**Naval Facilities Engineering Systems Command Southwest**
**San Diego, California**

# Final

# Work Plan

Site Inspection for Per- and Polyfluoroalkyl Substances (PFAS) at IR Sites 7, 14, 21, and 24 and AOIs 1, 2, 3, 4, and 54

Former Naval Station Treasure Island
San Francisco, California

June 2022

**Approved for public release; distribution is unlimited.**

**Naval Facilities Engineering Systems Command Southwest**
**San Diego, California**

# Final

# Work Plan

## Site Inspection for Per- and Polyfluoroalkyl Substances (PFAS) at IR Sites 7, 14, 21, and 24 and AOIs 1, 2, 3, 4, and 54

Former Naval Station Treasure Island
San Francisco, California

June 2022

DCN: MMAC-4010-4484-0028

**Prepared for:**
United States Department of the Navy
Base Realignment and Closure Program Management Office
33000 Nixie Way
Building 50, Suite 207
San Diego, CA 92147

**Prepared by:**

Multi-MAC JV
9177 Sky Park Court
San Diego, CA 92123-4341
(858) 278-3600
Contract N62470-19-D-4010; Task Order N6247321F4484

# FINAL

# WORK PLAN

For

# SITE INSPECTION FOR PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) AT IR SITES 7, 14, 21, AND 24 AND AOIS 1, 2, 3, 4, and 54

## FORMER NAVAL STATION TREASURE ISLAND
## SAN FRANCISCO, CALIFORNIA

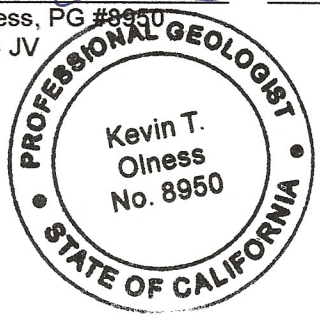
**June 2022**

**Prepared for**
**United States Department of the Navy**
**Base Realignment and Closure Program Management Office West**

---

**REVIEW AND APPROVAL**

| | | | |
|---|---|---|---|
| Project Manager: | Lansana Coulibaly<br>Multi-MAC JV | 858-633-2795<br>Phone | 06/09/2022<br>Date |
| Principal Geologist: | Kevin Olness, PG #8950<br>Multi-MAC JV | 619-204-8195<br>Phone | 06/09/2022<br>Date |



This page is intentionally blank.

# Table of Contents

# Table of Contents (continued)

**Page**

## List of Appendices



## List of Attachments



## List of Figures

# Acronyms and Abbreviations

µg/L ..... microgram(s) per liter

AFFF ..... aqueous film-forming foam
AOI ..... Area of Interest

Basin Plan ..... Water Quality Control Plan for the San Francisco Bay Basin
bgs ..... below ground surface
BRAC ..... Base Realignment and Closure

CE2-Kleinfelder JV ..... CE2-Kleinfelder Joint Venture
CERCLA..... Comprehensive Environmental Response, Compensation, and Liability Act

DCN ..... document control number
DDW..... Division of Drinking Water
DERP ..... Defense Environmental Restoration Program
DoD ..... United States Department of Defense
DON ..... United States Department of the Navy
DPT ..... direct-push technology

EBS ..... environmental baseline survey
ESL ..... environmental screening level

HA ..... health advisory

IDW ..... investigation-derived waste
IR..... Installation Restoration

LC/MS-MS.....liquid chromatography/tandem mass spectroscopy

mg/kg ..... milligram(s) per kilogram

NAVD88 ..... North American Vertical Datum of 1988
NAVFACSYSCOM SW..... Naval Facilities Engineering Systems Command Southwest
NCP..... National Oil and Hazardous Substance Pollution Contingency Plan
NEI ..... Nicklaus Engineering, Inc.
NIRIS..... Naval Installation Restoration Information Solution
NSTI ..... Naval Station Treasure Island

# Acronyms and Abbreviations (continued)

NTTC ..... Naval Technical Training Center

OWS ..... oil/water separator

PA ..... preliminary assessment
PFAS ..... per- and polyfluoroalkyl substances
PFBS ..... perfluorobutanesulfonic acid
PFOA ..... perfluorooctanoic acid
PFOS ..... perfluorooctane sulfonate
PMO ..... Program Management Office
PVC ..... polyvinyl chloride

QA ..... quality assurance
QC ..... quality control
QSM ..... Quality Systems Manual

RSL ..... regional screening level
RWQCB .... California Regional Water Quality Control Board, San Francisco Bay Region

SAP ..... Sampling and Analysis Plan
SFFD ..... San Francisco Fire Department
SI ..... site inspection
State Water Board ..... California State Water Resources Control Board

TI ..... Treasure Island
TIDA ..... Treasure Island Development Authority
TtEMI ..... Tetra Tech EM Inc.

U.S. EPA ..... United States Environmental Protection Agency
UST ..... underground storage tank

Wood ..... Wood Environment & Infrastructure Solutions, Inc.
WWTP ..... wastewater treatment plant

YBI ..... Yerba Buena Island

# 1.0 Introduction

Multi-MAC JV, which is composed of joint venture members Wood Environment & Infrastructure Solutions, Inc. (Wood) and Nicklaus Engineering, Inc. (NEI), has prepared this Work Plan to conduct a site inspection (SI) for investigation of per- and polyfluoroalkyl substances (PFAS) in soil, sediment, and groundwater at four Installation Restoration (IR) sites and five Areas of Interest (AOIs) at former Naval Station Treasure Island (NSTI), in San Francisco, California (Figures 1 and 2). IR sites and AOIs were selected for the SI based on the results from the basewide preliminary assessment (PA), which identified sites that have the potential to be impacted by the environmental release of materials known to contain PFAS (Multi-MAC JV, 2021). Although IR Site 5 was identified separately in the PA, the PA indicates that IR Site 5 was merged with IR Site 24 in 2001 (Multi-MAC JV, 2021); therefore, the investigation for the IR Site 5 area will be addressed under IR Site 24 for this SI. This Work Plan was prepared on behalf of the Base Realignment and Closure (BRAC) Program Management Office (PMO) West under Contract Number N62473-16-D-2405, Task Order Number N6247321F4484.

BRAC PMO is conducting an investigation at former NSTI to determine PFAS impacts on soil, sediment, and groundwater from a potential release as a result of prior United States Department of the Navy (DON) activities. With the exception of IR Site 7, where two grab groundwater samples were collected during a previous investigation of adjacent IR Site 6, PFAS have not been evaluated as part of previous investigations at the specific IR sites and AOIs included in this SI. Therefore, the presence of PFAS at these IR Sites and AOIs is currently unknown.

Pursuant to the findings of the PA, this Work Plan describes the sites, background information, project objective, and planned field investigation and rationale for sampling soil, sediment, and groundwater for PFAS. The rationale for including each IR site and AOI in this SI is presented in Section 3.0. A Sampling and Analysis Plan (SAP) is included as Appendix A to provide procedures for soil, sediment, and groundwater sampling, analysis, and quality assurance (QA) procedures. Detailed descriptions of requirements for conducting fieldwork and data management activities are presented in the SAP (i.e., the Field Sampling Plan and Quality Assurance Project Plan). In addition, the SAP provides the rationale for specific sampling locations within each IR site and AOI (refer to SAP Worksheet #17). This SI Work Plan meets the requirements of the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) for an SI.

## 1.1 PFAS Description and History of Use

PFAS are a class of synthetic organofluorine compounds that possess chemical structures that give them unique properties, including thermal stability and the ability to

repel both water and oil. The characteristics of these compounds that create these unique properties also make this class of compounds extremely resistant to biodegradation, photo-oxidation, direct photolysis, and hydrolysis. They have been used in hundreds of industrial applications and consumer products such as carpeting, apparel, upholstery, personal care products, nonstick cookware, food paper wrappings, and metal plating, and aqueous film forming foam (AFFF) (United States Environmental Protection Agency [U.S. EPA], 2016a).

PFAS have been identified by the DON as chemicals of emerging concern. PFAS are of environmental concern because of their persistence in the environment and in organisms, migration potential in aqueous systems (e.g., groundwater), historically ubiquitous use in commercial products, and possible adverse health effects at low levels of exposure (U.S. EPA, 2017). At this time, only three PFAS have U.S. EPA-derived toxicity values available to help understand potential health effects from exposure: perfluorobutanesulfonic acid (PFBS), perfluorooctanoic acid (PFOA), and perfluorooctane sulfonate (PFOS). In 2016, U.S. EPA issued a drinking water lifetime health advisory (HA) of 0.07 microgram per liter (µg/L) for PFOA and PFOS. When both PFOA and PFOS are found in drinking water, the combined concentrations of PFOA and PFOS (PFOA+PFOS) should also be compared with the 0.07 µg/L lifetime HA level because of similarities in the noncancer health effects of PFOS and PFOA (U.S. EPA 2016a, 2016b, 2016c). The lifetime HA has been a driving force for investigation and remediation efforts.

On December 19, 2019, U.S. EPA published a guidance document providing interim recommendations for addressing groundwater impacted with PFOA and/or PFOS. The guidance document recommends that screening of sites be based on a target hazard quotient of 0.1 for PFOA or PFOS individually, which is currently 0.04 µg/L (i.e., site groundwater concentrations should be compared with one-tenth of the calculated tap water regional screening level [RSL] of 0.4 µg/L for PFOS or PFOA, which works out to 0.04 µg/L). The reason for selecting a target quotient of 0.1 (i.e., one-tenth the acceptable concentration for noncancer effect) is to protect against the possible co-occurrence in groundwater of multiple PFAS and other chemicals with similar additive health effects. In addition, it recommends that the U.S. EPA lifetime HA of 0.07 µg/L be used as the preliminary remediation goal for groundwater that is a current or potential source of drinking water where no state or tribal maximum contaminant level or other applicable or relevant or appropriate requirements are available or sufficiently protective (U.S. EPA, 2019).

In June 2018, the California State Water Resources Control Board (State Water Board) Division of Drinking Water (DDW) introduced notification levels for PFOA and PFOS. On July 13, 2018, the State Water Board released guidelines for testing and reporting of PFOA and PFOS, based on DDW recommendations. Notification levels are

nonregulatory, health-based advisory levels established by the DDW for chemicals in drinking water that lack enforceable regulatory standards called maximum contaminant levels. The interim notification levels were 0.014 µg/L for PFOA and 0.013 µg/L for PFOS. In addition to setting interim notification levels for PFOA and PFOS, the State Water Board also included an interim response level of 0.07 µg/L combined for PFOA and PFOS, consistent with the drinking water lifetime HA issued by U.S. EPA in 2016; if the combined level is exceeded, the state recommended that the water system remove the source from service. The guidelines did not require public water systems to test for PFOA and PFOS but did require water systems that voluntarily opted to test to report the results if the notification levels were exceeded.

On July 31, 2019, the California Legislature passed Assembly Bill 756, authorizing the State Water Board to require public water systems to test for PFAS. If any monitoring undertaken pursuant to a State Water Board order results in a confirmed PFAS detection, the water system must report that detection in its annual consumer confidence report. For PFAS compounds with notification levels, water systems are also required to report the response levels. When a detection exceeds the response level, the water system must take the water source out of use or provide public notification within 30 days of the confirmed detection. On August 23, 2019, the State Water Board announced it had lowered its notification levels for PFOA and PFOS to 0.0051 µg/L and 0.0065 µg/L, respectively. Furthermore, on February 6, 2020, the State Water Board also lowered the response levels to 0.010 µg/L for PFOA and 0.040 µg/L for PFOS (State Water Board, 2020).

In May 2020, the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) published interim final environmental screening levels (ESLs) for PFOS and PFOA for groundwater and soil. Groundwater ESLs included values for direct exposure, maximum contaminant level priority, ecotoxicity for freshwater and saltwater, and seafood ingestion for freshwater and saltwater. Soil ESLs were also calculated for direct exposure, terrestrial habitat, and leaching to groundwater. These interim values are planned to be updated and incorporated into the ESL Workbook and User's Guide as part of the next major ESL update, which is tentatively scheduled for 2021 (RWQCB, 2020).

In 2021, the United States Department of Defense (DoD) issued an updated memorandum (DoD, 2021) addressing PFAS in soil and groundwater within the Defense Environmental Restoration Program (DERP) under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Screening levels for PFOS and PFOA in soil and groundwater were calculated by the DoD using the U.S. EPA online calculator on April 6, 2018, and the screening level for PFBS was based on the U.S. EPA November 2021 RSLs for PFBS (U.S. EPA, 2021). The current screening levels were identified as part of the memorandum (DoD, 2021). The screening level

identified for PFOA and PFOS in soil is 0.13 milligram per kilogram (mg/kg), and for PFOA and PFOS in groundwater is 0.04 µg/L. The screening level identified for PFBS in soil is 1.9 mg/kg, and for PFBS in groundwater is 0.60 µg/L. All screening criteria are based on a target hazard quotient of 0.1.

No U.S. EPA published, peer-reviewed, or consensus environmental screening values currently exist for PFAS in marine sediments. Screening benchmarks will be selected from currently available and representative ecological screening values in marine environments (Divine et al., 2020).

The use of aqueous film-forming foam (AFFF) is considered to be a potential source for release of PFAS to the environment at DON installations. The DON has used AFFF containing PFAS in fire training exercises, in suppression of aircraft and other vehicle fires, and in aircraft hangar fire suppression systems at many installations across the United States. AFFFs containing PFAS were manufactured as early as the mid-1960s and were put into routine use by the early 1970s; some PFAS are still required as an integral component of AFFF by the military specification.

The potential release mechanisms of PFAS to the environment at DON facilities include AFFF usage as part of the following activities:

- Fire training exercises at burn pits or structures
- Crash crew training exercises
- Hangar fire suppression system operations, testing, and accidental releases
- Firefighting and crash response vehicle testing and cleanout
- Emergency response actions, such as at aircraft and vehicle crash sites
- Responses to Class B or fuel fires

Other potential releases of PFAS may have occurred in relation to improper filling and leakage from storage tanks, firefighting trucks, or crash response vehicles. PFAS may be released from oil/water separators (OWSs) receiving PFAS-containing wastewater and from landfills where PFAS-containing materials or waste were disposed of. Releases may also be associated with the use of PFAS in mist suppression systems associated with chromium plating operations if present at an installation (DON, 2016).

## 1.2 Project History

A basewide PFAS PA was completed in July 2021 (Multi-MAC JV, 2021) to identify AOIs within the boundaries of former NSTI where PFAS were potentially handled, stored, used, or released. Research conducted during the PA to identify such AOIs included (1) group discussions during the kickoff meeting, (2) personnel interviews

(civilian and military, along with former NSTI employees), (3) online research (i.e., Naval Facilities Engineering Systems Command Southwest [NAVFACSYSCOM SW] Administrative Record and Naval Installation Restoration Information Solution [NIRIS]), and (4) archival research at former NSTI to document PFAS storage and use at the installation. Additionally, on May 30, 2018, a field visit to former NSTI was conducted under escort by former NSTI personnel for site walks and observation of potential AOIs.

The following sites where PFAS-containing materials were potentially released to the environment were identified as PFAS AOIs in the PA:

- IR Site 7 – Pesticide Storage Area and Wastewater Treatment Plant (WWTP) Sludge Disposal
- IR Site 14 – Former New Fuel Farm
- IR Site 21 – Waste Oil Recovery Area
- IR Site 24 – Former Dry Cleaner (note: as mentioned previously, IR Site 5, Old Boiler Plant, has been merged into IR Site 24)
- AOI 1 – Naval Technical Training Center (NTTC) Fire Training School
- AOI 2 – Former Naval Station Fire Department
- AOI 3 – Helicopter Landing Area
- AOI 4 – Former Fire Station and Equipment Storage
- AOI 54 – Pier 1

The IR sites and AOIs included in the SI are identified in Section 3.1, and their locations are shown on Figure 2.

## 1.3 Project Objective

The objective of the SI is to determine whether PFAS are present in soil and groundwater at concentrations exceeding the current DoD screening levels, presented in Table 1-1, (DoD, 2021) at locations identified in the July 2021, *Final Preliminary Assessment Report, Basewide Investigation of PFAS* for the former Naval Station Treasure Island site (PFAS PA). There are no current U.S. EPA published, peer-reviewed, or consensus environmental screening values for marine sediments. Therefore, the environmental screening levels (Divine et al, 2020) and available ambient levels of PFAS in San Francisco Bay (San Francisco Estuary Institute, 2022) will be used to evaluate potential impacts from PFAS on sediment. The SI is not intended to detail the vertical and lateral extents of contamination, nor is it intended to fully characterize risk. However, the SI sampling is intended to target areas with the highest

potential for contamination; therefore, the maximum concentrations detected at each investigation area are intended to be sufficient to determine whether additional PFAS characterization is warranted.

**Table 1-1: PFAS Screening Criteria for Media of Concern**

| Analyte Name[1] | Acronym | CAS Number | DoD Groundwater Screening Criteria[2] (µg/L) | DoD Soil Screening Criteria[2] (mg/kg) | U.S EPA RSL Groundwater Screening Criteria[3] (µg/L) | U.S. EPA RSL Soil Screening Criteria[3] (mg/kg) | Sediment Ecological Target Value[4,5] (mg/kg) | Sediment Ambient Value San Francisco Bay Central Bay[6] (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| Perfluorooctanoic acid | PFOA | 335-67-1 | 0.04 | 0.13 | 0.00602 | 0.019 | 0.006 | 0.000158[7] |
| Perfluorooctane sulfonic acid | PFOS | 1763-23-1 | 0.04 | 0.13 | 0.00401 | 0.0126 | 0.0014 | 0.000223–0.000613 |
| Perfluorobutanesulfonic acid | PFBS | 375-73-5 | 0.60 | 1.9 | 0.601 | 1.9 | 0.73 | – |
| N-Ethyl perfluorooctanesulfonamidoacetic acid | EtFOSAA | 2991-50-6 | – | - | – | - | – | – |
| N-Methyl perfluorooctanesulfonamidoacetic acid | MeFOSAA | 2355-31-9 | – | – | – | - | – | – |
| Hexafluoropropylene oxide dimer acid | HFPO-DA | 13252-13-6 | – | - | 0.0062 | 0.0235 | - | – |
| 11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid | 11Cl-PF3OUdS | 763051-92-9 | – | – | – | - | – | – |
| 9-chlorohexadecafluoro-3-oxanone-1-sulfonic acid | 9Cl-PF3ONS | 756426-58-1 | – | - | – | - | - | – |
| 4,8-dioxa-3H-perfluorononanoic acid | ADONA | 919005-14-4 | – | – | – | - | – | – |
| Perfluoroheptanoic acid | PFHpA | 375-85-9 | – | – | – | - | – | – |
| Perfluorohexanesulfonic acid | PFHxS | 355-46-4 | – | – | 0.0394 | 0.126 | – | – |
| Perfluorohexanoic acid | PFHxA | 307-24-4 | – | - | – | - | 1.8 | – |
| Perfluorononanoic acid | PFNA | 375-95-1 | – | - | 0.00589 | 0.019 | 0.01 | – |
| Perfluorotetradecanoic acid | PFTeDA | 376-06-7 | – | - | – | - | – | – |
| Perfluorotridecanoic acid | PFTrDA | 72629-94-8 | – | – | – | - | – | – |
| Perfluoroundecanoic acid | PFUnA | 2058-94-8 | – | – | – | - | – | – |
| Perfluorodecanoic acid | PFDA | 335-76-2 | – | – | – | - | – | – |
| Perfluorododecanoic acid | PFDoA | 307-55-1 | – | – | – | - | – | – |

**Notes:**

1. These established criteria provide guidance only, and no federal or state of California promulgated criteria currently exist. Screening criteria are derived as described in notes 2 and 3.

2. All criteria are from the DoD memorandum: *Investigating Per- and Polyfluoroalkyl Substances with the Department of Defense Cleanup Program* (DoD, 2021). The criteria were calculated using slope factors or reference doses for PFOS and PFOA published by the U.S. EPA Office of Water in support of the Lifetime Health Advisory, and default exposure assumptions for each potential receptor scenario, contained in U.S. EPA's RSL Calculator (https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search). PFBS screening criteria are in U.S. EPA. 2021. Regional Screening Levels. May. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.
3. U.S. EPA. 2022. Regional Screening Levels. May. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables. These values are included in the Work Plan for informational purposes only.
4. Values provided are estimated by Divine et al., 2020, to be protective of aquatic wildlife food chain ingestion, and are based on muskrat (herbivore), little brown bat (insectivore), river otter (carnivore), harbor seal (carnivore), mink (carnivore), red-winged blackbird (omnivore), tree swallow (invertivore), and brown pelican (piscivore).
5. There are no current U.S. EPA published, peer-reviewed or consensus ESVs for marine sediments. The ecological target screening levels were selected to set project-specific quantitation limits that enable data quality to be sufficient to evaluate the sediment concentrations as part of the SI.
6. San Francisco Estuary Institute (SFEI), cd3 Contaminant Data, Central Bay Stations (CB001S, CB073S, CB100S, CB133S, and BC11), https://cd3.sfei.org/downloads/. San Francisco Bay Regional Monitoring for Water Quality Program. Retrieved March 15, 2022. The ambient concentrations of PFAS at most locations are below the detection limits used in the SFEI database, including the monitoring location (BC11) closest to NSTI.
7. Only one sediment sample reported detected concentration of PFOA in the Central Bay Stations.

µg/L = microgram(s) per liter; DoD = United States Department of Defense; ESV = environmental screening value; HQ = hazard quotient; mg/kg = milligram(s) per kilogram; PFAS = per- and polyfluoroalkyl substance; PFBS = perfluorobutanesulfonic acid; PFOA = perfluorooctanoic acid; PFOS = perfluorooctane sulfonic acid; RSL = regional screening level; SI = site inspection; U.S. EPA = United States Environmental Protection Agency

## 1.4 Purpose and Scope

The purpose of the SI for PFAS at former NSTI is to conduct a field investigation focused on the specific areas identified in the PA with suspected historical use or release of PFAS to the environment. Soil borings will be advanced in areas of known or suspected PFAS releases to the environment at eight onshore AOIs, and sediment sampling will be performed nearshore at one AOI (Pier 1 at NSTI). Soil, sediment, and groundwater samples will be collected and analyzed for PFAS compounds.

The SI for PFAS will consist of the following general tasks (details are presented in Section 3.0):

- Soil sampling: Samples will be collected from 33 boreholes at depth intervals of 0 to 2 feet below ground surface (bgs) and 4 to 6 feet bgs (66 soil samples) at IR Sites 7, 21, and 24 and AOIs 1, 2, and 3 to determine the presence of PFAS in soil relative to the current DoD screening criteria.
- Groundwater sampling: The 33 boreholes listed above, along with an additional 10 boreholes (at IR Site 14 and AOI 4), will be converted into temporary groundwater monitoring wells and then sampled. Two existing groundwater monitoring wells at IR Site 24 will also be sampled. The samples from the temporary and existing well samples will be used to determine the presence of PFAS in groundwater relative to the current DoD screening criteria.

- Depth-to-water measurements: A total of 45 groundwater monitoring wells (43 temporary and 2 existing wells) will be used to collect depth-to-water measurements; the data in the temporary wells will not be used to assess groundwater gradients because the temporary wells are not surveyed by a licensed surveyor and also may not represent stabilized water levels after drilling and installation.
- Sediment sampling: five sediment core locations will be advanced, and samples will be collected from 0 to 0.5 foot bgs, 1 to 2 feet bgs, and 2 to 3 feet bgs at each location to evaluate potential release of PFAS relative to available ecological screening values and ambient San Francisco Bay levels (San Francisco Estuary Institute, 2022) in the nearshore sediment of AOI 54.

Details of the technical approach are presented in Section 3.0. The findings of the SI will be presented in the SI Report described in Section 4.0.

## 1.5 Work Plan Organization

This Work Plan was prepared in accordance with applicable DON Environmental Restoration Program guidance and is organized as follows:

- **Section 1.0: Introduction** – Describes PFAS and the history of use, the project history, the project objective and scope, and the organization of the Work Plan.
- **Section 2.0: Background** – Provides a brief facility history along with potential PFAS use at the facility, general geology and hydrogeology information, a description of the drinking water supply at former NSTI, a biological and ecological profile, and potential human health and ecological exposure pathways to PFAS.
- **Section 3.0: Field Investigation Planning and Implementation** – Describes each IR site and AOI and the rationale for sampling in this SI, presents permitting and notification procedures, and provides an overview of the field investigation methods and procedures for conducting the soil, sediment, and groundwater sampling, laboratory analysis and quality control (QC), decontamination, and management and disposal of investigation-derived waste (IDW).
- **Section 4.0: Reporting and Scheduling** – Presents the reporting requirements for the SI and the overall project and deliverable schedule.
- **Section 5.0: References** – Lists documents and appendices used to prepare this Work Plan.

- **Appendix A: Sampling and Analysis Plan** – provides procedures for soil, sediment, and groundwater sampling, analysis, and QA procedures.
- **Appendix B: Responses to Government Comments** (provided in the final version)
- **Attachment 1** – contains relevant supporting information and historical photographs of selected site features to support information presented in the text.

This page is intentionally blank.

# 2.0 Background

This section describes the overall facility and its historical and current mission and use, use of PFAS at former NSTI, and other pertinent background information, including the geology and hydrogeology and any potential exposure pathways to PFAS releases.

## 2.1 Facility Description and History

Former NSTI is located in San Francisco Bay, midway between San Francisco and Oakland within the City and County of San Francisco. It consists of two adjacent islands: Yerba Buena Island (YBI) and the man-made Treasure Island (TI), connected by a causeway (Figure 1). The land mass of the northern island, TI, encompasses approximately 403 acres, and the land mass of the southern island, YBI, encompasses approximately 147 acres (NOREAS, Inc., 2019). More than 527 acres of submerged lands within San Francisco Bay surrounding the two islands are also part of former NSTI (DON, 2020).

Military activities in the area date back to 1866 when the United States Government took possession of YBI for defensive fortifications. The DON operated the first West Coast Naval Training Station on YBI until 1923, when the center was transferred to the City of San Francisco. TI was constructed on the Yerba Buena Shoals north and northwest of YBI from 1936 to 1937 under the direction of the United States Army Corps of Engineers. It consists primarily of sediments dredged from San Francisco Bay that were placed within a retaining wall of rock and sand dikes. TI was originally constructed for the 1939 Golden Gate International Exposition World's Fair (NOREAS, Inc., 2019). In 1943, the DON offered the City of San Francisco a large parcel of land in San Bruno in exchange for the TI property. The results of the trade provided the City of San Francisco with land for its proposed international airport, and the DON secured a permanent base within San Francisco Bay (DON, 1995). The island became a major naval facility, processing approximately 12,000 military personnel per day for service overseas and upon their return to the United States (Trevet, 2016). It was used primarily to provide training, administration, housing, and other support services to the United States Pacific Fleet. In 1993, the Defense BRAC Commission recommended closure of former NSTI. The facility was subsequently closed on September 30, 1997 (NOREAS, Inc., 2019).

The DoD Office of Economic Adjustment designated San Francisco as the Local Redevelopment Authority for former NSTI in May 1994. In 1997, the California State Legislature created a special reuse authority for former NSTI, transferring the Local Redevelopment Authority status from San Francisco to the Treasure Island Development Authority (TIDA). TIDA is a state agency staffed by the San Francisco

mayor's office and is the entity responsible for planning the reuse and redevelopment of the former installation (Trevet, 2016). Of the total 1,077.6 acres at former NSTI, 948.6 acres (88 percent) have been transferred, and 129 acres remain under DON custody and control and are yet to be transferred to TIDA. Federal land use is expected to continue. The DON will retain certain parcels until transferred to TIDA (DON, 2020). The United States Department of Labor Job Corps Center, United States Coast Guard Station, and California Department of Transportation highway operations are expected to remain on former NSTI (Trevet-Bay West JV LLC, 2021). Also expected to continue are utility operations by the City of San Francisco Public Utilities Commission (TIDA, 2020).

## 2.2 Geology and Hydrogeology

TI was constructed from sandy sediments dredged from San Francisco Bay and placed within a retaining wall of rock and sand dikes. Dredging and construction of the island, as directed by the United States Army Corps of Engineers, began in 1936 and were completed in 1937. The island was constructed on the Yerba Buena Shoals, a spit of sand that extended north and northwest of naturally occurring YBI (NOREAS, Inc., 2019).

Subsurface materials at TI can be divided into the following four geologic units, listed from youngest (shallowest) to oldest (deepest) (NOREAS, Inc., 2019):

- Fill and Shoal Sands (dredged sand fill and Yerba Buena Shoal sands)
- Younger Bay Mud
- Older Bay Mud
- Franciscan Assemblage

Dredged sediments used to construct TI consisted primarily of fine- to coarse-grained sand with lesser amounts of silt, clay, and gravel. The dredged sand included some shell fragments and clay nodules. The clay nodules were derived from clay beds within the sediment, excavated by dredging, and rounded as they passed through the delivery pipeline. Thin beds of clay occasionally developed as finer materials in the dredged sand fill settled out during fill operations (NOREAS, Inc., 2019).

Underlying the Yerba Buena Shoal and fill sands are Younger Bay Mud sediments of marine origin that consist of soft to stiff, olive-gray silty clay and clay with interbedded sand and silt layers in some areas. Younger Bay Mud sediments range from approximately 10 to 120 feet thick. These sediments are thinnest on the eastern portion of the island and thicken toward the northwestern portion of the island (NOREAS, Inc., 2019).

Underlying the Younger Bay Mud sediments are the Older Bay Mud sediments, which consist of stiff to very stiff, sandy and silty clays that extend to the Franciscan Assemblage bedrock. The Older Bay Mud sediments, approximately 20 to 170 feet thick, are thinnest on the southern portion of the island and thicken toward the northern portion of the island (NOREAS, Inc., 2019).

Underlying the Older Bay Mud sediments is bedrock of the Franciscan Assemblage, which consists of interbedded shales and sandstone. Observations from borings that penetrated bedrock on the northwestern portion of TI indicate that the estimated depth to the Franciscan Assemblage ranges from 150 to 320 feet below ground surface (bgs). Depths are shallowest on the southern portion of the island and deepest toward the northern portion of the island (Geomatrix Consultants, Inc., 1990).

The dredged material and shoal sands used to construct TI act as an unconfined aquifer with an average depth to the water table of 5.6 feet bgs per the recent basewide groundwater monitoring event (NOREAS, 2021). Perched groundwater may exist locally above the shallow water table because of the presence of silt and clay lenses. Groundwater recharge occurs primarily from infiltration of precipitation, with some contribution from landscape irrigation. Shallow groundwater flow is generally radial from the center of the island toward the shoreline with low gradients. Tidal fluctuations influence the groundwater gradient at locations within 200 to 250 feet of the shoreline.

Former NSTI lies within several hydrogeological stratigraphic units (Figure 3). The portion of the island north of the Bay Bridge lies in the Bay Water hydrogeological unit, and the portion of the island south of the Bay Bridge lies within the Bay Channel hydrogeological unit. The California Department of Water Resources identified no domestic use wells on former NSTI or within 1 mile from the installation boundary (Trevet, 2016). The 1-mile boundary falls almost entirely within the waters of San Francisco Bay, and other than former NSTI and the extreme northwestern corner of Ben E. Nutter Terminal, no other land is within that area (Figure 3). One irrigation well was identified approximately 2 miles away from former NSTI, but is separated by a 1.5-mile expanse of San Francisco Bay (Trevet, 2016).

Watersheds in the San Francisco Bay area range from large ones such as the Alameda Creek watershed, which encompasses 700 square miles and includes two counties and seven cities, to small watersheds such as the 1.1-square-mile Codornices Creek watershed along the Berkeley/Albany border. All of the San Francisco Bay area watersheds ultimately drain to San Francisco Bay, or in coastal areas, to the Pacific Ocean (State Water Board, 2018). Former NSTI receives no surface water from any watershed, and any unevaporated precipitation ultimately drains to San Francisco Bay, via either surface runoff or groundwater. The Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) states that existing and potential beneficial uses

include human consumption of organisms, aquatic life, wildlife, and recreation. The Basin Plan also protects the beneficial use of groundwater that replenishes a surface water body and requires that groundwater discharges to surface water do not impact the existing or potential beneficial uses of that surface water body (RWQCB, 2019). Hydrological basins in the vicinity of former NSTI are shown on Figure 3.

## 2.3 Drinking Water Supply

As described under the Basewide Groundwater Monitoring Program, groundwater within former NTSI has been identified as brackish, and because of the small volume of fresh groundwater available, potentially prone to saltwater intrusion (Shaw Environmental, Inc., 2004). Groundwater at former NSTI is not suitable as a potential source of drinking water pursuant to State Water Board Resolution 88-63 and RWQCB Resolution No. 89-39 (RWQCB, 2001). The primary water supply is provided by the San Francisco Water Department through a 10-inch-diameter pipe attached to the Bay Bridge; a secondary or emergency supply is provided by the East Bay Municipal Utility District through a 12-inch-diameter pipe that runs along the Bay Bridge to Emeryville (DON, 2000).

## 2.4 Potential Receptors and Pathways of Exposure

All AOIs are within the boundary of former NSTI. Potential human receptors at the AOIs include commercial/industrial workers, construction workers, hypothetical future residents, hypothetical future recreators, and hypothetical future wetland receptors. Additionally, human receptors for AOI 54 include recreational users in the nearshore.

Potential ecological receptors at the AOIs include plants that make up the vegetative cover on the base and fauna that may feed, burrow, or nest on the island or in the shallow offshore water of San Francisco Bay. TI is an engineered island and contains little native habitat. Most of the land surface is either developed or landscaped and therefore provides limited habitat for wildlife. Much of the vegetation consists of introduced species, including trees such as blue gum eucalyptus, Monterey pine, and Monterey cypress. There are no freshwater wetlands or shoreline salt marshes on TI. Future plans for areas adjacent to IR Site 7 may include development of stormwater wetlands (CE2-Kleinfelder Joint Venture, 2018). More specifically, TIDA planning information for redevelopment of former NSTI shows that a new wastewater treatment plant, wetlands, and open space parks are proposed to encompass the entire northeastern portion of former NSTI, apparently including the area encompassing IR Sites 7 and 14 and AOI 1 (TIDA, 2011, 2018). The marine habitat around TI is subtidal, with unconsolidated mud bottom substrate. There is limited intertidal habitat, consisting of concrete riprap, and dock and pier pilings are found along most of the shoreline surrounding TI. Benthic and water column communities (including plants, invertebrates, and fish) and higher trophic-level organisms could be exposed to

impacted sediment. No rare or endangered terrestrial floral or faunal species are known to inhabit or visit the island on a regular basis (DON, 2003). However, according to studies to track migratory patterns of Chinook salmon and steelhead trout from a Sacramento River hatchery, both migratory special-status species are present in San Francisco Bay and are potentially in the vicinity of former NSTI (Singer et al., 2012). Several water-dependent special-status species, including the California least tern (*Sterna antillarum browni*) and California brown pelican (*Pelecanus occidentalis*), feed throughout the region and have been observed near former NSTI (TtEMI, 2003).

Potential exposure pathways are summarized as follows.

### *Flora*

Terrestrial and marine exposure pathways include uptake by roots or direct exposure to plant tissues from PFAS-impacted soil, sediment, or sea water. These exposure mechanisms result in a potentially complete pathway for ecological receptors.

### *Fauna*

Terrestrial exposure pathways include direct contact (invertebrates), food chain ingestion of PFAS-impacted prey, or incidental dietary ingestion of PFAS-impacted soil. Marine exposure pathways include direct contact (invertebrates, fish), food chain ingestion of PFAS-impacted prey (fish, marine-dependent birds, and marine-dependent mammals), or incidental dietary ingestion of PFAS-impacted soil or sea water (if present) at AOI 54.

### *Human*

Pathways include dermal contact and ingestion of PFAS-impacted soils and surface water. Inhalation of chemicals released to outdoor air (dust) from wind erosion is a potentially complete exposure pathway. DON personnel, civilian workers, contractors, and authorized visitors may traverse the AOIs. All of the AOIs to be investigated may be accessible to both residents and recreational users in the future. Complete exposure pathways exist for surface soil through ingestion, or dermal contact and inhalation of surface soil or dust generated by wind or earth-moving activities. Additionally, dermal contact and incidental ingestion may be complete exposure pathways for surface and subsurface soil if intrusive activities, such as underground utility work, occur at the sites. Complete exposure pathways exist for construction or maintenance workers through ingestion and dermal contact with groundwater. Direct contact and incidental ingestion of sediment and surface water, and fish consumption, are potential exposure pathways for hypothetical future residents and recreators at AOI 54.

This page is intentionally blank.

# 3.0 Field Investigation Planning and Implementation

This section identifies the areas to be investigated in the PFAS SI, includes the rationale for the sampling locations, and summarizes the general field-related activities to be completed to support soil, sediment, and groundwater sampling, including planning activities. These field-related activities include activities such as permitting and notification, mobilization, utility clearance, advancement of direct-push technology (DPT) borings, soil, sediment, and groundwater sampling, temporary monitoring well installation, decontamination, and IDW management are discussed in detail in the SAP (Appendix A).

## 3.1 PFAS Sampling Sites and Sampling Rationale

The nine PFAS sites to be investigated in this SI are IR Sites 7, 14, 21, and 24 and AOIs 1, 2, 3, 4, and 54. The site-specific locations and planned soil, sediment, and groundwater sampling locations are shown on Figures 4 through 11. Soil samples will be collected at depth intervals of 0 to 2 feet bgs and approximately 4 to 6 feet bgs at the capillary fringe (i.e., at or just above the top of the water table). Borings will be advanced using hand auger and/or DPT (if deeper than 5 feet bgs). Temporary wells, which will be abandoned after sampling, will be installed at each boring location for collection of one groundwater sample. Sediment samples will be collected at depth intervals of 0 to 0.5 foot bgs, 1 to 2 feet bgs, and 2 to 3 feet with a vibracore sampler from a boat at low tide.

All samples will be analyzed for 18 PFAS compounds by liquid chromatography and tandem mass spectrometry (LC/MS-MS) method compliant with *DoD Quality Systems Manual (QSM) Version 5.3 Table B-15* (DoD, 2019).

The following sites were identified in the PA (Multi-MAC JV, 2021) as AOIs where further investigation may be warranted but are not being investigated in this SI:

- IR Site 6, Firefighting Training School: site of a current remedial investigation.
- AOI 56, WWTP Outfalls: site planned for future evaluation.

### 3.1.1 IR Site 7 – Pesticide Storage Area and Wastewater Treatment Plant Sludge Disposal (Figure 4)

***Description and Rationale****:* IR Site 7, Pesticide Storage Area or Building 62, is north of 13th Street and east of Avenue M. Building 62 is a pesticide storage area; a former WWTP sludge disposal area was located southwest of Building 62.

The area was used from 1968 to 1976 to dispose of sludge from the adjacent WWTP. Approximately 960 to 1,440 cubic yards of waste sludge were disposed of at both IR Site 7 and a parcel located on Yerba Buena Island (YB024). Wastewater generated at the Fire Training School (IR Site 6), which may have contained PFAS, was discharged to the former NSTI WWTP, and then waste sludge from the WWTP was reportedly spread on the ground of IR Site 7 (see Exhibit 3 of Attachment 1). It is anticipated that most of the potentially PFAS-contaminated soil at IR Site 7 was removed during construction activities associated with the expansion and modification of the WWTP in the western half of the parcel, which was paved in 1989.

Based on historical uses of IR Site 7 and concentrations of PFAS detected in previous hydropunch samples (groundwater grab samples) that exceed screening criteria, PFAS may have been released into the environment from historical operations and resulted in potentially impacted soil and/or groundwater.

***Planned Sampling***: A total of 10 soil samples and 5 groundwater samples from 5 borings will be collected in the area of suspected historical sludge disposal activities (Figure 4):

- Three sampling locations, IR7-PFAS-TW2, IR7-PFAS-TW3, and IR7-PFAS-TW5, will be used to evaluate the potential PFAS release area and any residual PFAS remaining in onsite soils within the eastern area of the former waste sludge disposal area.
- Two sampling locations, IR7-PFAS-TW1, which is adjacent to hydropunch location HP13 where PFAS were previously detected at a concentration greater than the groundwater screening level, and IR7-PFAS-TW4, will be used to evaluate the potential PFAS release in the western area of the former waste sludge disposal area.

Depth to groundwater will be measured from the five temporary wells.

### 3.1.2 IR Site 14 – Former New Fuel Farm (Figure 5)

***Description and Rationale****:* IR Site 14, Former New Fuel Farm, is south of 13th Street and east of Avenue N. The Former New Fuel Farm was established in 1943 as the primary fuel storage and distribution center at former NSTI. It served as a fuel storage area and gas station for more than 50 years.

Available information about the site history and operations indicates that a firefighting foam dispenser adjacent to petroleum fuel tanks served as a precautionary fire suppression system. A 1994 SI along Avenue N revealed 2- and 1-inch pipe stub-ups associated with a possible underground storage tank (UST) located adjacent to the firefighting foam dispenser on Avenue N. The locations of the former aboveground

storage fuel tanks are shown on a historical photograph and figures (see Exhibits 4 and 5 of Attachment 1). The location of the and the former foam dispenser is also shown on historical figure (see Exhibit 6B of Attachment 1).

***Planned Sampling***: Five groundwater samples from five borings will be collected to evaluate the presence or absence of PFAS from firefighting foam storage at IR Site 14 as follows (Figure 5):

- A potential PFAS release area at the former foam dispenser along Avenue N will be evaluated (IR14-PFAS-TW2 and IR14-PFAS-TW4).
- The potential source of PFAS will be evaluated at the approximate location of former ASTs at the fuel farm, which are possible locations of AFFF storage (IR14-PFAS-TW1, IR14-PFAS-TW3, and IR14-PFAS-TW5).

Depth to groundwater levels will be measured from the five temporary wells. Soil sampling is not proposed at IR Site 14 because of previous geotechnical mitigation conducted in the area that included this site. This mitigation included building foundation and soil removal, vibrocompaction, and surcharge, with effects of the mitigation typically extending approximately 6 feet below original grade.

### 3.1.3 IR Site 21 – Waste Oil Recovery Area (Figure 6)

***Description and Rationale****:* IR Site 21 is directly southwest of and adjacent to AOI 3 (see Section 3.1.7) and adjacent to Clipper Cove, and is the former vessel waste oil recovery area.

The IR Site 21 site boundary includes the southeastern corner of Building 3 and the open area between Building 3 and the shoreline. In addition, Building 111, the former footprint of which is located within IR Site 21 and was adjacent to Building 3, was the old fire house which was abandoned after earthquake damage from the 1989 Loma Prieta earthquake (ERM-West, Inc., 1995).

The former OWS, located at the southeastern boundary of IR Site 21 consisted of 5 aboveground tanks associated with waste oil from the ships and Pier 11/12, and were not documented as suspected to have received PFAS-containing wastewater.

During an environmental baseline survey (EBS) SI conducted in November 1994, storage of approximately 2,700 gallons firefighting foam (in 33 55-gallon drums and 180 5-gallon drums) was observed in the open area south of Building 3 (Multi-MAC JV, 2021; ERM-West, Inc., 1995). Because the exact storage location was not identified in the EBS, the estimated location of the containers was derived using land-based photographs in the EBS of the foam container storage area and nearby former Building 325, descriptions of the locations and directional facing of those photographs

(ERM-West, Inc., 1995), and review of historical aerial photographs on Google Earth Pro (desktop application). Estimated storage locations are indicated on Figure 6. The approximate location of this storage area is based on the information in Exhibits 8, 9, and 10 in Attachment 1.

***Planned Sampling***: A total of 10 soil samples and 5 groundwater samples from 5 borings will be collected to evaluate the presence or absence of PFAS at IR Site 21 as follows (Figure 6):

- Sampling locations IR21-PFAS-TW1 through IR21-PFAS-TW3 are within the approximate former AFFF storage area.
- Sampling location IR21-PFAS-TW4 is on the southern side of the former firehouse Building 111, between this former building and the approximate former AFFF storage area.
- Sampling location IR21-PFAS-TW5 is on the southern side of the approximate former AFFF storage area, between this storage area and the former OWS facility.

Depth to groundwater will be measured in the five temporary wells.

### 3.1.4 IR Site 24 – Former Dry Cleaner (Figure 7)

***Description and Rationale****:* IR Site 24 is on the southeastern part of TI and extends from the central portion of the island east toward San Francisco Bay. IR Site 24 includes Building 99 (former dry cleaner) and Building 455 (old boiler plant) to be investigated for this SI. The old boiler plant (historically referred to as IR Site 5), is located along the southwestern boundary of IR Site 24. Although IR Site 5 was identified separately in the PA, the PA indicates that IR Site 5 was merged with IR Site 24 in 2001 (Multi-MAC JV, 2021); therefore, the investigation for the IR Site 5 area will be addressed under IR Site 24 for this SI.

Building 99 is in the northwestern portion of IR Site 24. It was used as a laundry and dry-cleaning facility from 1942 to 1977. In November 1994, it was documented that approximately 200 gallons of AFFF were stored in 5-gallon containers within a refrigeration locker at Building 99, and AFFF was stored in a 55-gallon drum near the outdoor fuel transfer area (Multi-MAC JV, 2021); the locations of these AFFF storage areas could not be identified from the available historical information.

Building 455 was constructed in 1970 as a boiler plant. It provided steam heat to nonresidential buildings. Three 55-gallon drums of AFFF were also reportedly stored in open space northwest of Building 455 (see Exhibit 7 of Attachment 1).

There was no evidence to indicate a PFAS release at the site; only storage of AFFF was found. However, potential release of PFAS may have occurred as a result of improper filling and leakage from storage tanks containing AFFF.

***Planned Sampling***: A total of 14 soil samples and 9 groundwater samples from 7 borings and 2 existing wells will be collected to evaluate the presence or absence of PFAS at the former AFFF storage at IR Site 24 as follows (Figure 7):

- Three sampling locations, IR24-PFAS-TW1 through IR24-PFAS-TW3, will be used to evaluate potential PFAS release from AFFF storage at Building 455.
- Four sampling locations, IR24-PFAS-TW4 through IR24-PFAS-TW7, will be used to evaluate potential PFAS release from AFFF storage in Building 99 and the outdoor fuel transfer area; because the exact locations of these storage areas were not documented, the sampling locations were spaced around the building to provide spatial coverage and were also considered the locations of the two existing wells proposed for sampling.
- Groundwater samples will also be collected and analyzed for PFAS in two existing monitoring wells at Building 99 (24-EW28R) and downgradient of Building 455 (24-IW24); because of uncertainties regarding the locations of a refrigeration locker and outdoor fuel transfer area, these wells will be sampled to augment the temporary well data to identify whether PFAS were released to groundwater. Additionally, permanent wells have less potential for higher turbidity and also can be repeatedly sampled, if needed in the future.

Depth to groundwater levels will be measured from the seven temporary wells and from two existing groundwater monitoring wells (24-EW28R and 24-IW24).

### 3.1.5 AOI 1 – NTTC Fire Training School (Figure 8)

***Description and Rationale****:* AOI 1 includes the following: Parcel T120, Buildings 600-618, the former NTTC Fire Training School, and an area southeast of the NTTC Fire Training School (adjacent to the baseball field) where three propane storage tanks were formerly used to supply fuel to the fire training school (see Exhibit 11 of Attachment 1). The available information indicated that propane, rather than liquid petroleum fuel, was used as a fire source; thus, AFFF was not used at this site to extinguish fires. The NTTC Fire Training School was constructed in 1990. Construction of the equalization tanks at the New Firefighting School was nearing completion during a visit in December 1991, and the tanks were scheduled to begin operation in 1992. The tanks are shown in the 1992 SPCC Plan (Radian Corporation, 1992a). Building 612 was used for aviation firefighting training. The Fire Training School has been operated by the San Francisco Fire Department (SFFD) since base closure in 1997. Building 615, a

utility building within Parcel T120, was used to store AFFF according the 1995 basewide EBS (Multi-MAC JV, 2021).

According to information provided by the SFFD (2021), at no time has training with PFAS-containing foam been conducted at the facility. SFFD stated that the TI facility has been and is currently used for fire suppression, rescue, and emergency management services training not involving the use AFFF. Historical fire training activities conducted by the DON primarily used propane as the source of the fire at the site. Structures 610 and 611 are 100,000-gallon, open concrete equalization tanks used to neutralize water (which likely did not contain AFFF according to information provided by SFFD) generated during fire training activities at Parcel 120. The equalization tanks were used by the DON to handle firefighting training wastewater effluent before discharge to the WWTP (Multi-MAC JV, 2021). While it is not believed that chemicals containing AFFF were used for firefighting training activities at this site, the potential release of PFAS may have occurred as a result of improper filling and leakage from storage tanks containing AFFF located in Building 615. The potential release of PFAS from concrete equalization tanks will be characterized using soil and groundwater samples in the accessible areas around the tanks. Numerous equipment items, including aboveground tanks, were observed in the northern portion of the site during a recent site visit on March 2, 2022. The southern and eastern portions of the site were accessible, and no equipment was stored there. A small, paved area separated the tanks from the unpaved surface approximately 10 feet south of the tanks, where potential releases could migrate to the unpaved surface and into the soil.

***Planned Sampling***: A total of 10 soil samples and 5 groundwater samples from 5 soil borings will be collected to evaluate the presence or absence of PFAS at AOI 1 as follows (Figure 8):

- Two sampling locations, AOI1-PFAS-TW1 and AOI1-PFAS-TW2, will be used to evaluate potential PFAS release from the storage of AFFF in Building 615.
- Three sampling locations, AOI1-PFAS-TW3, AOI1-PFAS-TW4, and AOI1-PFAS-TW5, will be used to evaluate potential PFAS release at the open concrete equalization tanks used to store neutralized water that contained firefighting training wastewater, to address the possibility that AFFF reportedly stored in Building 615 could have been used during training activities.

Depth to groundwater levels will be measured from the five temporary wells.

### 3.1.6 AOI 2 – Former Naval Station Fire Department (Figure 9)

***Description and Rationale****:* AOI 2 consists of Building 157, Former Naval Station Fire Department, and adjacent structures Building 70 (Fire Department gear locker and

storage) and Building 421 (Fire Department storage). The Naval Station Fire Department was built in 1943 and encompasses approximately 10,000 square feet. Research indicates that the DON may have conducted training in the paved portion of the fenced yard area north and adjacent to Building 157 (see Work Plan Attachment 1 Exhibit 12). Additionally, fire trucks were reportedly washed at this location, and findings from previous investigations at current and former fire stations at DON installations have indicated that cement aprons for entering and exiting the firehouse are areas of potential PFAS release. The period of operations coincides with the timeframe for AFFF use beginning in the 1969 and until NSTI base closure in 1997.

***Planned Sampling***: A total of 10 soil samples and 5 groundwater samples from 5 soil borings will be collected to evaluate the presence or absence of PFAS during firefighting training, the reported truck washing, and potential for AFFF to have been used in the yard adjacent to Building 157 as follows (Figure 9):

- Two sampling locations, AOI2-PFAS-TW1 and AOI2-PFAS-TW5, will be used to evaluate potential PFAS release at the concrete apron at the truck entrance on the eastern portion of Building 157 where trucks were presumably washed.
- Two sampling locations, AOI2-PFAS-TW2 and AOI2-PFAS-TW3, will be used to evaluate potential PFAS release within the open yard north of the site where firefighting training was likely performed.
- One sampling location, AOI2-PFAS-TW4, will be used to evaluate the unpaved western portion of the fenced area at the time of DON use of the site.

Depth to groundwater levels will be measured from the five temporary wells.

### 3.1.7 AOI 3 – Helicopter Landing Area (Figure 6)

***Description and Rationale****:* AOI 3 is the helicopter landing area northeast of Building 3 at adjacent IR Site 21. Two helicopter landing pads were located in a large concrete-paved area northeast of Building 3 (see Exhibit 13 of Attachment A). According to a personnel interview conducted during the PA (Multi-MAC JV, 2021), the helicopter landing pads were used for firefighting training twice per year. Historically, the Fire Department practiced extinguishing fires at the helicopter landing pads using water and firefighting chemicals. Firefighting chemicals used and wastewater generated from activities at this site may have contained PFAS.

***Planned Sampling***: A total of 12 soil samples and 6 groundwater samples from 6 borings will be collected to evaluate the presence or absence of PFAS during firefighting training at AOI 3 as follows (Figure 6):

- Four sampling locations, AOI3-PFAS-TW1, AOI3-PFAS-TW2, AOI3-PFAS-TW3, and AOI3-PFAS-TW4, are located in and around the helicopter landing pads.
- Two sampling locations, AOI3-PFAS-TW5 and AOI3-PFAS-TW6, are located in areas of potential runoff from firefighting training activities at the helicopter pads.

Depth to groundwater will be measured from the six temporary wells.

### 3.1.8 AOI 4 – Former Fire Station and Equipment Storage (Figure 10)

***Description and Rationale***: AOI 4, Building 180, is north of Clipper Cover Way and west of Avenue D. Historically, the parcel containing Building 180 had been used as a reserve training and vehicle maintenance facility, Public Works Center shops, a seaplane maintenance/hangar, a self-help facility (e.g., self-serve facility for vehicle maintenance), and a transportation center. Building 180 was constructed in 1943.

The Building 180 Northern Side garage area was used for maintenance and storage of fire trucks and possibly other fire equipment. It was demolished in the 2010s (Multi-MAC JV, 2021). An outdoor bus wash rack was at the southeastern corner of former Building 180, and a second outdoor wash rack was near the northeastern corner of former Building 180; however, it was reported during the PA that this wash rack site was not used to clean fire trucks or other firefighting vehicles.

***Planned Sampling***: Five groundwater samples from five borings will be collected to evaluate the presence or absence of PFAS in AOI 4 as follows (Figure 10):

- Three sampling locations, AOI4-PFAS-TW2 through AOI4-PFAS-TW4, will evaluate potential PFAS release in the northern side garage area where fire trucks and possibly other fire equipment were stored.
- Sampling location AOI4-PFAS-TW5 will evaluate potential PFAS release in the former bus wash rack in the southeastern corner of former Building 180.
- Sampling location AOI4-PFAS-TW1 will be used to evaluate potential PFAS release in the former truck wash rack in the northeastern corner of former Building 180.
- Depth to groundwater levels will be measured from the five temporary wells.

Soil sampling is not proposed at AOI 4 because of previous geotechnical mitigation conducted in the area that included this site. This mitigation included building foundation and soil removal, vibrocompaction, and surcharge. At former Building 180, the result of the mitigation was that the new surface grade was approximately 6 feet lower on average than the original surface grade, from approximately 112 feet (North American Vertical Datum of 1988 [NAVD88]) to approximately 106 feet in elevation (ENEGO Incorporated, 2021).

### 3.1.9 AOI 54 – Pier 1 (Figure 11)

***Description and Rationale**:* Pier 1 was constructed and began operations in 1981. It is in the southeastern portion of TI, off the intersection of California Avenue and Avenue M. It served as the homeport for four **"**Knox**"** Class frigates, two mine-sweep Ocean vessels, and a number of workboats. Support activities included material and waste off-haul, general maintenance, mechanical repairs, and supply and fueling operations. Pier 1 was constructed with the equipment, utilities, and connections necessary for ship support-related activities. Electrical supply sources, chemical holding tanks, connections, fresh water supplies, and fire suppression outlets are located throughout the pier. Personnel were trained in emergency response, and both regular and unscheduled emergency drills reinforced this training. The emergency drills were related to ship operations, not firefighting drills, and are therefore not suspected to have been a potential source for release of AFFF to the environment.

A 1,000-gallon AFFF tank was in the southwestern corner of Pier 1, and 20 floor/surface drains on each side of the pier discharged directly into the underlying San Francisco Bay (see Exhibit 17 of Attachment 1). Unless immediately contained, any spills or releases on the surface of the pier would flow directly into the drains.

***Planned Sampling***: A total of 15 sediment samples will be collected from 5 locations to evaluate the potential for PFAS discharge from the floor/surface drains of Pier 1 to the bay as follows (Figure 11):

- Sampling location AOI54-PFAS-SD1 will be used to evaluate the potential release of PFAS near the location of the former AFFF storage tank.
- Sampling locations AOI54-PFAS-SD2 through AOI54-PFAS-SD5 will be used to evaluate the potential PFAS release and runoff to nearshore floor/surface drain to the underlying sediment.

## 3.2 Site Investigation Activities

The SAP included in Appendix A describes the planning and implementation of investigation activities in detail. The investigation will include the following activities:

- Permitting and notification (SAP Worksheet #14 Section 14.1)
- Mobilization, site preparation, and demobilization (SAP Worksheet #14 Section 14.2)
- Utility clearance (SAP Worksheet #14 Section 14.3)
- Soil sampling using hand auger and DPT (SAP Worksheet #14 Section 14.4)

- Monitoring well installation using DPT and groundwater sampling (SAP Worksheet #14 Section 14.5)
- Sediment sampling (SAP Worksheet #14 Section 14.6)
- Borehole abandonment (SAP Worksheet #14 Section 14.7)
- Analysis of soil, groundwater, and sediment samples (SAP Worksheet #14 Section 14.8)
- Decontamination of equipment (SAP Worksheet #14 Section 14.9)
- Field documentation (SAP Worksheet #14 Section 14.10)
- Sample quality control (SAP Worksheet #14 Section 14.11)
- Surveying of sampling locations (SAP Worksheet #14 Section 14.12)
- Investigation-derived waste management (SAP Worksheet #14 Section 14.13)
- Quality control and data management (SAP Worksheet #14 Section 14.14)
- Data verification and validation (SAP Worksheet #14 Section 14.15)

The data quality objectives are described in Worksheet #11, and the sampling design and rationale are described in Worksheet #17 of the SAP in Appendix A.

# 4.0 Reporting and Scheduling

General reporting requirements and the project schedule for the SI are presented in this section.

## 4.1 Reporting Requirements

Following the completion of the SI field investigation activities, laboratory analyses, and third-party data validation, Multi-MAC JV will prepare an SI report. Each of the four IR sites and five AOIs evaluated will be presented separately within the overall SI report. The report will describe the site background and activities completed during the field investigation, present analytical results, and provide conclusions and recommendations for each site investigated. The SI report will also document the field activities (e.g., sampling coordinates and soil boring descriptions), analytical data, and data validation in appendices. Initially, a draft version of the SI report will be submitted to the DON, California Environmental Protection Agency, Department of Toxic Substances Control, and RWQCB for review. Comments on the draft version of the document will be addressed in a draft final version and then included in the final submitted SI report.

## 4.2 Scheduling

The detailed schedule for planning documents, fieldwork, and reporting is included in Figure 12. This schedule is preliminary and will be updated, as needed, as the project progresses.

This page is intentionally blank.

# 5.0 References

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB). 2001. *Concurrence that Groundwater at the Naval Station Treasure Island, San Francisco, Meet the Exemption Criteria in the SWRCB Sources of Drinking Water Resolution 88-63*. January 23.

_____. 2019. *Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin (Region 2).* November 5.

_____. 2020. *Interim Final Environmental Screening Levels (ESLs) for Per- and Polyfluoroalkyl Substances (PFAS): Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoate (PFOA)*. May.

California State Water Resources Control Board (State Water Board). 2018. *Watershed Management, Bay Area Watersheds*. July 23.

_____. 2020. *Response Levels Lowered for Water Systems Statewide as PFAS Investigation Continues*. February 6.

CE2-Kleinfelder Joint Venture. 2018. *Final Remedial Action Completion Report, Installation Restoration Site 6, Soil Excavation and Off-Site Disposal, Naval Station Treasure Island, San Francisco, California*. February.

ENGEO Incorporated. 2021. Letter from Chris Stouffer, ENGEO, to Levi Conover, Treasure Island Development Group, Subject: *Former Building 180, Former Naval Station Treasure Island, San Francisco, California, Original Grade Elevation Change at Completion of Stage 1 Geotechnical Mitigation*. September 2.

ERM-West, Inc. 1995. Basewide Environmental Baseline Survey Report for Naval Station Treasure Island. May 19.

Geomatrix Consultants, Inc. 1990. *Perimeter Dike Stability Evaluation (Volume 1); Compilation of Data and Information for Evaluation (Volume 4); Evaluation of Interior Area Performance (Volume 5), Naval Station Treasure Island, San Francisco, California*.

Multi-MAC Joint Venture. 2021. *Final Preliminary Assessment Report for Basewide Investigation of Per- and Polyfluoroalkyl Substances, Naval Station Treasure Island, San Francisco, California*. July.

NOREAS, Inc. 2019. *2017 Annual Basewide Groundwater and Soil Gas Monitoring Report, Installation Restoration Sites 6, 12, 21, and 24 Former Naval Station Treasure Island, San Francisco, California*. February.

_____. 2021. *2020 Draft Annual Basewide Groundwater and Soil Gas Monitoring Report, Installation Restoration Sites 6, 12, 21, and 24 Former Naval Station Treasure Island, San Francisco, California*.

San Francisco Estuary Institute. 2022. *Contaminant Data Display & Download (CD3)*. https://cd3.sfei.org/downloads/. Accessed 15 March.

San Francisco Fire Department (SFFD). 2021. *Responses to questions regarding SFFD's use of AFFF*, transmitted via email from Olivia Scanlon. February 26.

Shaw Environmental, Inc. 2004. *Final Post-Construction Summary Report, Site 6 Fire Training School Remedial Excavation, Naval Station Treasure Island, Petroleum Remedial Excavation Program, Treasure Island, San Francisco, California*. March 30.

Singer, Gabriel P., Alex R. Hearn, Eric D. Chapman, Matthew L. Peterson, Peter E. LaCivita, William N. Brostoff, Allison Bremner, and A.P. Klimley 2012. *Interannual variation of reach specific migratory success for Sacramento River hatchery yearling late-fall run Chinook salmon (Oncorhynchus tshawytscha) and steelhead trout (Oncorhynchus mykiss)*. May 11.

Tetra Tech EM Inc. (TtEMI). 2003. Final Corrective Action Plan, Inactive Fuel Lines, Naval Station Treasure Island, San Francisco, California. December.

Treasure Island Development Authority (TIDA). 2011. *Treasure Island/Yerba Buena Island Sustainability Plan. Final*. Available at: https://sftreasureisland.org/sites/default/files/Documents/Master_Develpment_Submittals/Final_Docs_July_2011/Treasure_Island_SP_2012.02.02_digital_version_.pdf. June 28.

_____. 2018. *New Treasure Island Wastewater Treatment Plant Update*. Powerpoint presentation, available at: https://sftreasureisland.org/sites/default/files/061918%206-19-18%20ITC%20WWTP%20Presentation.pdf. June 19.

_____. 2020. *Development Project, Treasure Island Development Highlights*. Available at: https://sftreasureisland.org/

Trevet. 2016. *Final Well Searches, Potential PFAS Sites at BRAC Installations*. Prepared for Naval Facilities Engineering Command Southwest, BRAC PMO West. September.

Trevet-Bay West JV LLC. 2021. *Final 2021 Site Management Plan, Former Naval Station Treasure Island, San Francisco, California*. December.

United States Department of Defense (DoD). 2019. *Quality Systems Manual, Version 5.3.* May.

_____. 2021. Memorandum for Assistant Secretary of the Army (Installation, Energy and Environment); Assistant Secretary of the Navy (Energy, Installations and Environment); Assistant Secretary of the Air Force (Installations, Environment and Energy); Director, National Guard Bureau (Joint Staff, J8); Director, Defense Logistics Agency (Installation Support). Subject: *Investigating Per- and Polyfluoroalkyl Substances with the Department of Defense Cleanup Program*. September 15.

United States Department of the Navy (DON). 1995. Mare Island Naval Shipyard, BRAC Environmental Division. *Historical Study of Yerba Buena Island, Treasure Island, and Their Buildings. Revision 01*. March 1996.

_____. 2000. *Exemption to California State Water Resources Control Board Sources of Drinking Water Policy Resolution 88-63 and California Regional Water Quality Control Board, San Francisco Bay Region Resolution 89-39 for Treasure Island San Francisco, California*. Letter to the California Regional Water Quality Control Board, San Francisco Bay Region. March 24.

_____. 2003. Southwest Division, Naval Facilities Engineering Systems Command. *Disposal and Reuse of Naval Station Treasure Island, Final Environmental Impact Statement*. June. Available at: https://books.google.com/books?id=o_Q3AQAAMAAJ&pg=RA8-SA3-PA1&lpg=RA8-SA3- PA1&dq=biological+resources+treasure+island&source=bl&ots=tDBhAuSokW&sig=ACfU3U3YB76EqF4uPO94WzYUgBZnAhyrCg&hl=en&sa=X&ved=2ahUKEwiwyfSt5anoAhUDsZ4KHYsHDx8Q6AEwBHoECAoQAQ#v=onepage&q=biological%20resources%20treasure%20island&f=false

_____. 2016. *Perfluorinated Compounds (PFCs) Drinking Water System Testing Requirement*. June.

_____. 2020. *Base Realignment and Closure Management Information System*, e-mail from Mr. Rene L. Cardinale, BRAC RPM. March 18.

United States Environmental Protection Agency (U.S. EPA). 2016a. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)*. 822-R-16-004. May.

_____. 2016b. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. 822-R-16-005. May.

_____. 2016c. *Fact Sheet, PFOA and PFOS Drinking Water Health Advisories.* EPA 800-F-16-003. November.

_____. 2017. *Technical Fact Sheet – Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)*. EPA 505-F-17-001. November.

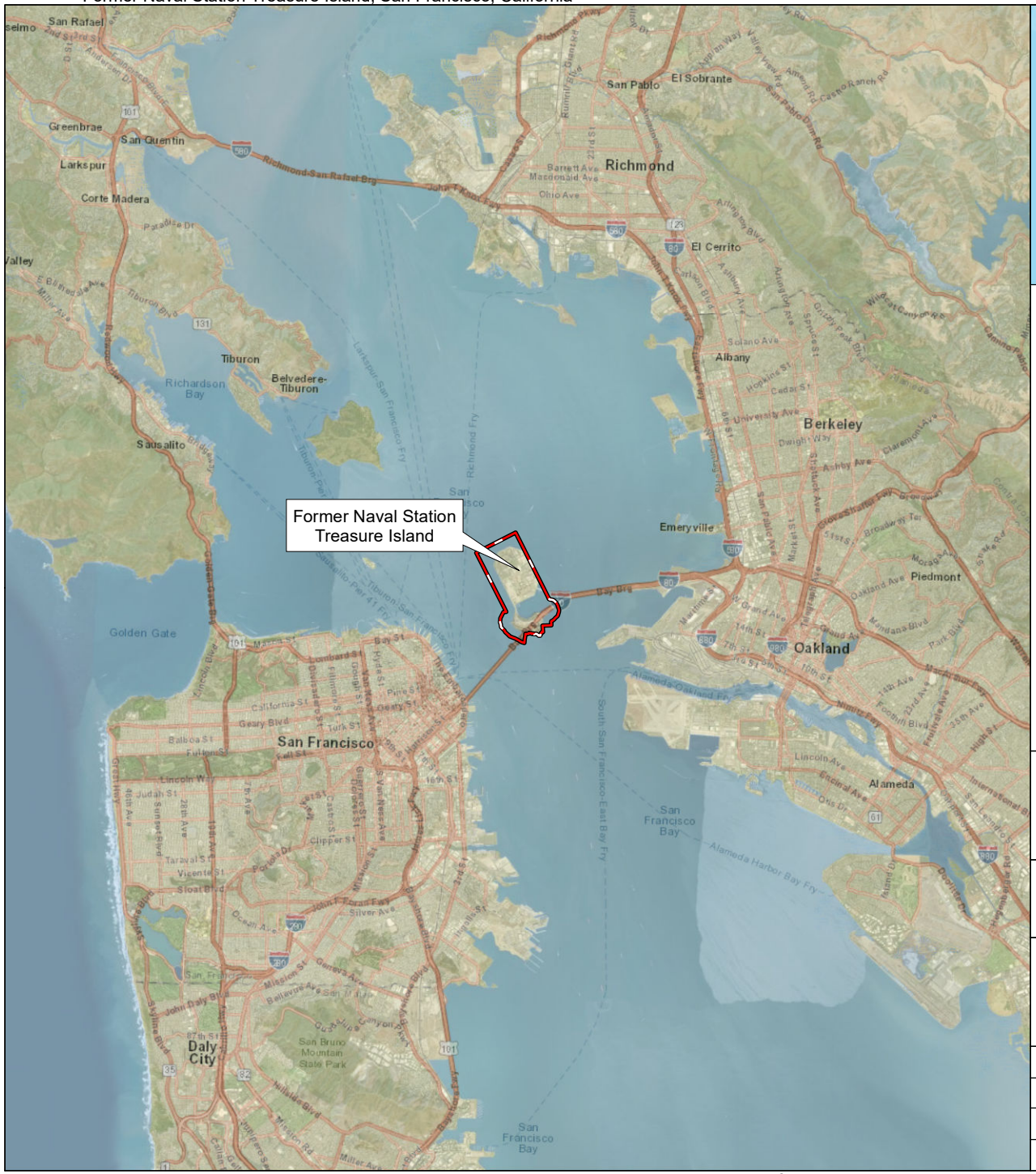
_____. 2019. *Interim Recommendation for Addressing Groundwater Contaminated with Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonate (PFOS)*. December 19.

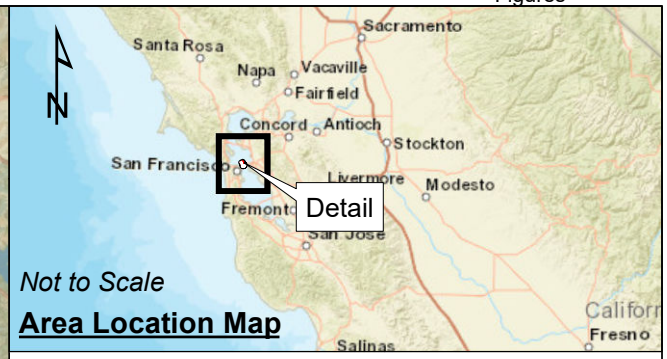
_____. 2021. *Regional Screening Levels*. November. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

_____. 2022. *Regional Screening Levels*. May. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

## Figures

This page is intentionally blank.




*Not to Scale*

**Area Location Map**

**LEGEND**

Former Naval Station Treasure Island Boundary

**Notes:**
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source/Aerial Photo: ESRI ArcGIS online service 2022

N

0 1.5 3 6
In Miles
1 Inch = 3 Mile

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Vicinity Map

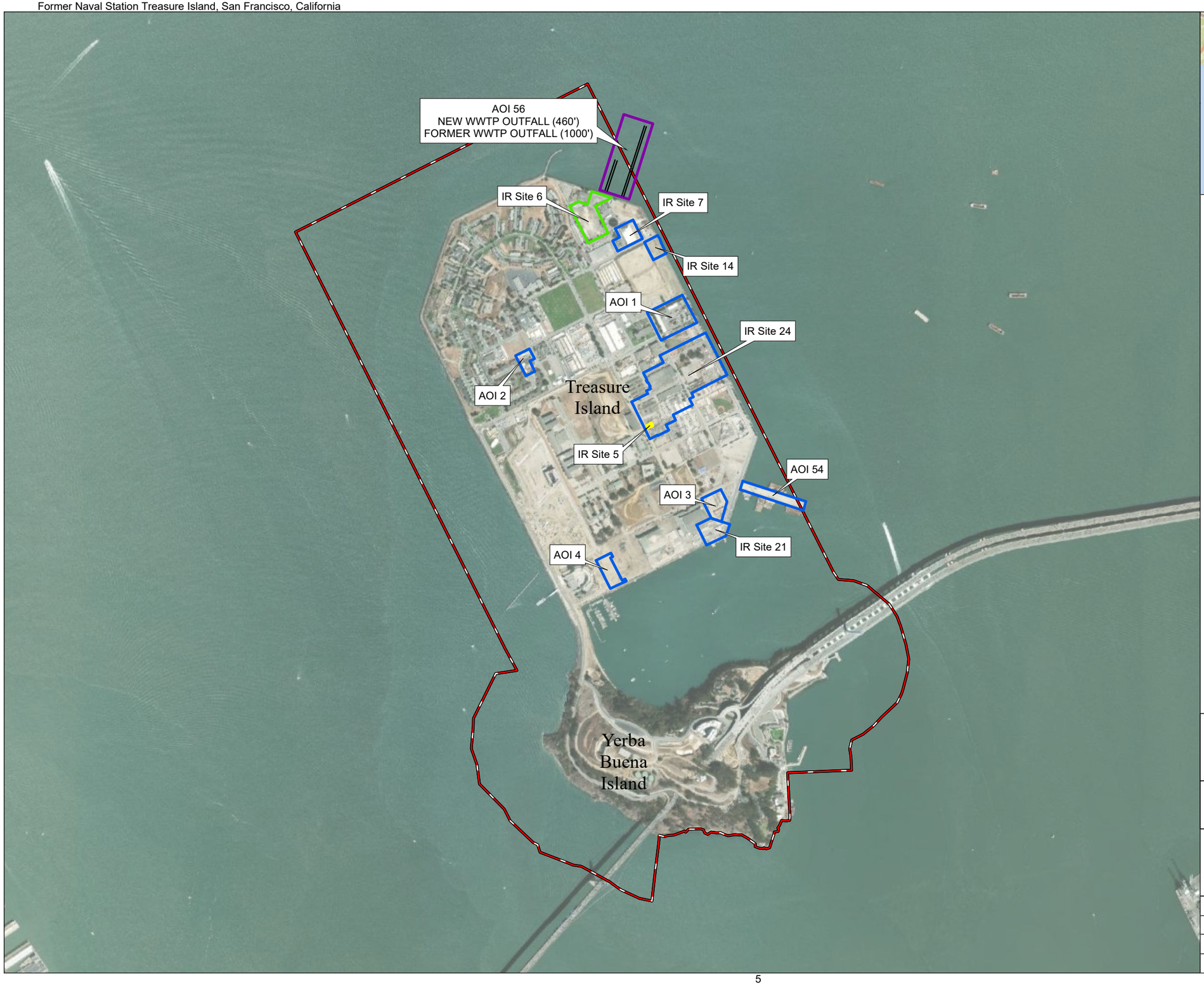
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

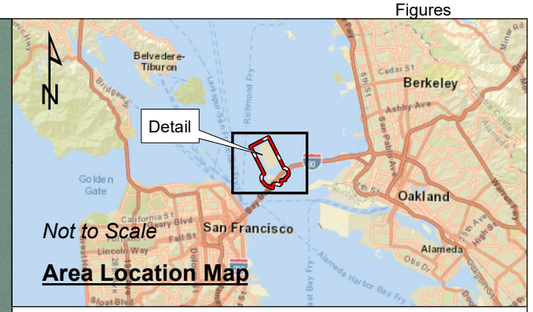
NAVFAC

FIGURE 1

Date: 5/19/2022 Path: D:\FilesFromWork\5026-2114484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig01_TI_PFAS_SI_Location.mxd

This page is intentionally blank.




**Legend**

- PFAS IR Sites and AOIs
- IR Site 5
- IR Site 6, Firefighting Training School, Will be Investigated During a Remedial Investigation
- AOI 56, WWTP Outfalls, Will Be Investigated In a Future Separate Investigation
- Former Naval Station Treasure Island Boundary

**Notes:**
AOI = Area of Interest
IR = Installation Restoration
PFAS = Per- and Polyfluoroalkyl Substances
WWTP = Wastewater Treatment Plan

Basemap Source: ESRI Online Streaming Service 2022

N

0 0.125 0.25 0.375 0.5
In Miles
1 Inch = 0.25 Miles

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Site Inspection Location Map

| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

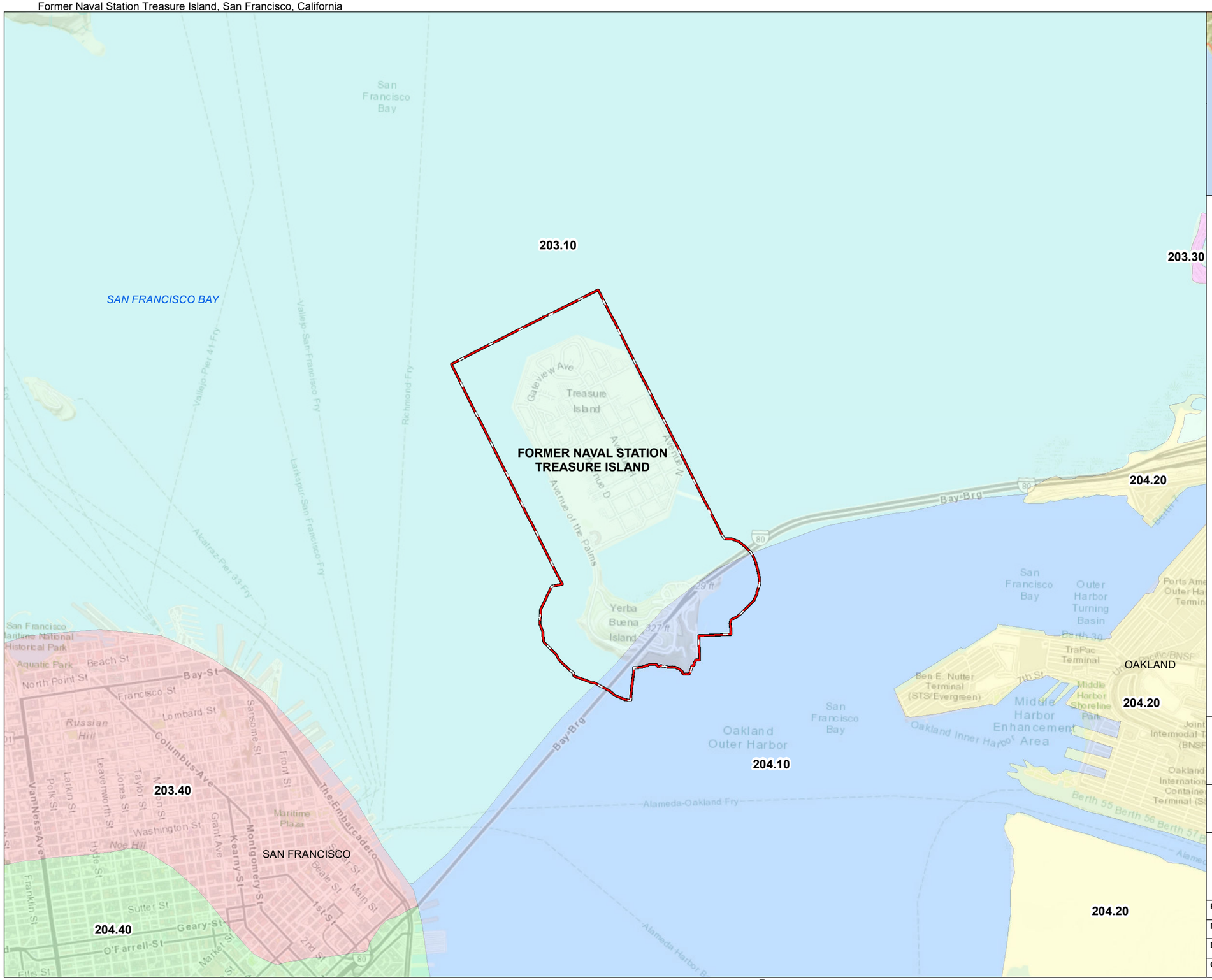
NAVFAC

FIGURE 2

Path: D:\FilesFromWork\5026-21\4484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig02_TI_PFAS_SI_AOIs.mxd

Date: 5/19/2022

This page is intentionally blank.




**Legend**

Hydrological Units

Bay Bridges Hydrological Unit

- 203.10, Bay Waters
- 203.30, Berkeley
- 203.40, San Francisco Bayside

South Bay Hydrological Unit

- 204.10. Bay Channel
- 204.20, East Bay Cities
- 204.40, San Mateo Bayside

- Former Naval Station Treasure Island Installation Boundary

**Notes:**
AOI = Area of Interest
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

N

0 0.25 0.5 0.75 1
In Miles
1 Inch = 0.5 Miles

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Former Naval Station Treasure Island Hydrological Basins

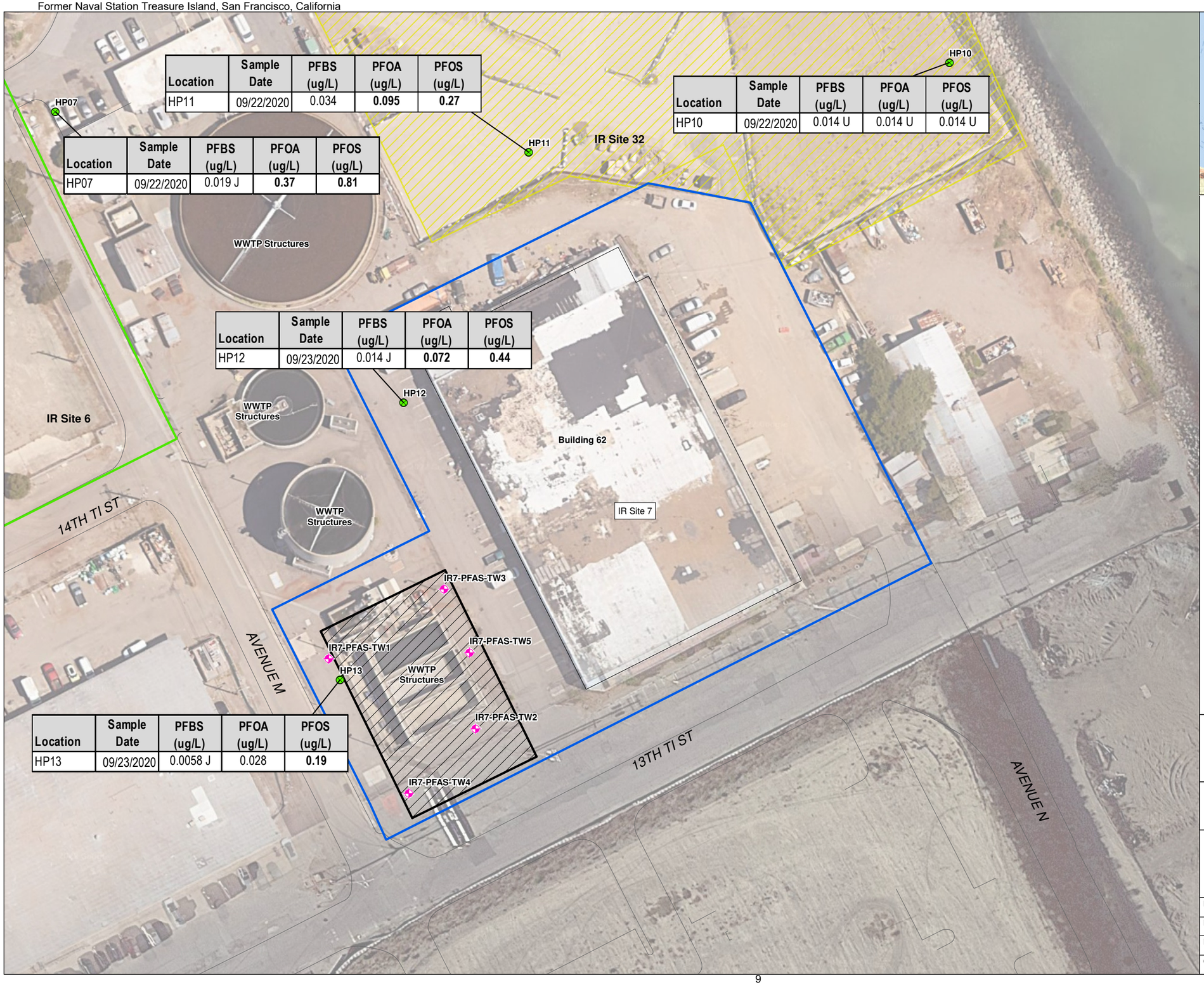
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

FIGURE 3

Path: D:\FilesFromWork\5026-21\4484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig03_TI_PFAS_SI_Hydro.mxd
Date: 5/19/2022

This page is intentionally blank.



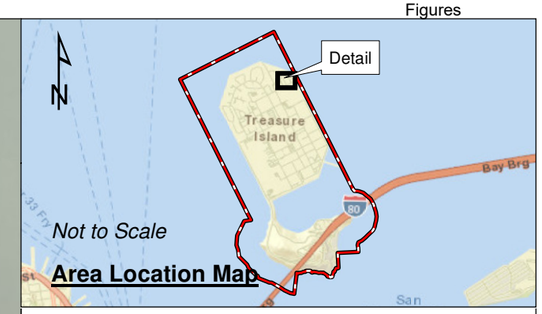

| Location | Sample Date | PFBS (ug/L) | PFOA (ug/L) | PFOS (ug/L) |
|---|---|---|---|---|
| HP11 | 09/22/2020 | 0.034 | **0.095** | **0.27** |

| Location | Sample Date | PFBS (ug/L) | PFOA (ug/L) | PFOS (ug/L) |
|---|---|---|---|---|
| HP07 | 09/22/2020 | 0.019 J | **0.37** | **0.81** |

| Location | Sample Date | PFBS (ug/L) | PFOA (ug/L) | PFOS (ug/L) |
|---|---|---|---|---|
| HP10 | 09/22/2020 | 0.014 U | 0.014 U | 0.014 U |

| Location | Sample Date | PFBS (ug/L) | PFOA (ug/L) | PFOS (ug/L) |
|---|---|---|---|---|
| HP12 | 09/23/2020 | 0.014 J | **0.072** | **0.44** |

| Location | Sample Date | PFBS (ug/L) | PFOA (ug/L) | PFOS (ug/L) |
|---|---|---|---|---|
| HP13 | 09/23/2020 | 0.0058 J | 0.028 | **0.19** |




**Legend**

- Proposed Temporary Well and Soil Sample Location for PFAS Sampling
- Hydropunch Location
- IR Site 7 (Approximate)
- IR Site 6
- Suspected Sludge Disposal Area
- Radiologically Impacted Area

| PFOS and PFOA Screening Levels in Groundwater (µg/L)[1] | |
|---|---|
| PFBS | 0.6 |
| PFOA | 0.04 |
| PFOS | 0.04 |

**Notes:**
**Bold** = exceeded screening criteria
[1.] Screening criteria for groundwater sample results follows Department of Defense. 2021. Memorandum on Investigating Per- and Polyfluoroalkyl Substances with the Department of Defense Cleanup Program, Residential Scenario Screening Levels. September 15.

µg/L = microgram(s) per liter
AOI = Area of Interest
IR = Installation Restoration
J = Value is estimated between the Detection Limit (Method Detection Limit) and the Limit of Detection (Reporting Limit)
PFAS = per- and polyfluorinated substances
PFBS = perfluorobutanesulfonic acid;
PFOA = perfluorooctanoic acid
PFOS = perfluorooctane sulfonate
U = analyte not reported at or above the method detection limit.
WWTP = Wastewater Treatment Plant

Basemap Source: ESRI Online Streaming Service 2022

0 25 50 75 100
Feet
1 Inch = 60 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Soil and Groundwater Sampling Locations IR Site 7 – Pesticide Storage Area and WWTP Sludge Disposal

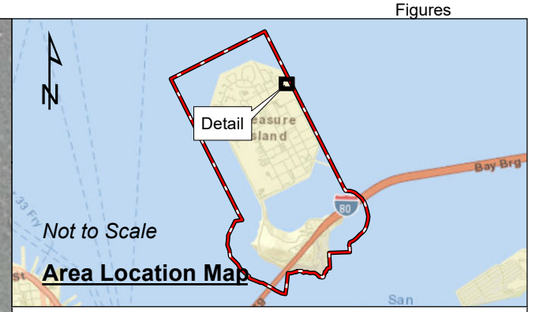
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

FIGURE 4

Path: D:\FilesFromWork\5026-21\4484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig04_TI_PFAS_SI_IR7.mxd
Date: 5/22/2022

This page is intentionally blank.


**Legend**

- Proposed Temporary Well Location for PFAS Sampling
- Former AST (Former Fuel Farm)
- Former Site Feature
- Former ASTs
- IR Site 14

**Notes:**
The soil in this location was surcharged to meet geotechnical criteria for future development.

AOI = Area of Interest
AST = Aboveground Storage Tank
IR = Installation Restoration
PFAS = Per- and Polyfluoroalkyl Substances
UST = Underground Storage Tank

Basemap Source: ESRI Online Streaming Service 2022

N

0 20 40 60 80
Feet
1 Inch = 40 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Groundwater Sampling Locations
## IR Site 14 – Former New Fuel Farm

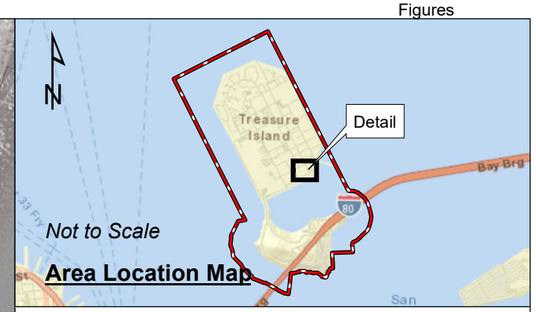
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

FIGURE 5

Date: 5/19/2022
Path: D:\FilesFromWork\5026-2114484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig05_TI_PFAS_SI_IR14.mxd

This page is intentionally blank.


**Legend**

- Proposed Temporary Well and Soil Sample Location for PFAS Sampling
- Approximate Location of Former Helicopter Pad
- Existing Concrete Pavement Encompassing Former Helicopter Pad Area
- Former Site Feature
- AOI 3 and IR Site 21

**Notes:**
*Approximate Former Firefighting Foam Drum Storage Area based on review of information in the 1995 Environmental Baseline Survey and publicly-available historical images in Google Earth Pro (ERM-West, Inc. 1995. Basewide Environmental Baseline Survey Report for Naval Station Treasure Island. May 19.)

AOI = Area of Interest
IR = Installation Restoration
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

N

0 40 80 120 160
Feet
1 Inch = 80 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Soil and Groundwater Sampling Locations IR Site 21/AOI 3 –Waste Oil Recovery Area/Helicopter Landing Area

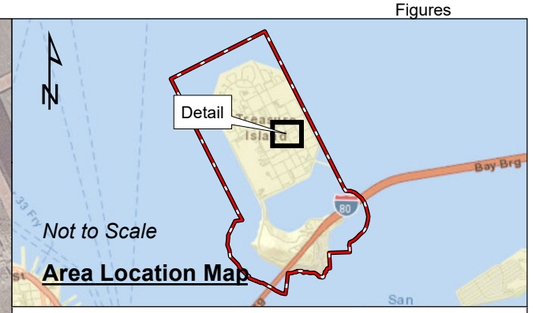
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

FIGURE 6

Date: 5/19/2022 Path: D:\FilesFromWork\5026-21\4484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig06_TI_PFAS_SI_IR21_AOI3.mxd

This page is intentionally blank.


**Legend**

- Existing Monitoring Well Proposed for PFAS Sampling
- Existing Alternative Monitoring Well Proposed for PFAS Sampling
- Proposed Temporary Well and Soil Sample Location for PFAS Sampling
- Approximate Groundwater Flow Direction (NOREAS 2021)
- IR Site 24
- IR Site 5

**Notes:**
AFFF = Aqueous Film Forming Foam
AOI = Area of Interest
IR = Installation Restoration
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

Reference:
NOREAS.2021. 2020 Draft Annual Basewide Groundwater and Soil Gas Monitoring Report, Installation Restoration Sites 6, 12, 21, and 24 Former Naval Station Treasure Island, San Francisco, California.

N
0 50 100 150 200
Feet
1 Inch = 100 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Soil and Groundwater Sampling Locations
## IR Site 24 - Former Dry Cleaner

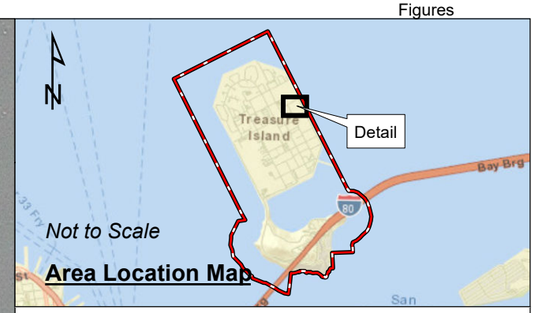
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

FIGURE 7

Path: D:\FilesFromWork\5026-2114484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig07_TI_PFAS_SI_IR24.mxd
Date: 5/19/2022

This page is intentionally blank.


**Legend**

- Proposed Temporary Well and Soil Sample Location for PFAS Sampling
- AOI 1

**Notes:**
AOI = Area of Interest
NTTC = Naval Technical Training Center
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

N

0 40 80 120 160
Feet
1 Inch = 80 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Soil and Groundwater Sampling Locations
## AOI 1 – NTTC Fire Training School

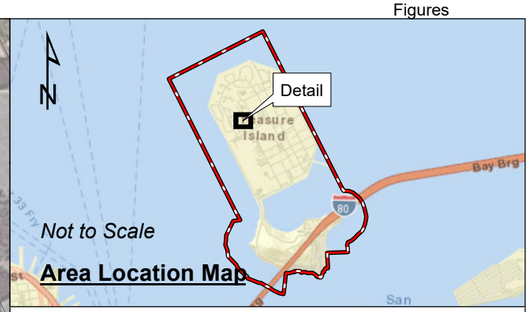
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

FIGURE 8

Date: 5/19/2022 Path: D:\FilesFromWork\5026-2114484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig08_TI_PFAS_SI_AOI1.mxd

This page is intentionally blank.


**Legend**

- Proposed Temporary Well and Soil Sample Location for PFAS Sampling
- Fence Line
- Former Site Feature
- AOI 2
- Radiologically Impacted Areas

**Notes:**
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

N

0 20 40 60 80
Feet
1 Inch = 50.57 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Soil and Groundwater Sampling Locations AOI 2 – Former Naval Station Fire Department

| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

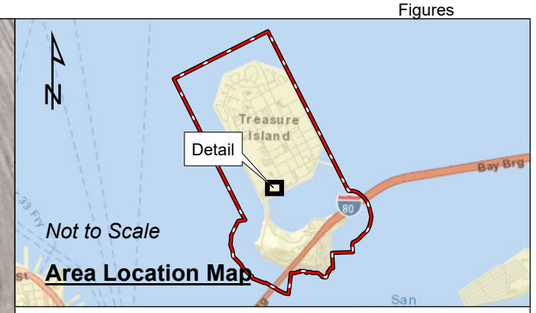
NAVFAC

FIGURE 9

Path: D:\FilesFromWork\5026-21\4484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig09TI_PFAS_SI_AOI2.mxd

Date: 5/19/2022

This page is intentionally blank.


**Legend**

- Proposed Temporary Well Location for PFAS Sampling
- Former Site Feature
- AOI 4

**Notes:**
The soil in this location was surcharged to meet geotechnical criteria for future development.

AOI = Area of Interest
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

N

0 25 50 75 100
Feet
1 Inch = 50 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Groundwater Sampling Locations AOI 4 – Former Fire Station and Equipment Storage Area

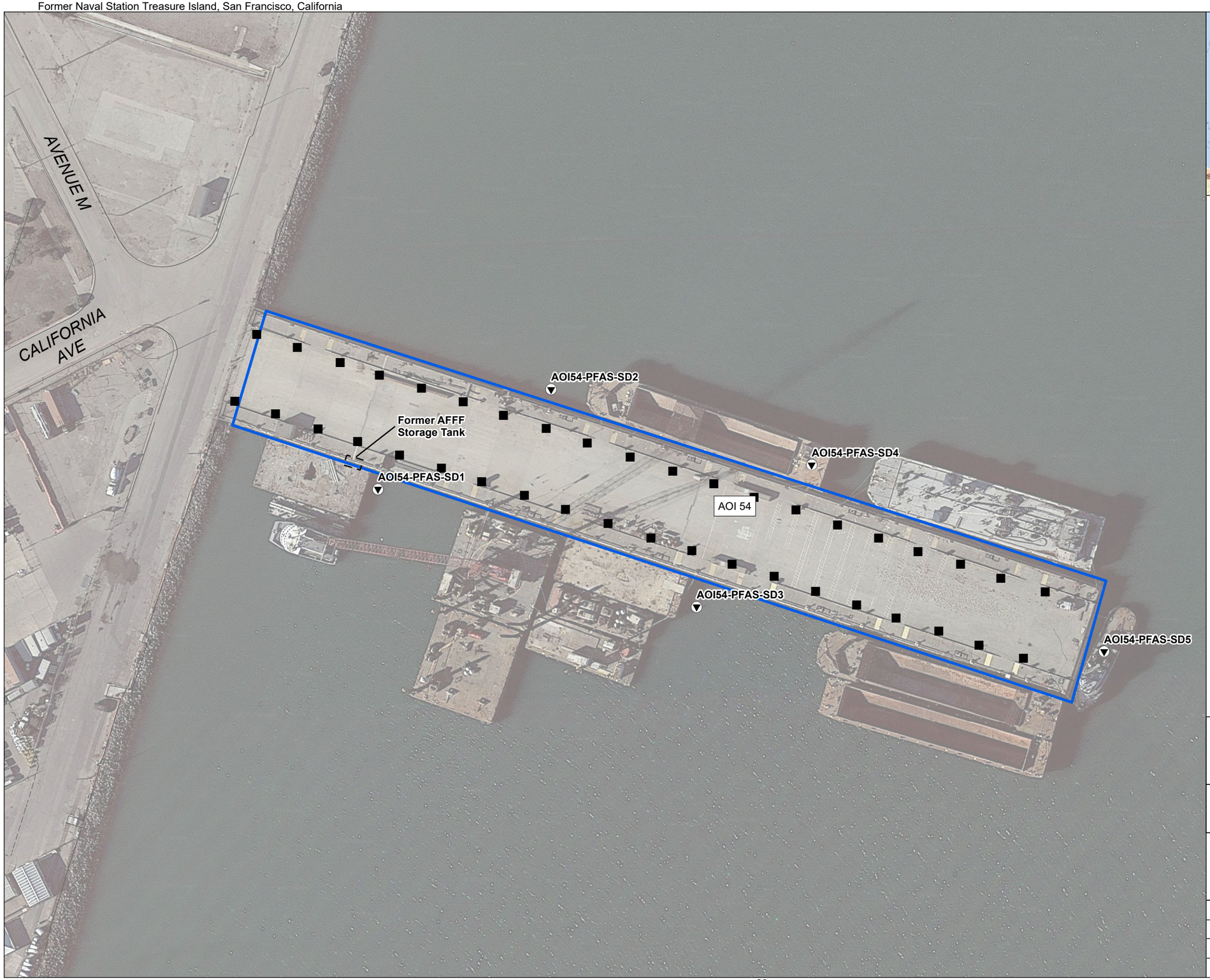
| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

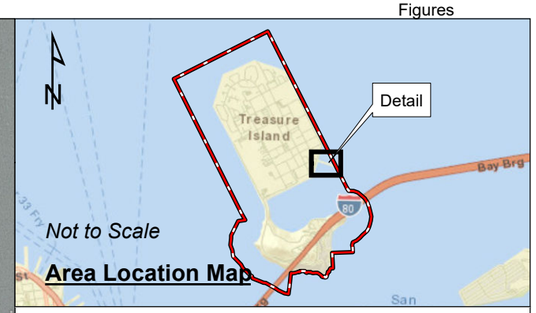
NAVFAC

FIGURE 10

Path: D:\FilesFromWork\5026-2114484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig10_TI_PFAS_SI_AOI4.mxd
Date: 5/19/2022

This page is intentionally blank.




**Legend**

- Proposed Sediment Sample Location for PFAS Sampling
- Floor/Surface Drain
- Former Site Feature
- AOI 54

**Notes:**
AFFF = Aqueous Film Forming Foam
AOI = Area of Interest
PFAS = Per- and Polyfluoroalkyl Substances

Basemap Source: ESRI Online Streaming Service 2022

N
0 50 100 150 200
Feet
1 Inch = 100 Feet

Site Inspection for PFAS
at Installation Restoration Sites 7, 14, 21, 24
and AOIs 1, 2, 3, 4, and 14.
Former Naval Station Treasure Island, San Francisco, California

## Sediment Sampling Locations
## Sampling Locations
## AOI 54 – Pier 1

| | |
|---|---|
| PROJECT NO.: | 5026-21-4484 |
| DATE: | May 2022 |
| DRAWN BY: | KOB |
| CHECKED BY: | LC |

NAVFAC

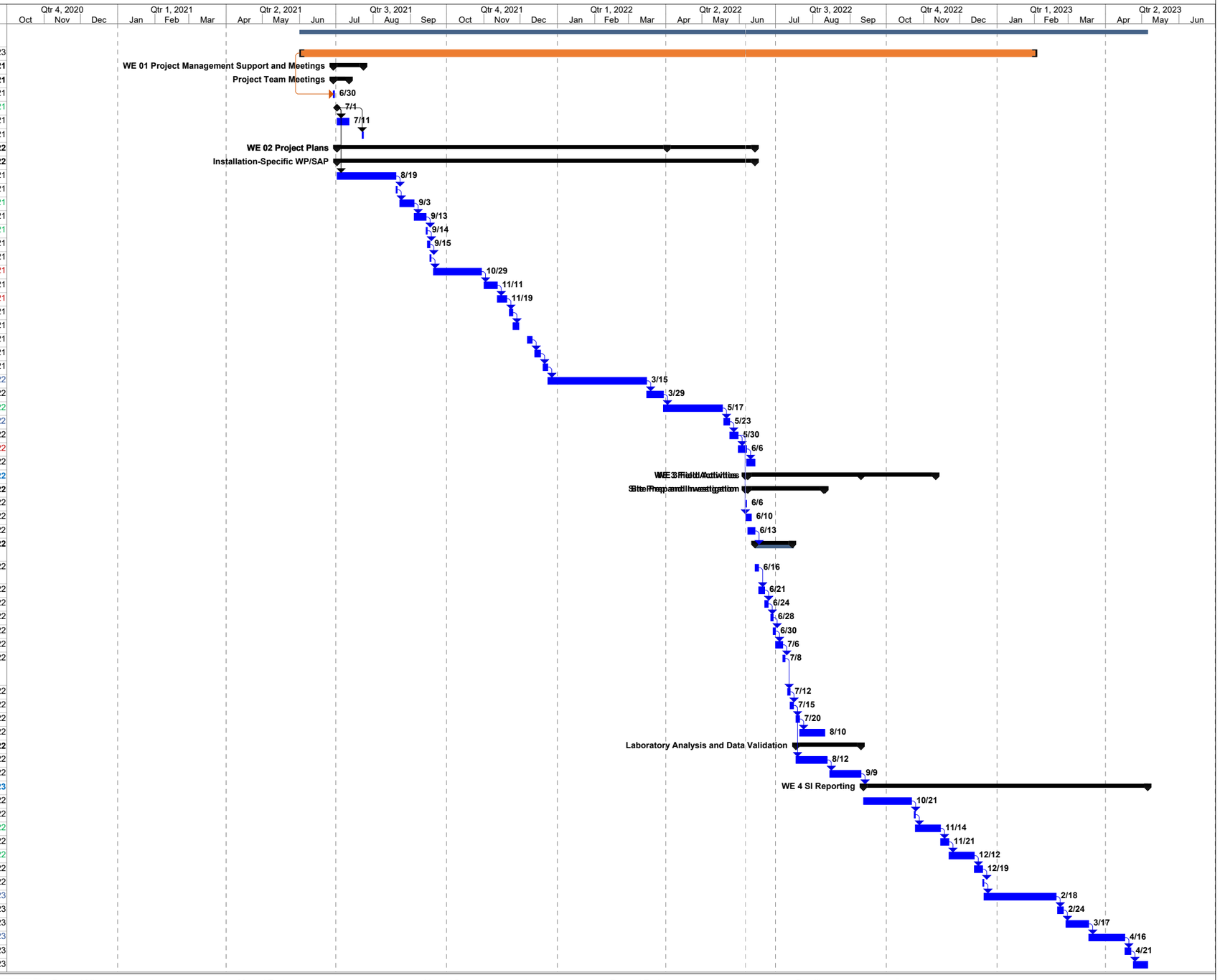
FIGURE 11

Date: 5/19/2022 Path: D:\FilesFromWork\5026-21\4484_TI_SI_PFAS\GIS\Figs_TI_PFAS_SI_August2021\Fig11_TI_PFAS_SI_AOI54.mxd

This page is intentionally blank.

**Figure A-12 Project Schedule**
**SI for PFAS at Former Naval Station Treasure Island, CA**
**U.S. Department of the Navy - NAVFAC SW**

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | **SI for PFAS Fomer Naval Station Treasure Island, San Francisco, CA** | | | |
| 2 | Award of Delivery Order/Period of Performance | 612 edays | Tue 6/1/21 | Fri 2/3/23 |
| 3 | **WE 01 Project Management Support and Meetings** | **19 days?** | **Tue 6/29/21** | **Fri 7/23/21** |
| 4 | **Project Team Meetings** | **9 days** | **Tue 6/29/21** | **Sun 7/11/21** |
| 5 | Provide Draft Agenda and Meeting Materials | 1 eday | Tue 6/29/21 | Wed 6/30/21 |
| 6 | Installation Kickoff Meeting | 1 day | Thu 7/1/21 | Thu 7/1/21 |
| 7 | Kickoff Meeting Minutes | 10 edays | Thu 7/1/21 | Sun 7/11/21 |
| 8 | Site Walk | 1 day? | Fri 7/23/21 | Fri 7/23/21 |
| 9 | **WE 02 Project Plans** | **196 days?** | **Fri 7/2/21** | **Fri 4/1/22** |
| 10 | **Installation-Specific WP/SAP** | **247 days** | **Fri 7/2/21** | **Mon 6/13/22** |
| 11 | Prepare Internal Draft WP/SAP | 35 days | Fri 7/2/21 | Thu 8/19/21 |
| 12 | Submit Internal Draft WP/SAP | 1 day | Fri 8/20/21 | Fri 8/20/21 |
| 13 | Navy RPM Review | 10 days | Mon 8/23/21 | Fri 9/3/21 |
| 14 | Complete RTCs on RPM review | 10 edays | Fri 9/3/21 | Mon 9/13/21 |
| 15 | Navy RPM Approval of RTC | 1 day | Tue 9/14/21 | Tue 9/14/21 |
| 16 | Prepare Internal Draft WP/SAP for QAO Review | 2 days | Wed 9/15/21 | Thu 9/16/21 |
| 17 | Submit Internal Draft WP/SAP for QAO Review | 1 day | Fri 9/17/21 | Fri 9/17/21 |
| 18 | Navy QAO Review of Pre-Draft WP/SAP | 30 days | Mon 9/20/21 | Fri 10/29/21 |
| 19 | RTCs on QAO Comments/Prepare Draft WP/SAP | 9 days | Mon 11/1/21 | Thu 11/11/21 |
| 20 | Navy QAO Approval of RTCs/Draft WP/SAP | 6 days | Fri 11/12/21 | Fri 11/19/21 |
| 21 | Additional Navy comments on WP | 3 days | Mon 11/22/21 | Wed 11/24/21 |
| 22 | Prepared and submit revised Internal Draft WP | 3 days | Thu 11/25/21 | Mon 11/29/21 |
| 23 | New Navy comments from BRAC and SME on WP | 4 days | Tue 12/7/21 | Fri 12/10/21 |
| 24 | Prepared and submit revised Internal Draft WP | 5 days | Mon 12/13/21 | Fri 12/17/21 |
| 25 | Submit Draft SAP for Agency Review | 4 days | Mon 12/20/21 | Thu 12/23/21 |
| 26 | Agency Review of Draft WP/SAP | 82 edays | Thu 12/23/21 | Tue 3/15/22 |
| 27 | Complete RTC on Agency Comments | 10 days | Wed 3/16/22 | Tue 3/29/22 |
| 28 | Navy RPM Review of RTC | 35 days | Wed 3/30/22 | Tue 5/17/22 |
| 29 | Agency Approval of RTCs | 5 edays | Wed 5/18/22 | Mon 5/23/22 |
| 30 | Prepare Final WP/SAP for Navy QAO Approval | 5 days | Tue 5/24/22 | Mon 5/30/22 |
| 31 | Navy QAO Approval and Signature of Final WP/SAP | 5 days | Tue 5/31/22 | Mon 6/6/22 |
| 32 | Complete Final WP/SAP for Distribution | 5 days | Tue 6/7/22 | Mon 6/13/22 |
| 33 | **WE 3 Field Activities** | **112 days** | **Wed 6/8/22** | **Thu 11/10/22** |
| 34 | **Site Prep and Investigation** | **45 days** | **Wed 6/8/22** | **Tue 8/9/22** |
| 35 | Obtain Site Access and permits, as needed | 1 day | Mon 6/6/22 | Mon 6/6/22 |
| 36 | Procure Subcontractors | 5 days | Mon 6/6/22 | Fri 6/10/22 |
| 37 | Perform subsurface clearances | 4 days | Wed 6/8/22 | Mon 6/13/22 |
| 38 | **Drilling and installation of temporary wells and Sampling at Individual Sites** | **23 days** | **Tue 6/14/22** | **Thu 7/14/22** |
| 39 | AOI 4 (site has 1 well [AOI4-PFAS-TW5] within 100 feet of the bay, sampling during low tide) | 3 days | Tue 6/14/22 | Thu 6/16/22 |
| 40 | IR Site 14 | 3 days | Fri 6/17/22 | Tue 6/21/22 |
| 41 | IR Site 24 | 3 days | Wed 6/22/22 | Fri 6/24/22 |
| 42 | IR Site 7 | 2 days | Mon 6/27/22 | Tue 6/28/22 |
| 43 | AOI 1 | 2 days | Wed 6/29/22 | Thu 6/30/22 |
| 44 | AOI 3 | 4 days | Fri 7/1/22 | Wed 7/6/22 |
| 45 | IR Site 21 (site has 3 wells [IR21-PFAS-TW1, IR21-PFAS-TW3 and IR21-PFAS-TW5] within 100 feet of the bay, sampling during low tide) | 2 days | Thu 7/7/22 | Fri 7/8/22 |
| 46 | AOI 2 | 2 days | Mon 7/11/22 | Tue 7/12/22 |
| 47 | AOI 54 | 3 days | Wed 7/13/22 | Fri 7/15/22 |
| 48 | Surveying sample locations | 3 days | Mon 7/18/22 | Wed 7/20/22 |
| 49 | Waste characterization sampling and management/disposal | 15 days | Thu 7/21/22 | Wed 8/10/22 |
| 50 | **Laboratory Analysis and Data Validation** | **40 days** | **Mon 7/18/22** | **Fri 9/9/22** |
| 51 | Laboratory Analysis | 20 days | Mon 7/18/22 | Fri 8/12/22 |
| 52 | Data Validation | 20 days | Mon 8/15/22 | Fri 9/9/22 |
| 53 | **WE 4 SI Reporting** | **170 days** | **Mon 9/12/22** | **Fri 5/5/23** |
| 54 | Prepare Internal Draft SI | 30 days | Mon 9/12/22 | Fri 10/21/22 |
| 55 | Submit Internal Draft SI | 1 day | Mon 10/24/22 | Mon 10/24/22 |
| 56 | Navy Review | 15 days | Tue 10/25/22 | Mon 11/14/22 |
| 57 | Complete RTC | 5 days | Tue 11/15/22 | Mon 11/21/22 |
| 58 | Navy Approval of RTC | 15 days | Tue 11/22/22 | Mon 12/12/22 |
| 59 | Prepare Draft SI for Agency Review | 5 days | Tue 12/13/22 | Mon 12/19/22 |
| 60 | Submit Draft SI for Agency Review | 1 day | Tue 12/20/22 | Tue 12/20/22 |
| 61 | Agency Review | 60 edays | Tue 12/20/22 | Sat 2/18/23 |
| 62 | Complete RTC | 5 days | Mon 2/20/23 | Fri 2/24/23 |
| 63 | Navy Review of RTC | 15 days | Mon 2/27/23 | Fri 3/17/23 |
| 64 | Agency Acceptance of RTCs | 30 edays | Fri 3/17/23 | Sun 4/16/23 |
| 65 | Prepare Final SI for Agency Submittal | 5 days | Mon 4/17/23 | Fri 4/21/23 |
| 66 | Complete Final SI for Distribution | 10 days | Mon 4/24/23 | Fri 5/5/23 |




Project: N6247321F4484 - BRAC PFAS SI
Date: Mon 6/6/22

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Progress | Deadline

This page is intentionally blank.