

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN II)
Northern and Central California, Nevada, and Utah
Contract No. N62474-94-D-7609
Contract Task Order No. 040

Prepared for

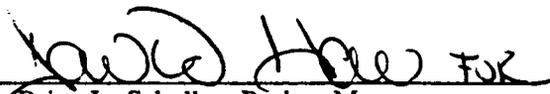
DEPARTMENT OF THE NAVY
Izzat Ahmadiyya, Remedial Project Manager
Engineering Field Activity West
Naval Facilities Engineering Command
San Bruno, California

FINAL
TIME-CRITICAL
REMOVAL ACTION MEMORANDUM
SANDBLAST GRIT AREAS (IR-02)
NAVAL FUEL DEPOT POINT MOLATE
RICHMOND, CALIFORNIA

June 13, 1997

Prepared by

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Brian L. Schuller, Project Manager

**TIME-CRITICAL REMOVAL ACTION
INSTALLATION RESTORATION PROGRAM**

SANDBLAST GRIT AREAS (IR-02)

**NAVAL FUEL DEPOT POINT MOLATE
RICHMOND, CALIFORNIA**

June 13, 1997

This decision document represents the selected removal action for the sandblast grit areas (Site 2) at Naval Fuel Depot Point Molate, Richmond, California. It is developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this response action. The administrative record list is included in Appendix A. Conditions at these sites meet the NCP Section 300.415(b)(2) factors for conducting a removal action, and approval of this action memorandum is recommended. Approval of this action memorandum is granted by signing below.

L.E. DOUCHAND
BRAC Environmental Coordinator
U.S. Department of the Navy

Date



June 13, 1997

Mr. Izzat Ahmadiyya
Department of the Navy
Engineering Field Activity West
Naval Facilities Engineering Command
900 Commodore Drive, Building 210
San Bruno, California 94006-2402

CLEAN Contract No. N62474-94-D-7609
Contract Task Order No. 040

**Subject: Final Time-Critical Removal Action Memorandum and Final Field Work Plan,
Sandblast Grit Areas (IR-02), Naval Fuel Depot Point Molate**

Dear Mr. Ahmadiyya:

Enclosed are five copies of the final time-critical removal action memorandum and five copies of the final field work plan for the Naval Fuel Depot (NFD) Point Molate site. We have also drafted a transmittal letter to Ms. Mary Rose Casa at the Department of Toxic Substances Control for your signature. We will forward the letter to you via e-mail.

Also attached are the Navy's responses to the regulatory agencies comments on the draft time-critical removal action memorandum and the draft field work plan for the Sandblast Grit Areas.

Please have Mr. Larry Douchand sign and date the signature page of all copies prior to distribution. If you have any questions, please call me at (303) 312-8884.

Sincerely,

A handwritten signature in black ink, appearing to read "Brian L. Schuller".

Brian L. Schuller
Project Manager

Enclosures

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FINAL ACTION MEMORANDUM

DATE: June 13, 1997
TO: L.E. Douchand, U.S. Department of the Navy
FROM: Izzat Ahmadiyya, Navy Remedial Project Manager
SUBJECT: Action Memorandum: Request for a Time-Critical Removal Action at Naval Fuel Depot Point Molate, Richmond, California

1.0 PURPOSE

This action memorandum documents approval of, for the administrative record, the U.S. Department of the Navy's (Navy) decision to undertake a time-critical removal action that will eliminate unacceptable risk associated with metals in sandblast grit at Site 2, Naval Fuel Depot (NFD) Point Molate. This action memorandum is the primary decision document for removal response at Site 2, and of the administrative record. The U.S. Department of Defense (DoD) has the authority to undertake Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions, including removal actions, under 42 United State Code (USC) Section 9604, 10 USC Section 2705, and Federal Executive Order 12580. This removal action follows factors set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300.415).

The removal action at Site 2 will consist only of removal and disposal of visible sandblast grit.

The proposed Site 2 removal action is consistent with (1) factors set forth in the NCP (40 CFR Part 300) and (2) the California Health and Safety Code (Ca-HSC) Chapter 6.8, based on actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants; high levels of hazardous substances or pollutants or contaminants in sandblast grit piles at the surface that may migrate; and weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

No nationally significant or precedent-setting issues exist for this site.

Figures 1 through 5 referenced throughout this action memorandum are located at the end of the report following Section 9.0.

2.0 SITE CONDITIONS AND BACKGROUND

The following sections provide the site description and discuss the removal evaluation, physical location, site characteristics, release of a hazardous substance or pollutant into the environment, and the site's National Priorities List status.

2.1 SITE DESCRIPTION

2.1.1 Site Removal Evaluation

The Naval Energy and Environmental Support Activity (NEESA) conducted a preliminary assessment (PA) at NFD Point Molate on September 22, 1987. The PA recommended a site investigation (SI) under the Navy's Installation Restoration (IR) program for Site 2 (NEESA 1988). Sandblast grit was identified at some Site 2 areas during the SI's visual inspection. One sandblast grit sample was collected during the SI and two additional sandblast grit samples were collected during the 1994 soil and sediment investigation (PRC 1992, 1994). These data were summarized and presented to the Base Realignment and Closure Team (BCT) during the January 28, 1997, BCT meeting (Navy 1997a). The BCT also conducted a site visit on January 28, 1997, to inspect the sandblast grit areas. At that time, the BCT requested a human health risk screening of the sandblast grit analytical results. Human health risk screening results, which demonstrated unacceptable risk (see Appendix B), were presented at the February 25, 1997, BCT meeting (Navy 1997b). The risk screen of sandblast grit analytical samples is included in this action memorandum as Appendix B. This removal action includes removal of sandblast grit only at areas where sandblast grit is currently visible.

2.1.2 Physical Location

NFD Point Molate covers approximately 412 acres in the Potrero Hills along the northeastern shore of San Francisco Bay on the San Pablo Peninsula. NFD Point Molate is located in the City of Richmond, California, about 1.5 miles north of the Richmond-San Rafael Bridge. The facility is bordered to the north, south, and east by Standard Oil Corporation (Chevron Corporation) and to the west by San Francisco and San Pablo Bays. San Pablo Peninsula forms the divide between the two bays. The majority of the land around NFD Point Molate is used by Chevron for oil refining and storage. Topography ranges from flat, filled areas (reclaimed tidal flats) near the bay to steep dissected slopes of nearly 500 feet elevation in the San Pablo Hills. Figure 1 is the facility location map. Figure 2 is the

IR Site 2 location map. IR Site 2 consists of five localized areas (Areas 2A, 2B, 2C, 2D, and 2E) of historical sandblasting activities or sandblast grit disposal. However, this removal action includes removal of sandblast grit only at areas where it is currently visible, in Areas 2A and 2E (see Figures 3 and 4).

2.1.3 Site Characteristics

Area 2A (Building 123) is located east of the administration buildings directly above Main Road and south of Building 123. Sandblast grit from metal cleaning operations was disposed of in this area. This area was used most extensively for sandblast operations and grit disposal: unpainted metal surfaces were sandblasted prior to painting. Sandblasting was conducted directly south of the maintenance shop on top of a concrete slab that extends nearly to the steep hillside to the south. Some sandblast grit was also pushed into the adjacent grass and brush area. During the 1990 SI, the 1996 environmental baseline survey (EBS) visual site inspection (VSI), and the January 1997 BCT site visit, sandblast grit was present as a thin veneer across most of the concrete slab, and several piles of grit were also present. Grit was also visible on the grass and brush area adjacent to the steep hillside (PRC 1992, 1996; Navy 1997a).

Area 2E is located within Drum Lot 2. The majority of Drum Lot 2 is paved with concrete. Visible sandblast grit was identified during a BCT site visit in January 1997 at one grass and brush covered area at the northern portion of the drum lot.

This is the first proposed removal action at Site 2.

2.1.4 Release or Threatened Release Into the Environment of a Hazardous Substance or Pollutant or Contaminant

This section discusses the release or threatened release of hazardous substances or pollutants or contaminants from the site to the environment.

A preliminary remediation goal (PRG) risk screening was completed using analytical data from sandblast grit samples. The screening was conducted following the U.S. Environmental Protection Agency (EPA) Region IX PRG cumulative screening approach and used standard EPA risk screening algorithms and EPA and California-modified (Cal-modified) toxicity values.

The PRG screening indicates that an unacceptable risk exists due to elevated levels of nickel, cadmium, and chromium in sandblast grit. The PRG screening evaluation methodology and results are included in Appendix B.

2.1.5 National Priorities List Status

NFD Point Molate is not a National Priorities List (NPL) site, nor has it been proposed for the NPL. NFD Point Molate has not been scored using the Hazard Ranking System.

2.2 OTHER ACTIONS TO DATE

The following sections describe previous and current actions at Site 2.

2.2.1 Previous Actions

A PA was conducted at NFD Point Molate in September 1987. The PA recommended an SI for Site 2 (NEESA 1988). An SI was conducted for Site 2 between September 14 and October 6, 1990. An SI is an on-site, visual inspection and sampling of specific media to establish whether a release or potential release of hazardous substances or pollutants or contaminants to the environment has occurred and to determine the nature of the associated threat. In 1994, two sandblast grit samples were collected and subsequently evaluated in the risk screening analysis (see Appendix B).

2.2.2 Current Actions

A time-critical removal action is planned for Site 2. Confirmation soil sampling will be conducted following the removal action to ensure that all unacceptable levels of metals in soil were removed (PRC 1997).

2.3 STATE AND LOCAL AUTHORITIES' ROLES AND ACTIONS TO DATE

The Navy is the lead agency for environmental work at NFD Point Molate. The Navy is also responsible for funding proposed removal action activities. EPA, the California Department of Toxic Substances Control (DTSC), and the Regional Water Quality Control Board (RWQCB) are the federal and state agencies providing regulatory review at NFD Point Molate. These agencies are also represented on the BCT.

3.0 STATUTORY AND REGULATORY AUTHORITIES

In accordance with 40 CFR Section 300.415(b)(2), this removal action is appropriate due to the potential for exposure of contaminants to nearby humans and ecological receptors.

3.1 THREATS TO PUBLIC HEALTH OR WELFARE

Site 2 meets the criteria in NCP Section (I), (iv), and (v) of 300.415(b)(2). Removal and disposal of sandblast grit is appropriate because potential exposure to humans can result from potential future use of the property. The Navy recommends a removal action to prevent exposure from metals contamination associated with sandblast grit.

4.0 PROPOSED ACTION AND ESTIMATED COSTS

This section presents (1) the proposed removal action, (2) the contribution of the removal action to long-term remedial action goals at the site, and (3) the applicable or relevant and appropriate requirements (ARARs), tentative schedules, and estimated costs for the removal action.

4.1 PROPOSED ACTION

This section describes the proposed action, remedial performance, other technologies considered, ARARs, and project schedules.

4.1.1 Proposed Action Description

The proposed Site 2 removal action consists of (1) removing brush to access sandblast grit areas; (2) conducting shallow excavation of sandblast grit and sweeping sandblast grit from concrete surfaces; (3) surveying horizontal and vertical coordinates of areas where sandblast grit is removed; and (4) hauling off site and disposing of sandblast grit at an appropriate treatment and disposal facility. Confirmation soil samples will be collected after the removal action to ensure that all unacceptable levels of metals in soil were removed.

Approximately 2 months will be required for completion of this proposed removal action. No vulnerable or sensitive populations, habitats, or natural resources will be affected by this removal action.

4.1.2 Contribution to Remedial Performance

This proposed removal action will further reduce the potential risk to human health from metals associated with metals contamination in shallow soil. This removal action will not limit the performance of any future remedial activities and will facilitate property transfer.

4.1.3 Description of Alternative Technologies

No engineering evaluation or cost analysis (EE/CA) for alternative technologies has been completed because the nature and goals of the removal action are straightforward. In addition, no EE/CA is required for time-critical removal actions.

The sandblast grit is present on soil and concrete and in brush. Removal of the sandblast grit requires vacuuming concrete surfaces and clearing brush, and removal and off-site disposal of sandblast grit piles. This removal action also facilitates early property reuse. Fencing and posting signs or capping the grit would prohibit early property reuse.

4.1.4 Applicable or Relevant and Appropriate Requirements

This section presents ARARs associated with the Site 2 removal action. All references and citations to federal and state laws or regulations as potential federal and state ARARs in this narrative text are references to substantive requirements. Administrative or procedural requirements in the cited laws and regulations are not ARARs consistent with the definitions and provisions of 40 CFR Part 300.

Those chemical-, action-, and location-specific ARARs determined to be specific to the Site 2 removal action are presented below:

- **Criteria for Determining Whether Soil Must Be Managed as a RCRA [Resource and Recovery Act] Hazardous Waste: 22 California Code of Regulations (CCR), Section 66261.21, 66261.22, 66261.23, 66261.24(a)**
- **Criteria for Determining Whether Soil Must Be Managed as Non-RCRA Waste: 22 CCR, Section 66261.24(a)(2), 66261.22(a)(3)-(4)**

- **Land Disposal Restrictions: 22 CCR, Section 66268.7(a)**
- **Identification and Listing of Hazardous Wastes: CCR, Chapter 30**
- **Standards Applicable to Generators of Hazardous Wastes: 22 CCR, Chapter 12**

The removal action (removal and disposal of visible sandblast grit) will comply with the above-listed ARARs to the extent practicable.

4.1.5 Project Schedule

Actual construction of the proposed alternative will require approximately 2 months. Figure 5 presents a tentative schedule for this removal action.

4.2 ESTIMATED COST

The Navy has estimated the present worth of the removal action costs. The estimated cost of the proposed removal action is \$12,000 to \$15,000. The estimated costs include the direct capital costs of the alternative.

5.0 EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

The potential exists for exposure to humans, particularly as the site moves toward reuse.

6.0 PUBLIC INVOLVEMENT

The Navy will place a public notice of the proposed removal action in a local newspaper and will inform the community that the NFD Point Molate administrative record is available for review. At a minimum, community relations will follow the requirements of the NCP (40 CFR Part 300.415[m]).

7.0 OUTSTANDING POLICY ISSUES

There are no outstanding policy issues.

8.0 RECOMMENDATIONS

This decision document represents the selected removal action for the sandblast grit areas (Site 2) at NFD Point Molate, in Richmond, California. It is developed in accordance with CERCLA, as amended, and is consistent with the NCP. This decision is based on the administrative record (see appendix A) for this response action.

9.0 REFERENCES

- Naval Energy and Environmental Support Activity (NEESA). 1988. Preliminary Assessment Report, NFD Point Molate, Richmond, California. U.S. Environmental Protection Agency. NEESA 13-159A. April.
- PRC Environmental Management, Inc. (PRC). 1992. Naval Fuel Depot (NFD) Point Molate, Site Inspection Final Summary Report. Prepared for the U.S. Department of the Navy, Western Division. San Bruno, California. August 26.
- PRC. 1994. NFD Point Molate, Shoreline Investigation Soil and Phase I Sediment Data Summary. Prepared for the Navy, Western Division. San Bruno, California. August 15.
- PRC. 1996. Basewide Environmental Baseline Survey Final Report. NFD Point Molate. November 21.
- PRC. 1997. Draft Sandblast grist areas (Site 2) Removal Action Field Work Plan. NFD Point Molate. March 31, 1997.
- Navy. 1997a. Meeting Minutes From the January 28, 1997, Base Realignment and Closure Cleanup Team (BCT) and Remedial Project Managers (RPM) Meeting. February 6.
- Navy. 1997b. Meeting Minutes From the February 25, 1997, Base Realignment and Closure Cleanup Team (BCT) and Remedial Project Managers (RPM) Meeting. March 4.

FIGURES

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FIGURE 1 – FACILITY LOCATION MAP

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FIGURE. THIS PAGE HAS BEEN INSERTED AS A
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MISSING ITEM BE LOCATED.

FOR ADDITIONAL INFORMATION, CONTACT:

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FIGURE 2 – SITE 2 LOCATION MAP

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FIGURE 3 – AREA 2A, SANDBLAST GRIT REMOVAL EXTENT
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FIGURE 4 – AREA 2E, SANDBLAST GRIT REMOVAL EXTENT

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FIGURE 5 – SITE 2 REMOVAL ACTION SCHEDULE

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APPENDIX A

ADMINISTRATIVE RECORD LIST APPLICABLE TO SITE 2 REMOVAL ACTION

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ADMINISTRATIVE RECORD LIST APPLICABLE TO SITE 2 REMOVAL ACTION

1. California Environmental Protection Agency Department of Toxic Substances Control (DTSC). 1997. Comments on the Draft Time-Critical Removal Action Sandblast Grit Disposal Areas (IR-02) Naval Fuel Depot (NFD) Point Molate. May 20.
2. Naval Energy and Environmental Support Activity (NEESA). 1988. Preliminary Assessment Report, NFD Point Molate, Richmond, California. U.S. Environmental Protection Agency. NEESA 13-159A. April.
3. PRC Environmental Management, Inc. (PRC). 1992. Naval Fuel Depot (NFD) Point Molate, Site Inspection Final Summary Report. Prepared for the U.S. Department of the Navy (Navy), Western Division. San Bruno, California. August 26.
4. PRC. 1994. NFD Point Molate, Shoreline Investigation Soil and Phase I Sediment Data Summary. Prepared for the Navy, Western Division. San Bruno, California. August 15.
5. PRC. 1996. Basewide Environmental Baseline Survey Final Report. NFD Point Molate. November 21.
6. U.S. Department of Navy (Navy). 1997a. Meeting Minutes From the January 28, 1997, Base Realignment and Closure Cleanup Team (BCT) and Remedial Project Managers (RPM) Meeting.
7. Navy. 1997b. Meeting Minutes From the February 25, 1997, Base Realignment and Closure Cleanup Team (BCT) and Remedial Project Managers (RPM) Meeting. March 4.
8. Navy. 1997c. Meeting Minutes from the March 24, 1997, BCT and RPM Meeting. April 24.
9. U.S. Environmental Protection Agency (EPA). 1977. Comments on the Draft Time-Critical Removal Action Sandblast Grit Removal Areas (IR-02) NFD Point Molate. May 22.

APPENDIX B
RISK SCREENING

1.0 PRG SCREENING EVALUATION METHODOLOGY

A risk-based screening evaluation preliminary remediation goal ([PRG] comparison) was conducted to estimate a screening risk level for the Sandblast grit areas. Methodology detailed in U.S. Environmental Protection Agency (EPA) guidance (EPA 1996) was used to estimate incremental lifetime cancer risks for carcinogens and hazard quotients (HQs) for noncarcinogens. PRGs are representative of exposure concentrations corresponding to a carcinogenic risk of $1E-6$ or noncarcinogenic hazard index (HI) of 1.0. Carcinogenic risk ratios and noncarcinogenic HI ratios were calculated for residential and occupational exposure scenarios.

Exposure Assessment

The exposure scenarios addressed in the PRG screening evaluation include residential and occupational worker scenarios. EPA Region 9 soil PRGs evaluate ingestion of soil, inhalation of particulates and volatile chemicals, and dermal contact with soil exposure pathways. Exposure assumptions used to derive PRGs are conservative EPA standard default exposure parameters developed for the general population. These single-point estimates are used with EPA-derived algorithms to calculate upper-bound, or high-end, chemical-specific PRGs for the maximally exposed individual. Exposure assumptions and intake algorithms used to derive residential and occupational PRGs for carcinogenic chemicals are presented in Tables 1 and 2. Exposure assumptions and intake algorithms used to derive residential and occupational PRGs for noncarcinogenic chemicals are presented in Tables 3 and 4.

Toxicity Assessment

Reference doses (RfDs) and carcinogenic slope factors (CSFs) developed by EPA and state regulatory agencies are the principal toxicity values used to estimate noncarcinogenic and carcinogenic human health risks. The likelihood of adverse health effects at different exposure levels is generally based on these values. RfDs and CSFs are derived using data from both animal experiments and human epidemiological studies and can be used directly with EPA algorithms. Sources of RfD and CSF values include the Integrated Risk Information System (IRIS) (EPA 1997), which is a database containing EPA-verified, current toxicity values; the Health Effects Assessment Summary Tables (HEAST) (EPA 1995); and the carcinogenic potency factors (CPFs) derived by California EPA (Cal/EPA 1994).

Toxicity values used in the PRG screening evaluation are presented in EPA Region 9 Guidance (EPA 1996).

Estimation of Risk or Hazard Index

To conduct the PRG comparison, the 95 upper confidence limit (UCL) on the mean concentration for each chemical was divided by its PRG. If the 95 UCL concentration exceeded the maximum detected concentration, the maximum detected concentration was divided by the PRG. The 95 UCL was determined from three samples of sandblast grit collected near Building 123 (Area 2A). The resulting ratios were multiplied by 1E-6 for carcinogens or 1.0 for noncarcinogens to estimate chemical-specific risks and HQs, respectively. Cumulative carcinogenic risks and noncarcinogenic HIs were calculated by summing individual risks and HQs for carcinogenic and noncarcinogenic chemicals, respectively. For some chemicals, EPA Region 9 PRGs are available in addition to California-modified (Cal-modified) PRGs. Cal-modified PRGs are more conservative than EPA Region 9 PRGs. They use toxicity values and exposure parameters developed by California EPA. Therefore, separate carcinogenic risks were calculated using EPA Region 9 PRGs and Cal-modified PRGs. In addition, separate EPA Region 9 PRGs are available for hexavalent chromium (Cr VI) and chromium at a 1/6 ratio of hexavalent chromium to trivalent chromium (Cr VI/III). Separate carcinogenic risks were calculated using EPA Region 9 PRGs for Cr VI and Cr VI/III.

2.0 PRG SCREENING EVALUATION RESULTS

Residential Exposure Scenario

Table 5 presents EPA Region 9 PRGs for the residential and occupational exposure scenarios. Table 6 presents the soil PRG screening evaluation for the Sandblast grit areas. In the PRG screening evaluation, site-specific 95 UCL chemical concentrations were compared to soil PRGs. For carcinogenic chemicals, the cumulative residential risks for the Sandblast grit areas were 2.7E-03 (assuming that all chromium is hexavalent), 2.6E-03 (assuming that chromium is partially hexavalent), and 8.6E-03 (calculated using the California-modified PRG for chromium). For noncarcinogenic chemicals, the total residential screening HI for the Sandblast grit areas is 1.2E+01, which exceeds the acceptable risk level of 1.0E+00.

Occupational Exposure Scenario

For carcinogenic chemicals, the cumulative occupational risks for the Sandblast grit areas were $3.6E-04$ (assuming that all chromium is hexavalent) and $3.4E-04$ (assuming that chromium is partially hexavalent). For noncarcinogenic chemicals, the cumulative occupational HI for the Sandblast grit areas is $5.4E-01$.

Quantifying Lead Exposure

Risks cannot be quantified for lead in the same manner as other chemicals because toxicity values are unavailable for this chemical. Instead, the 95 UCL concentration of lead was compared to the EPA residential screening level of 400 milligrams per kilogram (mg/kg) (EPA 1994) and the California EPA screening level of 130 mg/kg. The 95 UCL lead concentration, 124.5 mg/kg, at the Sandblast grit areas is below the EPA and California EPA residential screening levels for lead. Therefore, lead exposure was not further evaluated.

3.0 UNCERTAINTIES IN THE PRG SCREENING EVALUATION

A discussion of uncertainty is an important component of the PRG screening evaluation because many factors contribute to uncertainty. The magnitude of uncertainty can greatly influence the results and conclusions of a screening evaluation, as well as the perception of site-related risk by risk managers. Some of the sources of uncertainty in this risk-based evaluation include:

- Underlying assumptions regarding future potential land use and exposed receptors for estimating risk
- Unknown differences in absorption, distribution, metabolism, and excretion between humans and laboratory animals
- The quality and appropriateness of scientific studies that form the basis of toxicity values
- Statistical models used to extrapolate from high to low doses using experimental animal data
- The basic underlying assumption in the dose-response model for carcinogens that there is no threshold involved in the tumorigenesis of cancer

- The magnification of uncertainty through the multiplicative combination of many upper bound, conservative exposure assumptions

Additionally, according to EPA guidance (1989), toxicity values for the oral route of exposure are expressed as administered dose. However, oral toxicity values based on administered dose must be converted to absorbed dose because of a fundamental difference between gastrointestinal and dermal absorption. This conversion is necessary because it would be overly conservative to assume that the oral administered dose in these experiments was entirely absorbed from the gastrointestinal tract. The dose producing a particular adverse effect must be expressed as the absorbed dose. Methods for adjusting the EPA oral toxicity values, based on administered dose to absorbed dose, are outlined in EPA guidance (1989). However, EPA Region 9 (1996) recommends the use of unadjusted oral toxicity values for evaluating dermal exposures.

Furthermore, in the derivation of EPA Region 9 PRGs, route-to-route extrapolations were used when toxicity values were unavailable for a given route of exposure. According to EPA Region 9 (1996), "oral cancer slope factors and reference doses were used for both oral and inhaled exposures for organic compounds lacking inhalation values. Also, inhalation slope factors and inhalation reference doses were frequently used for both inhaled and oral exposures of organic compounds lacking oral values." This practice does not follow EPA guidance (1989); however, it does result in more conservative PRGs.

4.0 CONCLUSIONS

An acceptable risk level should be objectively defined as one of the two threshold criteria outlined in the Natural Oil and Hazardous Substances Pollution Contingency Plan (NCP). According to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 121(d)(1): "Remedial actions selected...under this Act shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and control of further release at a minimum which assures protection of human health and the environment." The NCP defines an acceptable carcinogenic risk range as being between one-in-a million ($1E-6$) to one-in-ten thousand ($1E-4$) lifetime excess cancer risk. However, a more recent directive from the EPA Office of Solid Waste and Emergency Response (OSWER) states: "Where the cumulative carcinogenic risk to an individual based on reasonable maximum exposure for both current and future exposures is less than $1E-4$, and the noncarcinogenic hazard index is less than 1, action generally is not warranted unless there are

adverse environmental impacts." The need to take a response action has been determined by risks outside the acceptable range (greater than $1E-4$ carcinogenic risk and an HI of 1.0).

Residential and occupational carcinogenic risks exceed $1E-4$. The residential carcinogenic risk was $2.6E-03$ due primarily to nickel, for which the chemical-specific risk is $2.5E-03$. The PRG for nickel refinery dust was used in calculating carcinogenic risk for nickel; this PRG was used because it is the only carcinogenic PRG for nickel. When all chromium is assumed to be hexavalent and the California-modified PRG for hexavalent chromium is used in calculating risk, residential risk is due primarily to chromium (Table 6).

Occupational carcinogenic risks also exceed $1.0E-04$. The risk is due primarily to nickel, based on the nickel refinery dust PRG, for which the chemical-specific risk is $3.2E-4$.

The noncarcinogenic HI of $1.2E+01$ was slightly above the target HI of 1.0 for the residential exposure scenario due primarily to thallium. However, it was assumed that thallium is present entirely as thallium oxide, the form of thallium for which the PRG is most conservative. The noncarcinogenic HI of $5.4E-01$ was below the target HI of 1.0 for the occupational scenario.

5.0 REFERENCES

- California Environmental Protection Agency (Cal/EPA). 1994. California Cancer Potency Factors: Update. Standards and Criteria Work Group. November.
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TABLE 1

**NAVAL FUEL STATION POINT MOLATE
PRG SCREENING EVALUATION
PRG ALGORITHM AND EXPOSURE PARAMETERS FOR CARCINOGENIC CHEMICALS
RESIDENTIAL EXPOSURE: SOIL INGESTION, DERMAL CONTACT WITH SOIL,
AND INHALATION OF PARTICULATES AND VOLATILES**

$$C \text{ (mg/kg)} = \frac{(TR \times AT)}{EF \times \left[\left(\frac{IFS_{adj} \times CSF_o}{10^6 \text{ mg/kg}} \right) + \left(\frac{SFS_{adj} \times ABS \times CSF_o}{10^6 \text{ mg/kg}} \right) + \left(\frac{InhF_{adj} \times CSF_i}{VF_s^*} \right) \right]}$$

Parameter	Default Value ⁽¹⁾
C = Preliminary Remediation Goal (mg/kg)	—
TR = Target cancer risk	10 ⁻⁶
CSF _o = Oral cancer slope factor (mg/kg-day) ⁻¹	Chemical-specific
CSF _i = Inhalation cancer slope factor (mg/kg-day) ⁻¹	Chemical-specific
AT = Averaging time (days)	25,550
EF = Exposure frequency (days/year)	350
IFS _{adj} = Age-adjusted soil ingestion factor [(mg-yr)/(kg-day)]	114
SFS _{adj} = Age-adjusted skin contact factor [(mg-yr)/(kg-day)]	503
ABS = Absorption factor (unitless)	Chemical-specific
InhF _{adj} = Age-adjusted inhalation factor [(m ³ -yr)/(kg-day)]	11
VFs* = Volatilization factor for soil (m ³ /kg)	Chemical-specific

Notes:

- ⁽¹⁾ EPA 1996
- mg/kg Milligrams per kilogram
- mg/kg-day Milligrams per kilogram day
- m³/kg Cubic meters per kilogram

TABLE 2

NAVAL FUEL STATION POINT MOLATE
 PRG SCREENING EVALUATION
 PRG ALGORITHM AND EXPOSURE PARAMETERS FOR CARCINOGENIC CHEMICALS
 OCCUPATIONAL EXPOSURE: SOIL INGESTION, DERMAL CONTACT WITH SOIL,
 AND INHALATION OF PARTICULATES AND VOLATILES

$$C \text{ (mg/kg)} = \frac{(TR \times BW_a \times AT)}{EF \times ED \left[\left(\frac{IRS \times CSF_o}{10^6 \text{ mg/kg}} \right) + \left(\frac{SA_a \times AF \times ABS \times CSF_o}{10^6 \text{ mg/kg}} \right) + \left(\frac{IRA_a \times CSF_i}{VF_s} \right) \right]}$$

Parameter	Default Value ⁽¹⁾
C = Preliminary Remediation Goal (mg/kg)	—
TR = Target cancer risk	10 ⁻⁶
CSF _o = Oral cancer slope factor (mg/kg-day) ⁻¹	Chemical-specific
CSF _i = Inhalation cancer slope factor (mg/kg-day) ⁻¹	Chemical-specific
AT = Averaging time (days)	25,550
EF = Exposure frequency (days/year)	250
ED = Exposure duration (years)	25
IFS = Soil ingestion rate (mg/day)	100
SA _a = Adult surface area (cm ² /day)	5,000
AF = Adherence factor (mg/cm ²)	0.2
ABS = Absorption factor (unitless)	Chemical-specific
IRA _a = Adult inhalation rate (m ³ /day)	20
VFs ^a = Volatilization factor for soil (m ³ /kg)	Chemical-specific
BW _a = Body weight (kg)	70

Notes:

- (1) EPA 1996
 mg/kg Milligrams per kilogram
 mg/kg-day Milligrams per kilogram day
 mg/cm² Milligrams per square centimeter
 m³/kg Cubic meters per kilogram

TABLE 3

**NAVAL FUEL STATION POINT MOLATE
PRG SCREENING EVALUATION
PRG ALGORITHM AND EXPOSURE PARAMETERS FOR NONCARCINOGENIC CHEMICALS
RESIDENTIAL EXPOSURE: SOIL INGESTION, DERMAL CONTACT WITH SOIL,
AND INHALATION OF PARTICULATES AND VOLATILES**

$$C \text{ (mg/kg)} = \frac{\text{THQ} \times \text{BW}_c \times \text{AT}}{\text{EF} \times \text{ED}_c \left[\left(\frac{1}{\text{RfD}_o} \times \frac{\text{IRS}_c}{10^6 \text{ mg/kg}} \right) + \left(\frac{1}{\text{RfD}_i} \times \frac{\text{SA}_c \times \text{AF} \times \text{ABS}}{10^6 \text{ mg/kg}} \right) + \left(\frac{1}{\text{RfD}_i} \times \frac{\text{IRA}_c}{\text{VF}_s^a} \right) \right]}$$

Parameter	Default Value ⁽¹⁾
C = Preliminary Remediation Goal (mg/kg)	—
THQ = Target hazard quotient	1
RfD _o = Oral reference dose (mg/kg-day)	Chemical-specific
RfD _i = Inhalation reference dose (mg/kg-day)	Chemical-specific
AT = Averaging time (days)	ED x 365
Bw _c = Body weight, child (kg)	15
EF = Exposure frequency (days/year)	350
IRS _c = Child soil ingestion rate (mg/kg-day)	200
SA _c = Child surface area (cm ² /day)	2,000
AF = Adherence factor (mg/cm ²)	0.2
ABS = Absorption factor (unitless)	Chemical-specific
IRA _c = Child inhalation rate (m ³ /day)	10
VF _s ^a = Volatilization factor for soil (m ³ /kg)	Chemical-specific
ED _c = Child exposure duration (years)	6

Notes:

- ⁽¹⁾ EPA 1996
- mg/kg Milligrams per kilogram
- mg/kg-day Milligrams per kilogram day
- mg/cm² Milligrams per square centimeter
- m³/kg Cubic meters per kilogram

TABLE 4

NAVAL FUEL STATION POINT MOLATE
 PRG SCREENING EVALUATION
 PRG ALGORITHM AND EXPOSURE PARAMETERS FOR NONCARCINOGENIC CHEMICALS
 OCCUPATIONAL EXPOSURE: SOIL INGESTION, DERMAL CONTACT WITH SOIL,
 AND INHALATION OF PARTICULATES AND VOLATILES

$$C \text{ (mg/kg)} = \frac{\text{THQ} \times \text{BW}_a \times \text{AT}}{\text{EF} \times \text{ED} \left[\left(\frac{1}{\text{RfD}_o} \times \frac{\text{IRS}_c}{10^6 \text{ mg/kg}} \right) + \left(\frac{1}{\text{RfD}_d} \times \frac{\text{SA}_a \times \text{AF} \times \text{ABS}}{10^6 \text{ mg/kg}} \right) + \left(\frac{1}{\text{RfD}_i} \times \frac{\text{IRA}_a}{\text{VF}_s^*} \right) \right]}$$

Parameter	Default Value ⁽¹⁾
C = Preliminary Remediation Goal (mg/kg)	—
THQ = Target hazard quotient	1
RfD _o = Oral reference dose (mg/kg-day)	Chemical-specific
RfD _i = Inhalation reference dose (mg/kg-day)	Chemical-specific
BW _a = Adult body weight (kg)	70
AT = Averaging time (days)	ED x 365
EF = Exposure frequency (days/year)	250
ED = Exposure duration (years)	25
IRS _c = Soil ingestion rate (mg/day)	100
SA _a = Adult surface area (cm ² /day)	5,000
AF = Adherence factor (mg/cm ²)	0.2
ABS = Skin absorption factor (unitless)	Chemical-specific
IRA _a = Adult inhalation rate (m ³ /day)	20
VF _s [*] = Volatilization factor for soil (m ³ /kg)	Chemical-specific

Notes:

- ⁽¹⁾ EPA 1996
- mg/kg Milligrams per kilogram
- mg/kg-day Milligrams per kilogram day
- mg/cm² Milligrams per square centimeter
- m³/kg Cubic meters per kilogram

TABLE 5

NAVAL FUEL STATION POINT MOLATE
 PRG SCREENING EVALUATION
 SOIL PRGs
 RESIDENTIAL AND OCCUPATIONAL EXPOSURE SCENARIOS

Chemical	Residential PRG (mg/kg)	Occupational PRG (mg/kg)
Carcinogenic Chemicals ¹		
Cadmium	9.7E-02	7.6E-01
Chromium VI	3.0E+01 (2.0E-01)	6.4E+01
Chromium VI/III	2.1E+02	4.5E+02
Nickel	7.3E-01	5.7E+00
Noncarcinogenic Chemicals ¹		
Antimony	3.1E+01	6.8E+02
Cadmium	3.8E+01 (9.0E+00)	8.5E+02
Chromium	3.8E+02	8.5E+03
Cobalt	4.6E+03	9.7E+04
Copper	2.8E+03	6.3E+04
Nickel	1.5E+03 (1.5E+02)	3.4E+04
Thallium ²	5.4E+00	1.2E+02
Zinc	2.3E+04	1.0E+05

Notes:

- ¹ California modified PRGs are presented in parentheses
- ² PRG for thallium oxide
- mg/kg Milligrams per kilogram
- PRG Preliminary remediation goal

TABLE 6

**NAVAL FUEL STATION POINT MOLATE
PRG SCREENING EVALUATION
RESIDENTIAL AND OCCUPATIONAL EXPOSURE SCENARIOS
SANDBLAST GRIT AREAS**

Exposure Scenario	Chemical	95 UCL⁽¹⁾ (mg/kg)	Soil PRG (mg/kg)	HI or Risk Ratio
Residential	Noncarcinogenic Chemicals			
	Antimony	1.8E+01	3.1E+01	5.8E-01
	Cadmium ²	1.3E+01	3.8E+01	3.4E-01
	Chromium	1.2E+03	3.8E+02	3.2E+00
	Cobalt	3.2E+01	4.6E+03	6.9E-03
	Copper	8.0E+01	2.8E+03	2.9E-02
	Nickel ²	1.8E+03	1.5E+03	1.2E+00
	Thallium	3.6E+01	5.4E+00	6.6E+00
	Zinc	6.2E+02	2.3E+04	2.7E-02
	Total noncarcinogenic HI for residential exposure			1.2E+01
	Carcinogenic Chemicals			
	Cadmium	1.3E+01	9.7E-02	1.3E-04
	Chromium VI/III ³	1.2E+03	2.1E+02	5.7E-06
	Nickel	1.8E+03	7.3E-01	2.5E-03
	Total carcinogenic risk for residential exposure			2.6E-03
Occupational	Noncarcinogenic Chemicals			
	Antimony	1.8E+01	6.8E+02	2.6E-02
	Cadmium	1.3E+01	8.5E+02	1.5E-02
	Chromium	1.2E+03	8.5E+03	1.4E-01
	Cobalt	3.2E+01	9.7E+04	3.3E-04
	Copper	8.0E+01	6.3E+04	1.3E-03
	Nickel	1.8E+03	3.4E+04	5.1E-02
	Thallium	3.6E+01	1.2E+02	3.0E-01
	Zinc	6.2E+02	1.0E+05	6.2E-03
	Total noncarcinogenic HI for occupational exposure			5.4E-01

TABLE 6 (Continued)

**NAVAL FUEL STATION POINT MOLATE
PRG SCREENING EVALUATION
RESIDENTIAL AND OCCUPATIONAL EXPOSURE SCENARIOS
SANDBLAST GRIT AREA**

Exposure Scenario	Chemical	95 UCL ⁽¹⁾ (mg/kg)	Soil PRG (mg/kg)	HI or Risk Ratio
Occupational (Cont'd)	Carcinogenic Chemicals			
	Cadmium	1.3E+01	7.6E-01	1.7E-05
	Chromium VI/III ⁴	1.2E+03	4.5E+02	2.6E-06
	Nickel	1.8E+03	5.7E+00	3.2E-04
	Total carcinogenic risk for occupational exposure			3.4E-04

Notes:

95 UCL 95 percent upper confidence limit on the arithmetic mean concentration

mg/kg Milligrams per kilogram

- ¹ 95 UCL on the arithmetic mean was used as the exposure point concentration in the calculation of the carcinogenic risk or noncarcinogenic hazard index. However, according to EPA guidance (1989), if the 95 UCL concentration exceeds the maximum detected concentration, the maximum detected concentration is used as the exposure point concentration.
- ² Chemical-specific HI ratios calculated using California-modified PRGs are 1.4E+00 and 1.2E+01 for cadmium and nickel, respectively. The total noncarcinogenic HI for residential exposure calculated using California-modified PRGs for cadmium and nickel is 2.4E+01.
- ³ The carcinogenic risk for chromium, calculated using the EPA Region 9 PRG for chromium (VI) (assuming all chromium is hexavalent), is 4.0E-05. The carcinogenic risk for chromium calculated using the California-modified PRG is 6.0E-03 for residential exposure.
- ⁴ The carcinogenic risk for chromium, calculated using the EPA Region 9 PRG for chromium VI (assuming all chromium is hexavalent), is 1.9E-05 for occupational exposure.