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MARE ISLAND
SSIC NO. 5090.3.A

Department of Toxic Substances Control

Terry Tamminen
Agency Secretary
Cal/EPA

700 Heinz Avenue, Suite 200
Berkeley, California 94710-2721

Arnold Schwarzenegger
Governor

November 12, 2004

Mr. Dwight Gemar
Weston Solutions, Inc.
750 Dump Road
Mare Island
Vallejo, California 94592

Dear Mr. Gemar:

Mare Island Draft Final Remedial Investigation, Investigation Area H1, dated 7/22/2004

The Department of Toxic Substances Control has completed a review of the subject document. The attached additional comments are forwarded to you for your consideration. These comments are in addition to comments submitted to you in a letter dated October 27, 2004.

Should you have any questions regarding this letter, please call me at (510) 540-3773.

Sincerely,

Chip Gribble
Remedial Project Manager
Base Closure Unit
Office of Military Facilities

Attachments

cc: Mr. Jerry Dunaway
Mr. Gary Riley
Ms. Carolyn d'Almeida

Post-It™ brand fax transmittal memo 7671	# of pages ▸ 23
To Jerry Dunaway	From Chip Gribble
Co. Navy Southwest Div	Co. DTSC
Dept.	Phone # 510-540-3773
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Department of Toxic Substances Control

Terry Tamminen
Agency Secretary
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8800 Cal Center Drive
Sacramento, California 95826-3200

Arnold Schwarzenegger
Governor

MEMORANDUM

TO: Chip Gribble
Engineering Geologist
Office of Military Facilities, Berkeley Office

FROM: Kate Burger, Ph.D., R.G. Kate Burger
Engineering Geologist, Northern California Geological Services Unit
Hazardous Waste Management Program, Sacramento Office

CONCUR: Brian Lewis, C.H.G., C.E.G. Kate Burger for Brian Lewis
Chief, Northern California Geological Services Unit
Hazardous Waste Management Program, Sacramento Office

DATE: November 5, 2004

SUBJECT: Groundwater Background Determination For
Groundwater Remedial Investigation and Article 6 Monitoring Program
Area H1 Landfill and Surface Impoundments
Mare Island, Vallejo, Solano County
Project No. 25010/200063-33/43-HWMP

DOCUMENTS REVIEWED

Section 5, Appendix F, Draft Final Remedial Investigation, Investigation Area H1 Mare Island Vallejo, California. Prepared by Weston Solutions, Inc. Dated July 22, 2004. (Weston RI; Weston 2004)

Proposed background well locations identified in a September 17, 2004 electronic mail message from Tracy Walker (Weston) to Kate Burger.

INTRODUCTION

As you requested, the Northern California Geological Services Unit (GSU) of the Department of Toxic Substances Control (DTSC) has prepared this memorandum regarding groundwater background concentrations for Investigation Area H1 at the former Mare Island Naval Shipyard (MINS). The intent of this memorandum is to address the confusion that has arisen regarding the groundwater background determination for the Resource Conservation and Recovery Act (RCRA) unit groundwater monitoring program and for the Groundwater Remedial Investigation (RI). If you have questions regarding this memorandum, please contact me at (916) 255-6537 or Brian Lewis at (916) 255-6532.

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WHY BACKGROUND CONCENTRATIONS ARE NEEDED

Three on-going activities within Investigation Area H1 necessitate establishment of groundwater background concentrations for this area.

Activity 1 (Risk Assessment): Background concentrations must be established to support constituent of potential concern (COPC) selection for the human health risk assessment (HHRA) and ecological risk assessment (ERA). In general, background concentrations for the purposes of COPC selection are fixed at one point in time.

Activity 2 (Remedy Evaluation): Background concentrations must be established to support long-term performance evaluation of the slurry wall and groundwater extraction trench as well as other remedial measures. To address the temporal variability that is common to groundwater data sets, background concentrations for this application require periodic updating (e.g., every one to five years).

Activity 3 (RCRA Groundwater Monitoring): Background concentrations must be established in order to determine whether a release from the RCRA-regulated units (i.e., RCRA Landfill, surface impoundments) has occurred. To address the temporal variability, background concentrations for this application require periodic updating.

The most efficient approach is to establish an initial set of groundwater background concentrations for Investigation Area H1 that can be consistently applied to all three activities. These initial background concentrations would subsequently be updated and used for remedy evaluation and groundwater monitoring.

Under this approach, the activity with the most structured requirements (i.e., RCRA groundwater monitoring) should dictate the methodology to be used to establish background concentrations. Hence, the prescriptive requirements identified in California Code of Regulations, title 22, section 66265.90 et seq. (Article 6) must be used to establish the background concentrations. These requirements are summarized in Table 1 of this memorandum.

Separate background concentrations need to be established for each monitored water-bearing unit [i.e., shallow water-bearing zone (SWBZ), intermediate water-bearing zone (IWBZ), deep water-bearing zone (DWBZ)]. Also, multiple background concentrations may be needed for a given water-bearing unit if geochemically distinct zones are identified. Geochemical zonation may be present given the geomorphic position of Mare Island (e.g., between the Napa River and San Pablo Bay).

CURRENT STATUS OF BACKGROUND CONCENTRATIONS FOR INVESTIGATION AREA H1

The currently proposed background concentrations for Investigation Area H1 are presented in Tables C-4, C-5, and C-6 of the *Draft Final Water Quality Sampling and Analysis Plan, Investigation Area H1, RCRA Landfill and IWTP Surface Impoundments* (WQSAP; Weston, 2004b). The proposed values for the SWBZ, IWBZ, and DWBZ are summarized in Table 2 of this memorandum. This memorandum includes comments

regarding the IWBZ and DWBZ values. GSU is currently reviewing the SWBZ values presented in the October 2004 WQSAP.

Shallow Water-Bearing Zone: Background concentrations for the SWBZ will be used for all three activities (risk assessment, remedy evaluation, groundwater monitoring). The most recent set of background concentrations for the SWBZ were presented in the WQSAP. As previously stated, GSU's review of SWBZ background concentrations presented in the WQSAP is on-going. However, a preliminary evaluation suggests that the "ambient" concentrations presented in the *Final Compilation of Technical Memoranda on Ambient Analyses of Metals in Soils and Groundwater, Mare Island, California* (TtEMI, 2002) are presented as SWBZ background concentrations, with some modification. If the WQSAP methods are similar to the methods used for the "ambient" concentrations, the background concentrations do not meet Article 6 regulatory requirements. Hence, the background concentrations for the SWBZ must be revised. GSU has provided additional comments on the technique applied by TtEMI (2002) in a subsequent section of this memorandum.

Intermediate & Deep Water-Bearing Zones: Background concentrations for the IWBZ and DWBZ will be used to support the remedy evaluation and the groundwater monitoring program. The most recent set of background concentrations was proposed in the Weston RI (Weston, 2004a) and repeated in the WQSAP (Weston, 2004b). As discussed in a subsequent section of this memorandum, the methods used to derive these background concentrations for the IWBZ and DWBZ do not meet the Article 6 regulatory requirements. Hence, the background concentrations for these zones must be revised.

RECOMMENDATIONS

MINS must develop a single set of background concentrations for the SWBZ, IWBZ, and DWBZ in the vicinity of Investigation Area H1 that can be used for the three above-described purposes. The background determination should consist of an initial set of background concentrations that can be used for all three applications. The background concentrations must be periodically updated for the groundwater remedy evaluation and groundwater monitoring applications in order to accommodate temporal variability.

The detailed methodology and results of the initial background determination should be presented in the WQSAP statistical evaluation plan. The protocol and results should be presented for each water-bearing zone (i.e., SWBZ, IWBZ, DWBZ) and, if appropriate, each geochemical zone within a given water-bearing zone. In the future, if additional water-bearing zones are added to the groundwater monitoring program or remedy, MINS will also need to establish background concentrations for the new zones.

The background concentrations must be developed in a manner that complies with the Article 6 requirements (summarized in Table 1 of this memorandum and discussed further in a later section of this memorandum). As discussed above, the statistical evaluation plan included in the WQSAP must provide the detailed protocol used to derive the background values and to update the values. As noted in Table 1, the

statistical evaluation plan must demonstrate the following: (1) the background data set is appropriate by providing the types of information described in later sections of this memorandum; (2) statistical protocol that are compatible with the data set; (3) the approach is protective of human health and the environment; (4) the statistical procedure meets the required performance standards; and (5) the approach will support the decisions that are needed for the monitoring program.

PROPOSED IWBZ AND DWBZ BACKGROUND CONCENTRATIONS (SUMMARIZED IN TABLE 2 OF THIS MEMORANDUM)

Background concentrations for IWBZ and DWBZ groundwater are proposed in Section 5, Appendix F of the Weston RI and repeated in the October 2004 WQSAP. The background data sets are summarized in Table 3 of this memorandum. The following steps were used to derive the background values:

Data sets with greater than 50% detection frequency: (1) substitution of one-half the reporting limit for censored data; (2) visual identification of outliers on boxplots; (3) for metals with outliers determined under Step 2, data were log-transformed, re-plotted on a boxplot, and remaining outliers were removed; (4) the normality assumption was tested with the Shapiro-Wilkes statistic; (5) metal data sets with a log-normal distribution were plotted on a log-normal probability plot and data sets with a normal or non-parametric distribution were plotted on an untransformed probability plot; (6) for data with normal and log-normal distributions, a least squares regression line was calculated and used to graphically determine the 95th percentile concentration; and (7) for data with neither normal or log-normal distributions, a non-parametric formula was used to estimate the 95th percentile.

Detection frequency between 0 and 50%: (1) a small arbitrary value was substituted for censored data points; (2) data were plotted on log-transformed probability plots; and (3) the second highest value judged not to be an outlier was selected as the background concentration.

Detection frequency of 0%: no ambient values are proposed.

GSU Comments

1. GSU could not fully evaluate the appropriateness of the proposed background well locations. MINS should provide the following information for the proposed background wells: appropriate-scale maps showing well locations, groundwater elevation contour maps, locations of wells relative to known or suspected source areas, summary of constituents of interest for known/suspected source areas, time series plots for each well, hydrograph for each well, cross-sections showing well screened intervals, boring logs and well completion records, and table summarizing well completion details. If the well completion documentation cannot be provided, the well should not be included in the background data set.

2. From the description provided in Section 5.0, the steps used to derive background values for data sets with detection frequencies between 0 and 50% are unclear.

Section 5 should be revised to clearly indicate the steps used to derive these values. It would be helpful to the reader if Tables 5-2 and 5-3 were modified to indicate the basis for the proposed background concentration (e.g., 95th percentile, second highest value).

3. GSU has the following comments regarding the statistical procedure used to derive the proposed background values.

   a. Prior to pooling data for all wells, data from each well should be screened for suspect data, outliers, and evidence of impact (e.g., trends, unusual concentration ranges). For example, the manganese and potassium values in well 01W44B during November 1993 should be removed as outliers. As another example, the iron concentrations in three replicate samples from well 01W47C in November 1993 (44.4U, 1420 µg/L, 477J µg/L) are not consistent and should be considered suspect.

   b. Prior to manipulating the pooled data set, the screened individual data sets should be compared to ensure that the data represent a similar statistical population (e.g., geochemical screening, box plot comparison). Data sets that do not appear to represent the same population should be removed. For example, calcium and magnesium data from well 01W44B are very different from concentration ranges of the metals observed at the other proposed background wells, and should not be included in the pooled data set.

   c. For the IWBZ, it appears that inadequate outlier screening was conducted for arsenic, cobalt, silver, and zinc. For the DWBZ, it appears that inadequate outlier screening was conducted for antimony, cobalt, molybdenum, silver, and vanadium. GSU recommends that MINS conduct a more rigorous screening for outliers (individual well and pooled data sets) and present the results of the screening in the revised Appendix F. The small sample size warrants a conservative outlier screening approach. For data sets with less than 50% detection frequency, professional judgment should be used to identify outliers. For data sets with greater than 50% detection frequency, box plots, probability plots, and quantitative outlier screening methods should be used. Results of the outlier screening step should be incorporated into this appendix.

   d. GSU does not agree with Step 3 in the procedure for data sets with greater than 50% detection frequency. GSU considers the use of box plots to screen for outliers to be a non-parametric procedure that makes no distributional assumptions. Hence, when using box plots to screen for outliers, data should not be transformed. Also, a consistent approach should be used to determine the outlier cutoff. For example, the outlier cutoff could be established as "Q3 + IQR" where Q3 is the third quartile and IQR is the interquartile range.

   e. From the description provided, it does not appear that the probability plots were used for data sets with detection frequency less than 50%. Hence, GSU does not see the value of the plots for these data sets.

f. The regression line procedure should not extrapolate data beyond the detected concentrations. For the IWBZ, the background concentrations for arsenic, iron, potassium, and sodium should be revised. For the DWBZ, the background concentrations for barium, calcium, iron, magnesium, manganese, and nickel should be revised.

g. Certain background concentrations derived using the regression line procedure appear to be underestimating the true background concentration. GSU recommends that MINS reevaluate the background concentrations for copper (DWBZ) and nickel (IWBZ).

h. For the IWBZ, the regression lines shown on the following probability plots do not fit the depicted data: nickel, tin, and zinc. For the DWBZ, the regression lines for the following probability plots do not fit the depicted data: arsenic, chromium, copper, iron, molybdenum, tin, and zinc. MINS should provide an explanation for the apparent discrepancies or make appropriate corrections.

4. GSU has highlighted proposed background values on Table 2 that are considered non-representative and unacceptably high.

5. MINS should propose the method reporting limit as the background concentration for data sets with 0% detection frequency or with only one detected value after data screening. The next revision of the WQSAP should identify the method reporting limits that will be used for the inorganic parameters.

6. The tables used to present the background well data are difficult to read and use. In the next version of Appendix F, GSU requests that the metals data be presented in a separate table or on a separate page. If additional data are incorporated into the data set, GSU requests that the data summary table be provided to us in Excel format.

7. GSU noted apparent inaccuracies in Table 5.3 in regards to the description of an anomalous zinc value (1,290 µg/L, 01W47C) apparently excluded from the DWBZ background data set, but not indicated in Table 5.3. In the next version of Appendix F, GSU requests that data identified as anomalous and excluded from the data set be clearly identified and tabularized to allow for replication of background calculations.

PROPOSED SWBZ BACKGROUND CONCENTRATIONS (SUMMARIZED IN TABLE 2 OF THIS MEMORANDUM)

GSU evaluated the SWBZ background concentrations presented in TtEMI (2002) because the October 2004 WQSAP had not yet been submitted at the time we drafted this memorandum. Because similar procedures appear to have been used for both the October 2004 WQSAP and TtEMI (2002), the review should still provide relevant feedback to MINS.

The SWBZ background concentrations were established in the *Technical Memorandum, Estimation of Ambient Metal Concentrations in Shallow Groundwater, Mare Island, Vallejo, California* (Technical Memorandum; PRC, 1996). The *Response to Regulatory Agency Comments on the Technical Memorandum* (TtEMI, 1998) did not substantively change the background concentrations presented in the Technical Memorandum. DTSC approved the SWBZ background concentrations in its approval of the *Final Compilation of Technical Memoranda on Ambient Analyses of Metals in Soils and Groundwater, Mare Island, California* (TtEMI, 2002).

NOTE: For the purposes of this discussion, GSU will refer to background concentrations instead of "ambient" concentrations.

As stated in the Technical Memorandum, the intended use of the background concentrations is to support the baseline HHRA, ecological risk assessment, and RI of the Installation Restoration Program sites at Mare Island. To develop these background values, MINS took a subset of 25 wells that are distributed primarily in the fill areas across the island and that were interpreted as being unimpacted by site contamination. Four groundwater samples were obtained from each well between November 1992 and May 1994. These data were pooled into a single data set for the purposes of performing statistical evaluation and deriving the background value for each metal. Steps in the statistical evaluation included treatment of non-detects, exclusion of outliers, normality testing, plotting the data on probability plots, and regression analysis to determine the 95th and 99th percentile concentration. The 95th percentile concentration was selected as the background value.

GSU Concerns

GSU acknowledges the difficulty in establishing SWBZ background concentrations at MINS, given the historical usages of the island and the extensive fill areas. However, GSU has the following concerns with the approach used to derive the SWBZ background concentrations.

1. The Technical Memorandum indicates that there is uncertainty as to whether the selected wells are unimpacted. Inclusion of data from impacted wells is likely because the wells were selected early in the RI process.
   a. The use of only four data points from each well thwarts recognition of impaired groundwater quality (and data of poor quality). To allow adequate evaluation of the data, each well included in the background data set should be monitored at consecutive, 90-day increments for at least two years.
   b. It seems appropriate to reevaluate the background well data set to determine whether data collected subsequent to May 1994 suggest that a well is impacted with a certain constituent. If this review identifies affected data within the data set, the background values should be recalculated.
   c. The detected concentration ranges for certain metals (e.g., arsenic, barium, cadmium, chromium, cobalt, copper, nickel, vanadium, zinc) suggest that the

data set contains influences from unrecognized impacts, outliers, and/or poor quality data. Several of these metals have low detection frequencies (3 to 15%) which hinder identification of elevated concentrations. This issue was also raised by the U.S. Environmental Protection Agency (EPA) in their comments on the Technical Memorandum.

d. GSU is concerned with the inclusion of data from well 01W40A in the background data set because the well is hydraulically downgradient of the RCRA Landfill.

2. The "significant turbidity variations" referenced in the Technical Memorandum suggest either that all wells were not in a condition capable of providing representative groundwater samples or that sampling practices affected the sample quality. Sample filtration does not eliminate the variability introduced by poor well condition or sampling practices. Regardless of the cause, the turbidity variations introduced data of questionable quality into the data set. The turbidity issue likely increased the variability in the data set and resulted in higher 95th percentile concentration.

3. Wells screened in multiple water-bearing zones are included in the "SWBZ" data set. For example, BGW01 is screened in the IWBZ and well BGW02 is screened in the DWBZ. Other inconsistently screened wells may also be present in the data set. Hence, the wells included in the data set should be reviewed so that only data from wells monitoring the SWBZ are included in the SWBZ data set.

4. The areal distribution of wells included in the background determination likely results in increased variability in the data set by including multiple geochemical zones, thus resulting in a higher 95th percentile concentration. GSU anticipates that a background determination specific to Investigation Area H1 would have lower variability and thus lower background values.

5. After the wells were selected, it does not appear that additional screening was used to evaluate whether the wells represented the same statistical population. Examples of additional screening would be to use geochemical methods (e.g., Piper diagram), other graphical methods (e.g., box-and-whisker plots), and other appropriate statistical methods (see Comment 6).

6. The application of the probability plot approach to aqueous media ignores a considerable body of literature[1] that has been developed by statisticians who are well-versed in groundwater monitoring statistics and background determinations. GSU offers the following examples to illustrate our concerns.

   a. Interpretation of probability plots is subjective, particularly when it is used without the "checks and balances" of other data evaluation methods. For example, visual outlier screening on a probability plot (that assumes a normal or log-

[1] Selected references for groundwater monitoring statistics are included in Appendix G of DTSG (2001).

normal distribution) could be checked with a quantitative outlier screening method or another graphical method (e.g., box-and-whisker plot).

b. The probability plot approach is biased to interpret that a data set has a normal or log-normal distribution when there may be insufficient detection frequency to make such a determination. For example, selenium is assumed to have a normal distribution when only 4 of 101 samples had detectable concentrations. For data sets of low detection frequency (e.g., between 0 and 50%), GSU recommends that no distributional assumptions be made.

c. A percentile concentration should not be calculated for very low detection frequencies. Instead, consistent with groundwater statistical literature, GSU recommends that the maximum value (or second highest value) of the conservatively screened data set be used as the ambient value.

d. Even with consideration of the regional setting, GSU finds some of the values to be unusually high (see Table 2 attached to this memorandum). GSU understands that representatives of EPA and the Regional Water Quality Control Board (RWQCB) share these concerns.

ESTABLISHING ARTICLE 6 BACKGROUND CONCENTRATIONS

GSU has previously commented on the need to establish appropriate background concentrations for the Article 6 groundwater monitoring program in the Comprehensive Groundwater Monitoring Evaluation Report (DTSC, 2004a) and in our comments on the December 2003 WQSAP (DTSC, 2004b). As summarized in Table 1 of this memorandum, Article 6 contains specific requirements that must be met in the establishment of background concentrations. These key requirements are as follows:

1. The background concentrations must be periodically updated throughout implementation of an Article 6 monitoring program.

2. The background concentrations must be established using wells that are hydraulically upgradient, or in reasonably close proximity to the regulated units. The requirement for close proximity is to ensure that the difference between unimpacted and impacted water quality can be identified. If the background well data set contains wells distributed across Mare Island, this might introduce data that is not representative of the uppermost aquifer in the vicinity of the regulated units.

   a. SWBZ: It is not feasible for MINS to select SWBZ background well locations that are hydraulically upgradient of the RCRA Landfill and surface impoundments. Therefore, wells should be selected in reasonably close proximity to the regulated units. To support the intended use of the background data, the well locations should not be affected by releases from other source areas.

   b. IWBZ/DWBZ: Based on GSU's review of Appendix F of the Weston RI, it seems feasible for MINS to select IWBZ and DWBZ well locations that are hydraulically upgradient of the regulated units. To support the intended use of the background

data, the well locations should not be affected by releases from other source areas.

3. The Article 6 performance standards require MINS to manage its false positive and negative rates associated with the groundwater monitoring program. Hence, when developing the statistical protocol that will be used to derive and update the background concentrations, MINS must consider the Type I and II errors.

As discussed with Weston representatives, GSU anticipates that the revision to the WQSAP will contain the statistical evaluation plan that will be used to derive and update background concentrations for the Article 6 monitoring program. When presenting the approach, MINS must demonstrate that: (1) the background data set is appropriate by providing the types of information previously identified in this memorandum; (2) statistical protocol are compatible with the data set; (3) the approach is protective of human health and the environment; (4) the statistical procedure meets the required performance standards; and (5) the approach will support the decisions that are needed for the monitoring program.

The statistical protocol should consist of a series of steps such as data screening, distribution checks, management of censored data, and calculation of the background concentration. GSU recommends that MINS include a flow chart with the statistical procedure so that the steps to be followed are clear to the reader. Appendix C of DTSC (2001) outlines the approach for developing the statistical evaluation plan portion of the WQSAP.

REFERENCES

Department of Toxic Substances Control (DTSC). 2001. *Guidance Document, Monitoring Requirements for Permitted Hazardous Waste Facilities.* July 2001. (www.dtsc.ca.gov/PublicationsForms/HWMP_Guidance_Monitoring-Requirements.pdf)

DTSC. 2004a. *Comprehensive Groundwater Monitoring Evaluation Report, Mare Island Naval Shipyard, RCRA Landfill, Surface Impoundments & IWTP Pipeline, Vallejo, Solano County, California.* April 30, 2004.

DTSC. 2004b. *GSU Memorandum Commenting on the RCRA/Facility Landfill Post-Closure Groundwater Monitoring, Mare Island Naval Shipyard, Vallejo, Solano County.* July 19, 2004.

PRC Environmental Management, Inc. (PRC). 1996. *Technical Memorandum, Estimation of Ambient Metal Concentrations in Shallow Groundwater, Mare Island, Vallejo, California.* November 15, 1996.

Tetra Tech EM, Inc. (TtEMI). 1998. *Response to Regulatory Agency Comments on the Technical Memorandum Estimation of Ambient Metals Concentrations in Shallow Groundwater, Mare Island, Vallejo, California.* February 2, 1998.

TtEMI. 2002. *Final Compilation of Technical Memoranda on Ambient Analyses of Metals in Soils and Groundwater, Mare Island, California.* April 19, 2002.

Weston. 2004a. *Draft Final Remedial Investigation, Investigation Area H1 Mare Island Vallejo, California.* July 22, 2004.

Weston. 2004b. *Draft Final Water Quality Sampling and Analysis Plan, Investigation Area H1, RCRA Landfill and IWTP Surface Impoundments, Post-closure Groundwater Monitoring, Mare Island, Vallejo, California.* October 1, 2004.

TABLE 1
SUMMARY OF CALIFORNIA CODE OF REGULATIONS, TITLE 22
REQUIREMENTS FOR ESTABLISHING BACKGROUND CONCENTRATIONS

Section No.	Description (*refer to complete regulatory citation for exact requirement*)
66265.97(b)(1)(A)	-Sufficient number of background monitoring points installed at appropriate locations and depths to yield groundwater samples from the uppermost aquifer that represent the quality of groundwater that has not been affected by a release from the regulated unit.
66265.97(b)(1)(C)(2)	-Sufficient number of background monitoring points installed at appropriate locations and depths to provide the data needed to evaluate changes in water quality due to the release from the regulated unit.
66265.97(b)(2)	-Monitoring system may include background monitoring points that are not hydraulically upgradient of the regulated unit if facility demonstrates that sampling of other monitoring points will provide samples representative of background quality or more representative than those provided by upgradient monitoring points.
66265.97(e)(6)	-Establish a data set to be used to calculate background values.
66265.97(e)(7)	-Select one of the statistical methods specified in subsection (e)(8). -Provide detailed description of criteria to be used for determining statistically significant evidence of a release and determining compliance with the water quality protection standard. -Demonstrate that use of the selected statistical method is protective of human health and the environment. -Demonstrate that method complies with performance standards of subsection (e)(9).
66265.97(e)(8)	-Specify one of the listed statistical methods in the WQSAP.
66265.97(e)(9)	-Comply with the listed performance standards. -Statistical method must include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.
66265.97(e)(10)	-Select and justify use of the procedure for determining background value for each COC and monitoring parameter. -If parameter does not show natural variation, establish a procedure for determining the background value. -If parameter shows natural variation, statistical method to determine background should include a procedure updating the background value.
66265.97(e)(11)	-If parameter does not show natural variation, establish background value. -If parameter shows natural variation, provide detailed description of procedure to be used to establish and update background value.
66265.97(e)(12)	-For each COC and monitoring parameter, specify the procedure for establishing background values. -For each COC and monitoring parameter, specify the sampling methods that will be used to support establishment of the background value, determination of statistically significant release, and assessment of compliance with GWPS.

TABLE 2
PROPOSED BACKGROUND VALUES FOR GROUNDWATER

Metal	Proposed SWBZ Values (µg/L)	Proposed IWBZ Values (µg/L)	Proposed DWBZ Values (µg/L)
Aluminum	743	257	—
Antimony	11	—	—
Arsenic			11.6
Barium	203	1,720	670
Beryllium	2.6	—	—
Cadmium	26	—	—
Calcium	1,370,000		406,000
Chromium		3.5	8.4
Cobalt		1.8	
Copper		—	2.7
Hexavalent Chromium	—	—	—
Iron	7,120		
Lead	12	—	—
Magnesium	3,250,000		553,000
Manganese	15,800	6,000	10,500
Mercury	0.33	—	—
Molybdenum		4.4	10
Nickel		1.22	
Potassium	364,000	180,000	155,000
Selenium	9.2	—	—
Silver			4.4
Sodium	8,650,000	9,800,000	6,720,000
Thallium	—	—	—
Tin	—	20	11.5
Vanadium			
Zinc		9	12.3

µg/L is micrograms per liter.
DWBZ is deep water-bearing zone.
IWBZ is intermediate water-bearing zone.
Shading indicates concentrations that GSU considers to be too high.
SWBZ is shallow water-bearing zone.
— indicates that nothing is proposed.

TABLE 3
SUMMARY OF IWBZ AND DWBZ DATA SETS

Unit	Well No.	Sample Dates
IWBZ	BGW01	4/22/93 8/19/93 11/17/93 2/21/94 6/1/99
	01W43B	4/8/91 11/30/92 4/12/93 8/3/93 11/2/93 6/22/99
	01W44B	4/9/91 11/24/92 4/13/93 8/3/93 11/3/93 6/29/99
	DPW-73	10/22/03 1/28/04
	DPW-74	10/24/03 1/28/04
	DPW-75	10/24/03 2/3/04
DWBZ	BGW02	4/21/93 8/18/93 11/15/93 2/22/94 6/16/99
	01W47C	4/10/91 12/01/92 4/19/93 8/5/93 11/9/93 6/24/99 5/20/03
	DPW-70	10/27/03 1/29/04
	DPW-71	10/23/03 1/3/04
	DPW-72	10/27/03 1/27/04

Department of Toxic Substances Control

Terry Tamminen
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TO: Chip Gribble, DTSC Project Manager
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FROM: James M. Polisini, Ph.D., Staff Toxicologist
Human and Ecological Risk Division (HERD)
1011 North Grandview Avenue
Glendale, CA 91201

DATE: **October 29, 2004**

SUBJECT: DRAFT FINAL REMEDIAL INVESTIGATION REPORT INVESTIGATION AREA H1 – ECOLOGICAL RISK ASSESSMENT COMPONENTS
[PCA: 18040 SITE: 201208-18 H:44]

BACKGROUND

HERD reviewed the document titled *Draft Final Remedial Investigation, Investigation Area H1*, dated 22 July 2004. This document was prepared by Weston Solutions, Inc. of Vernon Hills, Illinois. The document under review was submitted as a revision of the Draft Remedial Investigation for Investigation Area (IA) H1, soil, Installation Restoration (IR) Site 05 and the Western Magazine Area, which was originally prepared by Weston, dated 13 September 2002 and the Draft Final Groundwater RI for IA H1 prepared by Weston and dated 9 May 2002. HERD also participated in a conference call on October 14, 2004 to discuss potential remedial actions and balancing criteria among the Responsible Party, regulatory agencies and natural resource trustees.

Subsequent to the construction of Dikes 12 and 14 at the southern end of Mare Island, the Navy constructed levees in IA H1 along the western shoreline to hold dredge spoils pumped from Mare Island Strait. Dredge spoil ponds were expanded to the west as spoil ponds reached containment capacity. From as early as 1909 until 1978, solid wastes generated in the shipyard, including hazardous wastes and petroleum wastes, were deposited within IA H1 in unlined pits and low-lying terrain

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along Dump Road. IA H1 was also the site of a fire-fighting training area, storage areas for spent lead-acid batteries, a fenced solid waste disposal area (Landfill subarea), and industrial wastewater treatment plant (IWTP), and treatment waste sludge impoundments.

IA H1 encompasses approximately 230 acres with an elevation ranging from 6 feet to 23 feet above mean sea level (msl). An estimated 4.5 million gallons of waste oil were reportedly disposed of at the former waste oil sumps within the Waste Disposal Sump/Lead Oxide Storage and Disposal Area. Estimates of the free product, observed in borings and test pits, in the IA H1 area range from 900,000 gallons to upwards of 2 million gallons. The presumptive remedy for IA H1 is consolidation of contaminated material into a proposed containment boundary containing the former landfill, placement of a slurry wall with engineered dewatering collection trench, and capping of the former landfill area.

Mare Island Naval Shipyard (MINSY) was the first naval station on the Pacific Coast, where shipbuilding began in 1854. The former MINSY is located on a peninsula approximately 30 miles northeast of San Francisco. The peninsula is bounded to the east, south, and west by the Napa River (Mare Island Strait), Carquinez Strait, and San Pablo Bay, respectively. Mare Island was originally an island of approximately 1,000 acres with surrounding wetlands of approximately 300 acres. Fill material was added to enlarge Mare Island and connect it to the mainland. MINSY has been in operation under Navy control from approximately 1853 until the recent transfer to the City of Vallejo through the State Lands Commission.

GENERAL COMMENTS

Both the Screening Ecological Risk Assessment (ERA) and Baseline ERA contained in this report for IA H1 indicate ecological hazard associated with a subset of the contaminants evaluated. HERD agrees with the conclusion that the containment area, the non-tidal wetlands and the upland subareas of IA H1 proceed to evaluation of remedial alternatives.

SPECIFIC COMMENTS

1. HERD has no objection to the conclusions presented (ES 1.4, page ES-4) that all IA H1 subareas are recommended to be carried forward to the Feasibility Study (FS) stage. This comment is meant for the DTSC Project Manager and no response is required from Responsible Parties (RPs) or consultants to those parties.

2. HERD defers to the DTSC Geological Services Unit (GSU) regarding the adequacy of the groundwater sampling, modeling and conclusions regarding the depth to groundwater in the Shallow Water-Bearing Zone, the Intermediate Water-Bearing Zone and the Deep Water-Bearing Zone, the direction of groundwater flow and the magnitude of tidal influence in IA H1 (Section 3.3, pages 3-8 through 3-13 and Section 7 pages 7-1 through 7-87).

3. The genera of algae present in offshore habitats (Section 3.6.1, page 3-15) are listed in parentheses following the common names. A parenthetical associated with diatoms, however, indicates '*OFFSHORE*'. Please correct or remove this reference.

4. The listing of Species of Special Concern (Section 3.6.6, page 3-21) includes the salt marsh harvest house (*Reithrodontomys raviventris*) in the listing of Threatened and Endangered Species. From the discussions during the October 14, 2004 IA H1 conference call, the presence of the salt marsh harvest mouse (SMHM) in IA H1 is a significant risk management decision point for implementation of any remedy at IA H1. This comment is meant to a focal point of the October 14, 2004 conference call and no response is required from the RPs or contractors.

5. Please provide a description of the activities associated with the mercury and polychlorinated biphenyl (PCBs) in sediments at the outfall of the discharge pipe from the IWTP in some part of the summary of IA H1 activities. The text indicates that 'all structures ...associated with the IWTP are known to have contained hazardous wastes and should be considered RCRA regulated units.' (Section 4.60, page 4-31 and Section 4.67, page 4-35). This statement would indicate that the discharge pipe is a RCRA 'unit' or part of a RCRA 'unit' and should be specifically included or excluded from the IA H1 investigation.

6. The National Oceanic and Atmospheric Administration (NOAA) has developed screening criteria for fish exposed to polycyclic aromatic hydrocarbons (PAHS), polychlorinated biphenyls (PCBs) and tributyltin (TBT) that are significantly lower than NOAA sediment screening criteria based on benthic invertebrates. These fish-based sediment screening criteria should be included along with other sediment criteria. HERD reviewed the remaining screening criteria (Appendix F) and found them appropriate as long as the most protective screening criteria, where more than one exists, is used to assess ecological hazard.

7. Industrial soils are not sediment and, therefore, U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for industrial soil, nor the San Francisco Regional Water Quality Control Board (SFRWQCB) Tier 1 human health-based concentrations should not be used for ecological screening of sediments (Section 4.4.2, page 5-12). The only appropriate use for these criteria as screening would be for 'sediments' which have been dredged from Mare Island Strait, or other offshore areas of Mare Island, and are currently above msl where human exposure would be a complete exposure pathway. Please segregate the listed criteria to indicate those used to screen for potential ecological effects from those used to screen for potential human-health effects.

8. HERD reserves the right to review the Contaminants of Ecological Concern (COECs) which are dropped from the Surface Water ERA or are identified as 'risk drivers' based on the SFRWQCB listing of Environmental Screening Levels (ESLs) (Section 5.4.4.4, page 5-13). Several of the ESLs for water are based on the use of 'generic' uncertainty factors or appear to be based on drinking water standards.

9. HERD reviewed the proposed ecological exposure routes for each representative taxonomic group (Section 5.10, page 5-31, unnumbered table) and found them acceptable for ecological screening. However, footnote number 2 indicates that sediment and surface water exposure is expected to occur only within the non-tidal wetlands. Please explain why these exposure pathways would not be complete in tidal wetlands. If tidal wetlands are excluded from this exposure consideration because tidal wetlands are non-existent in IA H1, as appears to be the case (Figure 1-3), then state in the footnote that tidal wetlands do not occur within the boundary of IA H1.

10. Individual Ecological Screening Criteria (Table 5-3) were checked, for those elements and compounds most likely to be of concern at IA H1, and found to agree, or be more protective than those listed in the cited reference.

11. There is no footnote text matching the footnote indicator of 3 in the list of surface water screening criteria (Table 5-5). Please include the associated text in the footnotes.

12. U.S. EPA Tier II Secondary Chronic Values (SCVs) may be available for those Contaminants of Ecological Concern (COECs) lacking National Ambient Water Quality Criteria (NAWQC) (TABLE 5-5). These SCVs are listed and can be searched for by accessing the Oak Ridge National Laboratory (ORNL). Risk Assessment Information System (RAIS) at

http://risk.lsd.ornl.gov/cgi-bin/eco/ECO_select. This data base should be consulted for those COECs lacking surface water screening criteria.

13. Both a conservative ERA using maximum concentrations and exposure parameters and a less conservative ERA using mean exposure parameters are performed for IA H1. The less conservative method, also called a Baseline Ecological Risk Assessment (BERA) utilizes an upper confidence limit estimate of the contaminant concentration, the 95 percent upper confidence limit on the mean (95UCL) and the mean home range, not a lower estimate of the home range, to estimate a Site Use Factor (SUF) for vertebrate species assessed by the Hazard Quotient (HQ) method (Appendix J, Section 6.1, page J-6-3). Estimates of ecological hazard using the less conservative method could indicate adverse effects on one half the population members, based on a mean SUF.

14. HERD agrees with the conclusions that the containment area, the upland area outside the containment area, and the non-tidal wetland area should all proceed to evaluation of remedial alternatives based on the ecological risk assessment (Section 11.5, pages 11-6 through 11-8). The human health risk and/or hazard also indicate that these three areas of IA H1 proceed to evaluation of remedial alternatives.

Appendix J – Ecological Risk Assessment (CD-ROM)

15. The suite of soil screening criteria listed (Appendix J, Section 2.2, page J-2-4) from EPA headquarters, EPA Regional offices and Oak Ridge National Laboratory (ORNL) are acceptable to HERD for screening purposes as long as the most conservative value is used. No response is required for this comment.

16. HERD agrees that a screening level ERA is appropriate for the containment area, while a more detailed, site-specific ERA is performed for the upland area outside the containment area and the non-tidal wetland area outside the containment area as long as the remedial action performed is the presumptive slurry wall and capping outlined for the landfill and surrounding area (Appendix J, Section 1, page J-1-1). In the event this presumptive remedy is not selected, a site-specific ERA should be performed for the area currently described as the containment area to assist in selection of a different remedial alternative. This contingency is required as COECs in the containment area exceeding screening criteria were not further evaluated based on the presumptive placement of a RCRA cap (Appendix J, Section 2.2, page J-2-4) over the containment area.

17. HERD accepts the ecological guilds and specific representative species selected for evaluation in all three subareas of IA H1 (Appendix J, Section 3.3) together with the assessment (Appendix J, Section 3.4.1, page J-3-17) and measurement endpoints (Appendix J, Section 3.4.2, page J-3-18 through J-3-20) outlined for these species. This comment is meant for the DTSC Project Manager and no response is required from the RPs or contractors.

18. Selection of the meadowlark as a representative species for the upland habitat (Appendix J, Section 3.3.1, page J-3-9) will provide a protective estimate of potential hazard to omnivorous bird species, in an area of H1 not within the containment area, given the use of earthworm tissue concentrations for evaluation of intake. This comment is meant for the DTSC Project Manager and no response is required from the RPs or contractors.

19. Please explain the significance of the 'NA = No food source documented' notation at the bottom of the table providing the Target Receptor, Primary Food Source and Assessment Endpoints (Appendix J, Section 3.4.1, page J-3-17). Food sources are indicated in the table for all target receptors. Please remove this notation if it is not applicable.

20. The soil ingestion rate proposed for the meadowlark is remarkably low. Values for exposure to soil in the diet of the American woodcock are readily available (EPA, 1993). The American woodcock inhabits primarily woodlands and abandoned upland fields and feeds mostly on invertebrates (EPA, 1993) in soil. The percent soil ingestion is 10.4 percent of the diet (EPA, 1993, Table 4-4), significantly greater than the 0.01 percent of the diet used for the western meadowlark (Appendix J, Table J-21), also a consumer of invertebrate food items. Please explain this marked discrepancy.

21. A subset of the Toxicity Reference Values (TRVs) for mammals and birds were examined (Appendix J, Table J-28 and Table J-29) and those checked were found to agree numerically with the cited reference. This comment is meant for the DTSC Project Manager and no response is required from the RPs or contractors.

22. Several of the intake equations presented in the footnotes to associated intake tables contain arithmetic errors (e.g., Appendix J, Table J-35). The intake equation in this table is presented as: [IRplant (dry wt) x Cprey(plant, dry wt) x CF x DCF x SUF]/BW + [IRearthworm (dry wt) x

Cprey(earthworm, dry wt) x CF x DCF x SUF]/BW [(IRsoil x. The termination of the incidental soil intake portion of the formula, however, appears to be a typographic error as the total intake was duplicated.

CONCLUSIONS

The Ecological Risk Assessment portions of the Draft Final Remedial Investigation Report for IA H1 indicate that all three areas of IA H1 show elevated or significant potential ecological hazard and should proceed to evaluation of remedial alternatives.

Presence of a listed species, the salt marsh harvest mouse, in the proposed containment area appears, from discussions at the October 14, 2004 meeting, to be the major impediment to selection of the presumptive remedy of capping at the landfill site. Selection of a presumptive remedy for the landfill area is a risk management decision; however, from a risk assessment viewpoint, relocation and sequestration of contaminated soils and sediments under a landfill cap would appear to be a win/win resolution for ecological receptors which will continue to utilize the area of IA H1 after any remedial action.

REFERENCE

U.S. Environmental Protection Agency. 1993. Wildlife Exposure Factors Handbook. Volume I and Volume II. Office of Research and Development, Washington, D.C. EPA/600/R-93/187a and EPA/600/R-93/187b.

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