



Area 6 History

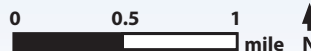
Additional information and updates can be found online at <http://go.usa.gov/xkMBC>

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



LEGEND

- Area 6 boundary
- Phase 2 Sampling Area
- Phase 1 Sampling Area
- Base boundary



1969 – Landfill begins operation

- 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)

1990 – Landfill designated as Superfund site

- Chlorinated volatile organic compounds, including vinyl chloride, present in groundwater

1993 – Landfill clean-up begins

- Engineered landfill cap constructed
- Monitoring and operation of a groundwater treatment system to address chlorinated volatile organic compounds (including breakdown products such as vinyl chloride)
- Ongoing monitoring activities have also included sampling off-base private wells and adding off-base monitoring wells to evaluate the migration of contaminants (including vinyl chloride and trichloroethene) in groundwater from Area 6

2001 – Excavation at Former Industrial Waste Disposal Area

- Approximately 3,472 tons of impacted soil excavated and properly disposed of

2010 – Washington State begins regulation of 1,4-dioxane

- 1,4-Dioxane present in groundwater on- and off-base
- 1,4-Dioxane not part of original clean-up effort in 1993
 - 1,4-Dioxane historically added to certain chlorinated solvents as a stabilizer
 - Existing groundwater treatment system does not remove 1,4-dioxane
- Refining and finalizing clean-up strategy

2017 – PFAS found in groundwater at Area 6

2018 – Additional Investigation – Area 6 Off-Base Sampling

- To assess whether vinyl chloride and 1,4-dioxane in groundwater have migrated farther to the south and/or west
- To assess whether PFAS in groundwater at Area 6 has migrated off-base
- 1,4-Dioxane present below action levels in off-base drinking water and groundwater wells to the south/southwest
- PFAS present in off-base drinking water wells to the southwest above the EPA LHA
- Navy will continue to provide bottled water for drinking and cooking for those with PFOS and/or PFOA LHA exceedances

AFFF aqueous film forming foam
 EPA U.S. Environmental Protection Agency

LHA lifetime health advisory
 PFAS per- and polyfluoroalkyl substances

PFOA perfluorooctanoic acid
 PFOS perfluorooctane sulfonate

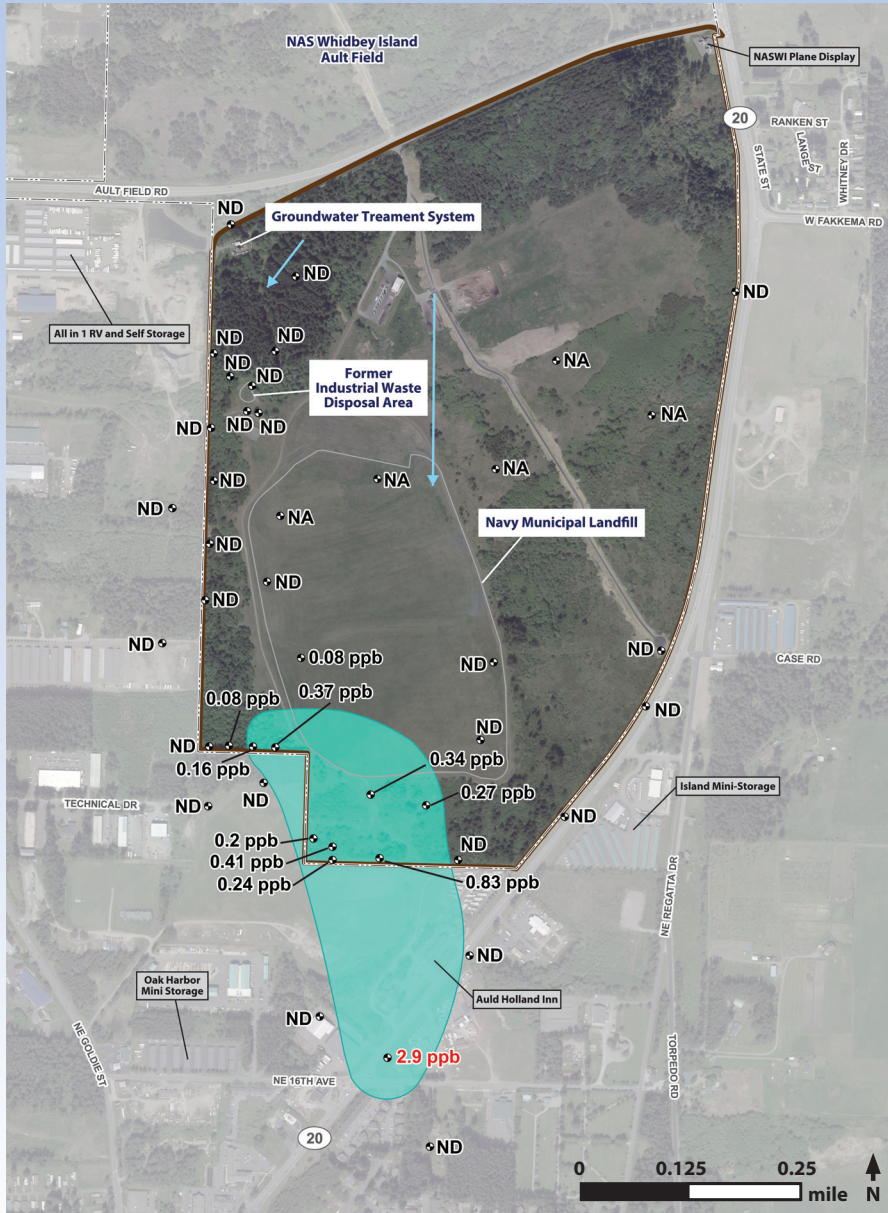
ppb parts per billion
 ppt parts per trillion



Why Is the Navy Sampling for Vinyl Chloride at Area 6?

Additional information and updates can be found online at <http://go.usa.gov/xkMBC>

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The Navy is being protective by identifying potential vinyl chloride in drinking water. The Navy is taking action for past disposal practices.

- Monitoring indicates that the vinyl chloride groundwater plume extends off-base.
- The EPA has established a maximum contaminant level for drinking water of 2 ppb for vinyl chloride.
- The Navy sampled off-base drinking water to evaluate potential human health risk associated with vinyl chloride from Area 6 and is taking action as necessary.

LEGEND

- Vinyl chloride groundwater plume (≥ 0.10 ppb)
- Area 6 boundary
- Base boundary
- Well
- Approximate groundwater flow direction

Notes:

1. Results in exceedance of the federal maximum contaminant level (2 ppb) are shown in red.
 2. Data shown in figure is from 2017.
- NA = well not analyzed for vinyl chloride
ND = vinyl chloride not detected

AFFF aqueous film forming foam
 EPA U.S. Environmental Protection Agency
 LHA lifetime health advisory
 PFAS per- and polyfluoroalkyl substances

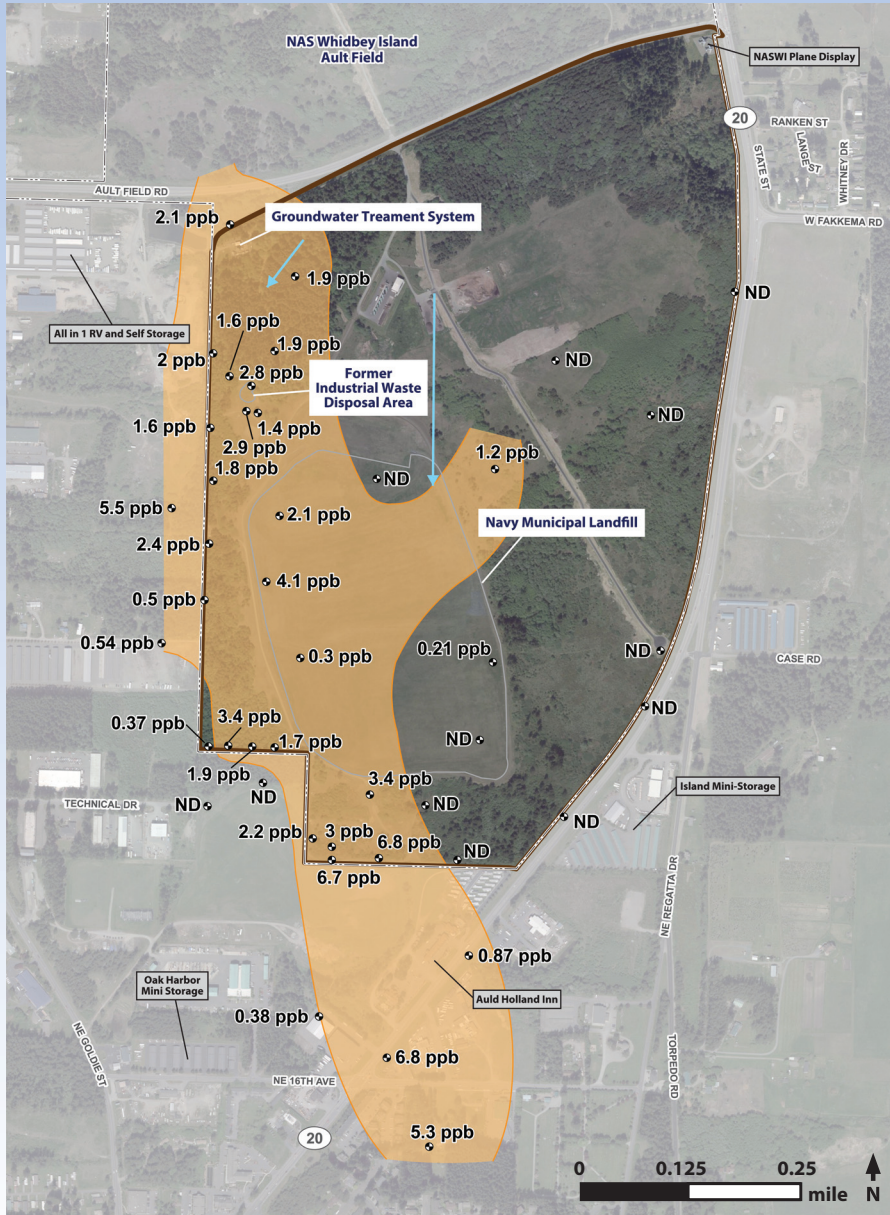
PFOA perfluorooctanoic acid
 PFOS perfluorooctane sulfonate
 ppb parts per billion
 ppt parts per trillion



Why Is the Navy Sampling for 1,4-Dioxane at Area 6?

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The Navy is being protective by identifying potential 1,4-dioxane in drinking water. The Navy is taking action for past disposal practices.

- Monitoring indicates that the 1,4-dioxane groundwater plume extends off-base.
- The EPA has not established a maximum contaminant level for 1,4-dioxane. The Navy has adopted 35 ppb as the drinking water exposure assessment action level, which is based on an EPA risk-based value for tap water.
- The Navy sampled off-base drinking water to evaluate potential human health risk associated with 1,4-dioxane from Area 6 and is taking action as necessary.

LEGEND

- 1,4-Dioxane groundwater plume (≥ 0.44 ppb)
- ▭ Area 6 boundary
- ▭ Base boundary
- Well
- ➔ Approximate groundwater flow direction

Notes:

1. There were no results in exceedance of the EPA value for cancer risk in tap water (35 ppb).
 2. Data shown in figure is from 2017.
- ND = 1,4-dioxane not detected

AFFF aqueous film forming foam
 EPA U.S. Environmental Protection Agency
 LHA lifetime health advisory
 PFAS per- and polyfluoroalkyl substances

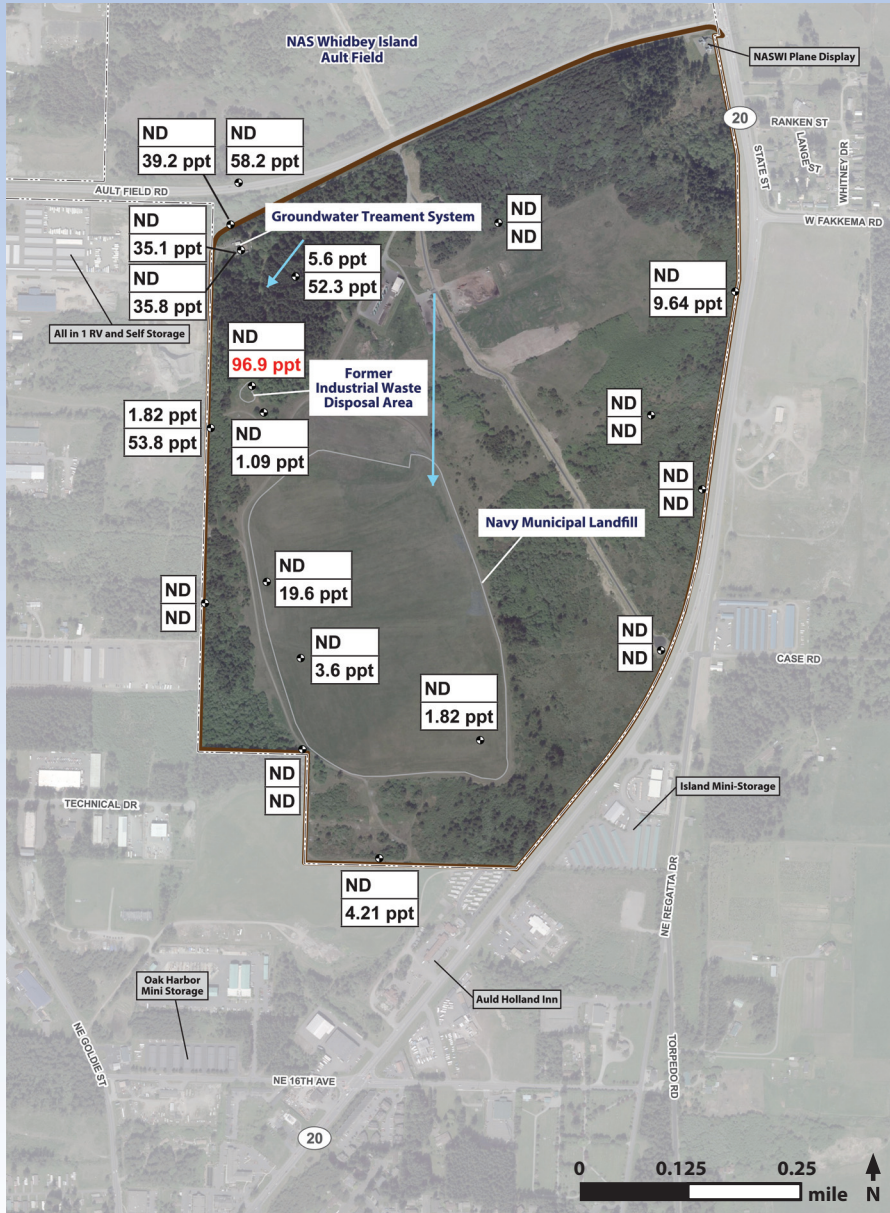
PFOA perfluorooctanoic acid
 PFOS perfluorooctane sulfonate
 ppb parts per billion
 ppt parts per trillion



Why Is the Navy Sampling for PFAS Off-Base at Area 6?

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The Navy is being protective by identifying potential unregulated compounds (PFAS) in drinking water.

- The Navy used AFFF, a source of PFAS, for fire fighting.
- The EPA established a lifetime health advisory (70 ppt) for two PFAS, specifically PFOS and PFOA, in drinking water.
- Navy policy is to identify and prioritize locations with the potential for exposure to PFOS and/or PFOA.
- PFOS and PFOA have been identified in groundwater at Area 6.
- The Navy sampled off-base drinking water to evaluate potential human health risk associated with PFOS and PFOA from Area 6 and is taking action as necessary.

LEGEND

- Area 6 boundary
- Base boundary
- Groundwater monitoring well
- Approximate groundwater flow direction

Notes:

1. Results in exceedance of the EPA lifetime health advisory for PFOS and/or PFOA (70 ppt) are shown in red.
 2. Data shown in figure is from December 2017 and February 2018.
- ND = not detected

PFOS concentration
PFOA concentration

AFFF aqueous film forming foam
 EPA U.S. Environmental Protection Agency
 LHA lifetime health advisory
 PFAS per- and polyfluoroalkyl substances

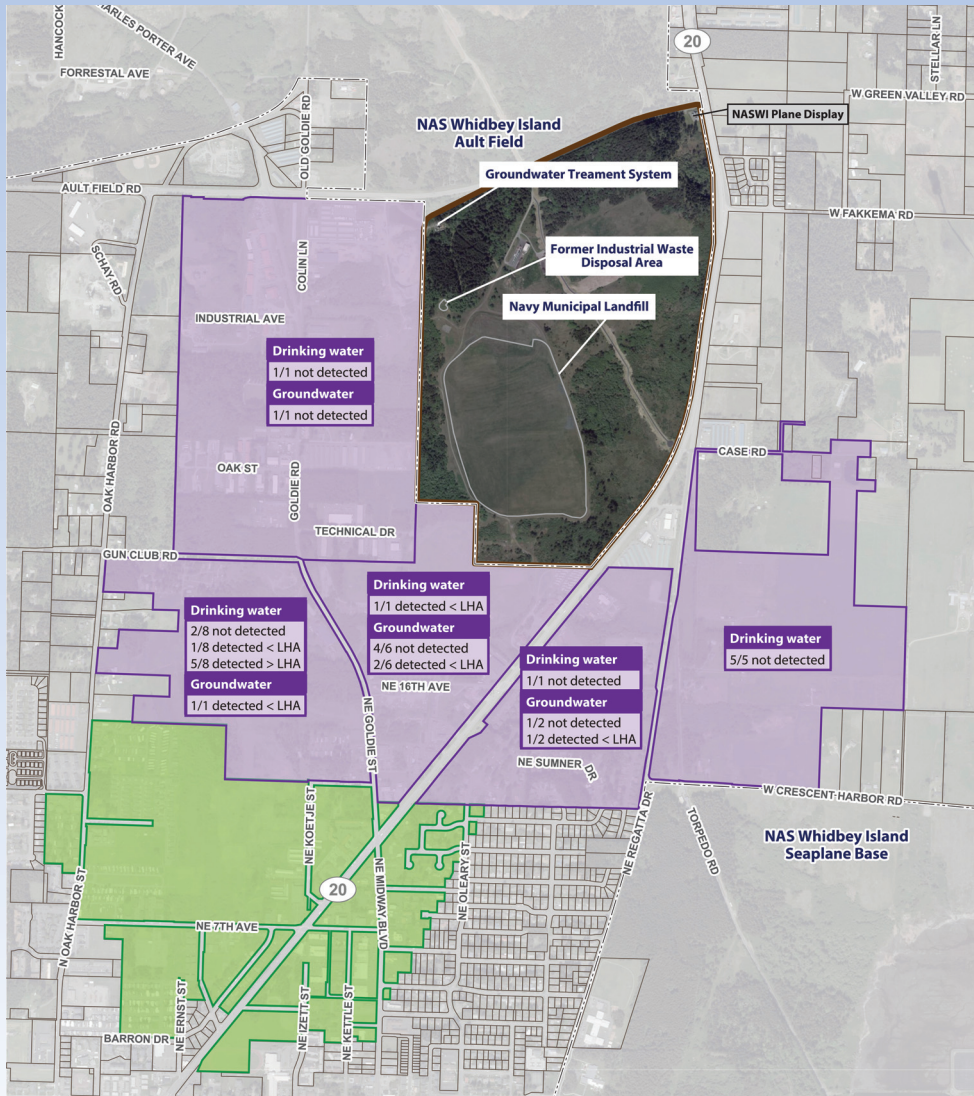
PFOA perfluorooctanoic acid
 PFOS perfluorooctane sulfonate
 ppb parts per billion
 ppt parts per trillion



Off-Base Drinking Water and Groundwater PFAS Sampling near Area 6

Additional information and updates can be found online at <http://go.usa.gov/xkMBC>

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Area 6 Off-Base Decision-Making Process

- The Phase 1 Off-Base Sampling Area included parcels within 1/2 mile in the direction of groundwater flow to the south and the west of the landfill boundary.
- PFOS and/or PFOA were detected above the action level in five drinking water wells southwest of Area 6.
- The Navy is providing bottled water for residents served by these wells until a long-term solution is implemented.
- The Phase 2 Off-Base Sampling Area includes parcels within 1/2 mile in the direction of groundwater flow to the southwest of the exceedance area.
- If your property is within the Phase 2 Sampling Area and has a well, the Navy will sample your well for PFOS, PFOA, 1,4-dioxane, and vinyl chloride. The Navy will also sample wells within the Phase 1 Sampling Area that have not yet been tested.
- The Navy will provide an alternate water source if your drinking water well exceeds the action levels for PFOS, PFOA, 1,4-dioxane, and/or vinyl chloride.

LEGEND

- Area 6 boundary
- Phase 2 Sampling Area
- Phase 1 Sampling Area
- Base boundary

Scale: 0, 0.25, 0.5 mile

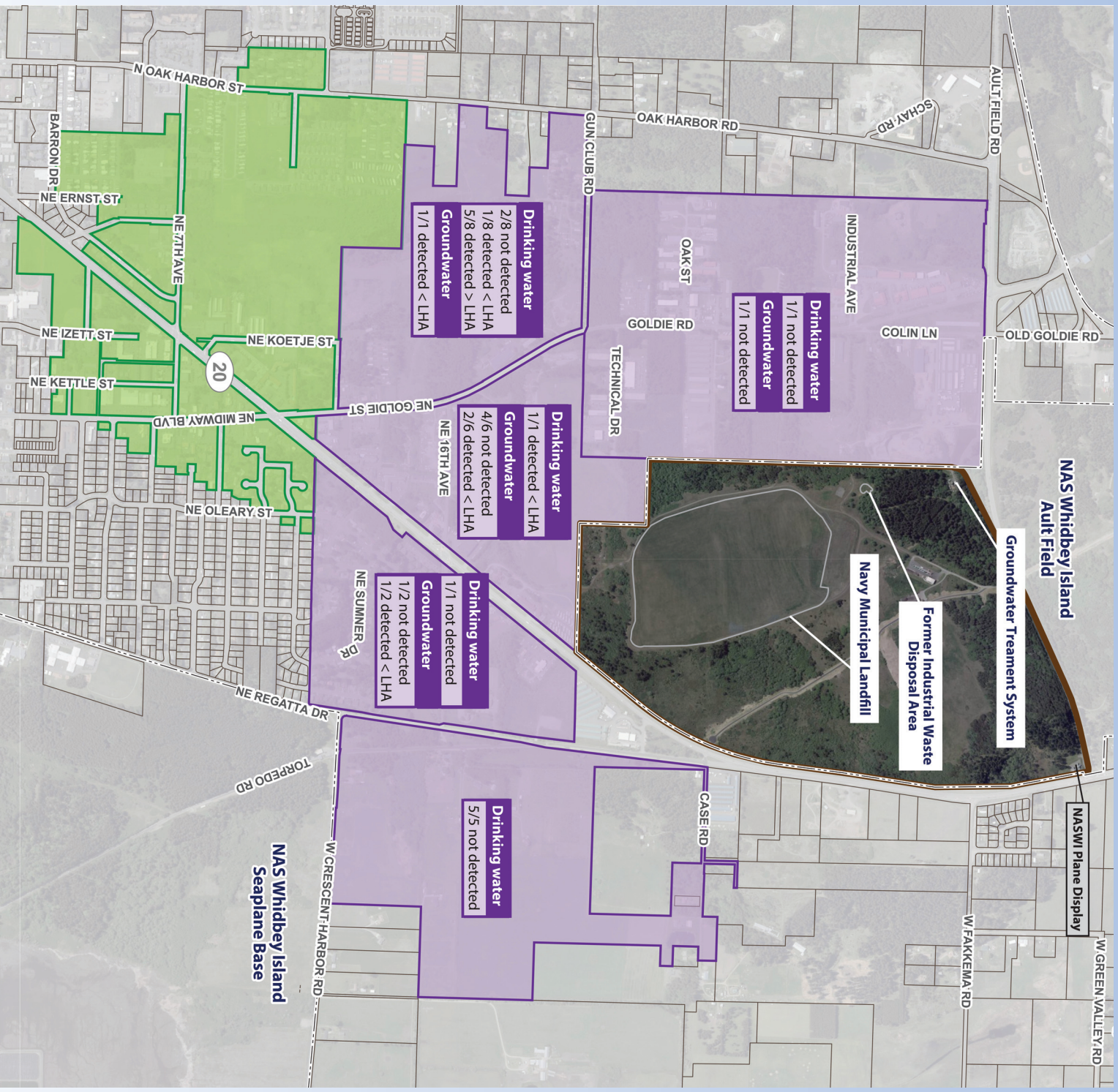
AFFF	aqueous film forming foam	PFOA	perfluorooctanoic acid
EPA	U.S. Environmental Protection Agency	PFOS	perfluorooctane sulfonate
LHA	lifetime health advisory	ppb	parts per billion
PFAS	per- and polyfluoroalkyl substances	ppt	parts per trillion



Off-Base Drinking Water PFAS Sampling near Area 6

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LEGEND

- Area 6 boundary
- Phase 1 Sampling Area
- Phase 2 Sampling Area
- Base boundary



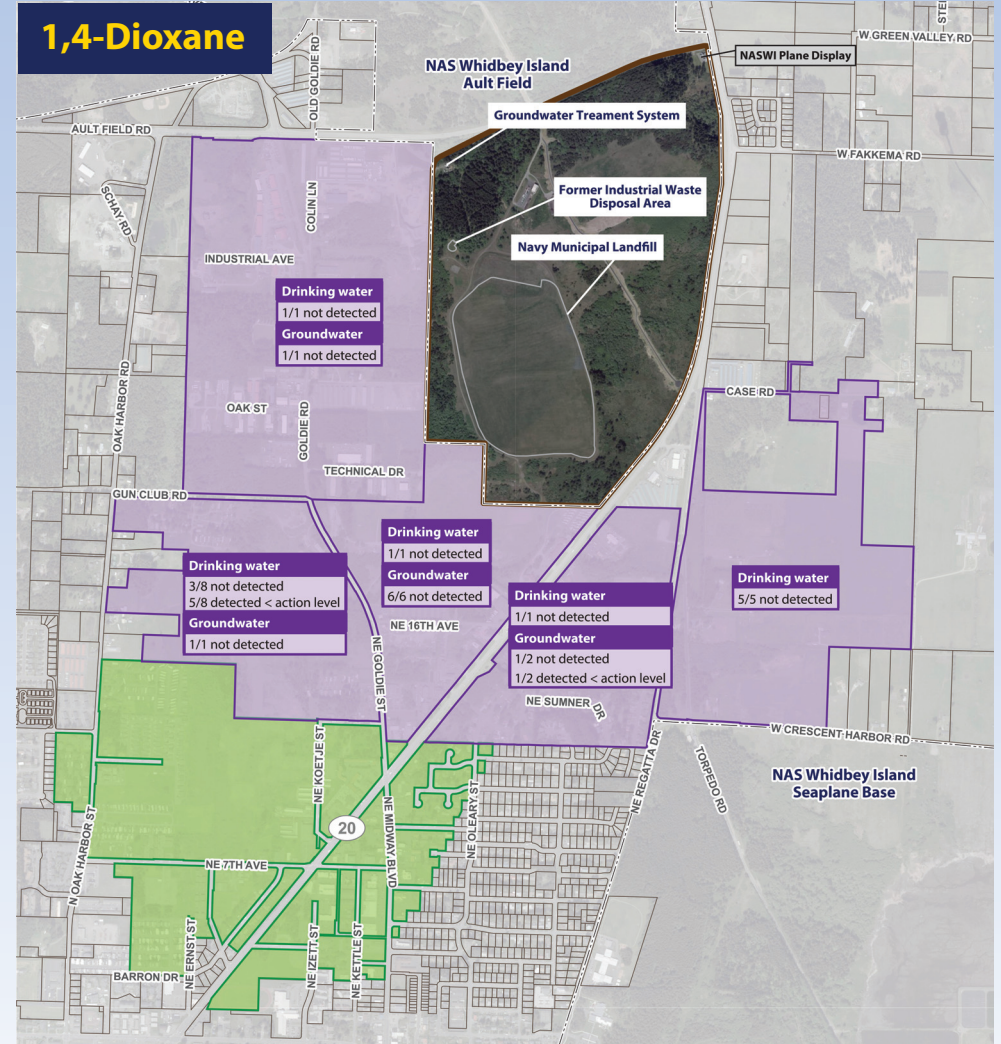
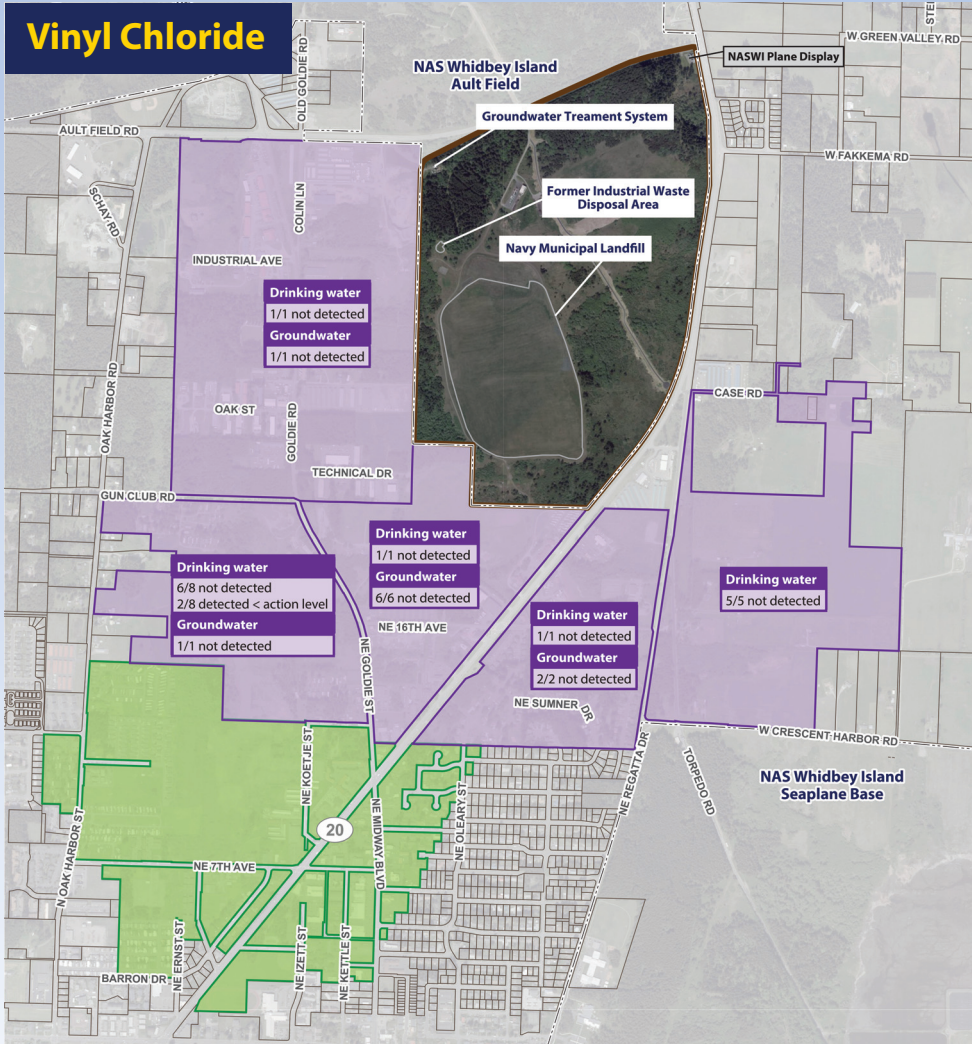
- AFPP aqueous film forming foam
- EPA U.S. Environmental Protection Agency
- LHA lifetime health advisory
- PFAS per- and polyfluoroalkyl substances
- PFOA perfluorooctanoic acid
- PFOs perfluorooctane sulfonate
- ppb parts per billion
- ppt parts per trillion



Off-Base Drinking Water and Groundwater Vinyl Chloride and 1,4-Dioxane Sampling near Area 6

Additional information and updates can be found online at <http://go.usa.gov/xkMBC>

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



LEGEND

- Area 6 boundary
- Phase 1 Sampling Area
- Phase 2 Sampling Area
- Base boundary



AFFF aqueous film forming foam
EPA U.S. Environmental Protection Agency

LHA lifetime health advisory
PFAS per- and polyfluoroalkyl substances

PFOA perfluorooctanoic acid
PFOS perfluorooctane sulfonate

ppb parts per billion
ppt parts per trillion



Vinyl Chloride

Additional information and updates can be found online at <http://go.usa.gov/xkMBC>

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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 trichloroethene (TCE) or tetrachloroethene (PCE) break down in the environment. TCE, PCE, and other chlorinated solvents were used to clean aircraft and parts.
- It is mostly used in the production of polyvinyl chloride (PVC) to make plastic, pipes, wire coatings, and packaging materials.
- Smaller amounts are used in furniture and automobile upholstery, wall coverings, housewares, and automotive parts; it was also used in the past as a refrigerant.
- Low levels are found in tobacco smoke.

Sources and Potential Exposure

- For most people, exposure occurs when they:
 - Drink contaminated groundwater. Chlorinated solvents disposed of or spilled on the ground can migrate into the groundwater.
 - Eat food in contact with contaminated packaging; this exposure route has decreased.
 - Breathe air after evaporation from contaminated water used for bathing or laundering.
 - Breathe exhaust from factories or evaporation from storage areas.
 - Come into skin contact with contaminated groundwater or products containing vinyl chloride; this exposure route is not significant.
- People who work with vinyl chloride and other solvents may have the highest exposures from inhaling vapors.
- Vinyl chloride is eliminated quickly from the body and does not accumulate in plants or animals. It has not been found in breast milk.

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 report:
 - Effects on liver, kidney, and nervous system
 - 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 Action Level in Water

- EPA has set an enforceable maximum contaminant level in drinking water of 2 ppb.
- Maximum contaminant levels are set as close to health goals as possible but consider cost to remove and ability to detect.
- The Navy will provide bottled water if drinking water has vinyl chloride levels higher than 2 ppb.
 - Non-cancer effects at this level are not expected.
 - Drinking at this level over a lifetime adds cancer risk of one additional cancer in 10,000 people.

AFFF	aqueous film forming foam	PFOA	perfluorooctanoic acid
ATSDR	Agency for Toxic Substances and Disease Registry	PFOS	perfluorooctane sulfonate
EPA	U.S. Environmental Protection Agency	ppb	parts per billion
LHA	lifetime health advisory	ppt	parts per trillion
PFAS	per- and polyfluoroalkyl substances		



1,4-Dioxane

Additional information and updates can be found online at <http://go.usa.gov/xkMBC>

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

Where Does 1,4-Dioxane Come From?

- It is used in the production of solvents and plastics.
 - 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 contaminated groundwater.
 - Eat food in contact with contaminated packaging; this exposure route has decreased.
 - Breathe air after evaporation from contaminated water used for bathing or laundering.
 - Come into skin contact with contaminated groundwater or products containing 1,4-dioxane.
- 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 Action Level in Water

- EPA has not set an enforceable maximum contaminant level for 1,4-dioxane.
- EPA has set a non-enforceable lifetime health advisory of 200 ppb for 1,4-dioxane, which:
 - Protects the general population over a lifetime; non-cancer health effects are not expected.
 - Assumes 20% of exposure from water and 80% from other sources.
- The Navy will provide bottled water if drinking water has 1,4-dioxane levels higher than 35 ppb.
 - Non-cancer effects at this level are not expected.
 - Drinking at this level over a lifetime adds cancer risk of one additional cancer in 10,000 people.

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ATSDR	Agency for Toxic Substances and Disease Registry	PFOS	perfluorooctane sulfonate
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PFAS	per- and polyfluoroalkyl substances		



Per- and Polyfluoroalkyl Substances (PFAS)

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

Where Do PFAS Come From?

- They are manufactured compounds with no natural occurrence.
- They have been used since the 1950s in many products.
- They last a long time in the environment.
- They are globally distributed and have been detected in people, wildlife, and fish.



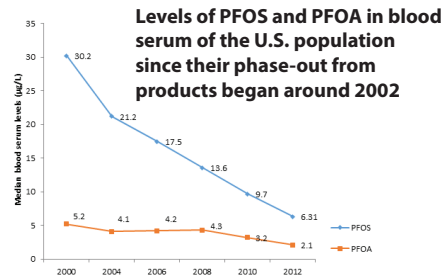
AFFF, paints and stains, water-repelling fabrics



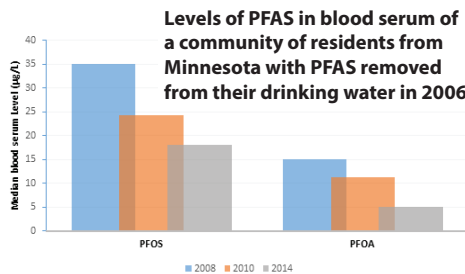
nonstick cookware, food packaging, stain-resistant carpets

Sources and Potential Exposure

- Monitoring by the Centers for Disease Control estimates that most people in the U.S. have PFAS in their bodies.
- Some PFAS can build up in the body and leave slowly over time through urine.
- For most people, exposure occurs when they:
 - Ingest contaminated food, water, or soil.
 - Breathe air that contains contaminated dust from carpets, upholstery, clothing, dirt, etc.
- PFAS reach the fetus or nursing infant of a mother who is exposed.
- Exposure is not significant through skin contact or inhalation when bathing or showering.



Source: CDC National Health and Nutrition Examination Survey



Source: Minnesota Department of Health. Available from: <http://www.health.state.mn.us/divs/hpcd/tracking/biomonitoring/projects/emetro-landing.html>

Health Effects

- More research is needed to confirm or rule out possible links between exposure and health effects. Based on limited evidence from studies with people, the potential health effects include:
 - Increased cholesterol levels
 - Changes in growth, learning, and behavior of the developing fetus and child
 - Changes in the immune system
 - Decreased fertility
 - Altered thyroid function
 - Increased risk of certain types of cancer
- Animals in PFAS studies exhibit developmental, reproductive, and liver effects, as well as an increased occurrence of cancer.
- The presence of PFAS in a well or water system does not predict whether any health effects will occur.

PFAS Action Level in Water

- EPA has not set an enforceable maximum contaminant level for any PFAS.
- EPA has set a lifetime health advisory of 70 ppt in drinking water for PFOS and PFOA combined, which:
 - Protects sensitive populations including the fetus or nursing infant of a mother who is exposed.
 - Protects the general population for a lifetime.
 - Assumes 20% of exposure from drinking water and 80% from other sources.
 - Is based on animal studies and considers health effects found in exposed populations.
- The Navy will provide bottled water if drinking water has PFOS or PFOA levels higher than 70 ppt individually or combined.

AFFF aqueous film forming foam
 ATSDR Agency for Toxic Substances and Disease Registry
 EPA U.S. Environmental Protection Agency
 LHA lifetime health advisory
 PFAS per- and polyfluoroalkyl substances

PFOA perfluorooctanoic acid
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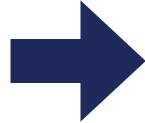


Next Steps

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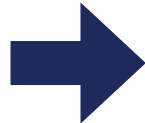
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Is the result **above** the action level?



The Navy will provide alternate water for drinking and cooking.

Is the result **at or below** the action level?



No immediate action is needed; the Navy may monitor.

Additional Follow-On Actions

- Meet with homeowners with results above action levels to gather data needed to develop long-term solutions.
- Continue to communicate with members of the public through the press, websites, emails, phone line, and Restoration Advisory Board.
- Continue to partner with local, state, and federal environmental and health agencies to determine the best path forward.
- Continue to investigate groundwater for PFAS, vinyl chloride, and 1,4-dioxane source locations, migration, and exposure pathways.
- Continue to monitor the science and regulations related to PFAS, vinyl chloride, and 1,4-dioxane.
- Refine and finalize clean-up strategy for 1,4-dioxane.

Please help us:

- Identify water wells in sampling area.
- Sample wells to aid site investigations.
- Understand the community's concerns by participating in the Restoration Advisory Board.



We Need Your Help – Drinking Water Sampling Process

Additional information and updates can be found online at <http://go.usa.gov/xkMbc>

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Sampling Process

- We encourage you to contact us if you've received a sampling notification letter and have not signed up for sampling.
- We need your help to:
 - Make your appointment (sampling will take less than an hour).
 - Review and fill out the questionnaire.
- A team of qualified professionals will:
 - Collect cold water from the sample point (water will run for 3–5 minutes).
 - Analyze the sample according to EPA guidelines for a sampling and analysis process that follows strict quality control and quality assurance protocols.



Other Ways to Schedule an Appointment

To schedule an appointment for sampling your drinking water, please contact:
PAO_feedback@navy.mil (email) or
360-396-1030 (voicemail)



Sign Up for Your Sampling Appointment Here

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Off-Base Drinking Water Well Sampling

- Drinking water samples will be collected **Monday–Saturday, June 25–30** and **Monday–Saturday, July 9–14**.
- Sampling appointments are available **8 a.m.–7 p.m. Monday–Friday** and **9 a.m.–1 p.m. Saturday**.
- The homeowner must give permission for sampling.
- Sampling takes less than an hour.
- An adult resident (18 years of age or older) must be present during sampling.

Area 6 Off-Base Drinking Water Sampling Phase 1 and Phase 2 Activities – 2018

Phase 1 Public Meeting
early February

Phase 1 Drinking Water Sampling
mid-February– mid-April

Phase 1 Results
mid-April–mid-June

Phase 2 Open House Public Meeting
June 18

Phase 2 Drinking Water Sampling
June 25–July 14

Phase 2 Results
and Public Meeting
July–September

FEBRUARY

MARCH

APRIL

MAY

JUNE

JULY

AUGUST

SEPTEMBER

WE ARE HERE

