin	2.1 U	12.6 UJ	4.3 J	6.7 J	FWDBKG-SD15, FWDBKG-SD17	12/22	2.1U - 12.6UJ	22	12
Vanadium	ND	ND	77 J	230	56SD07	22/22	NA	22	22
Zinc	ND	ND	41.2 J	203 J	FWDBKG-SD13	22/22	NA	22	22

Notes:

J = The analyte was positively identified; however, the concentration value is an estimate; Also used if a result was measured at a concentration below the Contract Required Quantitation Limit or Contract Required Detection Limit

U = The analyte was analyzed for, but not detected at the reported sample quantitation limit

UJ = The analyte was analyzed for, but not detected at the reported sample quantitation limit; The reported sample quantitation limit is qualified as estimated

NA = Not Applicable

mg/kg = milligram per kilogram

TABLE C-4
DESCRIPTIVE STATISTICS FOR AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	FOD	n	W-Test Results			Arithmetic Mean ⁽¹⁾ (x)	Standard Deviation ⁽¹⁾ (s)	Coefficient of Variation (CV)	Upper Limit of means (x + 2s)
			Normal Distribution	Lognormal Distribution	Assumed Distribution				
Metals (mg/kg)									
Antimony	C	22	NO	NO	NORMAL	2.11	3.25	1.543	8.62
Arsenic	D	22	NO	YES	NORMAL	1.16	0.83	0.718	2.83
Barium	D	22	NO	YES	NORMAL	105.90	51.07	0.482	208.04
Beryllium	C	22	NO	NO	NORMAL	0.19	0.09	0.460	0.36
Cadmium	C	22	NO	NO	NORMAL	0.07	0.07	1.113	0.22
Chromium	D	22	NO	YES	NORMAL	35.48	13.97	0.394	63.41
Cobalt	D	22	NO	YES	NORMAL	20.97	12.05	0.575	45.07
Copper	D	22	NO	YES	NORMAL	87.50	36.16	0.413	159.81
Lead	D	22	NO	NO	NORMAL	8.85	5.27	0.595	19.38
Mercury	D	22	YES	NO	NORMAL	0.09	0.04	0.473	0.17
Nickel	D	22	YES	YES	NORMAL	11.28	3.42	0.303	18.12
Selenium	D	22	YES	YES	NORMAL	1.58	1.05	0.669	3.69
Thallium	C	22	NO	NO	NORMAL	0.54	0.38	0.699	1.30
Tin	D	22	NO	YES	NORMAL	4.07	1.83	0.449	7.72
Vanadium	D	22	YES	NO	NORMAL	148.80	46.15	0.310	241.10
Zinc	D	22	YES	NO	NORMAL	79.88	34.29	0.429	148.46

Notes:

FOD = Frequency of Detection

C = Frequency of detection ≤ 50 percent with more than one detection

D = Frequency of detection > 50 percent

n = Total number of data points

mg/kg = milligram per kilogram

⁽¹⁾ For metals with non-detected results (i.e., antimony, arsenic, beryllium, cadmium, mercury, selenium, thallium, and tin), the value was derived using one-half the reporting limit for non-detected values.

TABLE C-5
ANALYTICAL DATA FOR NON-AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	FWDBKG-SD03	FWDBKG-SD08	FWDBKG-SD09	FWDBKG-SD17	FWDBKG-SD18	56SD06	56SD07
Sample ID	FWDBKG-SD03	FWDBKG-SD08	FWDBKG-SD09	FWDBKG-SD17	FWDBKG-SD18	56SD06	56SD07
Date	6/27/2009	6/25/2009	6/25/2009	6/24/2009	6/25/2009	9/25/2008	9/25/2008
Depth Range	0-0.4	0-0.4	0-0.4	0-0.4	0-0.4	0-4.0	0-4.0

Metals (mg/kg)

Antimony	12.2 J	0.33 UJ	0.32 UJ	0.62 UJ	0.28 UJ	0.84	0.21 U
Arsenic	1.9 UJ	1.2 J	0.76 J	0.83 UJ	0.83 J	3.8	1.9
Barium	62.7 J	105	82.1	37.1 J	123	51	210
Beryllium	0.47 UJ	0.45 U	0.48 U	0.43 UJ	0.54 U	0.28	0.23
Cadmium	0.46 UJ	0.05 U	0.05 U	0.09 UJ	0.04 U	0.32	0.13 J
Chromium	39.2 J	26.6	30.1	27.4 J	44.4	67	29
Cobalt	17.9 J	32.4	65.8	14.3 J	29.3	29	28
Copper	111 J	53.8	45.1	94 J	105	100	100
Lead	8 J	9.2	9.3	8.9 J	9.8	15	7.6
Mercury	0.14 UJ	0.11	0.097	0.096 J	0.092	0.16	0.029
Nickel	17.7 J	13.7	13.4	7 J	11	14	11
Selenium	4.3 J	0.76 J	0.72 J	1.6 J	1.5	1	0.98
Silver	0.64 UJ	0.06 U	0.06 U	0.11 UJ	0.05 U	0.055 U	0.043 U
Thallium	2.7 UJ	0.68 U	0.66 U	1.3 UJ	0.57 U	0.19 U	0.19 J
Tin	12.6 UJ	5.2 J	4.3 J	6.7 J	5.2 J	6.5 U	6.2 U
Vanadium	196 J	143	159	169 J	222	220	230
Zinc	88.9 J	53.2	47.3	41.2 J	61.3	74	99

Notes:

J = The analyte was positively identified; however, the concentration value is an estimate; Also used if a result was measured at a concentration below the Contract Required Quantitation Limit or Contract Required Detection Limit

U = The analyte was analyzed for, but not detected at the reported sample quantitation limit

UJ = The analyte was analyzed for, but not detected at the reported sample quantitation limit. The reported sample quantitation limit is qualified as estimated.

Shaded value was identified as an outlier by the Discordance test and the Dixon test

TABLE C-6
ANALYTICAL DATA SUMMARY FOR NON-AIRFIELD BACKGROUND FRESHWATER DRAINAGE DITCH SEDIMENT
REVISED FINAL II SUMMARY REPORT FOR ENVIRONMENTAL BACKGROUND CONCENTRATIONS OF INORGANIC COMPOUNDS
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Minimum Non-Detect	Maximum Non-Detect	Minimum Detected	Maximum Detected	Location of Maximum Detect	Frequency of Detection	Range of Detection Limits	Number of Samples	Number Detected
Metals (mg/kg)									
Antimony	0.21 U	0.62 UJ	0.84	12.2 J	FWDBKG-SD03	2/7	0.21U - 0.62UJ	7	2
Arsenic	0.83 UJ	1.9 UJ	0.76 J	3.8	56SD06	5/7	0.83UJ - 1.9UJ	7	5
Barium	ND	ND	37.1 J	210	56SD07	7/7	(5)	7	7
Beryllium	0.43 UJ	0.54 U	0.23	0.28	56SD06	2/7	0.43UJ - 0.54U	7	2
Cadmium	0.04 U	0.46 UJ	0.13 J	0.32	56SD06	2/7	0.04U - 0.46UJ	7	2
Chromium	ND	ND	26.6	67	56SD06	7/7	(5)	7	7
Cobalt	ND	ND	14.3 J	65.8	FWDBKG-SD09	7/7	(5)	7	7
Copper	ND	ND	45.1	111 J	FWDBKG-SD03	7/7	(5)	7	7
Lead	ND	ND	7.6	15	56SD06	7/7	(5)	7	7
Mercury	0.14 UJ	0.14 UJ	0.029	0.16	56SD06	6/7	0.14UJ - 0.14UJ	7	6
Nickel	ND	ND	7 J	17.7 J	FWDBKG-SD03	7/7	(5)	7	7
Selenium	ND	ND	0.72 J	4.3 J	FWDBKG-SD03	7/7	(5)	7	7
Thallium	0.19 U	2.7 UJ	0.19 J	0.19 J	56SD07	1/7	0.19U - 2.7UJ	7	1
Tin	6.2 U	12.6 UJ	4.3 J	6.7 J	FWDBKG-SD17	4/7	6.2U - 12.6UJ	7	4
Vanadium	ND	ND	143	230	56SD07	7/7	(5)	7	7
Zinc	ND	ND	41.2 J	99	56SD07	7/7	(5)	7	7

Notes:

J = The analyte was positively identified; however, the concentration value is an estimate; Also used if a result was measured at a concentration below the Contract Required Quantitation Limit or Contract Required Detection Limit

U = The analyte was analyzed for, but not detected at the reported sample quantitation limit

UJ = The analyte was analyzed for, but not detected at the reported sample quantitation limit: The reported sample quantitation limit is qualified as estimated

NA = Not Applicable

mg/kg = milligram per kilogram