Proposed Plan for Operable Unit 2C Installation Restoration Sites 5, 10, and 12 Former NAS Alameda

N00236_004016
ALAMEDA POINT
SSIC NO. 5090.3.A

Alameda, California ***September 2012***

U.S. NAVY ANNOUNCES PROPOSED PLAN

The U.S. Navy requests public comments on the **Operable Unit (OU)-2C Installation Restoration (IR)*** Sites 5, 10, and 12 Proposed Plan. OU-2C is located on the former Naval Air Station (NAS) Alameda, in Alameda, California (Figure 1). The U.S. **Environmental Protection Agency (EPA)**, California EPA **Department of Toxic Substances Control (DTSC)**, and the **San Francisco Bay Regional Water Quality Control Board (Water Board)** worked with the Navy and concur with this Proposed Plan.

This Proposed Plan announces the preferred alternatives to address areas with contaminated soil and groundwater at IR Sites 5 and 10, and proposes no action for IR Site 12. The soil contaminants, referred to as **chemicals of concern (COCs),** are metals, **volatile organic compounds (VOCs)**, and **radium [Ra]-226**. The groundwater COCs are VOCs. Ra-226 is the COC for contaminated soil/sediment within drain lines and any contaminated soil surrounding the lines originating in Building 5 at IR Site 5 and Building 400 at IR Site 10.

The **Remedial Investigation (RI)** Report presents the environmental investigation and associated evaluations, including the risk assessment. The RI concluded soil and groundwater at IR Site 5 required evaluation in a **Feasibility Study (FS)** and no action was required for IR Sites 10 and 12. It was later determined that radiologically-impacted drain lines are or may be present beneath and outside Building 400 (IR Site 10), and these lines were evaluated in the FS Report and FS Addendum.

The FS Report and FS Addendum evaluated several remedial technologies and alternatives to address contaminated soil and groundwater at IR Sites 5 and 10. The FS Addendum included risk evaluations of known or potentially radiologically-impacted drain lines and discharge points and identified the lines that require action. This Proposed Plan presents the preferred alternatives to address IR Sites 5 and 10 contamination associated with the following:

- Soil including radiologically-impacted drain lines beneath Buildings 5 and 400,
- shallow **first water bearing zone (FWBZ)** groundwater (5 to 20 feet [ft] below ground surface[bgs]),
- deep FWBZ (20 to 40 ft bgs) and **second water bearing zone (SWBZ)** groundwater (40 to 70 ft bgs), and
- radiologically-impacted drain lines located outside Buildings 5 and 400.

This Proposed Plan summarizes the alternatives evaluated to address unacceptable risk at IR Sites 5 and 10 under a non-residential land use scenario, as determined by the **human health risk assessment (HHRA)**. Per the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA),** this Proposed Plan explains the basis for the preferred alternatives. For IR Site 12, no action is recommended, and no land-use restrictions, environmental monitoring, or other cleanup actions are required.

Figure 1. Location of Former NAS Alameda and OU-2C

- NOTICE –

Public Comment Period

October 4, 2012
through
November 5, 2012

Public Meeting

October 11, 2012

Alameda Point
Main Office Building 1, Room 201
950 West Mall Square
Alameda, California
6:30 to 8:00 pm

*Words in **bold** are defined in the glossary on Page 21.

THE CERCLA PROCESS

The Navy is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of CERCLA and Section 300.430(f) (2) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**. The flowchart to the right illustrates the current phase of OU-2C within the CERCLA process.

This Proposed Plan summarizes information detailed in the RI Report (September 2008), the FS Report (May 2011), the FS Addendum (January 2012), and other documents contained in the **Administrative Record (AR)** file for this site. The Navy encourages the public to review these documents to gain an understanding of the environmental investigation activities and risk assessments that have been conducted at the site. The documents are available for public review at the locations listed on Page 20. Information about the AR, the public meeting for this Proposed Plan, and submitting public comments during the 30-day public comment period is also presented on Page 20.

In response to feedback from the community or new information and in consultation with the regulatory agencies, the Navy may modify the preferred alternatives or select alternative remedies. Therefore, the community is encouraged to review and comment on this Proposed Plan. A final decision, documented in the **Record of Decision (ROD)**, will not be made until all comments are considered. The ROD will include a Responsiveness Summary that explains how the Navy considered each comment received during the public comment period.

SITE DESCRIPTION AND BACKGROUND

Former NAS Alameda, now known as Alameda Point, is located on the western tip of Alameda Island, which is on the eastern side of San Francisco Bay (Figure 1). NAS Alameda ceased operations in 1997. OU-2C is located in the middle of Alameda Point and contains IR Sites 5, 10, and 12. It is approximately 53 acres in size and includes buildings and largely paved open space (Figure 2).

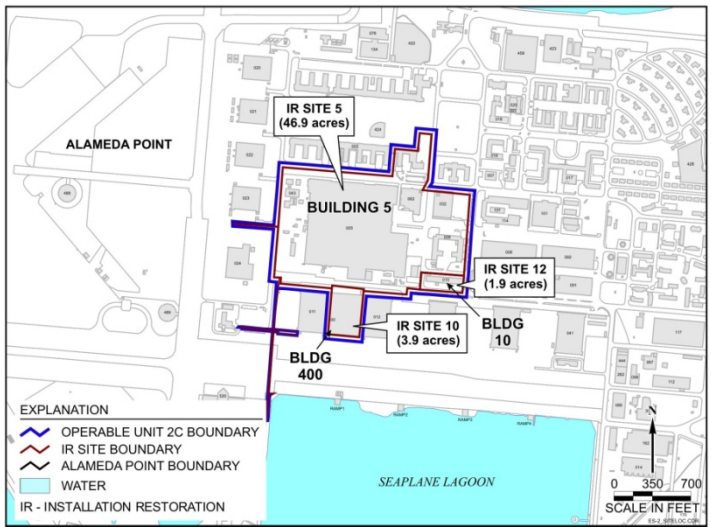
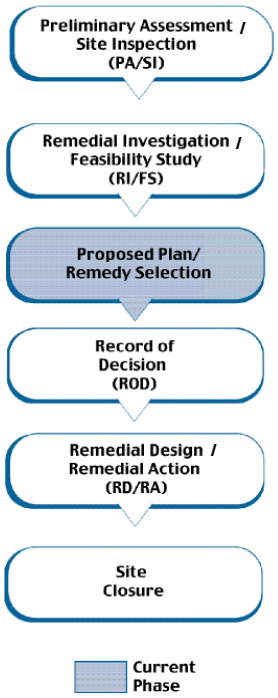


Figure 2. Layout of OU-2C

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA) PROCESS



IR Site 5 (approximately 47 acres in size) was the former Naval air rework facility and contains Building 5 (approximately 910,382 square feet [sf] or 20.9 acres). Past uses for Building 5 include cleaning, reworking, and manufacturing of metal parts; plating, painting, and tool maintenance operations; and specialty operations, such as the application of radioluminescent paint (containing Ra-226) to aircraft dial faces and refurbishment of aircraft instrumentation. In addition, battery fluids were discharged into a sink in the Building 5 storage area, which discharged into the industrial waste system. Storm drain lines, industrial waste lines, a hazardous waste storage area, and an industrial waste treatment plant were also historically identified at IR Site 5. All activities ceased in Building 5 in 1993. The hazardous waste storage area and industrial waste treatment plant were closed in accordance with **Resource Conservation and Recovery Act (RCRA)** requirements.

IR Site 10 is approximately 4 acres in size and was the former missile rework facility. It is bounded to the north by IR Site 5 and the southern boundary is approximately 600 ft north of Seaplane Lagoon. Building 400 occupies approximately 85% of IR Site 10; the remaining portions consist of paved open space, parking lots, and roads. Past uses for IR Site 10 include paint stripping, construction of fiberglass airplane components, airplane parts cleaning and degreasing, silk screening, and photographic development. The radium paint shop facilities for painting of radioluminescent aircraft instrument dials (Ra-226) were moved from Building 5 to Building 400 in the late 1950s.

IR Site 12 is approximately 2 acres in size. Site features include Building 10 (20% of site), an unpaved area (10% of site), and roads and parking lots (70% of site). Building 10 was constructed in 1940 as a power plant and operated

until base closure in 1997. Historical activities included generation of steam and air compression.

Drain lines that originate from OU-2C include storm drain lines, an industrial waste line, and a sanitary sewer line. Between 1940 and 1972, wastewaters from all Navy operations at Alameda Point were discharged directly into the nearest storm drain system, which in turn discharged to surface water. Although previously considered part of IR Site 18, Alameda Point Storm Water System, the storm water/drain lines originating from OU-2C were investigated and are being addressed as part of OU-2C, therefore, those lines that require cleanup are included in this Proposed Plan. Because of the radioluminescent painting operations, various drain lines associated with Buildings 5 and 400 are radiologically-impacted, with potential impact to the soils surrounding these drain lines.

Radiologically-impacted drain lines within Buildings 5 and 400 were addressed in the FS Report, which also addressed non-radiological soil and groundwater contamination. The FS Addendum addressed potentially radiologically-impacted drain lines located outside of Buildings 5 and 400 that were not removed during previous removal actions.

SITE INVESTIGATIONS

Initial RI/FS activities for NAS Alameda began in 1991 and identified the presence of VOCs in shallow groundwater (to depths of 15 ft below ground surface [bgs]) around the perimeter of Building 5. Additional RI/FS sampling was conducted in and around Building 5 in 1992 and 1993 and at IR Sites 5, 10, and 12 in 1994. In 1997 and 1998, two groundwater investigations were conducted that identified four plume areas (Plumes 5-1 through 5-4; Figure 3) with VOCs as **dense non-aqueous phase liquid (DNAPL)** as well as in a dissolved phase.

An **Environmental Baseline Survey (EBS)** was conducted between 1993 and 1999 to assess environmental impacts of base operations at targeted locations, including within the boundaries of IR Sites 5, 10, and 12. The RI Report for OU-2C was issued in 1999 and included a summary of the results of investigations conducted for IR Sites 5, 10, and 12.

After release of the 1999 RI Report, the Navy conducted additional investigations in preparation for and in conjunction with CERCLA or Petroleum Program clean up actions. A data gap sampling program in 2001 and 2002 characterized the lateral limits of VOCs in groundwater at and near Building 5. Additional investigations during 2001 and 2002 identified the vertical and lateral extent of DNAPL.

In addition to investigations under CERCLA, other environmental investigations have included studies in and around OU-2C to identify radiological contamination in storm drain lines, sewer lines, the industrial waste line, and potentially affected areas of Buildings 5 and 400, to assess impacts from fuel and related compounds, and to identify solid waste management units (SWMUs) and related areas of concern.

To address data gaps in the 1999 RI Report, a supplemental remedial investigation was conducted in 2007, and data were collected from 208 subsurface borings. A total of 441 soil samples and 152 groundwater samples were collected. Groundwater samples were also collected from 15 new monitoring wells and 14 existing monitoring wells. Eighty-seven soil gas samples were collected beneath Building 5 to support the HHRA. Field activities also included aquifer testing and a tidal study.

Soil and groundwater samples were analyzed for one or more of the following analyte suites: VOCs, **total petroleum hydrocarbons (TPHs)**, **semivolatile organic compounds (SVOCs)**, **polycyclic aromatic hydrocarbons (PAHs)**, **polychlorinated biphenyls (PCBs)**, cyanide, and metals. Select soil and/or groundwater samples were analyzed for hexavalent chromium, Ra-226, Ra-228, physical parameters, total dissolved solids, and/or dissolved gases.

REMOVAL ACTIONS

Several removal actions and a treatability study have been implemented at OU-2C and have significantly reduced chemical concentrations in soil and groundwater. A removal action for metals in soil within the Building 5 former plating shop area was conducted between December 2001 and February 2002. Approximately 1,750 cubic yards (cy) of soil containing metals (primarily cadmium, chromium, hexavalent chromium, and lead) was excavated beneath the building slab and disposed offsite.

A **steam-enhanced extraction (SEE)** treatability study was performed in 1999 to test the ability of this technology to remove waste oil containing chlorinated VOCs, like **trichloroethene**, from the subsurface at Plume 5-4 (Figure 3). Application of SEE met the goal of reducing the groundwater VOC (primarily trichloroethene) concentrations, indicating this is a feasible technology.

A full-scale DNAPL source removal action was completed in 2004 at Plume 5-1 (Figure 3) that included physical DNAPL removal followed by a **six-phase heating (SPH)** treatment with vapor extraction. This removal action reduced the total concentrations of VOCs to below 10,000 micrograms per liter (µg/L) within the horizontal extent of Plume 5-1 and to a depth of 20 ft bgs.

A full-scale DNAPL source removal action using SPH was also implemented in several phases at Plume 5-3 (Figure 3) from 2006 through 2009. Groundwater monitoring demonstrated that groundwater VOC concentrations were significantly reduced in this area.

Approximately 700 ft of radiologically-impacted drain lines, including several manholes, was removed between 1998 and 2000. A **time-critical removal action (TCRA)** was completed between 2008 and 2010 that addressed the storm drain lines outside of Buildings 5 and 400 that flow into the northwest area of Seaplane Lagoon. Over 9,500 ft of these radiologically-impacted lines, referred to as Lines F and FF, and associated soil around the lines were removed during this TCRA. Over 29,000 cubic yards of soil was excavated, sampled, and disposed. During the TCRA,

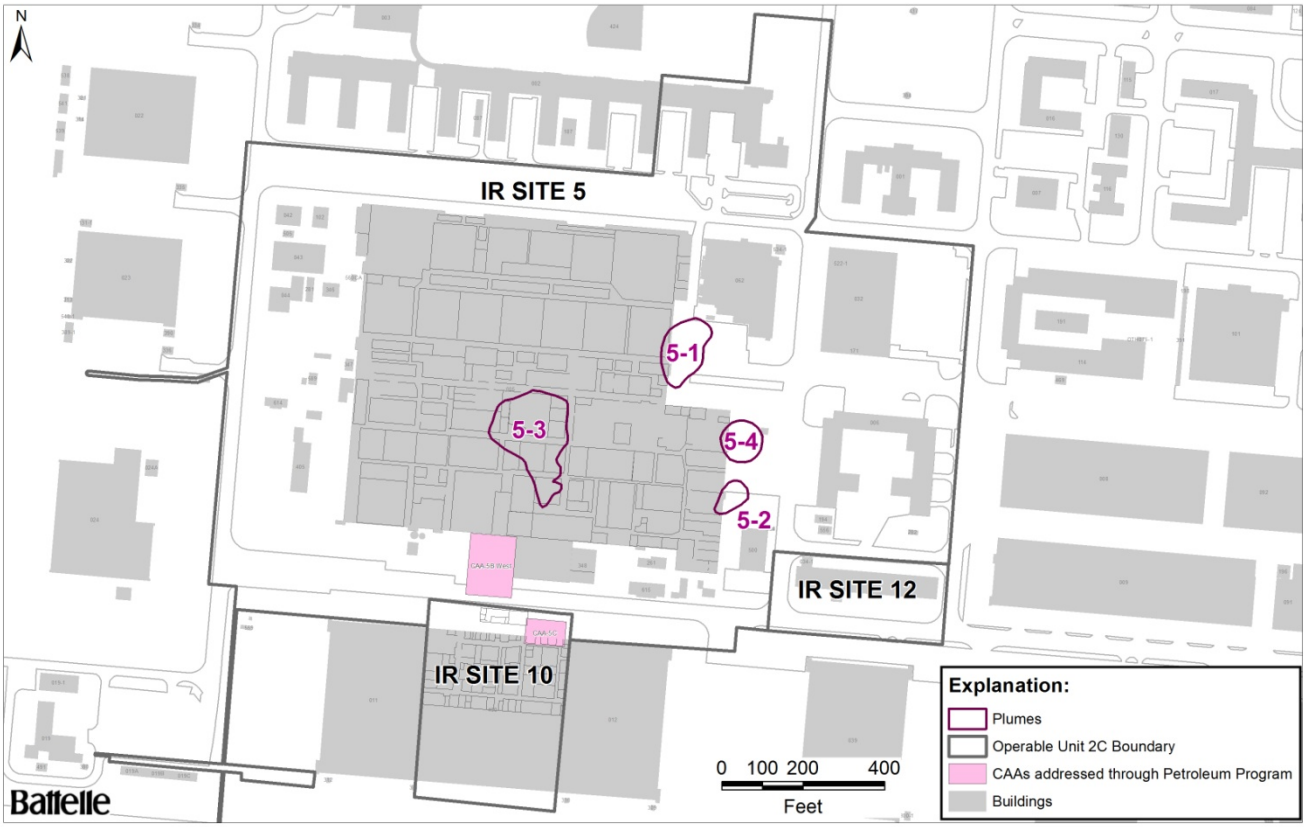


Figure 3. Historical VOC Groundwater Plumes 5-1 through 5-4

it was discovered that the radiological sources within Buildings 5 and 400 may also have been connected to other storm drain lines and, for Building 400, the industrial waste line, which is inactive and has been removed in some areas. Therefore, as part of the TCRA, manholes in these lines, as well as the sanitary sewer line, were sampled, and sediment exceeding 1.0 picocurie(s) per gram (pCi/g) plus background for Ra-226 was removed from the storm drain manholes. Further assessment of the collected data was conducted as part of the FS process. The TCRA removed the sediment from a surface drainage trench in the southern portion of Building 400 and sealed the trench. Source removal conducted between 2009 and 2011 also included removal of an area with high Ra-226 activity indicative of radioluminescent paint located near Outfall F. Additional source removal for the storm drain line originating in Building 5 that discharges into the northeast corner of Seaplane Lagoon, referred to as Line G, was conducted in 2011 prior to the dredging of the northeastern area of Seaplane Lagoon. This source removal consisted of removal of the sediment within the line and camera verification of the sediment removal.

PRESENT AND FUTURE SITE USE

Past and present use is commercial. For the areas of OU-2C that require remediation, the expected future use is also commercial.

Groundwater beneath Alameda Point (including OU-2C) is not currently used for drinking water, irrigation, or industrial supply. Drinking water is supplied to Alameda Point by the East Bay Municipal Utilities District. Shallow groundwater at OU-2C is not considered a potential drinking water source and deeper groundwater is characteristically unsuitable as a drinking water source.

Under existing and expected future site conditions, it is unlikely that ecological receptors are present at the site or would be exposed to chemicals. Most of the site is covered by pavement or buildings, and unpaved areas are generally landscaped, which offers little habitat value.

RISK ASSESSMENTS

Within the context of environmental investigations and actions, **risk** is the likelihood or probability that a hazardous substance, when released to the environment, will cause adverse effects on exposed people and/or the environment. For people, risk is further classified as carcinogenic (may cause cancer) or non-carcinogenic (may cause other illnesses). Risk assessments are designed to provide a margin of safety to protect public health and the environment by using conservative assumptions that ensure risks are not underestimated. No potentially unacceptable ecological risks were identified at OU-2C through the RI **ecological risk assessment (ERA)** under

current and anticipated future site use (see section above); only the HHRA and its results are discussed in this Proposed Plan.

HUMAN HEALTH RISK ASSESSMENT

HHRAs were conducted as part of the OU-2C RI, FS, and FS Addendum to assess potential impacts on human health from exposure to chemicals and radionuclides present in environmental media at OU-2C. The results of these HHRAs provided information for making decisions concerning actions to reduce exposure, as needed.

During the RI, OU-2C was divided into three subareas designated as Exposure Units 1, 2, and 3 for ease in assessing the large area of OU-2C (Figure 4). These exposure units were designated based on similarities in the known or presumed nature and extent of environmental impacts and historical site use:

- Exposure Unit 1 (approximately 30.3 acres) encompasses the perimeter of OU-2C. IR Sites 10 and 12 are contained within Exposure Unit 1, as are the northern, northwestern, western, southwestern, and eastern portions of IR Site 5.
- Exposure Unit 2 (approximately 20.9 acres) corresponds to Building 5 at IR Site 5.
- Exposure Unit 3 (approximately 7.2 acres) is located within IR Site 5, along the eastern and southern boundaries of Exposure Unit 2.

In addition to the exposure units, Local Area 1 (east of Building 5) and Local Area 2 (northwest of Building 5) within Exposure Unit 1 at IR Site 5 were also identified in the RI Report to facilitate the characterization of risk.

The RI HHRA conducted for OU-2C consisted of three individual HHRAs for Exposure Units 1, 2, and 3 that assessed potential exposures to chemicals in soil, groundwater, and soil gas. An additional HHRA was conducted as part of the FS Report to further evaluate potential exposures to chemicals in soil and groundwater within a portion of Exposure Unit 1 referred to as Western Exposure Unit 1. Figure 4 shows the location of Western Exposure Unit 1, which is the hatched yellow area located within IR Site 5 to the north, northwest, west, and southwest of Building 5, excluding Local Area 2. The FS Addendum evaluated the risk associated with potentially radiologically-impacted drain lines originating in OU-2C.

The HHRAs for Exposure Units 1, 2, and 3 and Western Exposure Unit 1 evaluated current and future potential health risks based on the likelihood that exposure to any chemical in soil, shallow FWBZ groundwater, and/or air at

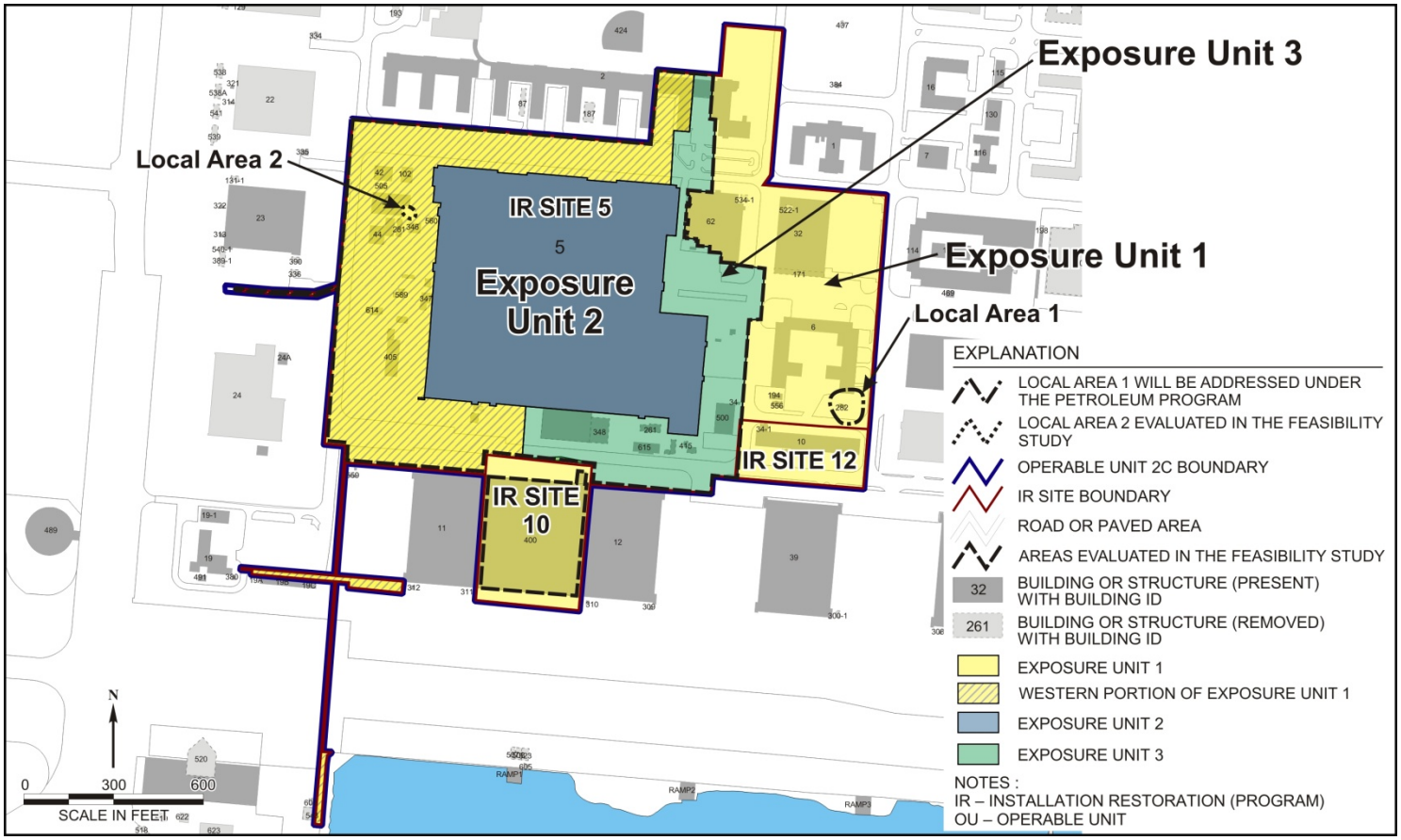


Figure 4. Risk Assessment Subareas

OU-2C could pose a risk to human health. The receptors evaluated were:

- office workers (representing all industrial or commercial work that is completed largely inside a building),
- construction workers, and
- hypothetical future residents (adult and child), as a measure of conservativeness despite the future commercial use (see Present and Future Site Use section on page 5) of OU-2C.

Exposure pathways evaluated in the HHRAs are shown in Table 1.

Table 1. Exposure Pathways for Current and Potential Future Human Receptors

- Direct contact with soil (ingestion, inhalation of dust, and skin absorption) for all receptors
- Consumption of homegrown produce for potential future residents
- Inhalation of vapors in indoor air from volatile chemicals in soil and groundwater for all receptors

Because groundwater is not a source of drinking water, the potential for exposure to chemicals in groundwater is limited to vapor migration. There are no complete exposure pathways for groundwater other than the shallow FWBZ at OU-2C; therefore, there are no current human health risks associated with chemicals in the deep FWBZ and SWBZ.

Cancer risk is expressed as a statistical probability that an individual could have an increased risk of cancer incidence. A 1 in 10,000 chance is expressed as a risk of 1×10^{-4}. For every 10,000 people, one additional cancer risk may occur as a result of exposure. A 1 in 1,000,000 chance is expressed as 1×10^{-6}. In this case, for every 1,000,000 people, one additional cancer case may occur as a result of exposure. Therefore, a 1×10^{-4} cancer risk is a higher risk than 1×10^{-6}.

For non-cancer hazards, a **hazard quotient (HQ)** was calculated. An HQ is the ratio of the potential exposure to the substance and the level at which no adverse effects are expected. HQs are based on the effects of a single chemical to express potential health effects. For multiple chemicals, the HQs are added to achieve a **hazard index (HI)**. An HI equal to or less than 1.0 is considered an acceptable exposure level.

Table 2 summarizes the results of the RI HHRA, including the total **cancer risk** and non-cancer hazards for each OU-2C area. The **risk drivers** were VOCs and metals in soil, and VOCs in shallow FWBZ groundwater. Inhalation of vapors in indoor air from soil and groundwater was the most common exposure pathway contributing to cancer risk and non-cancer hazard for VOCs. For metals in soil, the primary exposure was by direct contact.

Table 2. Total Risk for Soil and Groundwater

Area	Receptor	Total Cancer Risk	Non-cancer hazard [(a)]
Exposure Unit 1[(b)]	Future Office Worker Construction Worker Resident	3×10^{-5} 7×10^{-7} 5×10^{-5}	0.3 0.1 1[(c)]
Western Exposure Unit 1	Resident	2×10^{-5}	1
Local Area 2	Resident	7×10^{-4} [(d)]	2
IR Site 10[(e)]	Resident	5×10^{-5}	1
IR Site 12	Resident	7×10^{-6}	0.4
Exposure Unit 2	Current Office Worker Future Office Worker Construction Worker Resident	1×10^{-6} 3×10^{-5} 1×10^{-6} 2×10^{-3}	0.002 1 0.2 86
Exposure Unit 3	Future Office Worker Construction Worker Resident	4×10^{-4} 3×10^{-6} 1×10^{-2}	20 3 3,100

This table presents the risk for soil and groundwater within OU-2C, excluding contamination associated with the drain lines (storm water and industrial waste lines) originating from Buildings 5 and 400, which are described in this section and in Table 7.

(a) The hazard value is the sum of the hazard quotients, unless otherwise noted.
(b) Includes part of IR Sites 5, 10, and 12. Risks/hazards for Local Areas 1 and 2 are excluded. Local Area 1 will be addressed under the petroleum program, and Local Area 2 risk was separately included above in the table.
(c) Hazard quotient for all chemicals was less than 1. Conservatively assuming additive effects, the hazard index was calculated as 2.
(d) The risk is associated with one soil sample.
(e) Although cancer risks and non-cancer hazards were acceptable in the RI for IR Site 10, the drain lines beneath and outside of Building 400 (IR Site 10) were evaluated in the FS Report and FS Addendum.

Based on the results of the RI and FS HHRAs conducted for OU-2C, the following was concluded:

- Exposure Unit 1: No action is required for IR Site 12 or the remainder of Exposure Unit 1 soil and groundwater excluding the Local Areas on Figure 4 and drain lines shown on Figure 5d. In Local Area 1, the risk is due to benzene, and this area will be addressed under the Petroleum Program. Local Area 2 soil was evaluated in the Feasibility Study and is included in this Proposed Plan.
- Exposure Units 2 and 3 (IR Site 5): Action is required for soil and shallow (FWBZ) groundwater.

Based on U.S. Environmental Protection Agency input and subsequent coordination with the regulatory agencies, the deep FWBZ and SWBZ groundwater was evaluated in the FS and is included in this Proposed Plan despite the lack of a complete exposure pathway.

An additional HHRA was also conducted as part of the FS Addendum to evaluate potential exposures to radionuclides associated with known or potentially

radiologically-impacted drain lines originating from OU-2C and located outside Buildings 5 and 400 (including their discharge points). The FS Addendum evaluated radiological data for the storm drain lines, industrial waste line, and sanitary sewer line. The FS Addendum HHRA estimated the risks to human health due to radiological contaminants associated with potential future land-use scenarios, including residents (adult and child), outdoor workers, and recreational users (adult and child). Exposure pathways evaluated for all receptors included external radiation, soil ingestion, and inhalation of radiologically-contaminated dust and soil particles.

Based on the results of the FS Addendum HHRA, the following was concluded:

- There are no unacceptable risks and no action is required for the sanitary sewer line and points of discharge for the storm drain lines.
- Portions of the industrial waste line indicated unacceptable risk and require action.
- For the storm drain lines, portions of Lines A, B, and G indicated unacceptable risk and require action.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are medium-specific (e.g., soil or groundwater specific) goals for protecting human health and the environment. RAOs provide a means of identifying areas for potential remedial action, for screening the types of appropriate remedial technologies, and for assessing remedial alternatives.

The RAOs for OU-2C are to:

- Protect future human receptors (as represented by future office workers) within IR Site 5 from potentially unacceptable risks associated with the presence of COCs in soil and shallow groundwater that exceed **remedial goals (RGs)**;
- Prevent human exposure within IR Sites 5 and 10 to unacceptable risk from Ra-226 associated with radiologically-impacted drain lines and surrounding soil present beneath and outside of Buildings 5 and 400; and,
- Prevent human exposure to potentially unacceptable risks associated with the presence of VOCs in deep groundwater.

The RGs (Table 3) for soil and shallow FWBZ groundwater at OU-2C are **risk-based concentrations (RBCs)** derived to be protective when using a target cancer risk level of 1×10^{-6} and/or non-cancer HQ of 1. CERCLA guidance states that cleanup does not usually occur for concentrations below natural or anthropogenic background concentrations. Therefore, where background concentrations are higher than RBCs, background concentrations were selected as the RGs. These RGs are protective for commercial/industrial use. Because there is no specific risk associated with deeper groundwater at OU-2C, groundwater contaminant transport modeling was used to derive RGs for the deep FWBZ and SWBZ (Table 3).

The RGs were used to develop remedial footprints and guide the evaluation of remedial technologies and alternatives. The RGs will be finalized in the ROD and will be the basis for measuring the success of the cleanup.

Table 3. Occupational[(a)] RGs for Soil, Groundwater, and Drain Lines

COC	Soil RGs [(b)] (milligram per kilogram [mg/kg])	Shallow FWBZ Groundwater RGs (µg/L)	Deep FWBZ and SWBZ Groundwater RGs (µg/L)
1,1-Dichloroethane	- [(c)]	1,260	-
1,2,4-Trimethylbenzene	12.8	-	-
Ethylbenzene	0.86	-	-
Tetrachloroethene	0.36	-	-
Trichloroethene	0.54	280	-
Vinyl chloride	-	75.7	163
Total VOCs	-	-	1,000
Arsenic	9.14[(d)]	-	-
Thallium	66	-	-
Lead	800	-	-
Chromium	1,400	-	-
Ra-226	1.0 plus background[(e)]	-	-

(a) Occupational includes commercial and industrial workers who primarily perform their work inside a building.
(b) RGs are RBCs derived using a target risk level of 1×10^{-6} and/or non-cancer HQ of 1, unless otherwise indicated.
(c) "-" indicates that the COC was not a primary risk/hazard driver for the exposure scenario.
(d) Ambient background concentration.
(e) Reported in pCi/g. RG is 1.0 pCi/g plus background. RG is for drain lines and surrounding soils.

REMEDIAL ALTERNATIVES

Remedial alternatives for soil, groundwater, and drain lines were developed and evaluated in the FS Report and FS Addendum. The areas for which the alternatives apply for soil, shallow groundwater, deep groundwater, and drain lines located inside and outside of the OU-2C buildings are referred to as cleanup areas in this plan and are presented in Figures 5a through 5d. The remedial alternatives were evaluated against the first seven of the nine criteria required by CERCLA and as specified in the NCP (Figure 6). The two final criteria are state acceptance and community acceptance. State acceptance is documented in this Proposed Plan. Community acceptance will be evaluated after the public comment period for this Proposed Plan and will be addressed in a Responsiveness Summary in the ROD. Members of the public may submit written and oral comments on this Proposed Plan at the public meeting. In response to feedback from the community or new information and in consultation with the regulatory agencies, the Navy may modify the preferred remedial alternatives or select other cleanup remedies. Therefore, the community is strongly encouraged to review and comment. A final decision will not be made until all comments are considered.

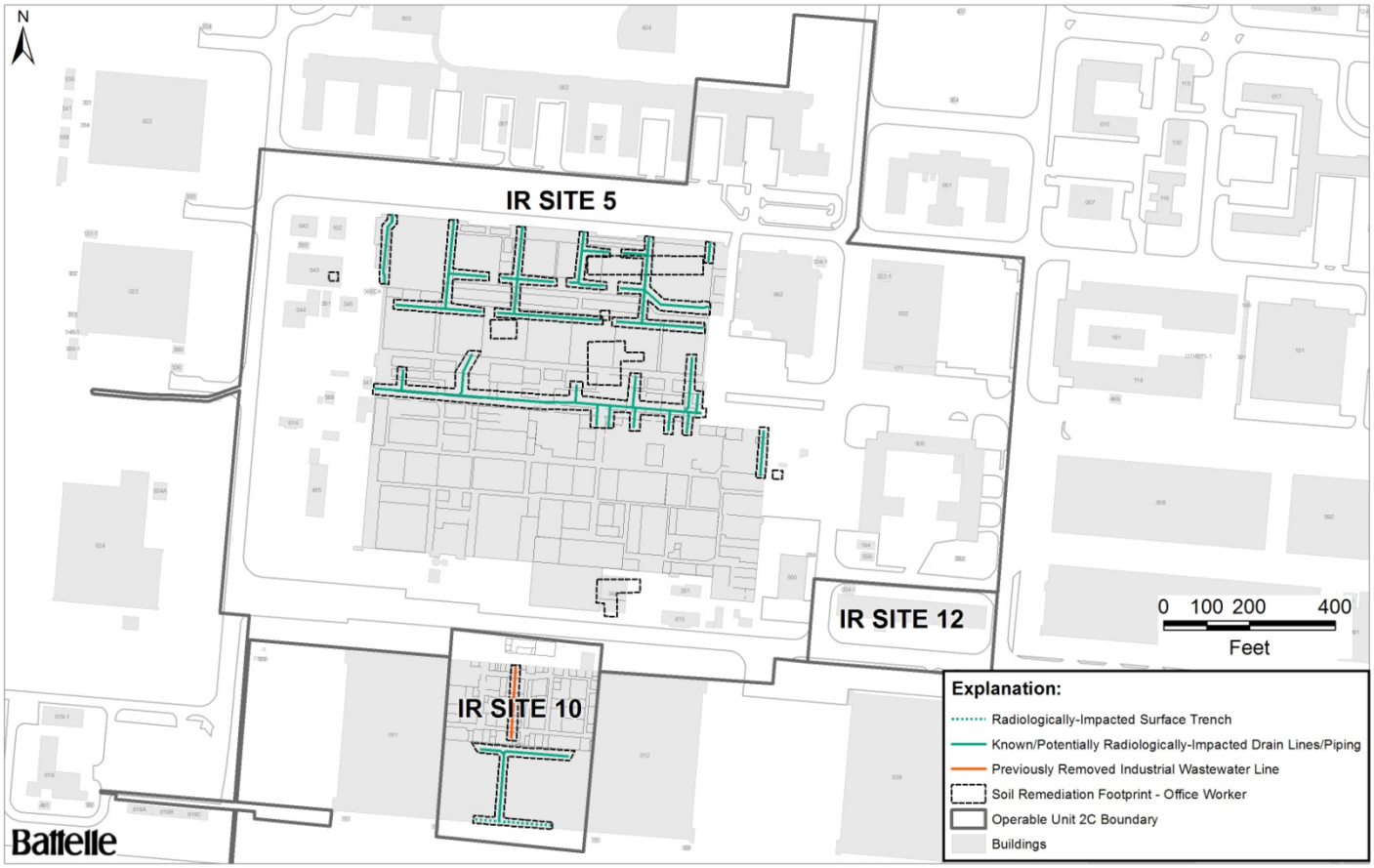


Figure 5a. Soil Cleanup Areas, Including Drain Lines Beneath Buildings 5 and 400

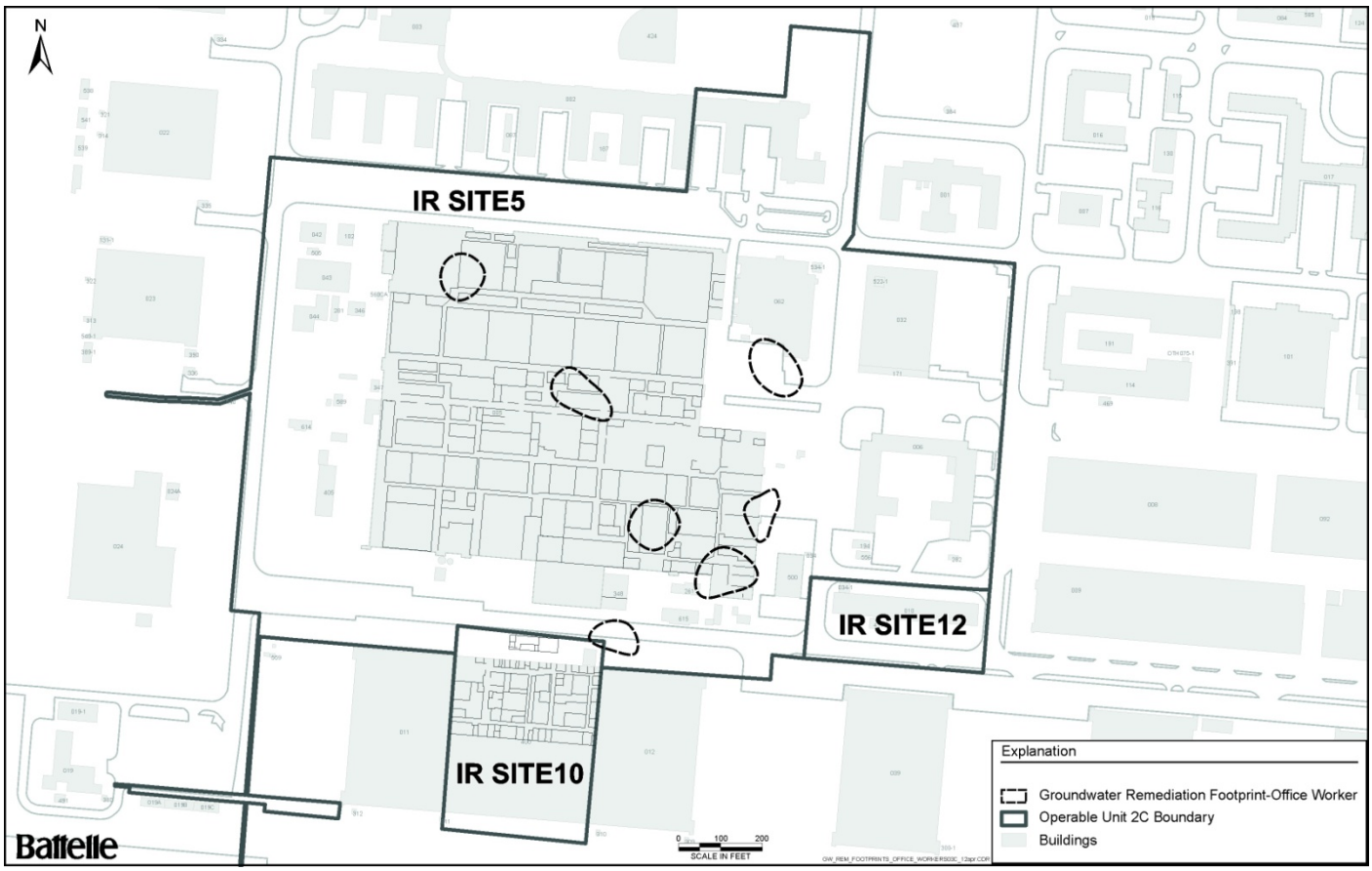


Figure 5b. Shallow Groundwater Cleanup Areas

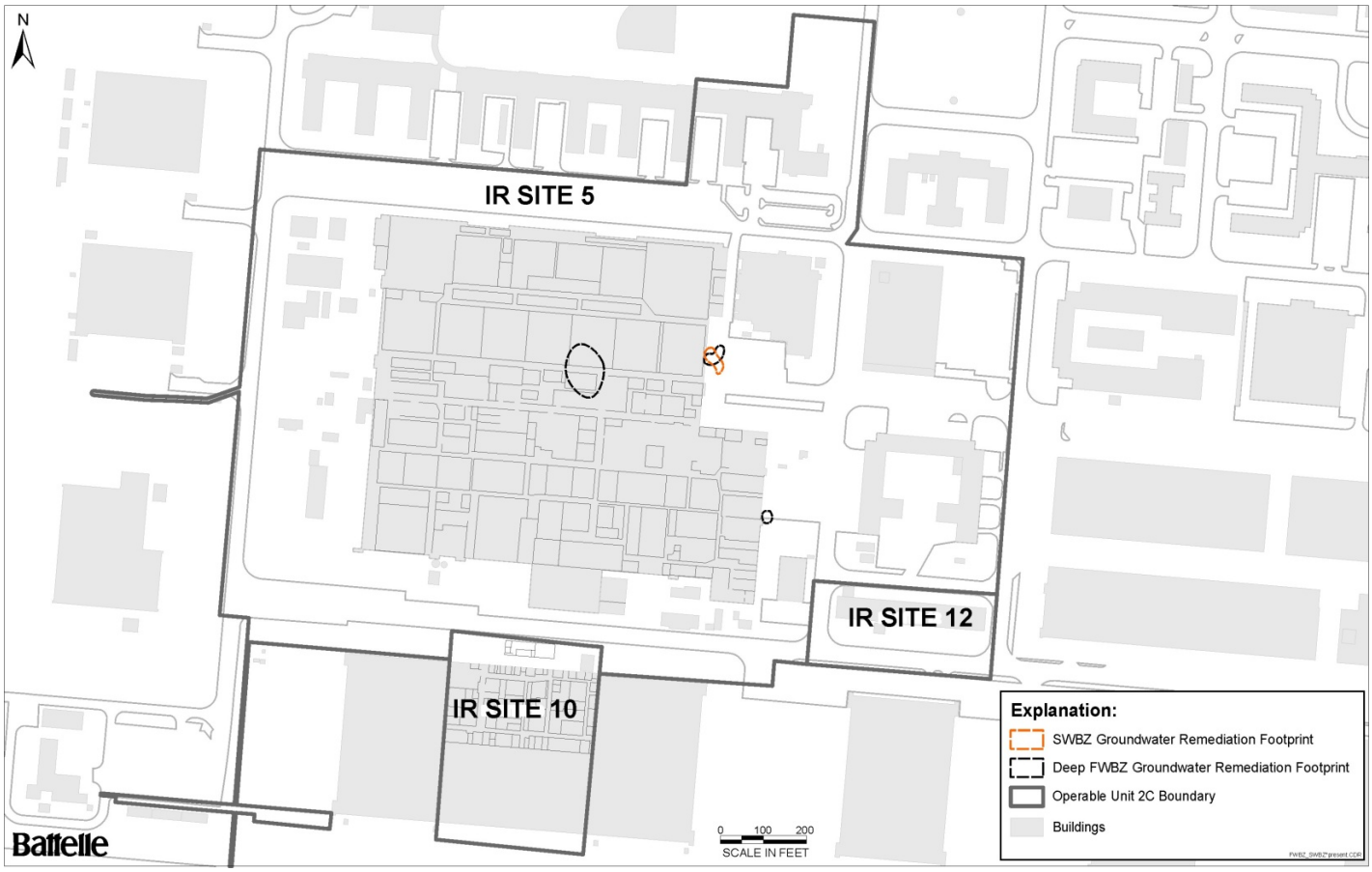


Figure 5c. Deep Groundwater Cleanup Areas

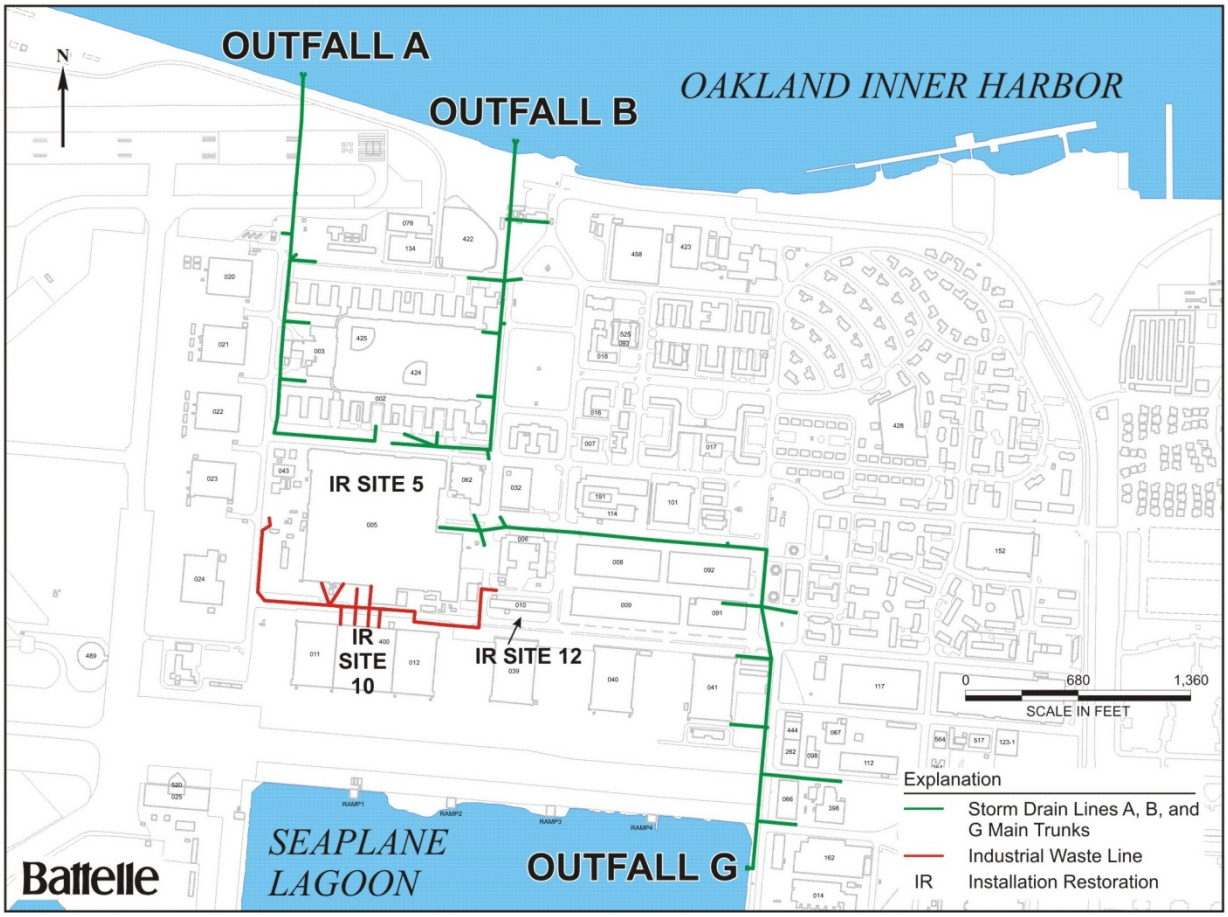


Figure 5d. Cleanup Areas Associated with Drain Lines Outside of Buildings

Figure 6. NCP Criteria for Comparison of Alternatives

Six soil, five shallow FWBZ groundwater, five deep FWBZ and SWBZ groundwater**,** and six drain line remedial alternatives, respectively, were evaluated in detail in the FS Report and FS Addendum (Tables 4, 5, 6, and 7). For these alternatives, pre-design work may be conducted, as appropriate, to support implementation of the alternative. The Preferred Alternative is highlighted on each of these tables.

Institutional Controls (ICs) are included in most remedial alternatives, except for the "no action" alternative. ICs are administrative actions, such as legal controls, that minimize the potential for exposure to contamination by ensuring appropriate land or resource use.

COMPARISON OF ALTERNATIVES

Identification of the preferred alternative is based on the NCP criteria (Table 8, page 16). Alternatives are rated "high", "moderate", or "low", based on their performance under each criterion. For example, an alternative that is substantially easier to implement than other alternatives is rated high in implementability. Similarly, an alternative that would be significantly lower in cost than the other alternatives is rated high under cost because it would perform most favorably within the cost comparison. The alternatives are ranked based on their protectiveness and on their ability to meet the RAOs. Tables 9, 10, 11, and 12 (pages 17 and 18) summarize the comparisons of the six soil, five shallow FWBZ groundwater, five deep FWBZ and SWBZ, and six drain line remedial alternatives as they relate to the nine criteria.

Multi-Agency Environmental Team Concurs with Preferred Remedy

The environmental team, which has been working cooperatively to address remedial decisions for Alameda Point OU-2C and will sign the ROD, consists of:

- Navy
- EPA, Region 9
- DTSC
- Water Board

Table 4. Soil (Including Drain Lines Beneath Buildings 5 and 400) Remedial Alternatives (shading indicates preferred alternative)		
Alternative	**Description**	**Total Cost (millions)**
S1. No Action	The No Action Alternative is required by CERCLA to be evaluated as an alternative to establish a baseline from which to compare the other alternatives. For this alternative, no actions are performed.	$0
S2. Engineering Controls and ICs	Metals impacted soil beneath Building 5 and the known or potentially radiologically-impacted drain lines and surrounding soil beneath Buildings 5 and 400 would be left in place. The current building slabs would serve as an engineering control and provide adequate protection against the exposure pathways (direct contact and incidental ingestion). Metals and VOC-impacted soil located outside of the Building 5 footprint, including Local Area 2, would also be left in place with the existing concrete or asphalt pavement functioning as an engineering control. The drain lines would be sealed in-place with grout to enhance the engineering control (building slab cover). ICs would be established to restrict future site use/site conditions and may include maintenance of building slabs and pavement as engineering controls. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$0.80
S3. Partial Excavation, Engineering Controls, Off-Site Disposal, and ICs	Metals and VOC-impacted soil located outside of the Building 5 footprint would be excavated, including Local Area 2 (Local Area 2 would be remediated to achieve unrestricted land use). The Building 5 and 400 slabs would be left in place to serve as engineering controls over the metals impacted soil beneath Building 5 and the known or potentially radiologically-impacted drain lines and surrounding soil beneath Buildings 5 and 400. In addition, the drain lines would be sealed in-place with grout as part of the engineering controls. Excavated soil would be sampled and properly disposed. ICs would be established to restrict future site use/site conditions and may include maintenance of engineering controls (see Alternative S2). Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$1.98
S4. Excavation, Off-Site Disposal, and ICs	Metals and VOC-impacted soil throughout OU-2C, including Local Area 2, and the known or potentially radiologically-impacted drain lines and surrounding soil beneath Buildings 5 and 400, would be excavated (Local Area 2 would be remediated to achieve unrestricted land use). Excavated soil would be sampled and properly disposed. ICs would be established to restrict future site use/site conditions. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$45.64
S5. Excavation, **Soil Vapor Extraction (SVE)**, Off-Site Disposal, and ICs	Metals-impacted soil, VOC-impacted soil at Local Area 2, and the known or potentially radiologically-impacted drain lines and surrounding soil beneath Buildings 5 and 400 would be excavated (Local Area 2 would be remediated to achieve unrestricted land use). VOC-impacted soil in areas east and south of Building 5, which generally coincides with locations of VOC-impacted groundwater, would be addressed with in situ SVE. Excavated soil would be sampled and properly disposed. ICs would be established to restrict future site use/site conditions. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$45.61
S6. Partial Excavation Beneath Building 5, Complete Excavation Beneath Building 400 and Outside Building Footprints, Engineering Controls, Off-Site Disposal, and ICs	Known or potentially radiologically-impacted drain lines and surrounding soil beneath Buildings 5 and 400 would be excavated. Excavation and disposal of metals and VOC-impacted soil located outside of the Building 5 footprint would be completed identically to Alternative S3. The Building 5 slab would be left in place to serve as an engineering control for metals-impacted soil beneath the building. Excavated soil would be sampled and properly disposed. ICs would be established to restrict future site use and site conditions and to ensure proper maintenance of engineering controls (see Alternative S2). Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$42.33

Table 5. Shallow FWBZ Groundwater Remedial Alternatives (shading indicates preferred alternative)		
Alternative	**Description**	**Total Cost (millions)**
GS1. No Action	The No Action Alternative is required by CERCLA to be evaluated as an alternative to establish a baseline from which to compare the other alternatives. For this alternative, no actions are performed.	$0
GS2. **In situ Chemical Oxidation (ISCO)**, Enhanced Bioremediation, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the shallow FWBZ (5 to 20 ft bgs) would be treated. ISCO would be implemented to treat higher concentration areas; more dilute plume areas would be treated using enhanced bioremediation. Site use restrictions will address vapor intrusion for future office workers until the RGs are met. Groundwater monitoring would be conducted to confirm that RGs have been achieved following treatment. ICs would be implemented to restrict future site use to commercial throughout Exposure Units 2 and 3 and prohibit the use of groundwater in the shallow FWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$2.46
GS3. **In situ Chemical Reduction (ISCR)**, Enhanced Bioremediation, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the shallow FWBZ (5 to 20 ft bgs) would be treated. ISCR would be implemented to treat higher concentration areas; more dilute plume areas would be treated using enhanced bioremediation. Groundwater monitoring would be conducted to confirm that RGs have been achieved following treatment. ICs would be implemented to restrict future site use to commercial throughout Exposure Units 2 and 3 and prohibit the use of groundwater in the shallow FWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$7.14
GS4. **Air Sparge-Soil Vapor Extraction (AS-SVE)**, Enhanced Bioremediation, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the shallow FWBZ (5 to 20 ft bgs) would be treated. AS-SVE would be implemented to treat higher concentration areas; more dilute plume areas would be treated using enhanced bioremediation. Groundwater monitoring would be conducted to confirm that RGs have been achieved following treatment. ICs would be implemented to restrict future site use to commercial throughout Exposure Units 2 and 3 and prohibit the use of groundwater in the shallow FWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$3.83
GS5. **Electrical Resistive Heating (ERH)**, ISCO/ISCR/AS-SVE, Enhanced Bioremediation, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the shallow FWBZ (5 to 20 ft bgs) would be treated. ERH would be implemented to treat source areas where potential DNAPL may be present (total VOC concentrations at or greater than 10,000 μg/L). Following ERH treatment, either ISCO, ISCR, or AS-SVE would be implemented in higher concentration areas. More dilute plume areas would be treated using enhanced bioremediation. Groundwater monitoring would be conducted to confirm that RGs have been achieved following treatment. ICs would be implemented to restrict future site use to commercial throughout Exposure Units 2 and 3 and prohibit the use of groundwater in the shallow FWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$4.56

Table 6. Deep FWBZ and SWBZ Groundwater Remedial Alternatives (shading indicates preferred alternative)		
Alternative	**Description**	**Total Cost (millions)**
GD1. No Action	The No Action Alternative is required by CERCLA to be evaluated as an alternative to establish a baseline from which to compare the other alternatives. For this alternative, no actions are performed.	$0
GD2. ICs	ICs prohibiting the use of groundwater from the deep FWBZ and SWBZ would be implemented. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy. There are no exposure pathways and no current or anticipated future human health or ecological risk associated with chemicals in deep FWBZ and SWBZ groundwater.	$0.73
GD3. ISCO, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the deep FWBZ (20 to 40 ft bgs) and SWBZ (40 to 70 ft bgs) would be treated. ISCO would be implemented to treat all areas. Groundwater monitoring would be conducted to confirm that RGs have been achieved after treatment. ICs would be implemented to prohibit use of groundwater from the deep FWBZ and SWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$2.07
GD4. ISCR, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the deep FWBZ (20 to 40 ft bgs) and SWBZ (40 to 70 ft bgs) would be treated. ISCR would be implemented to treat all areas. Groundwater monitoring would be conducted to confirm that RGs have been achieved after treatment. ICs would be implemented to prohibit use of groundwater from the deep FWBZ and SWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$2.48
GD5. ERH, Groundwater Monitoring, and ICs	VOC-impacted groundwater in the deep FWBZ (20 to 40 ft bgs) and SWBZ (40 to 70 ft bgs) would be treated. ERH would be implemented to treat all areas. Vapor extraction wells would be used to extract steam and volatilized chemicals. All extracted vapors would be treated prior to atmospheric discharge. Groundwater monitoring would be conducted to confirm that RGs have been achieved after treatment. ICs would be implemented to prohibit use of groundwater from the deep FWBZ and SWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.	$3.11

Table 7. Drain Lines (Outside of Buildings 5 and 400) Remedial Alternatives (shading indicates preferred alternative)		
Alternative	**Description**	**Total Cost (millions)**
D1. No Action	The No Action Alternative is required by CERCLA to be evaluated as an alternative to establish a baseline from which to compare the other alternatives. For this alternative, no actions are performed.	$0
D2. ICs	ICs would require that soils over the radiologically-impacted portion of the industrial waste line and main trunk lines and adjacent lateral lines, to the first manhole from the main trunk of Storm Drain Lines A, B, and G be maintained as engineering controls. These lines are shown on Figure 5d. Radiologically impacted lines that present unacceptable risk would not be disturbed and access would be restricted. If existing engineering controls (soils) are removed and other suitable engineering controls are not constructed in their place, then ICs would require that any remaining impacted soil and drain lines be excavated and disposed of off-site. Periodic monitoring and maintenance of engineering controls would be required to ensure they continue to provide adequate protectiveness. Five-year reviews would be required to evaluate the continued protectiveness of the institutional and engineering controls.	$0.77
D3. Excavation and Disposal of All Impacted Drain Lines	Drain line excavation and disposal of the main trunk lines and adjacent lateral lines to the first manhole from the main trunk in Storm Drain Lines A, B, and G and the radiologically-impacted portion of the industrial waste line. These lines are shown on Figure 5d. Piping would be replaced in the main trunk lines in Storm Drain Lines A, B, and G. The industrial waste line would not be replaced.	$57.69
D4. Excavation and Disposal of the Industrial Waste Line and ICs for Main Trunk of Storm Drain Lines A, B, and G	This alternative is similar to Alternative D3 except that only the radiologically-impacted portion of the industrial waste line is excavated. No replacement of the industrial waste line would be necessary. ICs would require that soils over the main trunk lines and adjacent lateral lines, to the first manhole from the main trunk of Storm Drain Lines A, B, and G be maintained as engineering controls. These lines are shown on Figure 5d. If existing engineering controls (soils) are removed and other suitable engineering controls are not constructed in their place, then ICs would require that any remaining impacted soil and drain lines be excavated and disposed of off-site. Periodic monitoring and maintenance of engineering controls would be required to ensure they continue to provide adequate protectiveness. Five-year reviews would be required to evaluate the continued protectiveness of the institutional and engineering controls.	$13.18
D5. Hydro-Jetting, Limited Excavation, and Disposal for Main Trunk of Storm Drain Lines A, B, and G and ICs for the Industrial Waste Line	Removal of sediment from within the main trunk lines and adjacent lateral lines to the first manhole from the main trunk of Storm Drain Lines A and B, and lateral lines, to the first manhole from the main line for Line G. Since the industrial waste line is not considered a candidate for hydro-jetting due to the deteriorated condition of the line, ICs would be required for the radiologically-impacted portion of the industrial waste line to limit exposure to contamination associated with the line. Once extraction of sediments in the storm drain lines via hydro-jetting has been completed, camera verification and a radiological survey of the inside of the pipe will be performed. The removed sediments in combination with the radiological survey would be used to determine whether the storm drain line is radiologically impacted. Limited excavation would be conducted, as appropriate. Continuing evaluation of the storm drain lines may be conducted prior to the ROD to support future remedial activities. For the industrial waste line, ICs would prohibit disturbance of the area encompassing the line and associated potentially impacted soil unless there is prior regulatory agency approval. If the existing engineering controls (soils) are removed, an equivalent engineering control must be implemented unless any remaining impacted soil and the industrial waste line are excavated and properly disposed off-site. Periodic monitoring and maintenance of the engineering controls for the industrial waste line would be required to ensure they continue to provide adequate protectiveness. Five-year reviews would be required to evaluate the continued protectiveness of the institutional and engineering controls.	$5.80
D6. Hydro-Jetting, Limited Excavation, and Disposal for Main Trunk of Storm Drain Lines A, B, and G and Excavation and Disposal of the Industrial Waste Line	Extraction of sediment from within the main trunk lines and adjacent lateral lines to the first manhole from the main trunk of Storm Drain Lines A and B, and lateral lines, to the first manhole from the main line for Line G. The radiologically-impacted portion of the industrial waste line would be excavated and removed since it is not considered a candidate for hydro-jetting due to the deteriorated condition of the line. Replacement of the industrial waste line would not be necessary. Once extraction of sediments from the storm drain lines via hydro-jetting is completed, camera verification and a radiological survey of the inside of the pipe will be performed. The removed sediments in combination with the radiological survey would be used to determine whether the storm drain line is radiologically impacted. Limited excavation of the storm drain lines would be conducted, as appropriate.	$16.23

PREFERRED ALTERNATIVE

The preferred soil remedial alternative to address potential human health risks associated with chemicals in soil and the known or potentially radiologically-impacted drain lines and surrounding soil beneath Buildings 5 and 400 is Alternative S2, Engineering Controls and ICs. This alternative meets the threshold criteria (Table 9) for overall protection of human health and the environment and for compliance with **Applicable or Relevant and Appropriate Requirements (ARARs**; Table 13**)** and is rated the highest overall for all NCP criteria except for "reduction of toxicity, mobility, or volume through treatment" because there is no active remediation for this alternative. The alternative is protective of human health and would achieve the project RAOs. Under this alternative, the current building slabs and pavement would remain in place and serve as the engineering control (or restore any removed slab/pavement with a suitable replacement engineering control) and provide protection against the exposure pathways. ICs would be established to restrict future site use and site conditions, including prohibiting residential reuse, and maintain building slabs and pavement as engineering controls (or restore any removed slab/pavement with a suitable replacement engineering control). The restriction on residential use would apply to Local Area 2. ICs are easily implementable and would ensure the long-term presence and protectiveness of engineering controls to restrict future site use and site conditions. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.

The preferred shallow FWBZ remedial alternative to address potential human health risks associated with chemicals in groundwater is Alternative GS2, ISCO, Enhanced Bioremediation, Groundwater Monitoring, and ICs. This alternative meets the threshold criteria (Table 10) for overall protection of human health and the environment and for compliance with ARARs and is rated the highest overall in satisfying the balancing criteria. ISCO would be implemented to treat higher concentrations of VOC-impacted groundwater in the shallow FWBZ; more dilute plume areas would be treated using enhanced bioremediation. This alternative would achieve the project RAOs by reducing chemical concentrations in groundwater to achieve the RGs and thereby addressing the risks from inhalation of vapors from chemicals in groundwater. ICs would be implemented to restrict future site use and prohibit the use of groundwater in the shallow FWBZ. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.

The preferred deep FWBZ and SWBZ remedial alternative is Alternative GD2, ICs. This alternative meets the threshold criteria (Table 11) for overall protection of human health and the environment and for compliance with ARARs and is rated the highest overall in satisfying the balancing criteria. Groundwater from these zones is not a drinking water source and because there are no complete exposure pathways, there is no current human health risk associated with chemicals in the deep FWBZ and SWBZ groundwater. ICs prohibiting the use of groundwater from the deep FWBZ and SWBZ would be implemented under this alternative and would ensure protection of human health and the environment. Five-year reviews would be conducted to evaluate the continued protectiveness of the remedy.

The preferred remedial alternative for the radiologically-impacted drain lines and surrounding soil outside of Buildings 5 and 400 is Alternative D5, Hydro-jetting, Limited Excavation and Disposal for Main Trunk of Storm Drain Lines A, B, and G, and ICs for the Industrial Waste Line. This alternative meets the threshold criteria (Table 12) for overall protection of human health and the environment and for compliance with ARARs and is rated moderately for all of the balancing criteria. This alternative involves removing sediment within the main trunk lines and adjacent lateral lines to the first manhole from the main trunk of Storm Drain Lines A and B. Line G lateral lines would also have sediments removed up to the first manhole encountered moving out from the main line in each lateral. Since the industrial waste line is not considered a candidate for hydro-jetting due to the deteriorated condition of the line, ICs would be required for the radiologically-impacted portion of the industrial waste line to limit exposure to contamination associated with the line. Once extraction of sediments in the storm drain lines via hydro-jetting has been completed, camera verification and a radiological survey of the inside of the pipe will be performed. The removed sediments in combination with the radiological survey would be used to determine whether the storm drain line is radiologically impacted. Limited excavation would be conducted, as appropriate. Continuing evaluation of the storm drain lines may be conducted prior to the ROD to support future remedial activities. For the industrial waste line, ICs would prohibit disturbance of the area encompassing the line and associated potentially impacted soil unless there is prior regulatory agency approval. If the existing engineering controls (soils) are removed, an equivalent engineering control must be implemented unless any remaining impacted soil and the industrial waste line are excavated and properly disposed off-site. Periodic monitoring and maintenance of the engineering controls for the industrial waste line would be required to ensure they continue to provide adequate protectiveness. Five-year reviews would be required to evaluate the continued protectiveness of the institutional and engineering controls.

SUMMARY STATEMENT

Based on information currently available, the preferred alternatives for OU-2C are the following:

- Soil, Including Drain Lines Beneath Buildings 5 and 400 – Alternative S2 – Engineering Controls and ICs
- Shallow Groundwater – Alternative GS2 – ISCO, Enhanced Bioremediation, Groundwater Monitoring, and ICs
- Deep Groundwater – Alternative GD2 – ICs
- Drain Lines Outside Buildings 5 and 400 – Alternative D5 – Hydro-jetting, Limited Excavation and Disposal for Main Trunk of Storm Drain Lines A, B, and G, and ICs for the Industrial Waste Line

Table 8. NCP Evaluation Criteria

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled.
2. **Compliance with ARARs** addresses whether or not a remedy will meet all applicable or relevant and appropriate federal and state environmental laws and regulations or provide grounds for a waiver.
3. **Long-term effectiveness and permanence** refers to the ability of a remedy to provide reliable protection of human health and the environment over time.
4. **Reduction of toxicity, mobility, or volume through treatment** refers to preference for a remedy that reduces health hazards, the movement of contaminants, or the quantity of contaminants at the site through treatment.
5. **Short-term effectiveness** addresses period of time needed to complete remedy and any adverse effects to human health and the environment that may be caused during construction and implementation of the remedy.
6. **Implementability** refers to the technical and administrative feasibility of the remedy, including availability of materials and services needed to carry out the remedy and coordination of federal, state, and local governments to work together to clean up the site.
7. **Cost** evaluates estimated capital and operation and maintenance costs of each alternative in comparison to other equally protective measures.
8. **State agency acceptance** indicates whether the state agrees with, opposes, or has no comment on the alternative.
9. **Community acceptance** includes determining which components of the alternatives are supported by, have reservations about, or opposed by (not complete until public comments on proposed plan are received) interested persons in the community.

NCP evaluation criteria are divided into three categories:

- **Threshold**. These criteria (1 and 2) must be satisfied for an alternative to be eligible.
- **Primary balancing**. These criteria (3, 4, 5, 6, and 7) are used to weigh major trade-offs among alternatives.
- **Modifying**. Once all comments are evaluated, state and community acceptance (8 and 9) may prompt modifications of the final remedy and are thus designated modifying criteria.

All of these alternatives meet the NCP threshold criteria and satisfy the following statutory requirements of CERCLA 121(b):

1. Protective of human health and the environment
2. Compliant with ARARs
3. Cost-effective
4. Utilize permanent solutions and alternative treatment technologies to the maximum extent practicable
5. Satisfy the preference for treatment

Results of the risk assessments show that the remainder of OU-2C outside the identified footprint areas does not pose an unacceptable risk to human health or the environment. Therefore, no further action is proposed for the remainder of OU-2C, including IR Site 12.

Table 9. Comparative Analysis of Soil Alternatives, Including Drain Lines Beneath Buildings (shading indicates preferred alternative)

NCP Criteria	S1 No Action*	S2 Engineering Controls and ICs	S3 Partial Excavation, Engineering Controls, Off-site Disposal, and ICs	S4 Excavation, Off-site Disposal, and ICs	S5 Excavation, SVE, Off-site Disposal, and ICs	S6 Partial Excavation Beneath Building 5, Complete Excavation Beneath Building 400 and Outside Building Footprints, Engineering Controls, Off-site Disposal, and ICs
1. Overall protection of human health and the environment	No	Yes	Yes	Yes	Yes	Yes
2. Compliance with ARARs	NA	Yes	Yes	Yes	Yes	Yes
3. Long-term effectiveness and permanence	NA	●	●	●	●	●
4. Reduction of toxicity, mobility, or volume through treatment	NA	○	○	○	●	○
5. Short-term effectiveness	NA	●	●	◐	◐	◐
6. Implementability	NA	●	◐	◐	◐	●
7. Cost ($M)[(a)]	NA	● 0.80	◐ 1.98	○ 45.64	○ 45.61	○ 42.33
8. State agency acceptance	To be considered during finalization of this Proposed Plan and during the ROD					
9. Community acceptance	To be evaluated after the Public Comment Period					

* Alternative 1 does not meet the protectiveness criterion; therefore, an evaluation against the other criteria was not performed.
[(a)] Cost estimates are shown as total cost.
Alternative S2 is the Preferred Alternative.
NA Not applicable ○ = low ◐ = moderate ● = high

Table 10. Comparative Analysis of Shallow FWBZ Groundwater Alternatives (shading indicates preferred alternative)

NCP Criteria	GS1 No Action*	GS2 ISCO, Enhanced Bioremediation, Groundwater Monitoring, and ICs	GS3 ISCR, Enhanced Bioremediation, Groundwater Monitoring, and ICs	GS4 AS-SVE, Enhanced Bioremediation, Groundwater Monitoring, and ICs	GS5 ERH, ISCO/ ISCR/ AS-SVE, Enhanced Bioremediation, Groundwater Monitoring, and ICs
1. Overall protection of human health and the environment	No	Yes	Yes	Yes	Yes
2. Compliance with ARARs	NA	Yes	Yes	Yes	Yes
3. Long-term effectiveness and permanence	NA	●	●	●	●
4. Reduction of toxicity, mobility, or volume through treatment	NA	●	●	◐	●
5. Short-term effectiveness	NA	●	●	●	●
6. Implementability	NA	●	●	●	●
7. Cost ($M)[(a)]	NA	● 2.46	○ 7.14	◐ 3.83	◐ 4.56
8. State agency acceptance	To be considered during finalization of this Proposed Plan and during the ROD				
9. Community acceptance	To be evaluated after the Public Comment Period				

* Alternative 1 does not meet the protectiveness criterion; therefore, an evaluation against the other criteria was not performed.
[(a)] Cost estimates are shown as total cost.
Alternative GS2 is the Preferred Alternative.
NA Not applicable ○ = low ◐ = moderate ● = high

Table 11. Comparative Analysis of Deep FWBZ and SWBZ Groundwater Alternatives (shading indicates preferred alternative)

NCP Criteria	GD1 No Action*	GD2 ICs	GD3 ISCO, Groundwater Monitoring, and ICs	GD4 ISCR, Groundwater Monitoring, and ICs	GD5 ERH, Groundwater Monitoring, and ICs
1. Overall protection of human health and the environment	No	Yes	Yes	Yes	Yes
2. Compliance with ARARs	NA	Yes	Yes	Yes	Yes
3. Long-term effectiveness and permanence	NA	◐	●	●	●
4. Reduction of toxicity, mobility, or volume through treatment	NA	○	●	●	●
5. Short-term effectiveness	NA	●	◐	◐	◐
6. Implementability	NA	●	◐	◐	◐
7. Cost ($M)[(a)]	NA	● 0.73	◐ 2.07	○ 2.48	○ 3.11
8. State agency acceptance	To be considered during finalization of this Proposed Plan and during the ROD				
9. Community acceptance	To be evaluated after the Public Comment Period				

* Alternative 1 does not meet the protectiveness criterion; therefore, an evaluation against the other criteria was not performed.
[(a)] Cost estimates are shown as total cost.
Alternative GD2 is the Preferred Alternative.
NA Not applicable ○ = low ◐ = moderate ● = high

Table 12. Comparative Analysis of Alternatives for Drain Lines Outside of Buildings (shading indicates preferred alternative)

NCP Criteria	D1 No Action*	D2 ICs	D3 Excavation and Disposal of All Impacted Drain Lines	D4 Excavation and Disposal of the Industrial Waste Line and ICs for Main Trunk of Storm Drain Lines A, B, and G	D5 Hydro-Jetting, Limited Excavation and Disposal for Main Trunk of Storm Drain Lines A, B, and G, and ICs for the Industrial Waste Line	D6 Hydro-Jetting, Limited Excavation and Disposal for Main Trunk of Storm Drain Lines A, B, and G, and Excavation and Disposal of the Industrial Waste Line
1. Overall protection of human health and the environment	No	Yes	Yes	Yes	Yes	Yes
2. Compliance with ARARs	NA	Yes	Yes	Yes	Yes	Yes
3. Long-term effectiveness and permanence	NA	◐	●	◐	◐	●
4. Reduction of toxicity, mobility, or volume through treatment	NA	○	○	○	○	○
5. Short-term effectiveness	NA	●	◐	◐	◐	◐
6. Implementability	NA	●	◐	◐	◐	◐
7. Cost ($M)[(a)]	NA	● 0.77	○ 57.69	◐ 13.18	◐ 5.80	◐ 16.23
8. State agency acceptance	To be considered during finalization of this Proposed Plan and during the ROD					
9. Community acceptance	To be evaluated after the Public Comment Period					

*Alternative 1 does not meet the protectiveness criterion; therefore, an evaluation against the other criteria was not performed.
[(a)] Cost estimates are shown as total cost.
Alternative D5 is the Preferred Alternative.
NA Not applicable ○ = low ◐ = moderate ● = high

Table 13. Applicable or Relevant and Appropriate Requirements

CERCLA requires that remedial actions meet federal or state (if more stringent) environmental standards, requirements, criteria, or limitations that are determined to be ARARs. Significant potential ARARs that must be met by the preferred remedy are listed below.

Chemical-Specific ARARs

Federal

- Cal. Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100 for characterizing waste prior to offsite disposal
- Resource Conservation and Recovery Act (RCRA) groundwater protection standards in Cal. Code Regs. tit. 22, § 66264.94(a)(1), (a)(3), (c), (d), and (e) for soil and groundwater cleanup levels to lowest levels technologically and economically achievable
- Standards for Protection Against Radiation (10 C.F.R. § 20.1402) for soil with radioactive material
- Standards for Cleaning of Land and Building Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Site (40 C.F.R. § 192.12[a]) for soil with radioactive material

State

- Substantive provisions of Cal. Code Regs. tit. 22, § 66261.3(a)(2)(C) or 66261.3(a)(2)(F), 66261.22(a)(3) and (4), 66261.24(a)(2)–(a)(8), 66261.101 and Cal. Code Regs. tit. 27, §§ 20210, 20220(a), and 20230(a) for characterizing waste prior to offsite disposal
- Cal. Water Code §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act as enabling legislation as implemented through the beneficial uses, WQOs, WDRs, promulgated policies of the WQCP for the San Francisco Bay Basin for groundwater
- Water Quality Control Plan (WQCP) for the San Francisco Bay Basin establishing WQOs, beneficial uses, and waste discharge limitations for groundwater

Federal Location-Specific ARARs

- Substantive provisions of 16 U.S.C. § 703 are relevant and appropriate because migratory birds are known to be present near OU2C
- Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. § 470, et seq.) and their implementing regulations (36 C.F.R. pt. 800), as amended, are federal ARARs

Action-Specific ARARs

Federal

- Substantive provisions of Cal. Code Regs. tit. 22, § 66262.10(a), 66262.11 and Cal. Code Regs. tit. 22, § 66264.13 (a) and (b) are applicable for waste characterization
- The substantive provisions of Cal. Code Regs. tit. 22, § 66264.171, 66264.172, 66264.173, 66264.174, 66264.175(a) and (b), 66264.177, 66264.178 and alternative requirements at Cal. Code Regs. tit. 22, § 66264.553 (b), (d), (e), and (f) are applicable for storing generated waste in containers
- Substantive provisions of 40 C.F.R. § 264.554(d)(1) (i–ii) and (d)(2), (e), (f), (h), (i), (j), and (k), Cal. Code Regs. tit. 22, § 66264.111, and Cal. Code Regs. tit. 22, § 66264.258(a) are potentially applicable if waste staged
- Cal. Code Regs. tit. 22 § 66264.100(d) requires a corrective action monitoring program to demonstrate the effectiveness of the corrective action program.
- Cal. Code Regs. tit. 22 § 66264.100(g)(1) requires continuing the groundwater monitoring under the corrective action program until in compliance for a year
- Cal. Code Regs. tit. 22, § 66264.93 defines constituents of concern as the waste constituents, reaction products, and hazardous constituents that are reasonably expected to be in or derived from waste contained at the site
- Cal. Code Regs. tit. 22, §66264.95(a) and (b) define the point of compliance
- Cal. Code Regs. tit. 22, §§ 66264.97(b)(1)(A), 66264.97 (b)(1)(D)(1) and (b)(1)(D)(2). 66264.97(b)(2), 66264.97(b)(4) – (7), 66264.97(e)(6), 66264.97(e)(12)(A) and (B), 66264.97(e)(13), 66264.97(e)(15) are general monitoring requirements
- Cal. Code Regs. tit. 22, § 66264.98(e)(1)-(e)(5), 66264.98(i), 66264.98(j), 66264.98(k)(1)-(k)(3), 66264.98(k)(4)(A), 66264.98(k)(4)(D), 66264.98(k)(5), 66264.98(k)(7)(C) and (D), 66264.98(n)(1), 66264.98(n)(2)(B), and (n)(2)(C) provide detection monitoring requirements
- Cal. Code Regs. tit. 22, § 66264.99(b), 66264.99(e)(1)-(e)(6), 66264.99(f)(3) and (g) provide evaluation monitoring requirements

State

- Cal. Health & Safety Code §§ 25202.5, 25222.1, 25233(c), 25234, and 25355.5(a)(1)(C) and Cal. Civ. Code § 1471 and Cal. Code Regs., tit. 22 § 67391.1 are state ARARs for institutional controls

SITE CONTACTS

Community involvement in the decision-making process is encouraged. If you have any questions or concerns about environmental activities at OU-2C, please feel free to contact any of the following project representatives:

- **Mr. Derek Robinson**
  BRAC Environmental Coordinator
  Department of the Navy
  BRAC Program Management Office West
  1455 Frazee Road, Suite 900
  San Diego, CA 92108-4310
  (619) 532-0951
- **Ms. Xuan-Mai Tran**
  Project Manager
  U.S. EPA, Region 9, SFD-8-3
  75 Hawthorne Street
  San Francisco, CA 94105
  (415) 972-3002
- **Mr. James Fyfe**
  Project Manager
  Department of Toxic Substances Control
  700 Heinz Avenue
  Berkeley, CA 94710
  (510) 540-3850
- **Mr. John West**
  Project Manager
  San Francisco Bay Water Board
  1515 Clay Street, Suite 1400
  Oakland, CA 94612
  (510) 622-2438
- **Mr. Wayne Hagen**
  Public Participation Specialist
  Department of Toxic Substances Control
  700 Heinz Avenue
  Berkeley, CA 94710
  (510) 540-3911
- **Ms. Dana Barton**
  Section Chief
  Community Involvement Section
  U.S. EPA, Region 9, SFD-6-3
  75 Hawthorne Street
  San Francisco, CA 94105
  (415) 972-3087 or toll-free (800) 231-3075

OPPORTUNITIES FOR PUBLIC INVOLVEMENT

Information Repository

Individuals interested in the full technical details beyond the scope of this Proposed Plan can visit the local Information Repository in Alameda:

- Alameda Point – 950 West Mall Square, Building 1, Room 240

Supporting documents include the 2008 Final RI Report, the 2011 Final FS Report, and the 2012 Final FS Addendum for OU-2C. In addition, the Alameda Public Library maintains new environmental documents during review periods and is located at 1550 Oak Street, Alameda, CA 94501; telephone: (510) 747-7777.

Administrative Record

The AR is the collection of reports and historical documents used by the decision-making team in the selection of the cleanup or environmental management alternatives for a site. The AR file includes the 2008 Final RI Report (AR File #3232), the 2011 Final FS Report (AR File #3787), and the 2012 Final FS Addendum (AR File #3915) for OU-2C discussed in this Proposed Plan. You may view these documents by appointment during working hours (Monday through Friday, 8 a.m. to 5 p.m.). Please contact Ms. Diane Silva at the number provided to make an appointment.

Administrative Record File
Contact: Ms. Diane Silva
NARA Certified Command Records Manager
NAVFAC Southwest
1220 Pacific Highway
Code EV33, NBSD Bldg. 3519
San Diego, CA 92132
Telephone: (619) 556-1280

PUBLIC COMMENT PERIOD

The 30-day public comment period for the OU-2C Proposed Plan is from October 4 through November 5, 2012.

Submit Comments
There are two ways to provide comments during this period:

- Offer oral or written comments during the public meeting on October 11, 2012
- Provide written comments by mail, e-mail, or fax (postmarked no later than November 5, 2012)

Public Meeting
The public meeting will be held on October 11, 2012 at Alameda Point, Main Office Building 1, Room 201, 950 West Mall Square, Alameda, California, from 6:30 pm to 8:00 pm. Navy representatives will provide visual displays and information on the environmental investigations and the remedial alternatives evaluated. You will have an opportunity to formally comment on this Proposed Plan.

Or you can send comments to:
Mr. Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
BRAC Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310
Phone (619) 532-0951
Fax (619) 532-0983
derek.j.robinson1@navy.mil

For more information:
www.bracpmo.navy.mil

Administrative Record (AR) – The reports and historical documents used in selection of cleanup or environmental management alternatives.

Applicable or Relevant and Appropriate Requirements (ARARs) – A Federal or state law or regulation that is required to be protective of human health and the environment during remedial actions at a site.

air sparge - soil vapor extraction (AS-SVE) – The method of injecting air into groundwater wells below the contamination area (the saturated zone). As the air rises through the interval containing COCs, VOCs are stripped from the groundwater and the VOC laden air enters the unsaturated zone where it is extracted under vacuum by the SVE system.

Base Realignment and Closure (BRAC) Program – Program established by Congress, under which Department of Defense installations undergo closure, environmental cleanup, and property transfer to other federal agencies or communities for reuse.

Corrective Action Areas (CAAs) - identified for petroleum contamination and being addressed under the Alameda Point basewide petroleum cleanup program.

cancer risk – the probability that an individual will develop cancer from direct exposure to chemicals classified as carcinogens. A carcinogen is a chemical that may cause cancer.

chemicals of concern (COCs) – Chemicals that were identified in the remedial investigation or feasibility study as a concern and requiring further investigation

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – Also known as Superfund, this federal law regulates environmental investigations and cleanup of sites in a manner that is protective of both human health and the environment.

dense non-aqueous phase liquid (DNAPL) – A liquid, which is composed of compounds such as chlorinated solvents and PAHs, that tends to sink in the subsurface. Physical and chemical properties of DNAPL include their relatively low solubility, high specific gravity, and tendency to remain sorbed to organic materials in an aquifer.

Department of Toxic Substances Control (DTSC) – A department within the California Environmental Protection Agency charged with overseeing the investigations and cleanup of hazardous waste sites.

ecological risk assessment (ERA) – The evaluation of potential harmful effects to plants, animals, and habitat as a result of exposure to chemicals in the environment.

Environmental Baseline Survey (EBS) – A multidisciplinary site survey conducted to determine the environmental condition of federal property, including excess and surplus property at closing and realigning military installations. This effort is conducted to fulfill certain requirements of CERCLA. The survey documents existing environmental conditions, determines the potential for present and past site contamination (e.g., hazardous substances, petroleum products, and derivatives), and identifies potential risks to human health and the environment.

Environmental Protection Agency (EPA) – The Federal agency established to protect human health and the environment.

electrical resistive heating (ERH) – ERH uses an electrical current to heat an aquifer, resulting in volatilization of chemicals from the groundwater that are then vacuum-extracted by an SVE system installed above ground.

exposure pathway – exposure pathway is the route of contaminants from the source of contamination to potential contact with a medium (air, soil, surface water, or groundwater) that represents a potential threat to human health or the environment.

first water bearing zone (FWBZ) – The FWBZ is the uppermost water-bearing zone at OU-2C and is composed of fill material and the upper portion of the Bay Sediment Unit, which is a natural clay layer that separates the FWBZ from the SWBZ. Across OU-2C, the bottom of the shallow FWBZ ranges in depth from 15 to 20 ft below ground surface.

feasibility study (FS) – The second of two major studies that must be completed before a decision can be made about how to clean up a site. (An RI is the first step to identify the nature and extent of contamination at the site and the associated risk.) The FS uses the RI information to calculate remedial objectives and goals and it screens and evaluates possible remedial technologies and alternatives for cleanup options at a site.

hazard index (HI) – The HI is the sum of all individual hazard quotients. For human health, it is a calculated value used to represent a potential non-cancer health risk for more than one chemical or exposure pathway. An HI value of 1.0 or less is considered an acceptable exposure level.

hazard quotient (HQ) – The ratio of the potential exposure to the substance and the level at which no adverse effects are expected. If the HQ is calculated to be equal to or less than 1, then no adverse health effects are expected as a result of exposure. If the HQ is greater than 1, then adverse health effects are possible.

human health risk assessment (HHRA) – The estimate of potential harmful effects humans may experience as a result of exposure to chemicals.

in situ chemical oxidation (ISCO) – a process in which chemical oxidants are injected into the subsurface via injection wells, trenches, or other means to chemically destroy COCs. The technology involves the conversion of the COCs into benign chemicals through oxidation in the subsurface, with water and carbon dioxide as final products.

in situ chemical reduction (ISCR) – refers to the use of chemical amendments to promote reducing conditions in aquifer formations to transform or remove contaminants from groundwater. The chemical amendments are generally introduced as injected liquid solutions or by emplacement of a solid media in the path of a contaminant plume.

Installation Restoration (IR) Program – The Department of Defense's comprehensive program to investigate and clean up environmental contamination at military facilities in full compliance with CERCLA.

Institutional Controls (ICs) – Actions, such as legal controls, that help minimize the potential for exposure to contamination by ensuring appropriate land or resource use. They are used when contamination is first discovered, when remedies are ongoing, and when residual contamination remains onsite at a level that does not allow for unrestricted use and unlimited exposure after cleanup.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – The federal regulation that guides the CERCLA (Superfund) program.

Operable Unit (OU) – A grouping of sites, such as large facilities or complex sites, that are addressed together in cleanups under CERCLA because of similar COCs or their proximity to each other.

polycyclic aromatic hydrocarbons (PAHs) – Specific class or group of semivolatile organic compounds whose molecules consist of multiple benzene rings. Some are suspected as cancer-causing compounds. PAHs are commonly associated with non-combusted fuels and waste oil.

polychlorinated biphenyls (PCBs) – Category of organic compounds in which a biphenyl molecule has been chlorinated to varying degrees. In the past, PCBs were often used in industry in electrical transformers because of their insulating properties.

radium[Ra]-226 – Radium (chemical symbol Ra) is a naturally-occurring radioactive metal. Its most common isotopes are radium-226, radium-224, and radium-228. Radium is a radionuclide formed by the decay of uranium and thorium in the environment. It occurs at low levels in virtually all rock, soil, water, plants, and animals.

record of decision (ROD) – A legal document that identifies the selected site remedy. It is signed by the Navy and regulatory agencies and is a binding agreement regarding the final remedy.

remedial action objectives (RAO) – Medium-specific (e.g., soil, groundwater, or air) or site-specific goals for protecting human health and the environment. These objectives focus the FS and define the scope of potential remedial activities, thereby guiding the development and evaluation of remedial alternatives that are consistent with anticipated future use.

remedial goals (RGs) – A chemical concentration that provides a quantitative means of identifying areas for potential remedial action, screening the types of appropriate technologies, and assessing the potential of each remedial alternative to achieve the RAOs.

remedial investigation (RI) – The first of two major studies that must be completed before a decision can be made about how to clean up a site. The RI is conducted to determine the nature and extent of contamination at the site and the associated risk. (The feasibility study is a second study that is only conducted when the RI recommends development of cleanup options for a site.)

Resource Conservation and Recovery Act (RCRA) – Enacted in 1976, RCRA is a Federal law that governs the disposal of solid and hazardous waste.

risk – Likelihood or probability that a hazardous substance released to the environment will cause adverse effects on exposed human or biological receptors. Risk is classified as carcinogenic or non-carcinogenic.

risk based concentrations (RBCs) – are calculated using acceptable risk levels, such as a one in one million cancer risk and default, conservative exposure values.

risk drivers – a COC that may have the potential to cause risk to a receptor and is identified during the risk assessment process.

San Francisco Bay Regional Water Quality Control Board (Water Board) – The California water quality authority; a department within the California Environmental Protection Agency. California is covered by nine regional boards; Alameda is within the San Francisco Bay Region (Region 2).

second water bearing zone (SWBZ) – is a semiconfined aquifer composed of coarse-grained sediments of the lower Bay Sediment Unit, the Merritt Sand Formation, and the upper unit of the San Antonio Formation. The SWBZ (40 to 70 ft below ground surface [bgs]) is sometimes referred to as the Merritt Sand aquifer.

semivolatile organic compound (SVOC) – An organic (carbon containing) compound that does not readily evaporate at room temperature. SVOCs include certain oils, pesticides, and PAHs.

six-phase heating (SPH) – uses an electrical current to heat an aquifer so that water and chemicals trapped in conductive regions are vaporized and ready for vacuum extraction.

soil vapor extraction (SVE) – a vacuum is applied to the subsurface to withdraw soil vapors through a series of extraction wells placed strategically within the remediation area. The extracted vapors are treated aboveground.

steam-enhanced extraction (SEE) – a form of thermally enhanced recovery where steam instead of electricity is used to heat the soil/groundwater to volatilize chemicals. Steam is forced into the aquifer through injection wells to vaporize volatile COCs. The vaporized COCs are subsequently captured using vacuum extraction (e.g., SVE).

time-critical removal action (TCRA) – time sensitivity refers to the need to take relatively prompt remedial action.

total petroleum hydrocarbon (TPH) – A family of several hundred chemical compounds in crude oil, such as benzene, hexane, toluene, and others. TPH includes motor oil-, diesel-, and gasoline-range hydrocarbons.

trichloroethene – Trichloroethene is a manufactured, volatile organic chemical. It has many uses, such as a solvent to remove grease from metal, a paint stripper, adhesive solvent, as an ingredient in paints and varnishes, and in the manufacture of other organic chemicals. Other names for trichloroethene include TCE and trichloroethylene. TCE is a clear, colorless liquid, and has a somewhat sweet odor. It is non-flammable at room temperature and will evaporate into the air.

volatile organic compound (VOC) – An organic (carbon containing) compound that evaporates readily at room temperature. VOCs are found in industrial solvents commonly used in dry cleaning, metal plating, and machinery degreasing operations.

Proposed Plan Comment Form

Alameda Point OU-2C

The public comment period for the Proposed Plan for OU-2C, Former NAS Alameda at Alameda Point, Alameda, California is from October 4, 2012 through November 5, 2012. A public meeting to present the Proposed Plan will be held at Alameda Point, Main Office Building 1, Room 201, 950 West Mall Square, Alameda, California on October 11, 2012 from 6:30 to 8:00 p.m. You may provide your comments verbally at the public meeting where your comments will be recorded by a stenographer. Alternatively, you may provide written comments in the space provided below or on your own stationery. All written comments must be postmarked no later than November 5, 2012. You may also submit this form to a Navy representative at the public meeting. Comments are also being accepted by e-mail. Please address email comments to: derek.j.robinson1@navy.mil.

Name: _____

Representing:
(if applicable) _____

Phone Number:
(optional) _____

Address:
(optional) _____

☐ Please check here if you would like to be added to the Navy's Environmental Mailing List for Alameda Point.

Comments:

Mail to:

Mr. Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Don't forget: A Public Meeting for the Proposed Plan will be held on October 11, 2012 at the Main Office Building 1, Room 201, 950 West Mall Square, Alameda Point, Alameda, California.

Proposed Plan for
Operable Unit 2-C
Installation Restoration Sites 5, 10, and 12
Former NAS Alameda

Mr. Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310