

**RESPONSE TO COMMENTS
 DRAFT REMEDIAL INVESTIGATION REPORT
 NAVAL SHIPYARD, LONG BEACH, CALIFORNIA**

October 24, 1996

**Comments by: Alvaro Gutierrez, DTSC Region 4, Long Beach, CA
 Response by: Aklile Gessesse, BNI**

Number	Comment	Response
SPECIFIC COMMENTS		
1	<p>Copper: In Figure E-19 of the Draft RI, the Navy showed a cumulative probability plot with two main populations for copper in the non-native fill materials which form the surface soil at Long Beach Naval Complex (LBNC). The separation point between the two populations lies at about 55 mg/kg, while the limit of the upper population lies near 650 mg/kg. The Navy invoked a geochemical argument that high total organic carbon (TOC) in soil can immobilize copper by forming stable organocopper complexes. They asserted that the higher population of copper values represented these complexes and was therefore part of the ambient conditions at this base. Using both populations to describe ambient conditions, the 95% upper tolerance limit on the 95th quantile (UTL_{95,95}) was estimated at 639 mg/kg for copper. DTSC commented (#3, p. 5) that ambient conditions were confined to the lower of these two populations (≤ 55 mg/kg), unless the Navy could demonstrate that the geochemical correlation of copper and TOC was operating locally.</p> <p>DTSC reminded the Navy that the use of sandblast grit at this base could have resulted in releases of copper to soils and sediments. Also, TOC in soils or sediments might represent releases of fuel hydrocarbons attributable to the Navy. Thus, DTSC is cautious about expanding the definition of ambient conditions for copper according to the mechanism the Navy proposes.</p> <p>At the project meeting on October 3, 1996, the Navy announced that too few data on TOC were available for soils to make the correlation, but data on both TOC and copper were available from Operable Unit 3, Site 7 of LBNC, the West Basin of the harbor. The Navy presented preliminary data showing a geochemical correlation between copper and TOC in sediments in the West Basin of the</p>	<p>The soil copper data which were used to calculate the statistical ambient background value were obtained from locations in the Naval Station, Shipyard, and Port of Los Angeles (POLA). Therefore, the ambient background concentration values are representative of the entire Terminal Island. The complete data set was first used to generate cumulative frequency probability plots (see Appendix E in the Draft RI report). The use of probability plots can identify the distribution characteristics of the metals. Multiple populations were indeed observed in several metals. Specifically, metals that have a tendency to show preferred association with soil organic matter exhibit multiple populations on the probability plots. These metals are lead, copper, and zinc. These metal data were examined for the removal of data that are indicative of contamination. Typically, the data removed show a "cluster effect." Those data that were removed usually are associated with specific sites, an indication that they are derived from site operation impact.</p> <p>The sandblast grit samples were identified and removed prior to the background calculations. The Navy agrees with the DTSC that an examination of the areal distribution of high values for copper in soil should be performed. After the removal of clustered data indicative of potential impact, a review of the data indicates that there are no clusters of data from a particular site.</p> <p>In an environment like Terminal Island, metal concentration data in soils can be expected to be affected by ambient background and human activities. In ambient background concentration data, the major factors controlling the metal distribution are: inorganic sorption and organic sorption. Inorganic sorption occurs when heavy metals are adsorbed by clays and certain metal hydroxides, especially iron and manganese oxides. Organic sorption refers to the sorption that occurs between metals and soil organic carbon matter. Because of the large surface areas for soil organic carbon, it has a very high capacity for the retention of heavy metals. Thus, the soil with high organic carbon content would have higher heavy metal concentrations, compared to the soil with low organic carbon content. When plotted on the probability plots, the soil samples with higher organic carbon content</p>

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	<p>harbor The upper limit of the ambient distribution of copper in these sediments is about 650 mg/kg, which agrees very well with the soil data.</p> <p>Because some (perhaps most) of the hydraulic fill covering Terminal Island came from this harbor or from similar sediments nearby, DTSC is inclined to accept the Navy's argument that both populations of copper concentrations may be considered ambient for the non-native soils at this base. However, DTSC will require the Navy to quantify this correlation. At the very least, the value for the correlation coefficient (r^2) should be calculated and presented. Perhaps a regression line with confidence limits about its slope would lend additional support to their argument. Lastly, the Navy should examine the areal distribution of high values for copper in soil, because "hot spots" from releases could be responsible rather than a basewide geochemical mechanism.</p>	<p>will form a different population above the first inflection point due to a different sorption mechanism from the inorganic sorption. The ambient background metal concentration data should include the fractions that are controlled by both inorganic and organic sorption.</p> <p>The widespread of samples (including those from the POLA locations) above the first inflection point supports the argument that organic sorption is responsible for the higher concentrations of copper. Thus, the high concentrations should be viewed as part of the ambient background. The intent of plotting of copper concentrations versus total organic carbon content (TOC) of sediment samples is to demonstrate that there is a tendency for copper to be associated with organic matter (Figure 1). The widespread of high copper in soils across Terminal Island can be explained by the probable source from hydraulic fill material.</p> <p>Because almost the entire Terminal Island was built with fill materials from various sources, soil metal data representing the ambient background concentrations would not necessarily form a single population. Especially, the hydraulic fill material would be high in heavy metal concentrations due to the presence of organic material in the sediment. This is reflected by the widespread of the metals from the segment above the inflection point on the probability plot. Metal data above the inflection points on the probability plots for lead, copper, and zinc were identified to have been collected from locations across Terminal Island. The widespread of these metals at concentrations above the first inflection point suggests that they are part of the ambient concentrations. Because of the nature of the fill, the first population shown on the probability plot is not necessarily the only population representative of the ambient background level.</p> <p>The phenomenon observed in the sediment samples provides a support to the argument that there is a tendency for copper to be adsorbed by organic matter in soil samples. For the copper versus TOC plot, the r^2 value is calculated to be 0.5346 for a sample size of 50 (Figure 1). A test for a zero population correlation</p>

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		<p>was performed to determine if the correlation between copper and TOC is significant. A zero correlation indicates that there is no linear association between the two variables, i.e., copper and TOC. To test the hypothesis $H_0: \rho = 0$, the t statistic is calculated:</p> $t = [r(n-2)^{0.5}] / (1 - r^2)^{0.5}$ <p>where n is the sample size, r is the sample correlation coefficient, and ρ is the population correlation. The alternate hypothesis is $H_a: \rho > 0$.</p> <p>The test results show that the calculated t statistic of 7.424 is greater than the critical value for 48 degrees of freedom and $p = 0.0005$ (see Table 1). This suggests that there is a significant positive correlation between the copper concentrations and TOC levels.</p>
2	<p>Zinc: The navy invokes the same argument for zinc as for copper, but no supporting data are presented. If the argument is valid for both metals, then some supporting evidence should be available from either soils or sediments. As with copper, quantification of any putative causal relationship is desirable.</p>	<p>Please see the above "Responses to Specific Comment No. 1."</p> <p>For zinc versus TOC plot, the r^2 value is calculated to be 0.5393 for a sample size of 50 (Figure 2). A test for a zero population correlation was performed to determine if the correlation between zinc and TOC is significant. A zero correlation indicates that there is no linear association between the two variables, i.e., zinc and TOC. The test results show that the calculated t statistic of 7.492 is greater than the critical value for 48 degrees of freedom and $p = 0.0005$ (see Table 1). This suggests that there is a significant positive correlation between the zinc concentrations and TOC levels.</p>

Figure 1
Total Copper versus Total Organic Carbon
Sediment Samples, Site 7, Long Beach Naval Complex

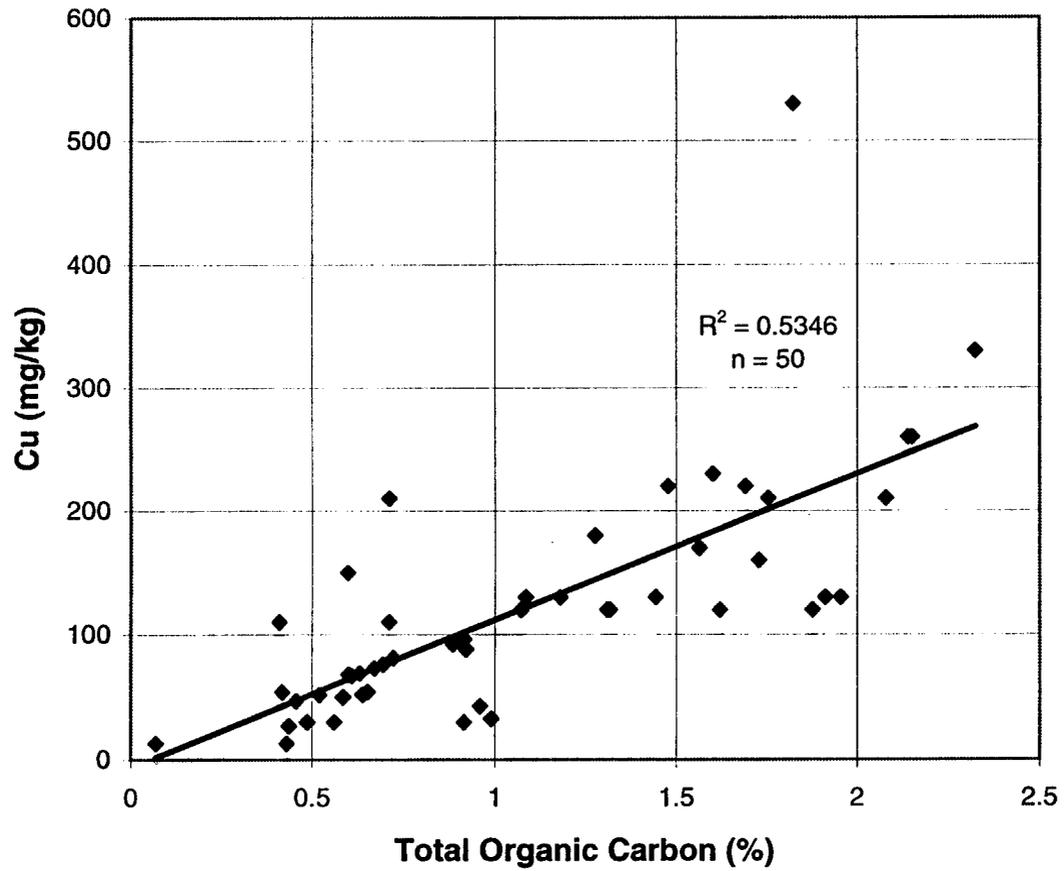
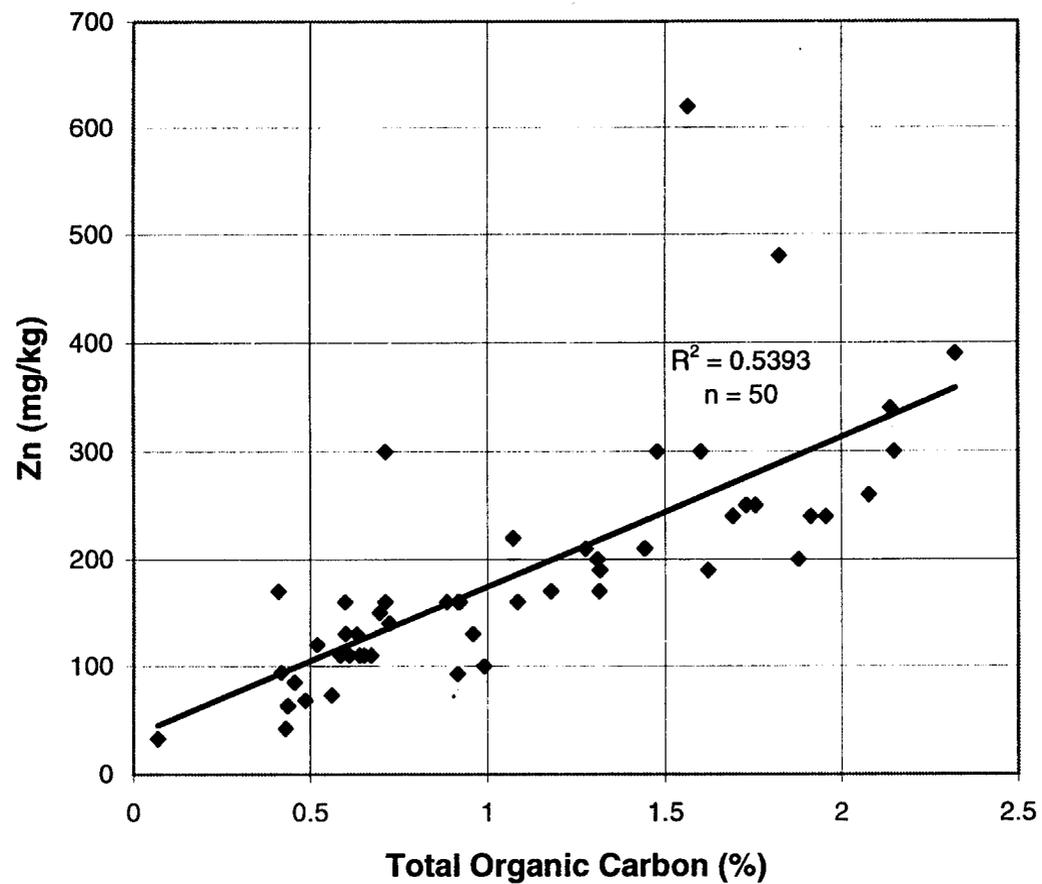


Figure 2
Total Zinc versus Total Organic Carbon
Sediment Samples, Site 7, Long Beach Naval Complex





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CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT

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Naval Facilities Engineering Command
Southwest Division
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San Diego, CA. 92132-5187

DATE: 14 January 1997

CTO #: 0037

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Program / Project Manager

Operations Manager

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14 January 1997

Commanding Officer
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Southwest Division
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Subject: Response to Additional DTSC Comments for the
Draft Remedial Investigation Report for
IR Sites 8 through 13 at Long Beach Naval Shipyard

Dear Mr. Selby:

Enclosed please find four (4) sets of the Response to Additional DTSC Comments for the Draft Remedial Investigation Report for IR Sites 8 through 13 at Long Beach Naval Shipyard for your review and distribution.

Should you have any questions or need additional information, please call Aklile Gessesse at (310) 807-2454 or myself at (310) 807-2396.

Very truly yours,



Krish Kapur
Project Manager

Encl.



Bechtel National, Inc.