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LETTER REGARDING FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION REVIEW AND COMMENTS ON DRAFT EVALUATION OF CHROMIUM IN GROUNDWATER OPERALE UNIT 2 (OU 2) and SITE 30 NAS PENSACOLA FL
04/28/2015
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
BOB MARTINEZ CENTER
2600 BLAIRSTONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

JONATHAN P. STEVERSON
SECRETARY

April 28, 2015

Ms. Patty Marajh-Whittemore
Remedial Project Manager
ITP Gulf Coast
Naval Facilities Engineering Command Southeast
Attn: AJAX Street, Building 135N
P.O. Box 30A
Jacksonville, FL 32212-0030

RE: Draft Evaluation of Arsenic in Groundwater, Revision 1, Naval Air Station Pensacola, Pensacola, Florida

Dear Patty:

The Department has completed its review of the Draft Evaluation of Arsenic in Groundwater, Revision 1, Naval Air Station Pensacola, submitted June 20, 2014 (received June 23, 2014), prepared by Resolution Consultants. The review was conducted by myself with support from the Department's Office of District and Business Support, and in consultation with the Department's contracted risk assessors with the University of Florida's Center for Environment & Human Toxicology. The premise behind the arsenic evaluation is that using a comprehensive data set of arsenic concentrations collected from groundwater samples collected at both arsenic contaminated and uncontaminated sites and applying certain rules to eliminate statistical outliers, that a better background arsenic value may be determined. The Department has certain reservations concerning this methodology and its use in deriving a new background arsenic concentration in groundwater for Naval Air Station Pensacola. The Department's concerns are as follows:

(1) The data set appears to be skewed toward analytical data from known arsenic contaminated sites. This is to be expected as groundwater at sites where arsenic is known to have contaminated the aquifer is repeatedly monitored to determine whether arsenic concentrations are stable, increasing or decreasing and whether the arsenic plume is migrating. Groundwater at sites where arsenic has been eliminated as a contaminant of concern would not continue to be analyzed for arsenic. Therefore, more arsenic analytical data bas been collected through time from arsenic contaminated sites than from similar sites where arsenic is not being analyzed.

(2) The method for identifying when to stop removing outliers seems arbitrary. Upon an acceptable distribution of arsenic concentrations where the data points fit nicely into a normal or log-normal curve with no remaining outliers, the maximum detected concentration in that dataset was proposed to represent a background threshold value (BTV) for Naval Air Station Pensacola. In the document provided, the BTV proposed for arsenic in groundwater is 56.9 µg/L based upon an assumed a log-normal distribution of natural arsenic concentrations. In EPA's review of this document, they derived a BTV of 19.8 µg/L assuming a normal distribution of natural arsenic. Based on my experience reviewing assessments conducted at Naval Air Station Pensacola and its Outlying Landing Fields and based on discussions with other Remedial Project Managers, I think both values are too high and that using either calculated BTV as a screening concentration would lead to arsenic contaminated sites being mistakenly screened out from further consideration. Also, if an arsenic concentration as high as 19.8 µg/L or 56.9 µg/L were reasonably to be expected at the high end of natural background concentrations, I would expect that numerous areas around the base would have been identified as contaminated with arsenic where no source for that arsenic could be attributed. To my knowledge, this has not been the case.

(3) The approach used to calculate the BTV appears to be flawed. The use of the 95% Upper Simultaneous Limit or any method that ends in a calculation of an upper limit or threshold from an analytical dataset that contains data from both contaminated and uncontaminated sites may be useful in minimizing Type I (false positive) errors, but allows for too many Type II (false negative) errors to occur. There needs to be a balance between minimizing both types of errors. In the general statistics provided on the combined detect and non-detect data with outliers removed on page 10, it identifies that 967 total observations were analyzed. Only one sample out of 967 in the final dataset had a concentration as high as 56.9 µg/L which indicates a low probability that arsenic would be detected at a concentration as high as that in a background sample.

(4) The data point used for the proposed BTV value of 56.9 µg/L was from a monitoring well located at a site known to have been contaminated with arsenic. In fact, several of the values remaining in the final combined dataset with concentrations above the 95% UCL (7.5 µg/L), but below the proposed BTV (56.9 µg/L), are from a known arsenic contaminated site. A detailed look at the positive detections of arsenic remaining in the dataset after removing the outliers should be conducted to determine the quality of the data and to determine the locations where the samples were collected. If most of the elevated arsenic concentrations are from samples of lower quality or are clustered in one area of the base, removing the outliers would not have removed all suspect data and contaminated site data.

(5) I have also attached comments from the Department's University of Florida risk assessors on a similar report evaluating chromium in groundwater. They identified many of the

same concerns in the chromium evaluation as have been provided in this letter. They conclude that the best approach to determining background concentrations for analytes in groundwater appears to be from collecting data from reference wells in areas not impacted by site releases. This is consistent with the Department's *Guidance for Comparing Background and Site Chemical Concentrations in Groundwater* (July 2013).

If you have any questions regarding this letter, please contact me at (850) 245-8997.

Sincerely,

David P. Grabka, P.G.
Remedial Project Manager
DoD and Brownfields Partnerships
Waste Cleanup Program

CC: Greg Campbell, NAS Pensacola
Tim Woolheater, EPA Region 4
Gerry Walker, Tetra Tech, Tallahassee
Allison Harris, Ensafe, Memphis, TN

KAW

UF UNIVERSITY of FLORIDA

Center for Environment & Human Toxicology

PO Box 110885
Gainesville, FL 32611-0885
352-392-2243 Tel
352-392-4707 Fax

April 23, 2014

Ligia Mora-Applegate
Office of District and Business Support
Division of Waste Management
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Evaluation of Chromium in Groundwater, Operable Unit 2 and Site 30, NAS Pensacola Pensacola, FL

Dear Ms. Mora-Applegate:

We have reviewed at your request the *Evaluation of Chromium in Groundwater, Operable Unit 2 and Site 30, NAS Pensacola, Pensacola, FL, Revision: 0.* This document was prepared by Resolution Consultants for the Department of the Navy and is dated November 7, 2013. The document describes an analysis in which data for chromium in groundwater are analyzed to determine the upper limit of background concentrations. The data set includes both contaminated and uncontaminated groundwater samples, and a graphical (quantile-quantile plot) approach is used to distinguish between these two groups of samples and identify those that represent background. This analysis was performed separately for groundwater data from OU2 and Site 30, which is a subset of the OU2 data.

Both data sets have a high percentage of non-detects. For each non-detect, a surrogate value was used for the analysis. The surrogate was obtained by calculating the 95% upper confidence limit of one-half the reporting limit for each non-detect sample in the respective data sets. Data quantiles (including the non-detect surrogate values) were plotted against a theoretical lognormal distribution. High value outliers, i.e., concentrations above an apparent inflection point in the line, were removed and a correlation coefficient for the regression was calculated. A total of 16 high value data points were removed from the 187 OU2 samples, and three high value data points were removed from the 75 Site 30 samples. Assuming that the remaining lognormal distribution was representative of background, the analysis concludes that background chromium in groundwater extends as high as 119 ppb in OU2, and 69.9 ppb in Site 30.

The proposed background chromium concentration in groundwater for OU2, 119 ppb, is only marginally above the current total chromium primary drinking water standard of 100 ppb in Chapter 62-777, F.A.C., and the proposed background concentration for Site 30 (69.9 ppb) is below the drinking water standard. As such, these background concentrations would have limited impact on the management of chromium in

groundwater at this site based upon human health risk considerations. However, we have concerns regarding the approach used to derive them:

1. Distinguishing between concentrations representing background and contamination is challenging, and looking for inflections in quantile-quantile plots is not a robust means of accomplishing this, in our opinion. Under the best of circumstances we have strong reservations about this approach.

2. Both data sets are heavily censored. Using surrogate values adds no information about the distribution of concentrations below the detection limit and can distort the regression of the detected concentrations. Either non-detects should not be included in the regression, or a method that incorporates the likelihood function that accounts for the distribution of concentrations below the detection limit should be used.

3. The results of the analysis are counterintuitive. Chromium concentrations in groundwater within the range designated as background by this analysis (up to 119 ppb) are seldom encountered in background wells in our experience. Although somewhat dated (1994-1997), the Florida Background Water Quality Monitoring Network survey of 1700 surficial aquifer wells provides a reasonably comprehensive look at natural background concentrations of several analytes, including total chromium. Upper quartile concentrations of chromium in groundwater from that survey were < 10 ppb. It could be argued that the background samples in the OU2 and Site 30 data sets are the numerous non-detects, and any inflections in the quantile-quantile plots are just indicative of different populations of contaminated groundwater.

Generally, we would recommend a mixture approach to identify distinct populations within the data sets rather than a quantile-quantile plot, but the large number of non-detects could make this challenging. Unfortunately there may not be a good method for sorting out background and contaminated samples for these specific data. The best approach to determine background concentrations appears to be collection of data from reference wells in areas that have not been impacted by any site releases.

As requested we have reviewed the Figures and Tables to ensure accuracy. These elements were correctly represented in the document. The document did not contain a Table of Contents, List of Figures, List of Tables, List of Appendices or Acronyms.

Sincerely,

Stephen M. Roberts, Ph.D.

Linda J. Young, Ph.D.

Leah D. Stuchal, Ph.D.

Roxana E. Weil, Ph.D