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LETTER REGARDING FOLLOW-UP EVALUATION OF ADDITIONAL DATA FOR  
GROUNDWATER BACKGROUND STUDY FOR METALS NS MAYPORT FL  
11/20/2014  
TETRA TECH



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Naval Facilities Engineering Command, Southeast  
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Reference: CLEAN Contract Number N62467-04-D-0055  
Contract Task Order Number JM71

Subject: Evaluation of Additional Data for Groundwater Background Study for Metals

Dear Mr. Hayworth:

This letter is a follow-up to the October 2014 Groundwater Background Study for Metals (Background Study) developed for the Naval Station (NAVSTA) Mayport, Jacksonville, Florida. The October 2014 Background Study addressed the comments received from the Florida Department of Environmental Protection (FDEP) dated December 13, 2012, which were associated with the draft Background Study submitted in August 2013.

During a phone call with the Navy Remedial Project Manager (RPM) on February 6, 2014, Tetra Tech discussed collecting an additional two rounds of groundwater data, and the Navy RPM agreed. During the April 2014 NAVSTA Mayport Installation Restoration Partnering Team (Partnering Team) meeting, Tetra Tech discussed collecting the additional two rounds of groundwater samples with Partnering Team members. These discussions resulted in the collection of additional samples.

The purpose of this follow-up is to communicate the findings of the 2014 sampling events and provide a recommendation on what activities, if any, need to occur to update the October 2014 Background Study.

## **STUDY BACKGROUND**

Originally, 13 target analytes were identified in the October 2012 Sampling and Analysis Plan as candidates for inclusion in the Background Study. After collection of two rounds of groundwater sample data in November 2012 and February 2013, a sample size of 30 was obtained, which is sufficient for statistical analysis. Using the sample size of 30, the Background Study concluded that 6 of the 13 analytes (antimony, chromium, lead, silver, thallium, and zinc) should not be retained in the background database because the percent of detection did not lend itself to supporting robust<sup>1,2</sup> groundwater background values for these 6 analytes.

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<sup>1</sup> Background evaluation may involve two steps. In the first step, a single background concentration (i.e., the twice the background mean or the maximum detected background concentration) is compared against the maximum site concentration. The user of the information may undertake the second step if the maximum site concentration exceeds the applicable background concentration. In the second step, the population of the background concentrations for an

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## ADDITIONAL DATA EVALUATION

The 15 background wells were resampled in March 2014 and June 2014 for the 13 target analytes. By combining the data from the first two rounds of sampling with the data from the 2014 events, the sample size was doubled from 30 to 60. A preliminary evaluation of the expanded data set showed the percent of non-detection of antimony, chromium, lead, silver, thallium, and zinc ranged from a low of 63 percent for chromium to a high of 100 percent for silver and thallium (see Table 1).

**TABLE 1**  
**PERCENT NON-DETECTION FOR FIVE ANALYTES**  
**NAVAL STATION MAYPORT, JACKSONVILLE, FLORIDA**

Analyte	Percent Not-Detected
Antimony	93
Chromium	63
Lead	87
Silver	100
Thallium	100
Zinc	65

As part of the follow-up data analysis, the unadjusted<sup>3</sup> 2012/2013 data sets were combined with the results from the 2014 sampling effort to yield the preliminary<sup>4</sup> mean concentration for the detected analytes in the expanded population (sample size = 60). The preliminary<sup>4</sup> mean concentrations on the detected compounds are presented in Table 2 in the combined data set column. As seen in Table 2, there were no significant changes in the mean concentrations for detected compounds.

In Table 2 the mean concentrations for iron and manganese for the 2012/2013 data set and the combined data set are unadjusted for outliers. Therefore, the preliminary means for these two analytes are not the final means presented in the October 2014 Background Study. The mean concentrations for iron and manganese in the October 2014 Background Study reflect the removal of outliers.

The next step in the data analysis on the expanded data sets would be the outlier evaluation. Identified outliers would be removed, and the summary statistics would be conducted on the expanded data sets.

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analyte is statistically compared against the population of the site concentrations for that analyte. Most statistical tests are unable to correctly perform if a large percentage of the data are represented by similar or the same values such as the method detection limit.

<sup>2</sup> In addition to a high percentage of non-detected values, the 2012/2013 data sets for chromium and zinc also presented an elevated frequency of non-detected values in the right tail of the distributions (i.e., the detected values were bounded on the lower and the higher portion of the data set by non-detected values).

<sup>3</sup> Outliers were removed from the 2012/2013 data set as part of the data evaluation that produced the final Groundwater Background Data Set contained in Appendix E of the Groundwater Background Study for Metals at NAVSTA Mayport, Jacksonville, Florida (October 2014).

<sup>4</sup> The mean concentrations in Table 2 are preliminary as the data sets have not been adjusted for outliers. Typically, the first evaluation of the data yields preliminary information whereby summary statistics (e.g., the mean) are developed and information on the need for further data adjustments (e.g., outlier evaluation) is communicated to stakeholders.

**TABLE 2**
**MEAN CONCENTRATION FOR DETECTED ANALYTES  
 NAVAL STATION MAYPORT, JACKSONVILLE, FLORIDA**

Analyte	2012/2013 Data Set <sup>(a)</sup>	2012/2013 and 2014 Combined Data Set <sup>(a)</sup>
Aluminum	140.63	113.46
Ammonia (mg/L)	1.77	1.64
Antimony	ND <sup>(b)</sup>	1.43
Arsenic	3.59	3.21
Chromium	1.97	1.60
Iron	1,119.95 <sup>(d)</sup>	1,069.28 <sup>(d)</sup>
Lead	ND <sup>(b)</sup>	0.76
Manganese	120.31 <sup>(d)</sup>	121.04 <sup>(d)</sup>
Silver	ND <sup>(b)</sup>	ND <sup>(c)</sup>
Sulfate (mg/L)	269.21	237.23
Thallium	ND <sup>(b)</sup>	ND <sup>(c)</sup>
Vanadium	3.20	3.18
Zinc	5.31	4.89

**Notes:**

Units are micrograms per liter unless otherwise specified.

mg/L = milligram per liter

(a) Values shown are the mean concentrations.

(b) Not detected in any sample for the 2012/2013 sampling events.

(c) Not detected in any sample for the 2014 sampling events.

(d) The 2012/2013 mean concentrations for iron and manganese are unadjusted for outliers.

**CONCLUSION**

After an evaluation of the expanded data set, Tetra Tech has concluded the additional data did not allow for inclusion of the six analytes eliminated from the 2012/2013 data set (i.e., the percent of detected values for the six analytes listed in Table 1 was too low<sup>5</sup> to be used to develop a useable groundwater background concentration). In addition, no significant change in the mean concentration of detected compounds was observed. Hence, no further effort should be expended to add the groundwater data collected in 2014 to the NAVSTA Mayport Groundwater Background Data Set since the additional data does not enhance the 2012/2013 data set.

The background values presented in Table 3 are provided in the Groundwater Background Study for Metals Report (October 2014). These values are the lessor of twice the mean or the maximum detected concentration and were developed in accordance with the approved October 2012 Sampling and Analysis Plan and in response to the FDEP comments letter of December 17, 2013. The background values presented in Table 3 should be retained for use when evaluating site data against background data.

<sup>5</sup> The combined data sets (2012/2013 combined with 2014; N = 60) for chromium and zinc continue to present an elevated frequency of non-detected values in the right tail of the distributions ( i.e., the detected values were bounded on the lower and the higher portion of the data set by non-detected values).



TABLE 3

MEAN CONCENTRATION FOR DETECTED ANALYTES  
NAVAL STATION MAYPORT, JACKSONVILLE, FLORIDA

Target Analyte	Background Groundwater Concentrations <sup>(a)</sup>
Aluminum	281
Ammonia (mg/L)	3.53
Antimony	ND <sup>(b)</sup>
Arsenic	7.18
Chromium	ND <sup>(b)</sup>
Iron	592.80
Lead	ND <sup>(b)</sup>
Manganese	188
Silver	ND <sup>(b)</sup>
Sulfate (mg/L)	538
Thallium	ND <sup>(b)</sup>
Vanadium	6.39
Zinc	ND <sup>(b)</sup>

Notes:

Units are micrograms per liter unless otherwise specified.

(a) Concentrations as provided in Table ES-1 of the Groundwater Background Study for Metals (October 2014).

(b) Not detected in any sample for the 2012/2013 sampling events.

Should you have any questions with regard to this submittal, please feel free to contact me by telephone at (904) 730-4669, extension 220, or via e-mail at [Ben.Marshall@tetrattech.com](mailto:Ben.Marshall@tetrattech.com).

Sincerely,

Ben Marshall, P.E.  
Project Manager

- c: Paul Malewicki, NAVSTA Mayport
- John Winters, FDEP
- RDM, Tetra Tech (1 unbound, 1 CD)
- CTO JM71 Project File