Area 6 History

Additional information and updates can be found online at
https://navfac.navy.mil/NASWIRAB

If you have specific questions, please contact
PAO_feedback@navy.mil (email) or **360-396-1030** (voicemail)

LEGEND

- Area 6 boundary
- Base boundary

0 0.5 1 mile N

ROD Record of Decision
VOCs volatile organic compounds

Landfill Operations

- Former Industrial Waste Disposal Area (1969 to early 1980s)
  - Disposed liquid wastes included solvents, oily sludges, and thinners
- Navy Municipal Landfill area (1969 to 1992)

Landfill Cleanup

- Designated as Superfund Site in 1990 due to chlorinated volatile organic compounds present in groundwater
- 1993 – Record of Decision Signed, official landfill clean-up begins
  - Constructed Landfill cap
  - Installed groundwater treatment system to address chlorinated volatile organic compounds
  - Monitoring on and off-base movement of contaminants in groundwater

1,4-Dioxane Discovered in 2003

- Groundwater was not originally analyzed for 1,4-dioxane and was not part of the original clean-up effort in 1993
- Present in on- and off-site groundwater
- Existing groundwater treatment system does not remove 1,4-dioxane
- 1,4-Dioxane historically added to certain chlorinated solvents as a stabilizer

Current Clean-up approach needs to be changed to address 1,4- dioxane.

July 2018 – Finalized Focused Feasibility Study

- Evaluation of potential cleanup alternatives capable of addressing 1,4-dioxane and chlorinated VOCs

November 2018 – Finalized the Proposed Plan

- Proposed Plan to clean up VOCs and 1,4-dioxane in groundwater

Proposed Plan is available here in hard copy

The Navy is proposing to amend the 1993 Record of Decision (ROD Amendment) to address 1,4-dioxane and chlorinated volatile organic compounds.

Area 6 Proposed Plan Overview

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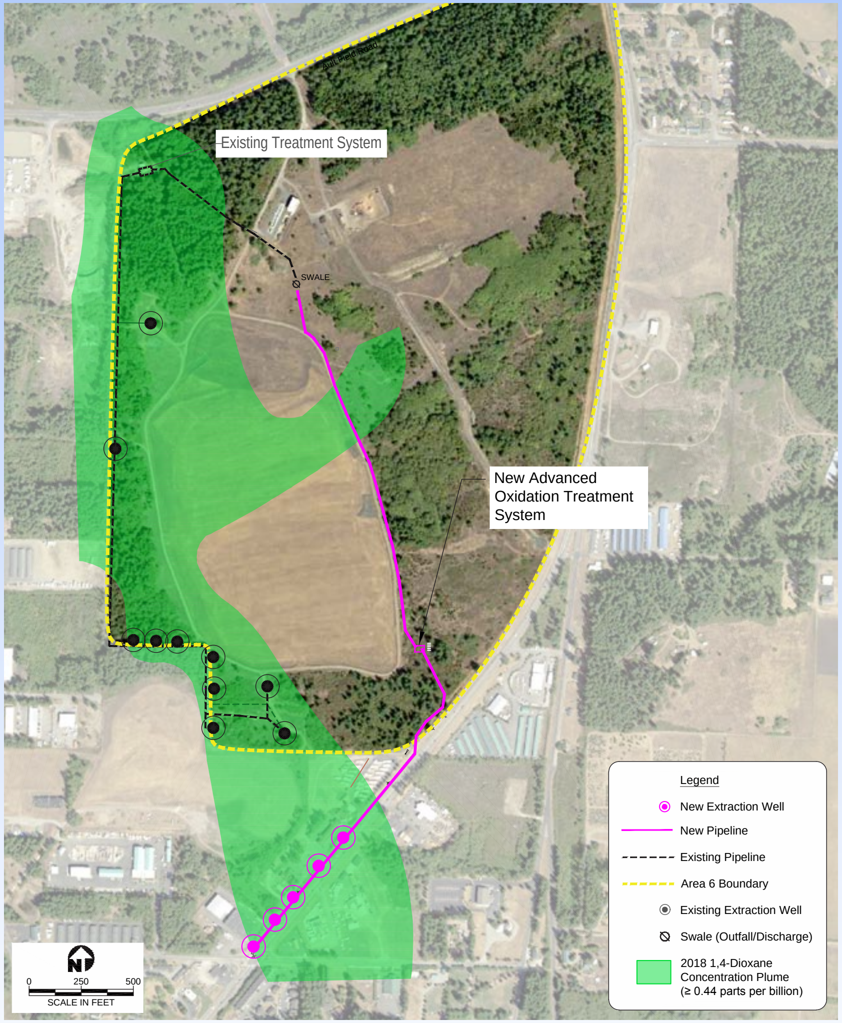

New Preferred Cleanup Alternative

- The Preferred Alternative includes groundwater treatment using advanced oxidation processes, adds a treatment plant to the south, upgrades the current treatment plant to AOP from air stripping, and expands the well network
- Two independent groundwater treatment systems, one in the north and one in the south
  - Both will use AOP to remove 1,4-dioxane and chlorinated volatile organic compounds
  - Expand the groundwater extraction network
  - Replace existing system with an AOP system in the north

Proposed Changes to 1993 Record of Decision Chemicals of Concern (COC)

- Add 1,4-dioxane as a COC
- Remove 1,1-dichloroethane as a COC since it has never been detected above the cleanup level
- Remove cis-1,2-dichloroethene as a COC because it has not been detected above the cleanup level in groundwater collected since 2008
- Proposed Remediation Goal changes for vinyl chloride and 1,1-dichloroethene

Integrated Remedy (2 Steps) for Groundwater Cleanup

1. Active Treatment – Groundwater Extraction and Treatment until contaminant concentrations have been reduced to 3 times the cleanup levels or concentrations have stabilized
2. Passive Treatment – Monitored Natural Attenuation until cleanup levels achieved

- Land use and institutional controls until cleanup is complete

AOP advanced oxidation process
COC chemical of concern

Decision Process and Why We are Here/Cleanup Team

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Decision Process

Why We Are Here

This open house is being held to present the Preferred Alternative for cleaning up the site and get public comments on the preferred alternative.

Cleanup Team

- The Navy's Environmental Restoration Program was established to meet requirements of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**
- The Navy is the lead agency for environmental restoration at Naval Air Station Whidbey Island
- **Naval Facilities Engineering Command (NAVFAC)** manages the environmental restoration program at Naval Air Station Whidbey Island
- EPA provides oversight and concurs with the preferred alternative and the final remedy
- Ensures public interests are served

Public Comment

The Navy is requesting public comments on the Proposed Plan and Preferred Alternative until December 21st, 2018. Public comments received during this period will be included in the Responsiveness Summary Section of the ROD Amendment and considered in the final cleanup action decisions for Area 6.

Two Groundwater Plumes and 1,4-Dioxane at Area 6

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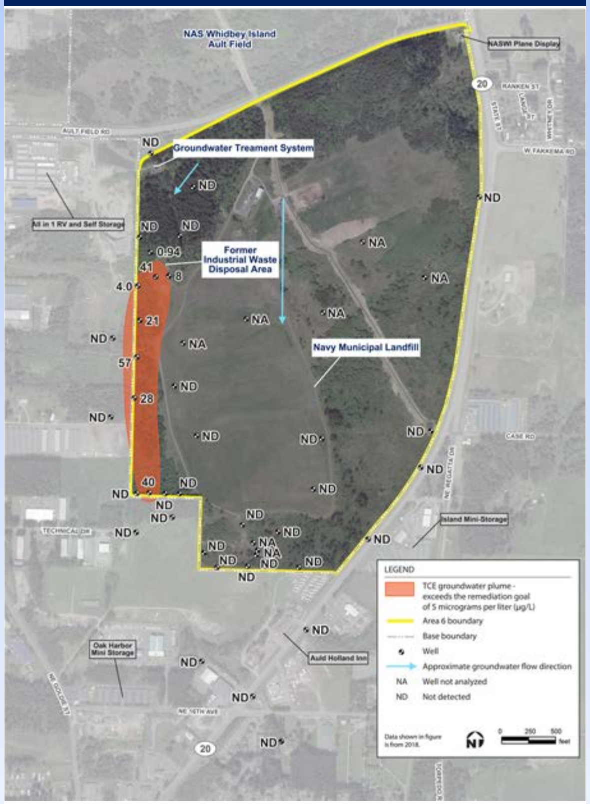
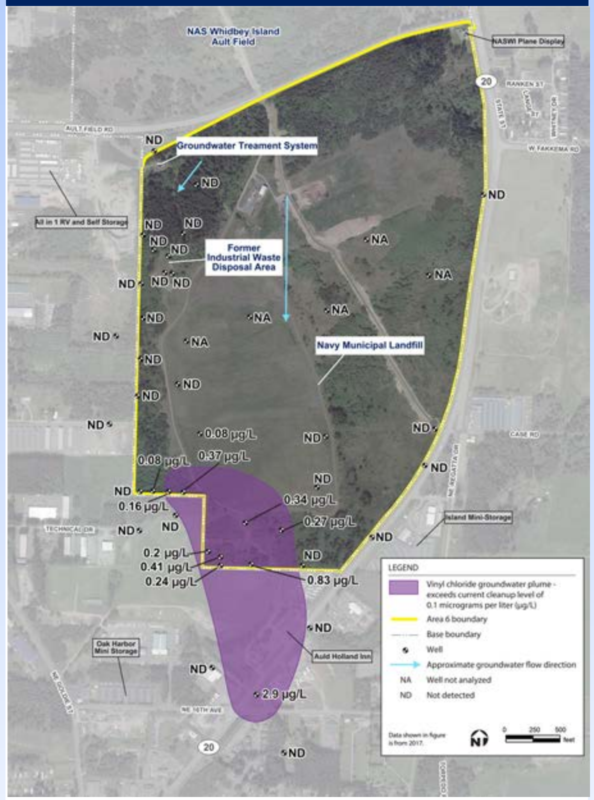
Western Plume



Trichloroethene (TCE) map shown. COCs in western plume include:

- Trichloroethene
- 1,1,1-Trichloroethane
- 1,1-Dichloroethene
- 1,4-dioxane

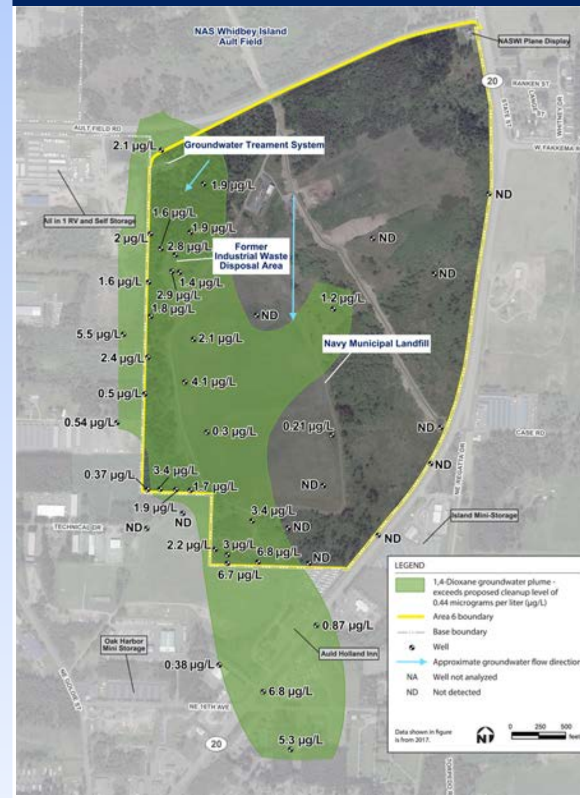
Southern Plume



Vinyl Chloride map shown. COCs in southern plume include:

- Vinyl Chloride
- 1,4-dioxane

1,4-Dioxane Plume



1,4-dioxane map shown. 1,4-dioxane is present in both the western and southern plumes.

Trichloroethene (TCE) at Area 6

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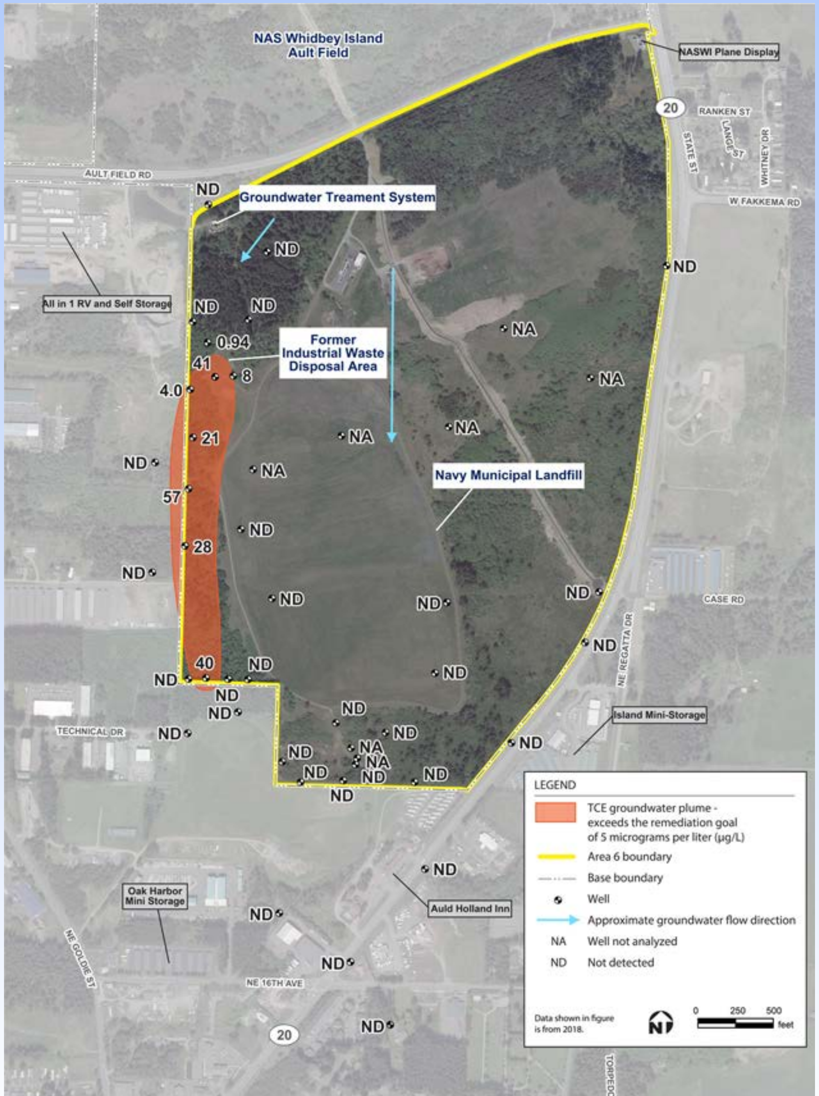

The current groundwater treatment system is preventing TCE from moving off-site in groundwater and has greatly reduced TCE concentrations.

TCE Cleanup Level

- The goal is to reduce TCE concentrations below **5 µg/L** (micrograms per liter) US EPA maximum contaminant level in drinking water

TCE Concentrations

- 1997 – Maximum concentration was **1,000 µg/L**
- 2018 (February) – Maximum concentration was **57 µg/L**

The new system will continue to contain TCE on-site and remove TCE from groundwater.

TCE trichloroethene
µg/L micrograms per liter

Vinyl Chloride at Area 6

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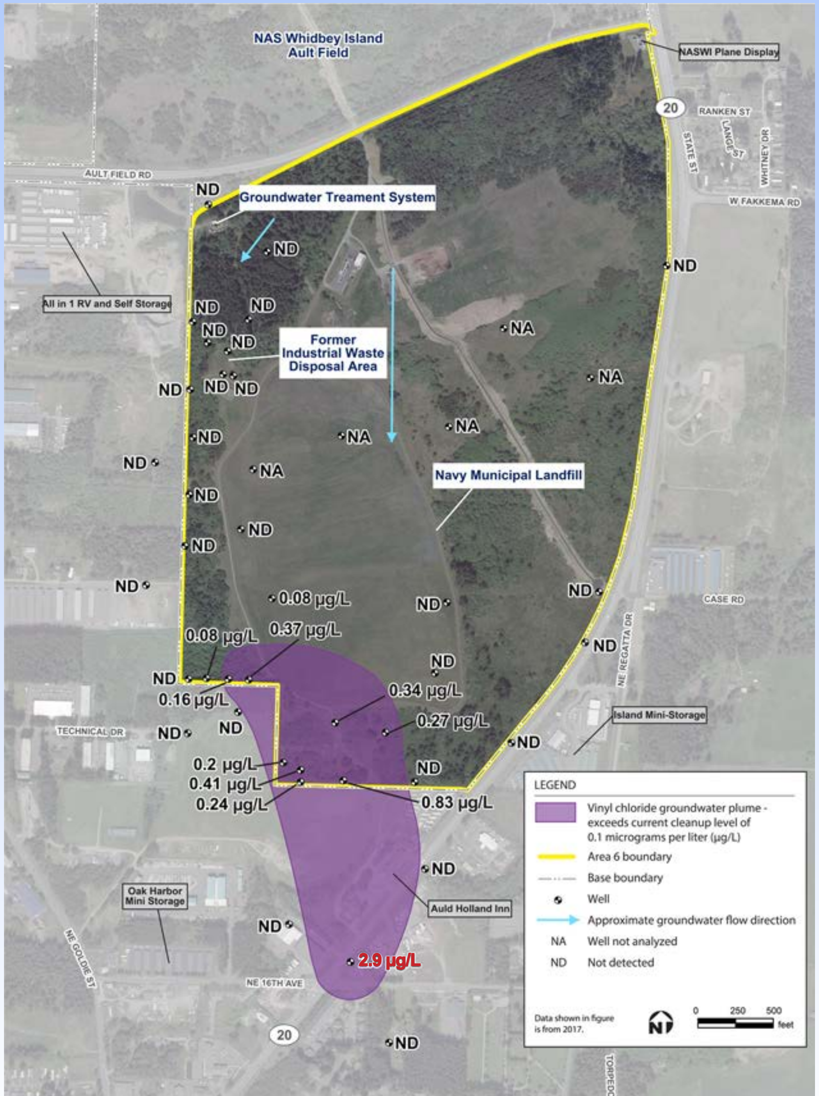

Vinyl chloride has moved off-site in groundwater.

- The Navy has sampled off-base drinking water to evaluate potential risk to human health associated with vinyl chloride from Area 6 and is taking action as necessary.

Vinyl Chloride Regulatory Levels

- US EPA has established a maximum contaminant level in drinking water of 2 µg/L (micrograms per liter)
- State of Washington has established Cleanup Levels for Groundwater
  - 1993 – 0.10 µg/L
  - Current – 0.29 µg/L

Proposed change to Cleanup Level for Area 6

- 1993 ROD – 0.10 µg/L
- New Preferred Alternative – **0.29 µg/L**

Vinyl Chloride Concentrations

- 1997 – Maximum concentration was **5.3 µg/L**
- 2018 (February) – Maximum concentration was **2.9 µg/L**

The new system will prevent additional vinyl chloride from moving off-site and remove vinyl chloride from groundwater.

ROD	Record of Decision
µg/L	micrograms per liter

1,4-Dioxane at Area 6

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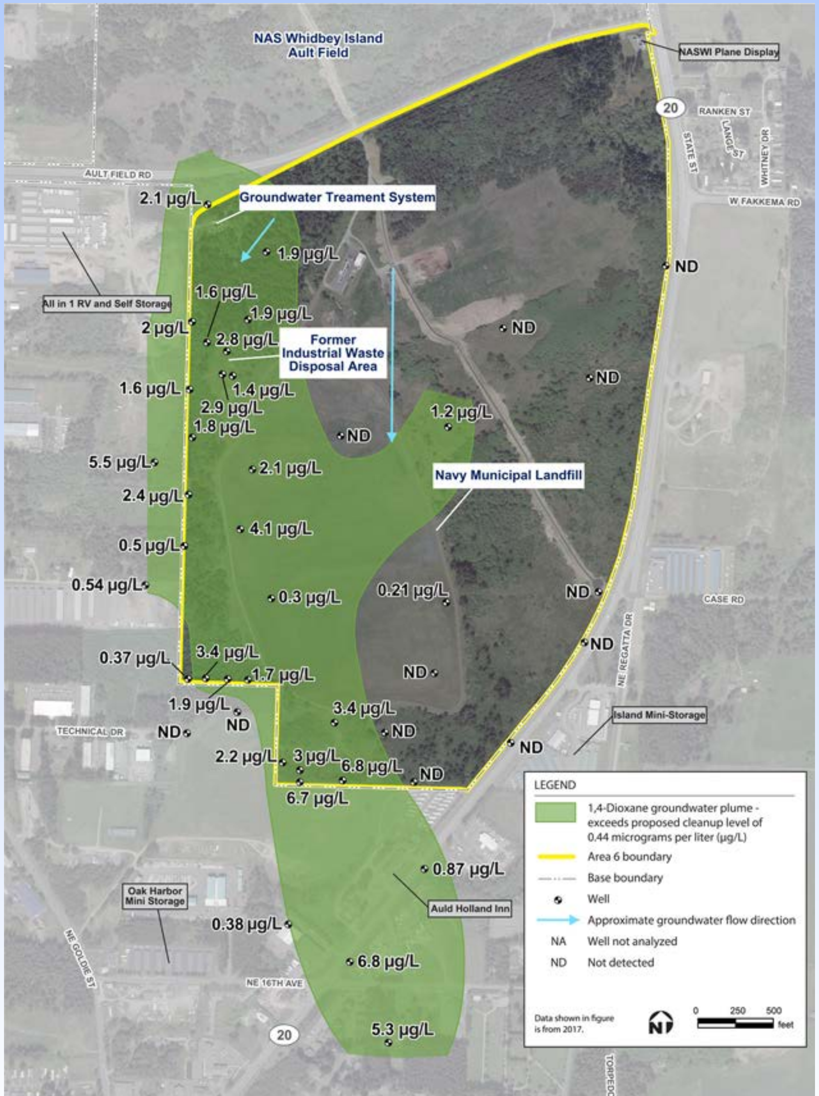

1,4-dioxane has moved off-site in groundwater.

- The Navy has sampled off-base drinking water to evaluate potential risk to human health associated with 1,4-dioxane from Area 6 and is taking action as necessary.

1,4-Dioxane Cleanup Level

- The goal is to reduce concentrations below 0.44 µg/L (micrograms per liter)
- Washington State Cleanup Value for groundwater

The new advanced oxidation plants will treat 1,4-dioxane in groundwater.

µg/L micrograms per liter

Evaluated Alternatives for Area 6

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Alternative 1 – No action, existing actions continue

Alternative 2 (Preferred Alternative)

Groundwater extraction and treatment using advanced oxidation (AOP)

- New treatment plant in the south
- New extraction network for the southern plume
- Upgrade current treatment plant to AOP from air stripper
- Potentially expand extraction network for the western plume

Alternative 3

In-situ groundwater treatment with chemical oxidation using base-activated persulfate

Alternative 5

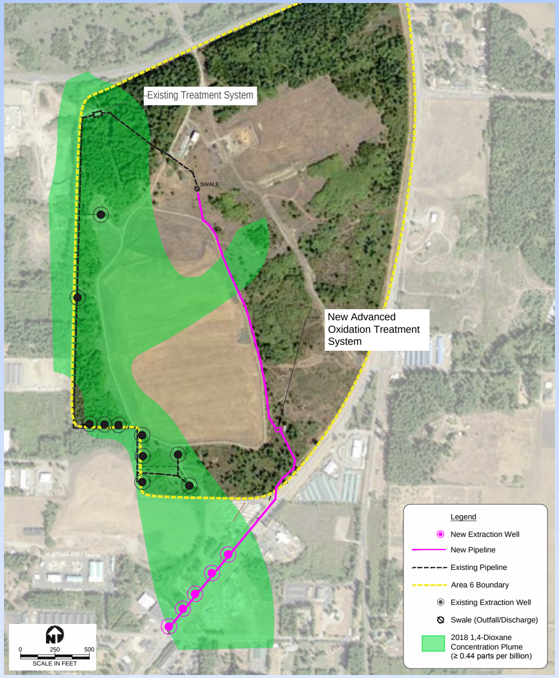
Continued groundwater treatment system with expanded well network, discharging all water to the Navy Ault Field Wastewater Treatment Plant (WWTP)

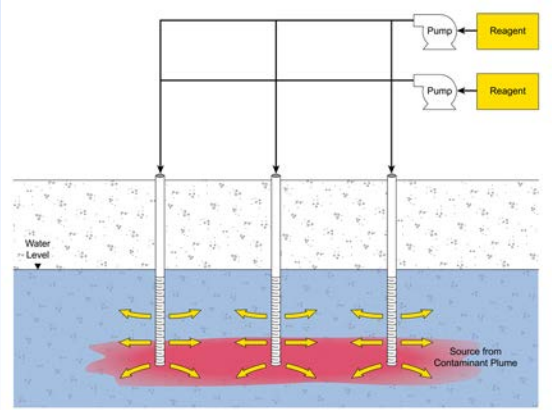
Alternative 4

In-situ groundwater treatment with chemical oxidation using catalyzed hydrogen peroxide

Alternative 6 - Combination of Alternatives 2 and 4

Groundwater extraction and treatment using advanced oxidation *In-situ* groundwater treatment with chemical oxidation using catalyzed hydrogen peroxide





AOP advanced oxidation process

Preferred Alternative for Area 6

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Alternative 2 (Preferred Alternative)

Integrated remedy active treatment followed by passive treatment

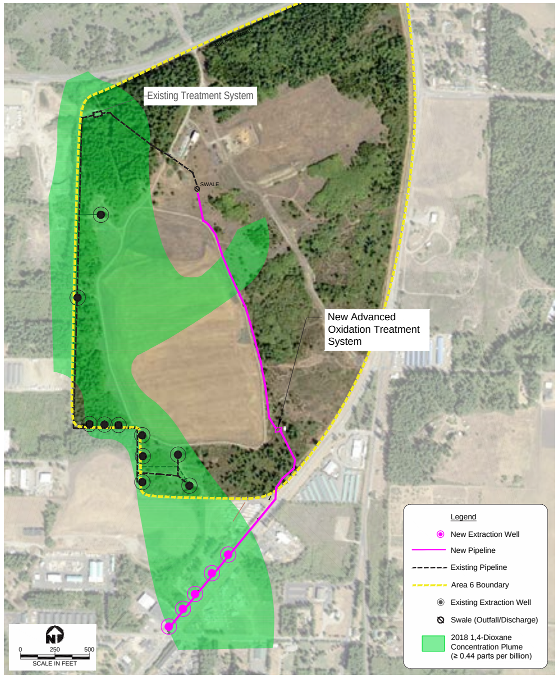
- Active treatment (groundwater extraction and treatment) will end once concentrations equal to 3 times the cleanup level or asymptotic conditions are reached. Passive treatment (monitored natural attenuation) will follow.

Groundwater extraction and treatment using advanced oxidation

- New treatment plant in the south with advanced oxidation to remove all chlorinated VOCs and 1,4-dioxane
- 5 new groundwater extraction wells along SR 20 to capture and remove 1,4-dioxane and vinyl chloride
- Upgrade existing treatment plant to advance oxidation
- Add up to 4 new extraction wells along centerline of western plume
- Phased approach
  - Southern plant constructed first (2019 contract award)
  - Implementation of construction of western plant following one year of continuous operation of southern plant

EPA U.S. Environmental Protection Agency
Ecology Washington State Department of Ecology
SR State Route
VOCs volatile organic compounds

- Land use controls
  - Prohibit drilling of downgradient wells and use of groundwater except for monitoring wells and remediation system wells authorized by EPA and Ecology in approved plans
  - Protect existing monitoring wells
  - Prevent of any disturbance to the landfill cap, except as necessary for authorized cap maintenance and maintenance activities
  - Ensure that land use at Area 6 remains commercial and or industrial, which includes a prohibition on development and use of this property for residential housing, elementary and secondary schools, child care facilities, and playgrounds
- Performance monitoring
  - Sampling monitoring wells
  - Monitoring systems
- Conduct 5-year reviews to ensure that the remedy is functioning as intended
- Total Present-Worth Cost $18,300,000



Reasons preferred over other alternatives:

- Advanced oxidation completely destroys all contaminants as opposed to diluting or transferring to different media (air)
- Above ground treatment, higher degree of certainty and control

Other Changes in ROD Amendment

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Changes to Chemicals of Concern (COCs)

1993 ROD COCs:

- Trichloroethene
- 1,1,1-Trichloroethane
- 1,1-Dichloroethane
- 1,1-Dichloroethene
- cis-1,2-dichloroethene
- Vinyl chloride

Proposed Plan COCs:

- Trichloroethene
- 1,1,1-Trichloroethane
- 1,1-Dichloroethene
- Vinyl chloride
- 1,4-dioxane

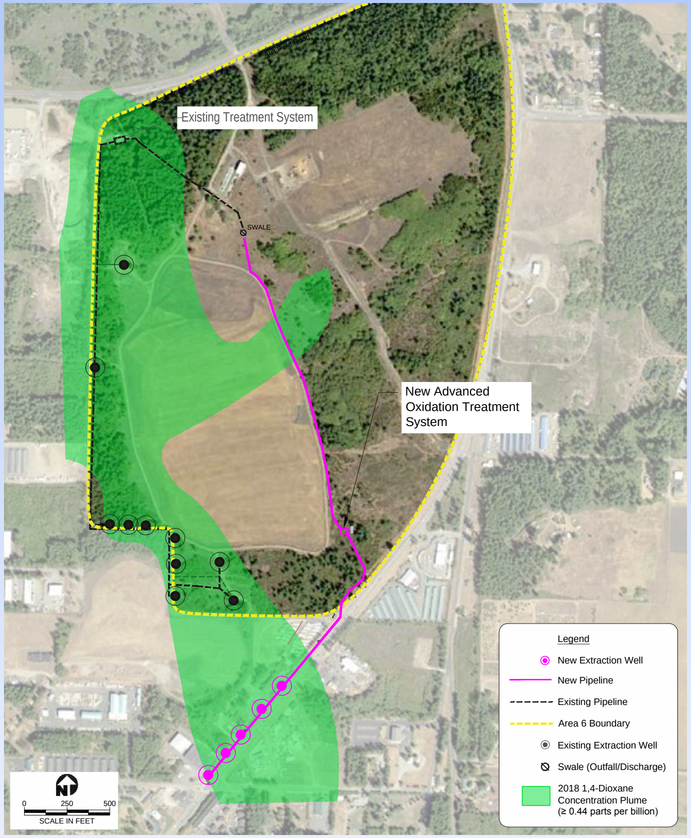
New Remedial Action Objectives

- Reduce the potential risk to COCs in groundwater for current and future users downgradient of Area 6.
- Actively remediate COCs in groundwater in the western and southern plume to the maximum extent possible followed by natural attenuation until goals are met.

Changes to Cleanup Levels

- Changing 1,1-dichloroethene from 0.07 µg/L (ecological risk based) to the EPA maximum contaminant level of 7 µg/L. Groundwater is too deep to be an ecological risk.
- Change vinyl chloride cleanup level from 0.1 µg/L to 0.29 µg/L based on updates to Washington MTCA.
- Establish MTCA Method B groundwater cleanup level of 0.44 µg/L for 1,4-dioxane

Constituent	Current Remediation Goal (µg/L)	Recommended ROD Amendment Remediation Goal (µg/L)	Transition Point from Active to Passive Remediation[c] (µg/L)	Maximum Concentration Detected at Site February 2018 (µg/L)
Trichloroethene (TCE)	5	5	15	57
1,1,1-Trichloroethane (1,1,1-TCA)	200	200	600	245
1,1-Dichloroethene (1,1-DCE)	0.07	7	21	64
Vinyl Chloride	0.1	0.29[a]	2	0.56
1,4-Dioxane	NE	0.44[b]	1.32	10



[a] The MTCA Method B groundwater cleanup level is based on a 1x10-6 risk. The proposed RG is based on a 1x10-5 risk which is consistent with the risk magnitude allowed in the 1993 ROD.

[b] EPA has set non-enforceable screening levels for 1,4-dioxane. The MTCA Method B groundwater cleanup level is being used as the RG.

[c] Active treatment goals are 3 times their respective RGs, with the exception of vinyl chloride which is based on the MCL.

COC	chemical of concern
MTCA	Washington State Model Toxics Control Act
RG	remediation goal
µg/L	micrograms per liter

Trichloroethene (TCE)

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Where Does TCE Come From?

- It is a manufactured chlorinated solvent with no natural occurrence.
- The main use of TCE is vapor degreasing of metal parts.
- TCE is also used as an extraction solvent for greases, oils, fats, waxes, and tars, a chemical intermediate in the production of other chemicals, and as a refrigerant.
- TCE is used in consumer products such as typewriter correction fluids, paint removers/strippers, adhesives, spot removers, and rug-cleaning fluids.

Sources and Potential Exposure

- For most people, exposure occurs when they:
  - Drink water contaminated with TCE. Chlorinated solvents disposed of or spilled on the ground can migrate into the groundwater.
  - Inhalation of TCE that can volatilize from contaminated water used for showering/bathing or other household use.
  - Persons may also be exposed to TCE through the use of products containing the chemical.
  - Dermal contact with contaminated water or products containing TCE; this is relatively minor compared to ingestion or inhalation exposures.
- People who work with TCE and other solvents may have the highest exposures from inhaling vapors.
- TCE will leave the body quickly through breathing out much of the TCE that reaches the bloodstream; most of the TCE breakdown products leave your body in the urine within a day.

Health Effects

- EPA has characterized TCE as "carcinogenic to humans" by all routes of exposure. This is based on convincing evidence of TCE exposure and kidney cancer, and strong evidence for non-Hodgkin lymphoma and liver cancer.
- Noncancer health effects may include reduced immune responses and fetal cardiac birth defects.
- TCE and its metabolites are excreted quickly, primarily in urine.

TCE Cleanup in Water

- The maximum February 2018 TCE concentration of 57 µg/L is equivalent to a cancer risk of approximately 1 in 10,000.
- EPA has set an enforceable maximum contaminant level in drinking water of 5 µg/L.
  - Drinking at this level over a 30 year period is estimated to result in 1 additional cancer per 100,000 exposed individuals.
- The TCE plume is contained by the current groundwater extraction system.

- TCE Cleanup Level
  - TCE remedial goal is 5 µg/L

µg/L	micrograms per liter

Vinyl Chloride

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Where Does Vinyl Chloride Come From?

- It is a manufactured chlorinated solvent with no natural occurrence.
- It is formed when larger chlorinated solvents, such as TCE breakdown in the environment.
- It is mostly used in production of polyvinyl chloride (PVC) to make plastic, pipes, wire coatings, and packaging materials.
- Smaller amounts are used in furniture and automobile upholstery, wall covering, housewares, and automotive parts. It was used in the past as a refrigerant.
- Low levels are also found in tobacco.

Sources and Potential Exposure

- For most people, exposure occurs when they:
  - Drink water contaminated with vinyl chloride. Chlorinated solvents disposed of or spilled on the ground can migrate into the groundwater.
  - Eat food in contact with contaminated packaging, this is less likely now because vinyl chloride-free packaging material is more prevalent.
  - Inhalation of vinyl chloride that can volatilize from contaminated water used for showering/bathing or other household use.
  - Dermal contact with contaminated water or products containing vinyl chloride; this is relatively minor compared to ingestion or inhalation exposures. People who work with vinyl chloride and other solvents may have the highest exposures from inhaling vapors.
- People who work with vinyl chloride and other solvents may have the highest exposures from inhaling vapors.
- Vinyl chloride will leave the body quickly through breathing out much of the vinyl chloride that reaches the bloodstream; most of the vinyl chloride breakdown products leave your body in the urine within a day.

Health Effects

- The health effects in people drinking water or breathing air contaminated with low levels of vinyl chloride are not well understood. Animal studies indicate:
  - Exposure to vinyl chloride during childhood increases the risk of developing cancer than if exposure only occurs during adult years.
  - Possible effects on fetal growth and development; birth defects not seen
  - Possible damage to sperm and testes. Vinyl chloride is a known liver carcinogen. Animal studies suggest infants and young children may be more susceptible than adults to cancer induced by vinyl chloride exposure.

Vinyl Chloride Cleanup Level in Water

- The maximum February 2018 vinyl chloride concentration of 0.56 µg/L is equivalent to an excess cancer risk of approximately 3 in 100,000.
- MTCA sets a groundwater cleanup level of 0.29 µg/L.
  - Drinking at this level over a 30 year period is estimated to results in 1 additional cancer per 100,000 exposed individuals
- Vinyl chloride preliminary remedial goal
  - Vinyl chloride preliminary remedial goal is 0.29 µg/L (this will become the remedial goal once established in the ROD Amendment)

µg/L micrograms per liter

1,4-Dioxane

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Where Does 1,4-Dioxane Come From?

- It is a manufactured chemical with no natural occurrence.
  - In the past, it was added to stabilize chlorinated solvents, including those used to clean aircraft and parts.
  - It is a by-product in antifreeze and aircraft deicing fluids.
  - It is a by-product in clear plastic such as water or soda bottles.
- Very low levels are found in consumer products and food.
- Very low levels are found in cosmetics, detergents, and shampoos.
  - Very low levels are found in food supplements, packaging adhesives, or food crops treated with pesticides that contain 1,4-dioxane.
  - It is used in the manufacture of some pharmaceuticals.

Sources and Potential Exposure

- Most 1,4-dioxane contamination found in groundwater comes from leaking storage tanks, discharges, and past disposal practices.
- It does not break down easily in water and travels ahead of other contaminants in the groundwater.
- For most people, exposure occurs when they:
  - Drink water contaminated with 1,4-dioxane. 1,4-Dioxane disposed of or spilled on the ground can migrate into the groundwater.
  - Eat food in contact with contaminated packaging; this exposure route has decreased.
  - Inhalation of 1,4-dioxane that can volatilize from contaminated water used for showering/bathing or other household use.
  - Dermal contact with contaminated water or products containing 1,4-dioxane; this is relatively minor compared to ingestion or inhalation exposures.
- 1,4-Dioxane is broken down and eliminated quickly from the body. It does not accumulate in plants or animals. It may be transferred to breast milk.

Health Effects

- The health effects in people drinking water contaminated with 1,4-dioxane are not well understood. Animal studies report:
  - Effects on liver and kidney
  - A slight effect on fetal growth and development; birth defects not seen
  - People breathing low levels of 1,4-dioxane for short periods of time have reported eye and nose irritation.
- EPA has classified 1,4-dioxane as likely to be carcinogenic to humans by all exposure routes. Animals given 1,4-dioxane in drinking water have had increased numbers of tumors of the nasal cavity, liver, and gall bladder.

1,4-Dioxane Cleanup Level in Water

- The maximum February 2018 1,4-dioxane concentration of 10 μg/L is equivalent to an excess cancer risk of approximately 2 in 100,000.
- MTCA sets a groundwater cleanup level of 0.44 μg/L.
  - Drinking at this level over a 30 year period is estimated to results in 1 additional cancer per 1,000,000 exposed individuals.
- 1,4-Dioxane preliminary remedial goal
  - 1,4-Dioxane preliminary remedial goal is 0.44 μg/L (this will become the remedial goal once established in the ROD Amendment)

μg/L micrograms per liter

Community Participation

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Where Do We Go From Here

November 21, 2018
Final Proposed Plan

November 21, 2018
December 21, 2018
Public Comment Period

Spring 2019
Record of Decision Amendment

Summer 2019
Construction Contracting

Winter 2019
Start South Plant Construction Process

Submit Written Comments

The Navy will accept written comment on the Proposed Plan during the public comment period.
Submit Written Comments to:

Public Affairs Officer
Leslie Yuenger
Department of the Navy
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Comments may also be sent via email to
Pao_Feedback@navy.mil

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