Draft

Radiological Data Evaluation Findings Report for Parcel E Soil

Former Hunters Point Naval Shipyard
San Francisco, California

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Executive Summary

This report summarizes background information and data evaluation activities conducted on the historical radiological data collected by Tetra Tech EC, Inc. (TtEC) at the former Hunters Point Naval Shipyard (HPNS), San Francisco, California, and findings from the evaluation of soil sample data from Parcel E. HPNS is divided into parcels, which are further broken down into subparcels or work areas. Separate reports will be provided for interior building surfaces and for soil collected from other parcels at HPNS. This report is limited to the soil data at Parcel E. Other parcels and HPNS buildings will be addressed in future reports.

Radiological data collection and removal actions have been previously conducted by contractors[1] at these parcels using Department of the Navy (Navy) and regulatory agency-approved plans based on the Historical Radiological Assessment (HRA) (NAVSEA, 2004) and release criteria documented in the Action Memorandum (Navy, 2006), followed by recommendations for radiological release. There have been various concerns raised regarding the integrity of the data collected during the prior radiological investigation and removal actions at HPNS. Specifically, there are allegations of fraudulent representations of data by TtEC.

The first evidence of soil sample data manipulation and falsification is summarized in the Investigation Conclusion, Anomalous Soil Samples report (TtEC, 2014a). TtEC conducted an investigation after Radiological Affairs Support Office (RASO) noted that the final systematic soil sample results from a building site survey unit in Parcel E appeared to be representative of two different data populations, indicating that the soil samples had not been collected where they were purported to have been collected. This report concluded that in addition to this survey unit, 11 survey units at 3 additional sites in Parcels C and E had a high probability that the soil samples were not representative of the respective survey units, including 5 survey units in the Building 707 Triangle Area, and one survey unit at the Former Shack 79 and 80 Sites. Seven other locations were identified for further evaluation, including 1 survey unit in the Former 500 Series Buildings Area and 2 survey units in the Building 707 Triangle Area. TtEC concluded that the persons listed as the sample collectors, either by themselves or in conjunction with others, collected soil samples in areas outside the designated survey units. TtEC implemented a series of corrective actions and considered the action items closed, stating that "TtEC had not had a reoccurrence of the type of anomalous soil sample results that led to this investigation, indicating that the corrective actions have addressed the problem." Ultimately, TtEC conducted rework at each of the survey units identified. Subsequently, former workers at HPNS alleged additional and more widespread data manipulation and falsification.

Allegations of soil data manipulation and falsification made by former TtEC workers include the following:

- When sufficiently low levels of contamination were not obtained, soil samples were collected from a different area known to have lower radioactivity, and reported as having come from the location being investigated.
- Samples and analytical results were discarded when the results were above the release criteria.

[1] This term refers to contractors who performed prior work at HPNS and who do not have any involvement in this evaluation. Further, the references herein to work and actions performed at HPNS by other contractors that are the subject of this evaluation are meant to pertain to prior work, including, but not limited to investigation, data gathering, and remediation. The members of the team conducting this evaluation had no involvement in the prior work of other contractors, and this evaluation relies solely on available information and documentation.

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- Instead of collecting soil samples from locations predetermined to have higher gamma scan readings, samples would be collected from nearby soil and represented as having come from the original location.
- When sufficiently low levels of contamination were not obtained, soil sample collection sites were moved 5 to 10 feet in another direction and a new sample was obtained. The new sample was represented as having been obtained from the original location.
- Chain-of-custody forms were falsified to support the false sample collection information.
- During the screening of overburden soil, actual towed array speeds were greater than allowed speeds, thereby reducing the probability of radiation detection.
- Handheld detectors were used improperly, which may have led to increasing the detection limit of the scanning devices.
- Onsite soil sample results were reviewed and shipment of samples to the offsite lab was blocked if there was a high chance that the release criteria would be exceeded.

In response to the concerns, the Navy assembled a Technical Team (a group of technical experts) to conduct an evaluation of the previous data in light of the claims made. The Technical Team includes representatives from the Navy, United States Environmental Protection Agency, California Department of Toxic Substances Control, California Department of Public Health, the City of San Francisco, and Oregon State University. An independent, third-party team of nationally recognized experts has been contracted to support the Technical Team and perform the evaluation and confirmation investigation. This team includes Battelle, Cabrera Services, CH2M, Perma-Fix Environmental Services, and SC&A Environmental Services and Consulting. Oak Ridge Associated Universities and Argonne National Laboratory have been contracted to provide independent review of reports.

The objective of this evaluation is to review the historical radiological data collected by TtEC at HPNS, assess the potential for data falsification or manipulation, and recommend follow-up data collection to validate previous decisions regarding the property condition. The evaluation process for soil included developing databases; establishing a list of primary radionuclides to evaluate; running statistical and logic tests to identify inconsistencies in soil data; performing graphical data reviews to identify anomalies or unusual trends; identifying historically significant sites to identify where potential contamination could be present and manipulation or falsification of data could have underestimated site conditions; identifying sites based on allegations; developing a form to standardize the assessment and document the data evaluation results for every survey unit; and conducting and documenting data reviews.

Soil sample data from Parcel E trench units (excavated areas created during removal of storm drains and sanitary sewer lines) and fill units (excavated material from trench units that was used as backfill) were evaluated. Based solely on a review of the data previously collected by TtEC and the findings of the data evaluations, recommendations are provided for no further action[2], reanalysis of archived samples, confirmation sampling, or physical inspection of archived samples. These recommendations are defined as follows:

- **No Further Action** – No further evaluation of the data is recommended during this phase of the project as it did not appear that data manipulation or falsification by TtEC had occurred. This

[2] No further evaluation of the data is recommended during this phase of the project as it did not appear from the scope of this data evaluation that data manipulation or falsification by TtEC had occurred. This designation is not meant to apply beyond the evaluation of the data and does not preclude other actions that may be taken by the Navy.

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- **Reanalysis of Archived Samples** – Reanalysis of the archived soil samples (samples collected by TtEC that may be available in onsite storage) collected as initial systematic sample data at an offsite laboratory is recommended. The evaluation indicated evidence of potential data manipulation or falsification of final systematic sample data. The purpose for the reanalysis is to a) compare the initial systematic sample results to the release criteria to see if the results may reveal that the release criteria were met and remediation was not required[3] even though final systematic sample results were potentially manipulated and falsified, or b) provide offsite laboratory results to document current site conditions.
- **Confirmation Sampling** – Collection of additional data (surveys, scans, or soil samples) is recommended during this phase of the project. The evaluation indicated evidence of potential data manipulation or falsification based upon the methods used to review the data. The available data are suspect and additional data are needed to document current site conditions. Task-specific plans will be provided detailing the extent of the confirmation sampling activities.
- **Physical Inspection of Archived Samples** – Physical inspection of archived soil samples (samples collected by TtEC that may be available in onsite storage) is recommended during this phase of the project. The evaluation indicated evidence of potential data manipulation or falsification based upon the methods used to review the data. The purpose of the physical inspection of the samples is to determine whether the physical soil characteristics are what would be expected given the sample's collection location. This comparison will help determine whether data have been manipulated or falsified.

The areas evaluated in Parcel E included 57 trench units, 96 fill units, and 16 current and former building sites with 104 soil survey units. More than 11,000 soil samples were collected from these areas from 2010 through 2016. The results of the resampling at the current and former building site in Parcel E; as discussed in the Investigation Conclusion, Anomalous Soil Samples report (TtEC, 2014a), were considered in the evaluations. Based solely on a review of the data previously collected by TtEC and the findings of the data evaluations, the following recommendations are provided:

- Trench units - There was no evidence of potential data manipulation or falsification identified at 31 of the 57 trench units evaluated; therefore, no further action is recommended. There was evidence of potential data manipulation or falsification at the remaining 26 trench units, and confirmation sampling is recommended for of these units.
- Fill units - There was no evidence of potential data manipulation or falsification identified at 32 of the 96 fill units evaluated; therefore, no further action is recommended. There was evidence of potential data manipulation or falsification at the remaining 64 fill units used as backfill for 32 trench survey units, and confirmation sampling is recommended. Of the 64 fill units, 60 were recommended for confirmation sampling based on evidence of biased sample collection at locations to potentially avoid the highest gamma scan measurements.

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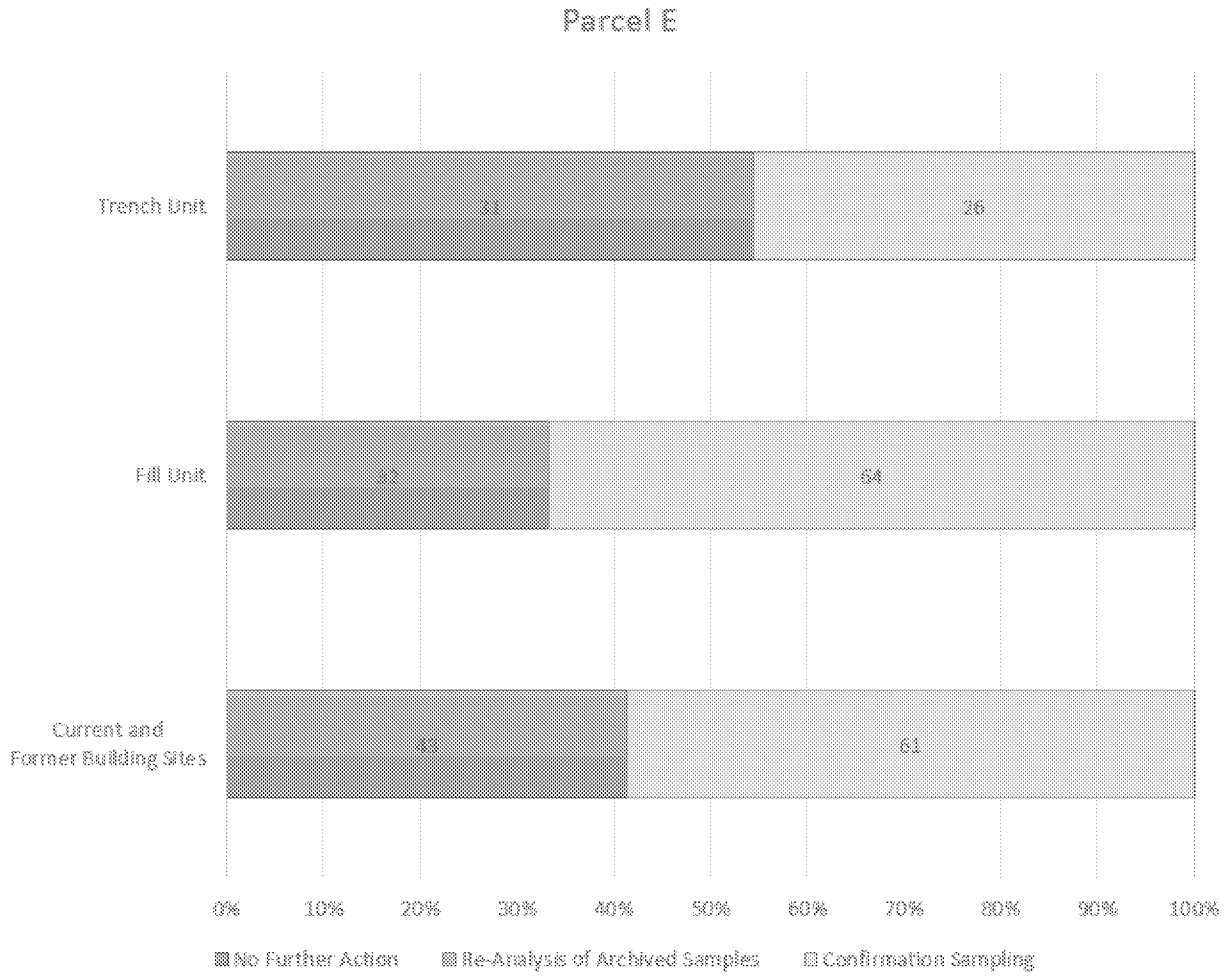
[3] Ra-226 results were reported by the onsite laboratory using a screening method based on the 186 keV energy peak. The offsite laboratory analyzed Ra-226 using a definitive method, allowing the soil samples to equilibrate (21-day in-growth) and reported concentrations using the 609 keV energy peak for Bi-214. Comparisons between the onsite laboratory screening results and the offsite laboratory definitive results for Ra-226 demonstrate the onsite laboratory results were consistently biased high. The Ra-226 analytical results from the onsite laboratory resulted in false exceedances of the release criteria, which resulted in the initiation of remediation. Remediation may have been avoided had soil samples been allowed to equilibrate (21-day in-growth) and decisions had been based on the more reliable Bi-214 analysis using the 609 keV energy peak. The screening method used by the onsite laboratory was selected to allow for rapid decision making during field investigations and to prevent health and safety concerns associated with large open excavations.

- Current and Former Building Sites – At 14 buildings, representing 102 survey units, there was evidence of potential data manipulation or falsification at 61 survey units and confirmation sampling is recommended; and there was no evidence of potential data manipulation or falsification identified at the remaining 41 survey units and no further action is recommended. At 2 buildings, representing 2 survey units, there was no evidence of potential data manipulation or falsification and no further action is recommended.



Assumptions and Uncertainties

The following assumptions and uncertainties are associated with this evaluation:

- This evaluation is based solely on available data. The procedures were developed to identify the potential for manipulation or falsification of soil samples previously collected by TtEC at HPNS. This evaluation should be used to identify recommended sampling locations and as a tool to help determine where additional data should be collected.
- The potential for falsification of gamma static measurements, where identified in the investigations of the trench units, was noted on the evaluation forms; however, confirmation sampling was only recommended if there was also evidence of potential manipulation or falsification in the soil sample data. It is expected that the results of gamma static measurements and soil sample data collected

from the same location would be correlated; however, if either the gamma static measurements or soil samples were falsified or collected incorrectly, the data would not be correlated.

The work plan did not provide specific instructions for performing gamma static measurements at systematic and bias locations. Gamma static measurement results were provided and the available documentation indicates the measurements were intended to be taken at locations where final systematic samples were collected. The data evaluation compared the gamma static measurement results with the soil sample results and gamma scan results. When differences between static, scan, and soil sample results were observed, the assumption of correlated results was rejected and each data set was evaluated independently. However, since final decisions regarding property transfer were based solely on soil sample data and the collection of gamma static measurements was not considered in these decisions, confirmation sampling was only recommended when potential falsification of soil sample results was identified.

- Evidence of potential data manipulation and falsification was discovered during the Navy's soil data evaluation of Parcel E. Because it is impossible to determine whether every instance of potential data manipulation or falsification has been identified, the Navy recommends additional surveys and sampling beyond the areas with evidence of data manipulation. Additional soil sampling locations will be selected in coordination with the regulatory agencies.
- Data quality related to TtEC's laboratory analytical methods and procedures were not evaluated. Data quality has been assessed and approved by the Navy and regulatory agencies in previous reports submitted by TtEC.

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Acronyms and Abbreviations

Ac	actinium
Am	americium
Bi	bismuth
COC	chain-of-custody
cpm	count(s) per minute
cps	count(s) per second
Cs	cesium
CSR	construction summary report
ES	excavated soil unit
FRED	Final Radiological Evaluation Database
FSSR	final status survey results
G-RAM	general radioactive material
H-3	tritium or hydrogen-3
HPNS	Hunters Point Naval Shipyard
HRA	historical radiological assessment
IR	Installation Restoration
K	potassium
K-S	Kolmogorov-Smirnov
K-W	Kruskal-Wallis
keV	kiloelectron volt
LLRW	low-level radioactive waste
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mrem/yr	millirem(s) per year
Navy	Department of the Navy
NORM	naturally occurring radioactive material
NRDL	Navy Radiological Defense Laboratory
Pb	lead
pCi/g	picocurie(s) per gram
PRC	PRC Environmental Management, Inc.
Pu	plutonium
Ra	radium
RACR	removal action completion report
RASO	Radiological Affairs Support Office
ROC	radionuclide of concern
RSY	radiological screening yard
Sr	strontium
SU	survey unit
SUPR	survey unit project report
Th	thorium
TtEC	Tetra Tech EC, Inc.

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TU	trench survey unit or trench unit
U	uranium
UC	utility corridor
USEPA	United States Environmental Protection Agency

SECTION 1

Introduction

This report summarizes background information and data evaluation activities conducted on the historical radiological data collected by Tetra Tech EC, Inc. (TtEC) at the former Hunters Point Naval Shipyard (HPNS), San Francisco, California, and findings from the evaluation of soil sample data from Parcel E. HPNS encompasses approximately 934 acres, including approximately 491 acres on land, at the point of a high, rocky 2-mile-long peninsula projecting southeastward into the San Francisco Bay. HPNS is divided into parcels, which are further broken down into subparcels or work areas. The radiologically impacted sites identified in the Historical Radiological Assessment (HRA) (NAVSEA, 2004) included in this evaluation are located within Parcels B, C, D-2, E, and G, and Utility Corridors (UC)-1, UC-2, and UC-3 (**Figure 1-1**). Separate reports will be provided for interior building surfaces and for soil collected from other parcels at HPNS. This report is limited to the soil data at Parcel E. Other parcels and HPNS buildings will be addressed in future reports.

Radiological data collection and removal actions have been previously conducted by contractors[1] at these parcels using Department of the Navy (Navy) and regulatory agency-approved plans based on the HRA (NAVSEA, 2004) and release criteria documented in the Action Memorandum (Navy, 2006), followed by recommendations for radiological release. There have been various concerns raised regarding the integrity of the data collected during the prior radiological investigation and removal actions at HPNS. Specifically, there are allegations of fraudulent representations of data by TtEC.

In response to the concerns, the Navy assembled a Technical Team (a group of technical experts) to conduct an evaluation of the previous data in light of the claims made. The Technical Team includes representatives from the Navy, United States Environmental Protection Agency (USEPA), California Department of Toxic Substances Control, California Department of Public Health, the City of San Francisco, and Oregon State University. An independent, third-party team of nationally recognized experts has been contracted to support the Technical Team and perform the evaluation and confirmation investigation. This team includes Battelle, Cabrera Services, CH2M, Perma-Fix Environmental Services, and SC&A Environmental Services and Consulting. Oak Ridge Associated Universities and Argonne National Laboratory have been contracted to provide independent review of reports.

1.1 Objective

The objective of this evaluation is to review and assess the historical radiological data collected by TtEC at HPNS and recommend follow-up data collection needed to validate decisions regarding current property condition. Based on the findings from the evaluation, recommendations are made herein for next steps.

1.2 Scope of Data Evaluation

This evaluation was conducted to evaluate the historical radiological data collected by TtEC at HPNS and determine whether, when, and how follow-up data should be collected to validate decisions regarding the current property condition. The radiological data previously collected by TtEC in support of the investigation and remediation of the sanitary sewer line and utility corridor, and current and former

[1] This term refers to contractors who performed prior work at HPNS and who do not have any involvement in this evaluation. Further, the references herein to work and actions performed at HPNS by other contractors that are the subject of this evaluation are meant to pertain to prior work, including, but not limited to investigation, data gathering, and remediation. The members of the team conducting this evaluation had no involvement in the prior work of other contractors, and this evaluation relies solely on available information and documentation.

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building sites include approximately 50,000 soil samples (equivalent to more than 900,000 analytical results) collected from more than 300 trench units, more than 500 fill units, more than 25 current and former building sites, and 11 survey units at the North Pier.

Figure 1-2 presents the areas evaluated by TtEC and defines the scope of the data evaluation.

1.3 Assumptions and Uncertainties

The following assumptions and uncertainties are associated with this evaluation:

- This evaluation is based solely on available data. The procedures were developed to identify the potential for manipulation or falsification of soil samples previously collected by TtEC at HPNS. This evaluation should be used to identify recommended sampling locations and as a tool to help determine where additional data should be collected.
- The potential for falsification of gamma static measurements, where identified in the investigations of the trench units, was noted on the evaluation forms; however, confirmation sampling was only recommended if there was also evidence of potential manipulation or falsification in the soil sample data. It is expected that the results of gamma static measurements and soil sample data collected from the same location would be correlated; however, if either the gamma static measurements or soil samples were falsified or collected incorrectly, the data would not be correlated.

  The work plan did not provide specific instructions for performing gamma static measurements at systematic and bias locations. Gamma static measurement results were provided and the available documentation indicates the measurements were intended to be taken at locations where final systematic samples were collected. The data evaluation compared the gamma static measurement results with the soil sample results and gamma scan results. When differences between static, scan, and soil sample results were observed, the assumption of correlated results was rejected and each data set was evaluated independently. However, since final decisions regarding property transfer were based solely on soil sample data and the collection of gamma static measurements was not considered in these decisions, confirmation sampling was only recommended when potential falsification of soil sample results was identified.
- Evidence of potential data manipulation and falsification was discovered during the Navy's soil data evaluation of Parcel E. Because it is impossible to determine whether every instance of potential data manipulation or falsification has been identified, the Navy recommends additional surveys and sampling beyond the areas with evidence of data manipulation. Additional soil sampling locations will be selected in coordination with the regulatory agencies.
- Data quality related to TtEC's laboratory analytical methods and procedures were not evaluated. Data quality has been assessed and approved by the Navy and regulatory agencies in previous reports submitted by TtEC.

SECTION 2

Radiological History

As part of the environmental investigations being performed to facilitate transfer of HPNS, the Navy prepared an HRA that documents the history of radiological materials at HPNS. The HRA is presented in two volumes. Volume I (NAVSEA, 2000) addresses radioactivity associated with the Naval Nuclear Propulsion Program and concludes that berthing of nuclear-powered ships at HPNS or work done on these ships resulted in no adverse effects on the human population or the environment. Volume II (NAVSEA, 2004) presents the history of general radioactive material (G-RAM) at HPNS in three primary operational areas:

- Use of G-RAM at HPNS by the naval shipyard and Triple A.
- Decontamination activities associated with ships that participated in atomic weapons testing, including OPERATION CROSSROADS.
- Radiological activities associated with the Radiation Safety Section/Radiation Laboratory Navy Radiological Defense Laboratory (NRDL).

In response to the HRA, an Action Memorandum for a time-critical removal action was prepared by the Navy in 2006, proposing removal actions to substantially eliminate identified pathways of receptor exposure to radioactive contamination for surrounding populations and nearby ecosystems, such as nearby wetlands and the San Francisco Bay (Navy, 2006). Soil areas with potential to contain low-level radioactive contaminants addressed through radiological removal actions by TtEC include the following:

- Storm drains and sanitary sewer lines and associated surrounding soil (more than 28 miles of trench lines and 300,000 cubic yards of soil were investigated and removed or used as backfill).
- Soil associated with current and former building sites.

This section presents a description of the investigations and cleanup that TtEC was contracted to perform and is based on available documents reviewed and approved by the Navy and regulatory agencies. Interior building surfaces investigated by TtEC will be addressed in a separate report. This section includes a summary of the Investigation Conclusion, Anomalous Soil Samples report (TtEC, 2014a) in which soil data falsification was first documented, and a summary of former worker allegations of additional wrongdoing.

2.1 Storm Drain and Sanitary Sewer Line Investigation

The Navy initiated the basewide removal action of the storm drains and sanitary sewer systems in 2006 as a part of the time-critical removal action to address potential radiological materials in soil, debris, and structures at HPNS (Navy, 2006). Cesium (Cs)-137, radium (Ra)-226, and strontium (Sr)-90 are the radionuclides of concern (ROCs) for the storm and sanitary sewer system (NAVSEA, 2004). As outlined in the *Base-Wide Sanitary Sewer and Storm Drain Removal Work Plan, Hunters Point Shipyard, San Francisco, California* (Storm Drain Removal Work Plan) (TtEC, 2010), the storm drains and sanitary sewer systems were removed parcel by parcel or specified area. The storm drains and sewer lines were considered radiologically impacted because of the possibility that radioactive waste materials had been disposed of in sinks and drains. The soil immediately below the lines was considered impacted to account for potential leakage, and the soil above the lines was considered impacted to account for undocumented repairs to the lines that may have mixed contaminated soil from leakage areas with overlying soil.

The storm drain and sewer line removal action included excavation of soil, removal of pipelines, plugging of open sewer or storm drain lines left in place during the removal process, ex situ radiological screening

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and sampling of the pipeline, and performance of final status surveys of the excavated soil and exposed excavation of trench surfaces. Excavated soil overlying storm drains and sanitary sewer lines was to be "removed to a minimum of 1 foot below and to the sides of each storm drain and sanitary sewer pipeline."

Excavated soil was transported to a radiological screening yard (RSY) pad for radiological surveys to determine whether the soil could be reused as backfill or required disposal. The soil was placed on screening pads in lifts, not exceeding 6 inches in height and up to 1,000 square meters in area. The radiological survey of excavated soil consisted of a high-density gamma surface scan, supported by global positioning system equipment. An investigation level for scan surveys was established to identify elevated levels of radioactivity. If the investigation level was exceeded, biased samples were collected at locations where elevated levels of radioactivity were identified, and soil characterized by laboratory analytical results above the release criteria was removed.

A minimum of 18 systematic soil samples was then collected from excavated soil on each screening pad based on a random starting point. Following radiological clearance for unrestricted use, soil excavated from areas within Installation Restoration Program sites was stockpiled and sampled for the site-specific chemicals of concern and either reused for trench backfill or disposed of as chemically contaminated waste. Radiologically cleared soil excavated from non-Installation Restoration Program sites (sites where chemical contamination had not been identified) was stockpiled separately and used as backfill without chemical testing.

After transporting excavated soil to the RSY pads, the piping was removed. The interior surfaces of the piping were radiologically characterized using a combination of static and scan measurements for total radioactivity and swipe sampling for removable radioactivity. If a sufficient quantity of solid material was present in the pipeline, solid/sediment samples were collected and analyzed for radiological contamination. The maximum concentrations reported for sediment samples collected from piping or manholes removed in Parcel E were 1,939 picocuries per gram (pCi/g) for Cs-137 and 3.321 pCi/g for Ra-226. At this stage, nearly all radioactive contamination is expected to have been removed. Surveying and sampling of the soil above and below the piping was a conservative measure implemented by the Navy.

After removal of piping and soil at least 1 foot beneath the piping, the trench was divided into sections such that the sum of the trench sidewalls and bottom was less than 1,000 square meters in area. This area is called a trench survey unit. Final status surveys for the excavated pipeline trench survey units included 100 percent gamma radiation scan surveys to identify elevated levels of radioactivity prior to systematic and biased soil sample collection. A minimum of 18 soil samples were located within each trench survey unit. The samples were analyzed by gamma spectroscopy at the onsite laboratory, with 10 percent of the samples sent to the offsite laboratory for quality control verification. Additionally, 10 percent of the samples were analyzed for Sr-90 by the onsite laboratory. If Cs-137 results from the onsite laboratory were at or above the release criteria, isotopic plutonium, isotopic uranium, and Sr-90 were also analyzed by the offsite laboratory. Analytical results for Ra-226 were reported by the onsite laboratory using a screening method based on the 186 kiloelectron volt (keV) energy peak. The offsite laboratory analyzed Ra-226 using a definitive method, allowing the soil samples to equilibrate (21-day in-growth) and reported concentrations using the 609 keV energy peak for bismuth (Bi)-214. The screening method used by the onsite laboratory was selected to allow for rapid decision making during field investigations and to prevent health and safety concerns associated with large open excavations.

Three types of survey units were established: trench, overburden, and excavated soil (TtEC, 2011b). Overburden survey units were specific to Parcel B and included overburden soil, which was defined as soils from excavations not in the immediate 1-foot vicinity of sewer or storm drain piping. Peripheral soils, also specific to Parcel B, were within the 1-foot vicinity of sewer or storm drain piping. This soil was stockpiled separately and surveyed on RSY pads. If peripheral soil was identified as low-level radioactive waste (LLRW), it was disposed of, and the trench segment where the peripheral soil originated was sampled in 3-foot intervals to determine the extent of potential contamination. For excavations in other

parcels, excavated soil (including overburden and peripheral soil) was placed on RSY pads and referred to as excavated soil units. To obtain radiological release, a single survey unit at HPNS was the sum of a trench unit that was excavated and the overburden or excavated soil units that were used to backfill the trench. For the evaluations detailed in this report, excavation units and overburden units will often be referred to as "fill" units.

The results of the storm drain and sanitary sewer line investigation activities performed by TtEC were documented in survey unit project reports (SUPRs). SUPRs were included as attachments in parcel-specific removal action completion reports (RACRs) or in radiological construction summary reports (CSRs).

2.2 Current and Former Building Soil Investigation

Two current and 14 former building sites where TtEC collected soil sample data are in Parcel E and were divided into 104 survey units (**Figure 2-1**). The current and former building sites evaluated include the following:

- Current Buildings 414 and 500
- Former Building Sites 506, 507, 508, 509, 510/510A, 517, 520, 529, and 701
- Building 704 Site
- Former Shack 79 and 80 Sites
- Former 500 Series Buildings Area
- Building 707 Triangle Area
- Installation Restoration (IR) Site 4 Former Scrap Yard Site and Former Building 807 Site

A brief description of the radiological investigations prior to any work performed by TtEC, a summary of the Final Status Survey performed by TtEC, specifically the soil sampling activities, and the recommendations based on this data evaluation are presented in **Section 4**.

2.3 Release Criteria

Release criteria for all ROCs except Ra-226 are based on USEPA release criteria for soil. For Ra-226, the release criterion agreed to by the Navy and regulatory agencies is 1 pCi/g above the background activity. The background activity was calculated for several areas in HPNS to account for variations in soil type. The "background" was calculated as the arithmetic mean of 18 samples collected in an area free of potential contamination. The background activity used for Parcel E is 0.485 pCi/g for trench and fill units and the background activity varied for the current and former building sites. For soil in the United States, the expected Ra-226 activity is 1 pCi/g and can range from 0.2 to 4 pCi/g (DoD et al., 2009). Therefore, the HPNS background value for Ra-226 is conservative.

Table 2-1 summarizes the release criteria established by the Action Memorandum (Navy, 2006).

Table 2-1. Release Criteria

	Soil (pCi/g)			
Radionuclide	**Outdoor Worker (pCi/g)**	**Residual Dose (mrem/yr)**	**Residential (pCi/g)**	**Residual Dose (mrem/yr)**
Cesium-137	0.113	0.2142	0.113	0.2561
Radium-226	1.0*	6.342	1.0	14.59
Strontium-90	10.8	0.1931	0.331	1.648

*Limit is 1 pCi/g above background per agreement with USEPA.
mrem/yr = millirem(s) per year

2.4 Anomalous Soil Samples Report

The first evidence of soil sample data manipulation and falsification is summarized in the Investigation Conclusion, Anomalous Soil Samples report (TtEC, 2014a). TtEC conducted an investigation after Radiological Affairs Support Office (RASO) noted that the final systematic soil sample results from a building site survey unit in Parcel E appeared to be representative of two different data populations, indicating that the soil samples had not been collected where they were reported to have been collected. This report concluded that in addition to this survey unit, 11 survey units at 3 additional sites in Parcels C and E had a high probability that the soil samples were not representative of the respective survey units. Seven other locations were identified for further evaluation. TtEC concluded that the persons listed as the sample collectors, either by themselves or in conjunction with others, collected soil samples in areas outside the designated survey units. TtEC implemented a series of corrective actions and considered the action items closed, stating that "TtEC had not had a reoccurrence of the type of anomalous soil sample results that led to this investigation, indicating that the corrective actions have addressed the problem." Ultimately, TtEC conducted rework at each of the survey units identified. Subsequently, former workers at HPNS alleged additional and more widespread data manipulation and falsification.

2.4.1 Former Building 517 Site Survey Unit 2

The first evidence of anomalous samples identified at HPNS included systematic samples collected from the Former Building 517 Site Survey Unit 2. The anomalous set of samples displayed low potassium (K)-40, Ra-226, Bi-214, and lead (Pb)-214 concentrations as reported by the onsite laboratory, and the concentrations were consistent for all samples (36 total). These sample results were inconsistent with a set of systematic samples that were previously collected from the same survey unit.

Investigations were performed to confirm whether the anomalous samples were representative of the respective survey unit. The first step in the investigation was to determine whether the anomalous samples were collected from a subsurface layer other than that prescribed in standard operating procedures. Potholes were excavated from four locations where anomalous samples were collected, and a comparison of geological lithologies was performed; however, the comparisons were inconclusive. Potholing was performed at additional locations, and additional subsurface depths and soil samples were collected for comparison to the results of the anomalous samples.

Additional review of soil sample data from other sites surrounding the Former Building 517 site was performed. Review of the data identified samples with uncharacteristically low K-40, Ra-226, and progeny concentrations at additional areas in Parcel E. Additional resampling was performed under direct oversight by the Navy for all the areas identified in the review, including at the Former Building 517 Site Survey Unit 2. The results of the resampling at the Former Building 517 Site Survey Unit 2 were inconsistent with the anomalous sample results. It was concluded that the anomalous sample results were not representative of the respective survey unit, and the data were rejected.

2.4.2 Building 707 Triangle Area Survey Units 9, 16, 17, 22, and 23

The sampling performed by TtEC included systematic sampling performed under direct Navy oversight at five survey units (SUs) (SUs 9, 16, 17, 22, and 23) at the Building 707 Triangle Area in Parcel E. This rework was initiated to determine whether the low concentrations of K-40, and Ra-226 and progeny reported by the onsite laboratory for systematic samples collected from these survey units could be replicated. The results of the systematic samples collected during the resampling showed significantly higher concentrations than the concentrations initially reported for the anomalous samples. Therefore, it was determined that the data for the anomalous systematic samples initially collected from these survey units were not representative of the respective survey units, and the data were rejected.

2.4.3 Former 500 Series Buildings Area Survey Unit 3 and Building 707 Triangle Area Survey Units 3 and 13

Several areas in Parcel E were identified for further review and potential resampling, including the Survey Unit 3 in the Former 500 Series Buildings Area, and Survey Units 3 and 13 in the Building 707 Triangle Area. The additional review was initiated to investigate the low concentrations of K-40 reported by the onsite laboratory for a subset of systematic samples collected from these trench units. It was determined that the data for the anomalous systematic samples initially collected from these survey units were not representative of the respective survey units, and the data were rejected.

2.5 Former Worker Allegations

Allegations of soil data manipulation and falsification made by former TtEC workers include the following:

- When sufficiently low levels of contamination were not obtained, soil samples were collected from a different area known to have lower radioactivity, and reported as having come from the location being investigated.
- Samples and analytical results were discarded when the results were above the release criteria.
- Instead of collecting soil samples from locations predetermined to have higher gamma scan readings, samples would be collected from nearby soil and represented as having come from the original location.
- When sufficiently low levels of contamination were not obtained, soil sample collection sites were moved 5 to 10 feet in another direction, and a new sample was obtained. The new sample was represented as having been obtained from the original location.
- Chain-of-custody (COC) forms were falsified to support the false sample collection information.
- During the screening of overburden soil, actual towed array speeds were greater than allowed speeds, thereby reducing the probability of radiation detection.
- Handheld detectors were used improperly, which may have led to increasing the detection limit of the scanning devices.
- Onsite soil sample results were reviewed and shipment of samples to the offsite lab was blocked if there was a high chance that the release criteria would be exceeded.

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SECTION 3

Data Evaluation Activities

The evaluation was conducted to (1) identify anomalies (unusual or suspect data) that suggest the possibility of prior data manipulation or falsification; (2) perform detailed reviews to further evaluate anomalous data; and (3) recommend additional data collection to confirm existing data, or replace potentially manipulated or falsified data. This evaluation process included developing databases, establishing a list of primary radionuclides to evaluate, and developing a form to standardize the assessment and document the data evaluation results. This section describes the purpose and approach of each element of the data evaluation and identifies how suspect data were flagged:

- **Final Radiological Evaluation Database (FRED) for Soil**
  - Purpose – To base the data evaluation on an electronic soil sample database that is consistent with data provided in the final written reports by TtEC (for example, SUPRs, final status survey results [FSSRs], RACRs, CSRs).
  - Approach – Identified incorrect and missing data in TtEC's database, filled data gaps using optical character recognition to extract soil data from printed versions of draft and final reports, and hand-entered data from older reports. A quality control review was conducted to confirm the accuracy and completeness of the electronic files. Soil sample data from the sanitary sewer line and current and former building site investigations were categorized by the reason the data were originally collected. For example, the final set of systematic samples as reported in the SUPRs were collected to represent the radiological conditions for the entire survey unit at the end of the project and were designated as "FSS-SYS" in FRED, and are also referred to as "FSS" and "Final Systematic" in this evaluation. Other systematic samples (collected prior to the final systematic samples) that describe radiological conditions for the entire survey unit at different times were designated as "SYS_1" and "SYS_2" in FRED, and are also referred to as "Characterization" samples in the evaluations. Biased samples that were collected to determine the limits of soil exceeding the release criteria or to confirm the successful removal of soil exceeding the release criteria, were designated as "FSS-BIAS" and "RAS" in FRED, and are also referred to as "Confirmatory" and "Bias" in this evaluation. The number of analytical results and soil samples included in the FRED is included on **Figure 3-1**.
- **Primary Radionuclides to Evaluate**
  - Purpose – To focus the presentation and interpretation of results on potential contaminants and the naturally occurring radioactive material (NORM) that can be used to help identify suspect data.
  - Approach – Used naturally occurring radionuclides that are not contaminants as the primary radionuclides to evaluate because they are universally present in nearly all soil and their level of radioactivity varies by soil type, which enabled the team to "fingerprint" the soil and identify soil samples that may have been switched. Naturally occurring radionuclides are expected to have detectable levels of radioactivity in soil samples. Through discussions with the team, the following primary radionuclides were identified for evaluation:
    - Bi-214, a Ra-226 daughter product often used as surrogate for Ra-226
    - K-40
    - Actinium (Ac)-228, a thorium (Th)-232 daughter product often used as a surrogate for Th-232

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  - Other naturally occurring radionuclides (including Th-232 progeny Bi-212 and Pb-212, and Ra-226 and progeny Pb-214) were evaluated when additional information was needed. ROCs not identified as primary radionuclides for this evaluation include Sr-90 and Cs-137, which are present in soil from fallout as a result of nuclear testing. Sr-90 was only analyzed in 10 percent of the soil samples, limiting its usefulness in the evaluation. Cs-137 is only discussed in the evaluation if exceedances of the release criterion in soil were reported.

- **Statistical Tests**
  - Purpose – To identify statistical inconsistencies in the soil data.
  - Approach – Several statistical tests (Kolmogorov-Smirnov [K-S], Peacock, Kruskal-Wallis [K-W], Benford's Law, Repeated Numbers, Hierarchical Cluster Analysis) were run using six data sets (final systematic data for onsite laboratory, offsite laboratory, and combined onsite and offsite laboratory; pre-remediation systematic data for onsite laboratory, offsite laboratory, and combined onsite and offsite laboratory) to identify groups of soil data statistically different from the data collected within a specific parcel. The data were grouped by survey unit[2], and the results for each survey unit were compared to all other survey units within the same parcel. The data were also grouped by collection date, and the results for each collection date were compared to all other days that samples were collected within the parcel. Because only 10 percent of the soil samples were required to be sent to the offsite laboratory for analysis, the K-S test results for the Final Status Survey data from the onsite and offsite laboratory were combined for the primary radionuclides listed above, to allow for enough data for comparison. K-S test results are included in **Appendix A**. The results from the other statistical tests were available for review during the evaluation as needed.
  - How data were flagged as unusual or suspect – A trench, overburden, excavation soil unit, or current and former building survey unit was flagged if the distribution of sample results (for example, mean and standard deviation) for a given radionuclide collected within the respective unit was significantly different from data collected for all other respective units within a parcel, and if the distribution of sample results for samples collected on a single day was significantly different from the data collected during all other days when samples were collected in a Parcel.
- **Logic Tests**
  - Purpose – To identify inconsistencies in the prior collection, handling, and processing of individual soil samples.
  - Approach – Logic tests were developed using the gamma spectrometry data available in the reports (SUPRs, FSSRs, RACRs, and CSRs) to identify anomalies in how soil samples were previously processed. Available data include sample collection dates, sample analysis dates, and sample masses reported by the onsite laboratory. It is expected that final systematic soil samples would have been collected as a group on the same day, would have been the final set of samples collected, would have been analyzed as a group within 2 working days, would have been collected before they were counted by the onsite laboratory, and would have been counted by the onsite laboratory within 2 weeks of sample collection to meet production schedules. It is expected that the sample mass reported by the onsite laboratory would have matched the sample mass reported by the offsite laboratory.

[2] For the evaluation of trench units, the data for one trench unit was compared against the data for all other trench units within a parcel. For the evaluation of fill units, fill units were grouped by the survey unit they were associated with as presented in the SUPRs, and comparisons were made on a survey unit basis. Additionally, based on the large number of data points for the current and former building sites in Parcel E, the data for the Building 707 Triangle Area and IR Site 4 Former Scrapyard Site and Former Building 807 Site were combined into a data set and the rest of the current and former building site data were combined into a separate data set.

  - How data were flagged as unusual or suspect – Gamma spectrometry data were flagged if final systematic soil samples were collected over multiple days, were collected before a set of confirmatory/bias samples, were analyzed over a period spanning more than 2 working days, were analyzed before they were collected, or were analyzed by the onsite laboratory more than 2 weeks after sample collection. Data were flagged if the sample mass reported by the onsite laboratory was inconsistent with the sample mass reported by the offsite laboratory.

- **Graphical Data Review**
  - Purpose – To identify anomalies or unusual trends in the soil data by visually interpreting graphical representations of the data.
  - Approach – Plots of the data were generated to provide tools for visual identification of inconsistencies, outliers, and trends within a given data set. Time-series plots were generated to present sample results as a function of collection date. Time-series plots included all soil data collected for a given unit. Box plots were generated to present the statistical distribution of data. Normal quantile plots were generated to identify whether all the data in the given data set were from a normally distributed population. Plots were generated for the naturally occurring, non-contaminant radionuclides Ac-228, Bi-214, and K-40, and separate box and normal quantile plots were generated for each sample type (bias, characterization, final systematic). Plots were also generated for Cs-137 if the reported soil concentrations exceeded the release criteria.
  - How data were flagged as unusual or suspect – Data were flagged if sample results for naturally occurring radionuclides were at or below zero; if final systematic samples indicated the potential for multiple data populations (e.g., potentially two or more soil types); and if the distribution of bias, characterization, and/or final systematic soil sample data within a data set were inconsistent, unusual, or not expected. Unique cases were noted if encountered.
- **Historically Significant Sites**
  - Purpose – To identify areas where potential contamination was more likely and manipulation or falsification of data would have underestimated site conditions to the greatest extent.
  - Approach – A map was generated to identify buildings designated as impacted in the HRA and sites where a known radiological cleanup was performed that were located in the vicinity of the trench survey unit data being evaluated (**Figure 3-2**).
  - How data were flagged as unusual or suspect – A trench or survey unit was flagged if it was adjacent to or downstream from a known radiological cleanup site or radiologically impacted building. Fill units were flagged if the soil used to create the fill unit originated from a trench unit that was adjacent or downstream from a known radiological cleanup site or radiologically impacted building.
- **Sites Based on Allegations**
  - Purpose – To identify sites based on allegations of potential data manipulation or falsification.
  - Approach – A list of TtEC employees and subcontractors potentially associated with allegations of data manipulation or falsification was provided by the Navy based on worker allegations, and the list was compared to available sample collection documents (SUPRs, FSSRs, RACRs, and CSRs). Available COC records are in the process of review to identify potential discrepancies such as sample times, dates relinquished, sampler names, and sampler signatures.
  - How data were flagged as unusual or suspect – Data were flagged if the name of a worker on the list provided by the Navy matched the name provided in available sample collection documentation. In most cases, the SUPR provided the name of the worker who performed the

gamma scan and gamma static measurements. Although a direct correlation could not be made, it was assumed that the worker who performed the gamma scan and gamma static measurements was involved with sample collection. Data will be further scrutinized if the COCs[3] indicate that the time sampled listed is after the sample was relinquished, the COC was relinquished by someone other than the sampler, uniform time internals, samplers listed as collecting samples at multiple locations at the same time, and signatures.

To address the flags discussed above, additional methods of evaluation were conducted, including database review, review of adjacent trench and survey units, and review of historical reports. The review of the database was performed to further investigate logic test results and other anomalies as needed. If the database review could not explain unusual trends, a comparison was performed against data collected from adjacent trench and survey units. Although it may not be true in all instances, it is expected that geographically localized results would be consistent. Historical reports, including SUPRs, FSSRs, RACRs, and CSRs, were reviewed to document observations regarding investigation activities, gamma static and scan measurements, the relationship between reported onsite and offsite laboratory data, and excavation and backfill activities. For trench unit evaluations, the disposition of soil excavated from the trench and fill units that were used to backfill the trench, were documented. For fill unit evaluations, the trench unit where the fill unit was used to backfill and the trench units from which soil was used to create the fill unit, were documented.

To document the data evaluation, findings, and recommended path forward, an evaluation form was developed. An example data evaluation form is included as **Appendix B**. There are three sections on the form, as follows:

- Section I identifies unusual, suspect, or anomalous data; lists the flags from the K-S and logic tests; and presents observations from time-series plots, historically significant sites, and allegations.
- Section II documents the review of the box and normal quantile plots, additional database review, adjacent survey or trench unit review, and review of historical reports.
- Section III summarizes the conclusions and recommendations.

An evaluation was performed for each trench unit, fill unit, and the current and former building site survey units by health physicists. The evaluation was reviewed by senior health physicists, Navy Base Realignment and Closure, and RASO. The time-series, box, and normal quantile plots and a location map are included at the end of each form.

[3] COCs were collected from the archived samples located at HPNS and include COCs by TtEC ranging from 2009 through 2016. An inventory and evaluation of the available COCs is currently being conducted and was not complete at the time of this report. The COCs will be evaluated and incorporated into this evaluation.

SECTION 4

Findings and Recommendations

A summary of findings and recommendations for Parcel E trench and fill units, and current and former buildings site survey units is provided in the following sections. For more detailed information, see the evaluation forms included in **Appendix C**. An abbreviated writeup of the findings and recommendations for trench units and fill units recommended for further action is included in the following sections. Each writeup generally includes bulleted lists of the flags (from Section I of the forms), findings from the additional reviews if they indicated potential data manipulation or falsification (from Section II of the forms), and the conclusions and recommendations (from Section III of the forms). The writeups for fill units with similar conclusions and recommendations were grouped together and summarize Section III of the forms.

Based solely on a review of the data previously collected by TtEC and the findings of the data evaluations, recommendations are provided for no further action, reanalysis of archived samples, confirmation sampling, or physical inspection of archived samples. These recommendations are defined as follows:

- **No Further Action** – No further evaluation of the data is recommended during this phase of the project as it did not appear that data manipulation or falsification by TtEC had occurred. This designation is not meant to apply beyond the evaluation of the data and does not preclude other actions that may be taken by the Navy.
- **Reanalysis of Archived Samples** – Reanalysis of the archived soil samples (samples collected by TtEC that may be available in onsite storage) collected as initial systematic sample data at an offsite laboratory is recommended. The evaluation indicated evidence of potential data manipulation or falsification of final systematic sample data. The purpose for the reanalysis is to a) compare the initial systematic sample results to the release criteria to see if the results may reveal that the release criteria were met and remediation was not required[4] even though final systematic sample results were potentially manipulated and falsified, or b) provide offsite laboratory results to document current site conditions.
- **Confirmation Sampling** – Collection of additional data (surveys, scans, or soil samples) is recommended during this phase of the project. The evaluation indicated evidence of potential data manipulation or falsification based upon the methods used to review the data. The available data are suspect and additional data are needed to document current site conditions. Task-specific plans will be provided detailing the extent of the confirmation sampling activities.
- **Physical Inspection of Archived Samples** – Physical inspection of archived soil samples (samples collected by TtEC that may be available in onsite storage) is recommended during this phase of the project. The evaluation indicated evidence of potential data manipulation or falsification based upon the methods to review the data. The purpose of the physical inspection of the samples is to determine whether the physical soil characteristics are what would be expected given the sample's

[4] Analytical results for Ra-226 were reported by the onsite laboratory using a screening method based on the 186 keV energy peak. The offsite laboratory analyzed Ra-226 using a definitive method, allowing the soil samples to equilibrate (21-day in-growth) and reported concentrations using the 609 keV energy peak for Bi-214. Comparisons between the onsite laboratory screening results and the offsite laboratory definitive results for Ra-226 demonstrate the onsite laboratory results were consistently biased high. The Ra-226 analytical results from the onsite laboratory resulted in false exceedances of the release criteria, which resulted in the initiation of remediation. Remediation may have been avoided had soil samples been allowed to equilibrate (21-day in-growth) and decisions had been based on the more reliable Bi-214 analysis using the 609 keV energy peak. The screening method used by the onsite laboratory was selected to allow for rapid decision making during field investigations and to prevent health and safety concerns associated with large open excavations.

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collection location. This comparison will help determine whether data have been manipulated or falsified.

Much of the evaluation of Parcel E focused on soil samples collected from storm drain and sanitary sewer line excavations. These drain lines were considered impacted because of the potential for radioactive waste disposal into sinks and drains. If radioactive waste disposal occurred, radioactive material was likely contained within the piping, and the piping was excavated, removed, and disposed of as LLRW. The soil excavated during drain line removal was analyzed for radionuclides because soil beneath the piping may have been contaminated if the piping leaked, and soil above the piping may have been contaminated if the drain lines were repaired or replaced in an area where leakage occurred. Contamination from leakage or drain line repair should be relatively rare, yet the release criterion for Ra-226 was exceeded many times in soil samples collected from the excavated soil and trench sidewalls. After carefully examining the analytical data and the conceptual model for soil contamination, it is concluded that the upper range of naturally occurring Ra-226 may exceed the release criterion. Therefore, cleanup will be hampered without an understanding that naturally occurring levels of Ra-226 may exceed the release criterion without being indicative of contamination. To address this concern, the Navy's plans for further evaluation of naturally occurring Ra-226 will be described in the work plan for radiological data evaluation and confirmation survey.

4.1 Parcel E

The areas evaluated in Parcel E include 57 trench units and 96 fill units, and 16 current and former building sites with 104 soil survey units. Analytical results for more than 11,000 soil samples were evaluated. The areas evaluated in Parcel E are presented on **Figure 4-1** and consist of samples collected from 2010 through 2016.

4.1.1 Trench Units

There were 57 trench units evaluated in Parcel E. Based upon the scope of this evaluation, there was no evidence of potential data manipulation or falsification at 31 trench units; therefore, no further action is recommended. There was evidence of potential data manipulation or falsification at the remaining 26 trench units, and confirmation sampling is recommended. The results of the Parcel E trench unit evaluation are presented on **Figure 4-2**. The data evaluation forms documenting the findings are provided in **Appendix C**.

The following text summarizes the evaluations of the trench unit where evidence of potential data manipulation or falsification was found.

4.1.1.1 Recommended for Confirmation Sampling

Trench Unit 152

Trench Survey Unit 152 is the net sum of Trench Unit (TU) 152; excavated soil from Excavated Soil Units (ESs) 244 and 245; and a volume of import fill material, which was used for backfill. Sediment samples collected from piping removed from TU 152 showed elevated Cs-137 concentrations exceeding the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 152, and 48 samples were collected: 30 biased samples to identify potential elevated Cs-137 concentrations in soil and a set of 18 final systematic samples.

Data from TU 152 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 152 final systematic data and other final systematic data collected from Parcel E.
- Logic tests identified inconsistencies related to the processing of samples from TU 152.

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 152.
- TU 152 is downstream from a radiologically impacted building and located near a known radiological cleanup.

The final systematic samples displayed characteristics that indicated the potential for two different data populations in the data set, where one subset included Ac-228, Bi-214, and K-40 concentrations that were significantly lower than the Ac-228, Bi-214, and K-40 concentrations of the other subset. Furthermore, there was an unusually small variance observed in the bias and final systematic sample results for Bi-214, and an unusually large variance observed in the bias and final systematic sample results for Ac-228. The final systematic sample results from TU 152 were compared to final systematic sample results from adjacent trench units (TU 157 and TU 158) to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 157 and TU 158 are suspect.

The gamma scan range provided in the SUPR for TU 152 was 4,320 to 8,190 counts per minute (cpm). The SUPR for TU 152 stated that the gamma scan data exceeded the investigation level (6,1712 cpm) and that additional surveys were performed. Biased samples were collected; however, based on the narrative provided in the SUPR, the biased samples were collected in response to the elevated Cs-137 concentrations measured in sediment samples collected from piping removed from TU 152. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are likely still present.

The results of the evaluation indicate that the final systematic sample results from TU 152 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 154

Trench Survey Unit 154 is the net sum of TU 154 and a volume of import fill material which was used for backfill. No remediation was performed at TU 154, and a set of 18 final systematic samples was collected.

Data from TU 154 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 154 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 154.
- TU 154 is downstream from a radiologically impacted building.
- At least one worker who collected data at TU 154 was mentioned in one or more allegations of wrongdoing.

The gamma scan range provided in the SUPR for TU 154 was 4,570 to 7,870 cpm. The SUPR for TU 154 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. However, based on the narrative provided in the SUPR, no additional surveys were performed. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are likely still present, and it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 155

Trench Survey Unit 155 is the net sum of TU 155 and a volume of import fill material which was used for backfill. Approximately 5 cubic yards of soil were remediated from TU 155 based on a subset of characterization sample results exceeding the release criterion for Ra-226 and one characterization sample result exceeding the release criterion for Cs-137. A total of 63 samples was collected from TU 155: 36 characterization samples, 3 biased samples to confirm the successful remediation of soil with concentrations of Ra-226 above the release criterion, 6 biased samples to confirm the successful removal of soil with concentrations of Ra-226 and Cs-137 above the release criterion (the text in the SUPR indicated that only 3 biased samples were collected), and a set of 18 final systematic samples was collected.

Data from TU 155 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 155 final systematic data and other final systematic data collected from Parcel E.
- Logic tests identified inconsistencies related to the processing of samples from TU 155.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 155.
- TU 155 is downstream from a radiologically impacted building.
- At least one worker who collected data at TU 155 was mentioned in one or more allegations of wrongdoing.

The final systematic samples display characteristics inconsistent with characterization samples, in that the initial set of characterization sample results display a higher sample variance and mean concentration for Ac-228, Bi-214, and K-40 than the subsequent set of characterization sample results and final systematic sample results. The SUPR for TU 155 reported only a small amount of soil remediated from TU 155; therefore, the changes in characteristics between the sample sets is unusual. Additionally, the gamma scan range provided in the SUPR for TU 155 was 4,250 to 9,760 cpm. The SUPR for TU 155 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. However, based on the narrative provided in the SUPR, no additional surveys were performed. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are likely still present.

The results of the evaluation indicate that the final systematic sample results from TU 155 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 156

Trench Survey Unit 156 is the net sum of TU 156; excavated soil from ES 248; and a volume of import fill material which was used for backfill. Approximately 4 cubic yards of soil were remediated from TU 156 based on one characterization sample result exceeding the release criterion for Ra-226. A total of 38 samples was collected from TU 156: 18 characterization samples, 2 biased samples to confirm the successful remediation of soil with concentrations of Ra-226 above the release criterion, and a set of 18 final systematic samples.

Data from TU 156 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 156 final systematic data and other final systematic data collected from Parcel E.

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 156.
- TU 156 is downstream from a radiologically impacted building and located near a known radiological cleanup.
- At least one worker who collected data at TU 156 was mentioned in one or more allegations of wrongdoing.

The final systematic samples display characteristics that are representative of at least two data populations, where the Bi-214 concentrations of one subset of final systematic sample results is lower than the Bi-214 concentrations of the other subset. Furthermore, the reported Ac-228 concentration of one final systematic sample is unusually high and the reported K-40 concentration of another final systematic sample is unusually high. The final systematic sample results from TU 156 were compared to final systematic sample results from adjacent trench units (TU 157) to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 157 are suspect.

The gamma scan range provided in the SUPR for TU 156 was 4,330 to 7,820 cpm. The SUPR for TU 156 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. Biased samples were collected; however, based on the narrative provided in the SUPR, these samples were collected to confirm the successful remediation of soil with Ra-226 concentrations above the release criterion. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are likely still present.

The results of the evaluation indicate that the final systematic sample results from TU 156 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 157

Trench Survey Unit 157 is the net sum of TU 157 and a volume of import fill material which was used for backfill. Sediment samples collected from manholes and piping removed from TU 157 showed elevated Cs-137 concentrations exceeding the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 157, and 22 samples were collected: 4 biased samples (a definitive explanation for the collection of these samples was not provided in the SUPR for TU 157) and a set of 18 final systematic samples.

Data from TU 157 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 157 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 157.
- TU 157 is downstream from a radiologically impacted building.
- At least one worker who collected data at TU 157 was mentioned in one or more allegations of wrongdoing.

The final systematic samples display characteristics that are representative of at least two data populations, where the K-40 concentrations of one subset of final systematic sample results is lower than the K-40 concentrations of the other subset. Furthermore, the reported K-40 concentration of another final systematic sample is unusually low. The final systematic sample results from TU 157 were compared to final systematic sample results from adjacent trench units (TU 152 and TU 156) to identify

potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 152 and TU 156 are suspect.

The gamma scan range provided in the SUPR for TU 157 was 4,330 to 7,820 cpm. The SUPR for TU 157 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. Biased samples were collected; however, the SUPR for TU 157 does not specify whether these samples were collected in response to the elevated Cs-137 concentrations identified in sediment samples collected from the manholes and piping removed from TU 157 or in response to the elevated gamma scan measurements above the investigation level. This presents uncertainty as to whether elevated gamma scan results were investigated. Therefore, locations with scan measurements that exceeded the investigation level are potentially still present.

The results of the evaluation indicate that the final systematic sample results from TU 157 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 158

Trench Survey Unit 158 is the net sum of TU 158; excavated soil from ESs 248 and 258; and a volume of import fill material, which was used for backfill. Approximately 3 cubic yards of soil were remediated from TU 158 based on one characterization sample result exceeding the release criterion for Sr-90 and approximately 8 cubic yards of soil were remediated from TU 158 based on one characterization and one biased sample result exceeding the release criterion for Cs-137. A total of 63 samples was collected from TU 158: 36 characterization samples, 3 biased samples to confirm the successful remediation of soil with concentrations of Sr-90 above the release criterion, 6 biased samples to confirm the successful remediation of soil with concentrations of Cs-137 above the release criterion, and a set of 18 final systematic samples.

Data from TU 158 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 158 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 158.
- TU 158 is downstream from a radiologically impacted building.

The final systematic samples display characteristics that are representative of at least two data populations, where the K-40 concentrations of one subset of final systematic sample results is lower than the K-40 concentrations of the other subset. The final systematic sample results from TU 158 were compared to final systematic sample results from adjacent trench units (TU 152 and TU 159) to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 152 and TU 159 are suspect.

The gamma scan range provided in the SUPR for TU 158 was 4,110 to 7,890 cpm. The SUPR for TU 158 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. Biased samples were collected; however, the biased samples were collected following remediation performed in response to elevated concentrations in soil sample results. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are potentially still present. Furthermore, the gamma scan range reported for TU 158 was exactly the same as the gamma scan range reported for TU 159. Additionally, the variance of the gamma static measurements was unusually low, which is an indication that the data were collected improperly.

The results of the evaluation indicate that the final systematic sample results from TU 158 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 159

Trench Survey Unit 159 is the net sum of TU 159; excavated soil from ES 249; and a volume of import fill material, which was used for backfill. One sediment sample collected from piping removed from TU 159 showed an elevated Cs-137 concentration exceeding the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 159, and 43 samples were collected: 18 characterization samples, 7 biased samples to identify potential elevated radionuclide concentrations in soil, and a set of 18 final systematic samples.

Data from TU 159 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 159 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 159.
- At least one worker who collected data at TU 159 was mentioned in one or more allegations of wrongdoing.

The final systematic samples display characteristics that are representative of at least two data populations, where the Ac-228, Bi-214, and K-40 concentrations of one subset of final systematic sample results is lower than the Ac-228, Bi-214, and K-40 concentrations of the other subset. The final systematic sample results from TU 159 were compared to final systematic sample results from adjacent trench units (TU 158 and TU 160) to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 158 and TU 160 are suspect.

The gamma scan range provided in the SUPR for TU 159 was 4,110 to 7,890 cpm. The SUPR for TU 159 stated that the gamma scan data exceeded the investigation level (6,712 cpm). However, all of the biased sample results were below the release criteria for all ROCs. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results.

The results of the evaluation indicate that the final systematic sample results from TU 159 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 160

Trench Survey Unit 160 is the net sum of TU 160 and a volume of import fill material, which was used for backfill. Sediment samples collected from piping removed from TU 160 showed elevated Cs-137 concentrations exceeding the release criterion; however, no elevated Cs-138 concentrations were reported in soil sample results. No remediation was performed at TU 160, and 26 samples were collected: 8 biased samples to identify potential elevated radionuclide concentrations in soil and a set of 18 final systematic samples.

Data from TU 160 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 160 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 160.

The final systematic samples display characteristics that are representative of at least two data populations, where the Ac-228 and K-40 concentrations of one subset of final systematic sample results is lower than the Ac-228 and K-40 concentrations of the other subset. The final systematic sample results from TU 160 were compared to final systematic sample results from adjacent trench units (TU 159 and TU 163 to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 159 and TU 163 are suspect.

The gamma scan range provided in the SUPR for TU 160 was 4,270 to 7,880 cpm. The SUPR for TU 160 stated that the gamma scan data exceeded the investigation level (6,712 cpm). However, all of the biased sample results were below the release criteria for all ROCs. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results.

The results of the evaluation indicate that the final systematic sample results from TU 160 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 161

Trench Survey Unit 161 is the net sum of TU 161; excavated soil from ES 259; and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 161. No remediation was performed at TU 161, and a set of 18 final systematic samples was collected.

Data from TU 161 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 161 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 161.

The final systematic samples display characteristics that are representative of at least two data populations, where the Ac-228, Bi-214, and K-40 concentrations of one subset of final systematic sample results is lower than the Ac-228, Bi-214, and K-40 concentrations of the other subset. Additionally, the statistical mean of K-40 final systematic sample results is unusually low compared to the K-40 concentrations reported for samples from Parcel E trench units.

The gamma scan range provided in the SUPR for TU 161 was 4,540 to 7,120 cpm. The SUPR for TU 161 stated that the gamma scan data exceeded the investigation level (6,712 cpm). However, based on the narrative provided in the SUPR, no additional surveys were performed. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are likely still present.

The results of the evaluation indicate that the final systematic sample results from TU 161 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 162

Trench Survey Unit 162 is the net sum of TU 162; excavated soil from ESs 263 and 264; and a volume of import fill, which was used for backfill. One sediment sample collected from one of the manholes removed from TU 162 showed elevated concentrations of Cs-137 above the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 162, and 26 samples were collected: 8 biased samples (no explanation is provided as to the justification for collection of these samples) and a set of 18 final systematic samples.

Data from TU 162 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 162 final systematic data and other final systematic data collected from Parcel E.
- Logic tests identified inconsistencies related to the processing of samples from TU 162.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 162.
- At least one worker who collected data at TU 162 was mentioned in one or more allegations of wrongdoing.

The final systematic samples display characteristics that are representative of at least two data populations, where the Ac-228, Bi-214, and K-40 concentrations of one subset of final systematic sample results is lower than the Ac-228, Bi-214, and K-40 concentrations of the other subset. Additionally, the reported Ac-228, Bi-214, and K-40 concentrations of one of the final systematic samples was unusually low compared to the concentrations of the rest of the final systematic samples.

The gamma scan range provided in the SUPR for TU 162 was 4,120 to 7,620 cpm. The SUPR for TU 162 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. Biased samples were collected; however, the SUPR for TU 162 does not specify whether these samples were collected in response to the elevated Cs-137 concentrations identified in sediment samples collected from the manholes removed from TU 162 or in response to the elevated gamma scan measurements above the investigation level. This presents uncertainty as to whether elevated gamma scan results were investigated. Therefore, locations with scan measurements that exceeded the investigation level are potentially still present. Additionally, the variance of the gamma static measurements was unusually low which is an indication that the data were collected improperly.

The results of the evaluation indicate that the final systematic sample results from TU 162 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 163

Trench Survey Unit 163 is the net sum of TU 163; excavated soil from ESs 263 and 265; and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 163. Approximately 10 cubic yards of soil were remediated from TU 163 based one characterization sample exceeding the release criterion for Ra-226 and a subset of characterization samples exceeding the release criterion for Cs-137. A total of 102 samples was collected from TU 163: 72 characterization samples, 3 biased samples to confirm the successful remediation of soil with concentrations of Ra-226 above the release criterion, 9 biased samples to confirm the successful remediation of soil with concentrations of Cs-137 above the release criterion, and a set of 18 final systematic samples.

Data from TU 163 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 163 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 163.

The final systematic samples display characteristics that are representative of at least two data populations, where the Ac-228, Bi-214, and K-40 concentrations of one subset of final systematic sample results is lower than the Ac-228, Bi-214, and K-40 concentrations of the other subset. The final systematic sample results from TU 163 were compared to final systematic sample results from adjacent

trench units (TU 160 and TU 162 to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 160 and TU 162 are suspect.

The gamma scan range provided in the SUPR for TU 163 was 4,060 to 7,020 cpm. The SUPR for TU 163 stated that the gamma scan data exceeded the investigation level (6,712 cpm) and that additional surveys were performed. Biased samples were collected; however, the biased samples were collected following remediation performed in response to elevated concentrations in soil sample results. This is an indication of a failure to investigate elevated gamma scan results. Therefore, locations with scan measurements that exceeded the investigation level are potentially still present. Additionally, the variance of the gamma static measurements was unusually low which is an indication that the data were collected improperly.

The results of the evaluation indicate that the final systematic sample results from TU 163 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 241

Trench Survey Unit 241 is the net sum of TU 241; excavated soil from ESs 653 and 654; and a volume of import fill material, which was used for backfill. Sediment samples collected from a manhole and piping removed from TU 241 showed Cs-137 and Ra-226 concentrations exceeding the release criterion. Approximately 220.5 cubic yards of soil were remediated from TU 241 based on a subset of biased samples exceeding the release criterion for Cs-137 and Ra-226. A total of 68 samples was collected from TU 241: 23 biased samples to identify potential elevated Cs-137 and Ra-226 concentrations in soil, 27 biased samples to confirm the success remediation of soil with concentrations of Cs-137 and Ra-226 above the release criterion, and a set of 18 final systematic samples.

Data from TU 241 were flagged as unusual or suspect for the following reasons:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 241.
- TU 241 was directly connected to a radiologically impacted building.
- At least one worker who collected data at TU 241 was mentioned in one or more allegations of wrongdoing.

The final systematic and second set of biased samples display characteristics inconsistent with the first set of biased samples. This is indicative that the sample collection at TU 241 was not representative of actual conditions. The Ac-228, Bi-214, and Cs-137 concentrations of final systematic samples and second set of biased samples are much lower than the Ac-228, Bi-214, and Cs-137 concentrations from the first set of biased samples. The final systematic sample results from TU 241 were compared to final systematic sample results from adjacent trench unit (TU 245) to identify potential similarities in results from geographically similar soils; however, inconsistencies were observed in data from the adjacent trench units, and sample results from TU 245 are suspect. Additionally, the variance of the gamma static measurements was unusually low which is an indication that the data were collected improperly.

The results of the evaluation indicate that the final systematic sample results from TU 241 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 245

Trench Survey Unit 245 is the net sum of TU 245; excavated soil from ESs 656, 657, and 683; and a volume of import fill material, which was used for backfill. One of the sediment samples collected from

the piping removed from TU 245 showed Cs-137 and Ra-226 concentrations exceeding the release criterion; however, no elevated Cs-137 or Ra-226 concentrations were reported in soil sample results. No remediation was performed at TU 245, and 26 samples were collected: 8 biased samples to identify potential elevated Cs-137 and Ra-226 concentrations in soil, and a set of 18 final systematic samples.

Data from TU 245 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 245 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 245.
- TU 245 was directly connected to a radiologically impacted building.
- At least one worker who collected data at TU 245 was mentioned in one or more allegations of wrongdoing.

The final systematic samples display characteristics inconsistent with biased sample results and sample results from adjacent trench units, in that the Ac-228, Bi-214, and K-40 final systematic sample results from TU 245 display an unusually low variance. These are indications that the final systematic samples are not representative of soil from TU 245.

The results of the evaluation indicate that the final systematic sample results from TU 245 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 300

Trench Survey Unit 300 is the net sum of TU 300; excavated soil from ESs 699, 704, and 710; excavated soil from the Former Building 503 Site Survey Unit 35; and a volume of import fill material, which was used for backfill. Approximately 2 cubic yards of soil were remediated from TU 300 based on one characterization sample exceeding the release criterion for Cs-137. A total of 39 samples was collected from TU 300: 18 characterization samples, 3 biased samples to confirm the successful remediation of soil with Cs-137 concentrations above the release criterion, and a set of 18 final systematic samples.

Data from TU 300 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 300 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 300.
- TU 300 is located downstream from a radiologically impacted building.
- At least one worker who collected data at TU 300 was mentioned in one or more allegations of wrongdoing.

The final systematic sample results from TU 300 are display characteristics inconsistent with the biased samples (3) collected to bound the remediation performed in the trench unit. There are expected differences between the biased and systematic sample results; however, the biased sample results showed significantly lower concentrations of Ac-228 and Bi-214 than the final and initial set of characterization samples. This is an indication that the biased samples are not representative of soils from TU 300.

The results of the evaluation indicate that the final systematic sample results from TU 300 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 309

Trench Survey Unit 309 is the net sum of TU 309; excavated soil from the Former Building 503 Site Survey Units 12, 15, 31, and 34; and a volume of import fill material, which was used for backfill. One sediment sample collected from one of the manholes removed from TU 309 showed an elevated concentration of Cs-137 exceeding the release criterion. Approximately 4 cubic yards of soil were remediated from TU 309 based on a subset of biased samples exceeding the release criterion for Cs-137. A total of 29 samples was collected from TU 309: 5 biased samples to identify potential elevated Cs-137 concentrations in soil, 6 biased samples to confirm the successful remediation of soil with Cs-137 concentrations above the release criterion (the text in the SUPR reported that only 5 biased samples were collected; however, data was included for six biased samples), and a set of 18 final systematic samples.

Data from TU 309 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 309 final systematic data and other final systematic data collected from Parcel E.
- Logic tests identified inconsistencies related to the processing of samples from TU 309.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 309.
- TU 309 is directly adjacent to a radiologically impacted building and located near a known radiological cleanup.
- At least one worker who collected data at TU 309 was mentioned in one or more allegations of wrongdoing.

The final systematic sample results from TU 309 display characteristics inconsistent with adjacent trench units, specifically the final systematic sample results from TU 309 have a lower variance for Ac-228 and Bi-214. Additionally, the variance of the gamma static measurements was unusually low which is an indication that the data were collected improperly.

The results of the evaluation indicate that the final systematic sample results from TU 309 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 310

Trench Survey Unit 310 is the net sum of TU 310; excavated soil from Former Building 503 Site Survey Units 16, 23, and 24; and a volume of import fill material, which was used for backfill. Sediment samples collected from manholes removed from TU 310 showed elevated concentrations of Cs-137 above the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 310, and 33 samples were collected: 15 biased samples to identify potential elevated Cs-137 concentrations in soil, and a set of 18 final systematic samples.

Data from TU 310 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 310 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 310.

- TU 310 is directly adjacent to a radiologically impacted building and located near a known radiological cleanup.
- At least one worker who collected data at TU 310 was mentioned in one or more allegations of wrongdoing.

The final systematic sample results from TU 310 display characteristics inconsistent with adjacent trench units, specifically the final systematic sample results from TU 310 have a higher variance Ac-228 and K-40. Furthermore, the gamma scan survey coincided with the collection of the final systematic samples, which provides uncertainty as to whether locations of elevated gamma scan measurements were investigated appropriately.

The results of the evaluation indicate that the final systematic sample results from TU 310 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 311

Trench Survey Unit 311 is the net sum of TU 311; excavated soil from the Former Building 503 Site Survey Units 18; and a volume of import fill material, which was used for backfill. No remediation was performed at TU 311, and a set of 18 final systematic samples was collected.

Data from TU 311 were flagged as unusual or suspect for the following reasons:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 311.
- TU 311 is directly adjacent to a radiologically impacted building and located near a known radiological cleanup.
- At least one worker who collected data at TU 311 was mentioned in one or more allegations of wrongdoing.

The final systematic sample results from TU 311 display characteristics inconsistent with adjacent trench units, specifically the final systematic sample results from TU 311 have a higher mean concentration of K-40 and the variance of Ac-228 is greater than adjacent trench units. Additionally, the variance of the gamma static measurements was unusually low which is an indication that the data were collected improperly.

The results of the evaluation indicate that the final systematic sample results from TU 311 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 345

Trench Survey Unit 345 is the net sum of TU 345; excavated soil from ESs 881 and 883; and a volume of import fill material, which was used for backfill. No remediation was performed at TU 345, and a set of 18 final systematic samples was collected.

Data from TU 345 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 345 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 345.

Reported Ac-228, Bi-214, and K-40 concentrations of two final systematic samples were significantly lower than the other final systematic samples collected from TU 345. The samples with noticeably lower

concentrations collected from TU 345 were spatially correlated; however, the noticeable difference in Ac-228, Bi-214, and K-40 concentrations in the two final systematic samples relative to the respective concentrations reported for the rest of the final systematic samples is an indication that these samples are not representative of the soil in TU 345.

The results of the evaluation indicate that the final systematic sample results from TU 345 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 347

Trench Survey Unit 347 is the net sum of TU 347; excavated soil from ESs 896 and 897; and a volume of import fill material, which was used for backfill. One sediment sample collected from piping removed from TU 347 showed an elevated concentration of Cs-137 above the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 347, and 34 samples were collected: 16 biased samples to identify potential elevated Cs-137 concentrations in soil, and a set of 18 final systematic samples.

Data from TU 347 were flagged as unusual or suspect for the following reasons:

- Statistical tests indicated significant differences between the TU 347 final systematic data and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 347.

Reported Ac-228 and Bi-214 concentrations of two final systematic samples were significantly lower than the other final systematic samples collected from TU 347. The samples with noticeably lower concentrations collected from TU 347 were spatially correlated; however, the noticeable difference in Ac-228 and Bi-214 concentrations in the two final systematic samples relative to the respective concentrations reported for the rest of the final systematic samples is an indication that these samples are not representative of the soil in TU 347.

The results of the evaluation indicate that the final systematic sample results from TU 347 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 348

Trench Survey Unit 348 is the net sum of TU 348; excavated soil from ESs 753, 837, 842, 895, and 901; and a volume of import fill material, which was used for backfill. Sediment samples collected from piping removed from TU 348 showed elevated concentrations of Cs-137 above the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 348, and 44 samples were collected: 26 biased samples to identify potential elevated Cs-137 concentrations in soil, and a set of 18 final systematic samples.

Data from TU 348 were flagged as unusual or suspect for the following reason:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 348.

Reported Ac-228, Bi-214, and K-40 concentrations of three final systematic samples were significantly lower than the other final systematic samples collected from TU 348. The samples with noticeably lower concentrations collected from TU 348 were spatially correlated; however, the noticeable difference in Ac-228, Bi-214, and K-40 concentrations in the three final systematic samples relative to the respective concentrations reported for the rest of the final systematic samples is an indication that these samples are not representative of the soil in TU 348.

The results of the evaluation indicate that the final systematic sample results from TU 348 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 349

Trench Survey Unit 349 is the net sum of TU 349; excavated soil from ES 902; and a volume of import fill material, which was used for backfill. One sediment samples collected from piping removed from TU 349 showed an elevated concentration of Cs-137 above the release criterion; however, no elevated Cs-137 concentrations were reported in soil sample results. No remediation was performed at TU 349, and 19 samples were collected: 1 biased sample to identify potential elevated Cs-137 concentrations in soil, and a set of 18 final systematic samples.

Data from TU 349 were flagged as unusual or suspect for the following reasons:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 349.
- TU 349 is downstream from a radiologically impacted building and located near a known radiological cleanup.

Reported Ac-228, Bi-214, and K-40 concentrations of two final systematic samples were significantly lower than the other final systematic samples collected from TU 349. The samples with noticeably lower concentrations collected from TU 349 were spatially correlated; however, the noticeable difference in Ac-228, Bi-214, and K-40 concentrations in the two final systematic samples relative to the respective concentrations reported for the rest of the final systematic samples is an indication that these samples are not representative of the soil in TU 349.

The results of the evaluation indicate that the final systematic sample results from TU 349 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 351

Trench Survey Unit 351 is the net sum of TU 351; excavated soil from ES 909, and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 351. No remediation was performed at TU 351, and a set of 18 final systematic samples was collected.

Data from TU 351 were flagged as unusual or suspect for the following reasons:

- Logic tests identified inconsistencies related to the processing of samples from TU 351.
- TU 351 is downstream from a radiologically impacted building and located near a known radiological cleanup.

The gamma scan range provided in the SUPR for TU 351 was 3,550 to 8,540 cpm. The SUPR for TU 351 stated that the gamma scan data exceeded the investigation level (7,671 cpm) and that the elevated scan measurement was associated with a final systematic sample location. However, the reported activity of this final systematic sample result was below the release criteria for all ROCs. Additionally, the gamma scan was performed at the same time as the final systematic samples were collected and no explanation is provided in available documentation for this reported procedure. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results. It is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 352

Trench Survey Unit 352 is the net sum of TU 352; excavated soil from ESs 907 and 908; and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 352. No remediation was performed at TU 352, and a set of 18 final systematic samples was collected.

Data from TU 352 were flagged as unusual or suspect for the following reason:

- TU 352 is downstream from a radiologically impacted building and located near a known radiological cleanup.

The gamma scan range provided in the SUPR for TU 352 was 3,860 to 8,540 cpm. The SUPR for TU 352 stated that the gamma scan data exceeded the investigation level (7,671 cpm) and that the elevated scan measurement was associated with a final systematic sample location. However, the reported activity of this final systematic sample result was below the release criteria for all ROCs. Additionally, the gamma scan was performed at the same time as the final systematic samples were collected and no explanation is provided in available documentation for this reported procedure. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results. It is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 353

Trench Survey Unit 353 is the net sum of TU 353; excavated soil from ESs 907 and 908; and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 353. No remediation was performed at TU 353, and a set of 18 final systematic samples was collected.

Data from TU 353 were flagged as unusual or suspect for the following reasons:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 353.
- TU 353 is downstream from a radiologically impacted building and located near a known radiological cleanup.

The gamma scan range provided in the SUPR for TU 353 was 6,640 to 11,900 cpm. The SUPR for TU 353 stated that the gamma scan data exceeded the investigation level (7,671 cpm) and that the elevated scan measurement was associated with two final systematic sample locations. However, the reported activity of this final systematic sample result was below the release criteria for all ROCs. Additionally, the gamma scan was performed at the same time as the final systematic samples were collected and no explanation is provided in available documentation for this reported procedure. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results. It is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 354

Trench Survey Unit 354 is the net sum of TU 354; excavated soil from ES 914; and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 354. No remediation was performed at TU 354, and a set of 18 final systematic samples was collected.

Data from TU 354 were flagged as unusual or suspect for the following reason:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 354.

The gamma scan range provided in the SUPR for TU 354 was 3,400 to 9,130 cpm. The SUPR for TU 354 stated that the gamma scan data exceeded the investigation level (7,671 cpm) and that the elevated scan measurement was associated with two final systematic sample locations. However, the reported activity of this final systematic sample result was below the release criteria for all ROCs. Additionally, the gamma scan was performed at the same time as the final systematic samples were collected and no explanation is provided in available documentation for this reported procedure. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results. It is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Trench Unit 355

Trench Survey Unit 355 is the net sum of TU 355 and a volume of import fill material, which was used for backfill. Elevated gamma scan measurements were identified during the performance of the gamma scans in TU 355. No remediation was performed at TU 355, and a set of 18 final systematic samples was collected.

Data from TU 355 were flagged as unusual or suspect for the following reasons:

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from TU 355.
- TU 355 is downstream from a radiologically impacted building and located near a known radiological cleanup.

The gamma scan range provided in the SUPR for TU 355 was 3,850 to 11,600 cpm. The SUPR for TU 355 stated that the gamma scan data exceeded the investigation level (7,440 cpm) and that the elevated scan measurement was associated with three final systematic sample locations. However, the reported activity of this final systematic sample result was below the release criteria for all ROCs. Additionally, the gamma scan was performed at the same time as the final systematic samples were collected and no explanation is provided in available documentation for this reported procedure. This narrative is consistent with the allegation that samples were collected in areas to avoid potentially elevated soil sample results. It is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

4.1.2 Fill Units

There were 96 fill units evaluated in Parcel E. Based upon the scope of this evaluation, there was no evidence of potential data manipulation or falsification at 32 fill units; therefore, no further action is recommended. There was evidence of potential data manipulation or falsification at 64 fill units used as backfill for 32 trench survey units, and confirmation sampling is recommended. Of the 64 fill units, 60 were recommended for confirmation sampling based on evidence of biased sample collection at locations to potentially avoid the highest gamma scan measurements. The results of the Parcel E fill unit evaluation are presented on **Figure 4-3**. The data evaluation forms documenting findings are provided in **Appendix C**.

The following text summarizes the evaluations of the 64 fill units where evidence of potential data manipulation or falsification was found.

4.1.2.1 Recommended for Confirmation Sampling

Excavated Soil Unit 264

ES 264 was used to backfill TU 162. Soil used to create ES 264 originated from TU 162. The text in the SUPR for TU 162 reported that "the gamma scan of ES 264 identified measurements above the investigation level"; however, no elevated concentrations in soil were reported. No remediation was performed at ES 264, and 20 samples were collected: 2 biased samples to identify potential elevated radionuclide concentrations in soil, and a set of 18 final systematic samples.

Data from ES 264 were flagged as unusual or suspect for the following reasons:

- Statistical tests identified significant differences between the ES 264 final systematic data and other excavated soil units used to backfill TU 164, and other final systematic data collected from Parcel E.
- Graphical data review identified anomalies or unusual trends in the soil sample data collected from ES 264.

Although the text in the SUPR for TU 162 stated that gamma scan measurements exceeded the investigation level, the gamma scan data also provided in the SUPR for TU 162 indicated a maximum measurement of 1,198 counts per second (cps), below the investigation level (1,215 cps). This apparent contradiction in the available documentation provides uncertainty regarding the validity of the gamma scan data. Due to this uncertainty, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Excavated Soil Unit 532

ES 532 was used to backfill TU 217. Available documentation did not provide information regarding the soil used to create ES 532. No remediation was performed at ES 532, and 20 samples were collected: 2 biased samples (no explanation was provided in available documentation for the collection of these samples) and a set of 18 final systematic samples.

Data from ES 532 were flagged as unusual or suspect for the following reasons:

- Statistical tests identified significant differences between the ES 532 final systematic data and other excavated soil units used to backfill TU 217, and other final systematic data collected from Parcel E.
- Logic tests identified inconsistencies related to the processing of samples from ES 532.

The SUPR for TU 217 reported an average gamma scan measurement of 536.68 cps and a standard deviation of 17.87 cps. The reported standard deviation is less than the square root of the mean (23.16 cps) which is indicative that the reported gamma scan measurements are not representative of measurements collected from the respective excavated soil unit. The reported gamma scan measurements are not appropriate; therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions.

Excavated Soil Units 873 and 875

ES 873 and ES 875 were used to backfill TU 343. Available documentation did not provide information regarding the soil used to create ES 873 and ES 875. No remediation was performed at either excavated soil unit, and 20 samples were collected from each: 2 biased samples (no explanation was provided in available documentation for the collection of these samples) and a set of 18 final systematic samples.

Data from ES 873 and ES 875 were flagged as unusual or suspect for the following reasons:

- Statistical tests identified significant differences between the ES 873 and ES 875 final systematic data and other excavated soil units used to backfill TU 343, and other final systematic data collected from Parcel E.

- Graphical data review identified anomalies or unusual trends in the soil sample data collected from ES 873 and ES 875.

Both ES 873 and ES 875 were used as backfill for TU 343. The final systematic sample results for Cs-137, K-40, Ra-226 and progeny (Bi-214 and Pb-214) and Th-232 progeny (Ac-228, Bi-212, and Pb-212) from the excavated soil units used to backfill TU 343 were statistically different from the final systematic sample results from fill units in Parcel E. Additionally, the final systematic sample results from ES 873 and ES 875 displayed an unusually low variance for Bi-214 and K-40. Because available documentation did not provide information regarding the origin of soil in these fill units, a comparison to geographically similar soil could not be performed.

The results of the evaluation indicate that the final systematic sample results from ES 873 and ES 875 are suspect. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed to document current site conditions. It is noted that ES 876 and ES 877 were also used as backfill for TU 343 and similar observations were made regarding the final systematic sample results from those units, and those are also recommended for confirmation sampling as described in the following subsection.

Excavated Soil Units 244, 249, 255, 258, 261, 263, 265, 519, 520, 521, 522, 523, 525, 527, 528, 529, 530, 531, 533, 537, 570, 624, 653, 654, 657, 681, 683, 686, 687, 688, 689, 690, 704, 710, 714, 715, 839, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 872, 876, 877, 878, 881, 883, 908, 910, 911, 912, 915, 916

The gamma scan for 60 excavated soil units in Parcel E identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the standard 18 final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Therefore, confirmation sampling and analysis by an independent, certified laboratory are recommended to document current site conditions at fill units. ES 264 had other inconsistencies and unusual findings described in the previous section.

4.1.3 Current and Former Building Sites

There are 16 buildings (2 current buildings and 14 former building sites) divided into 104 survey units, where soil sampling was performed in Parcel E. Based upon the scope of this evaluation, there was no evidence of potential manipulation or falsification at 2 buildings, and no further action is recommended. Based upon the scope of this evaluation, there was evidence of potential data manipulation or falsification at 14 buildings, and confirmation sampling is recommended.

The evaluation of the data from these buildings was performed similarly to the evaluation of data from the storm drain and sanitary sewer line investigation. The results of the Parcel E current and former building site survey unit evaluation are presented on **Figure 4-4**. The data evaluation forms documenting the findings are provided in **Appendix C**.

The following text summarizes the evaluations of the 14 buildings in Parcel E where evidence of potential data manipulation or falsification was found.

4.1.3.1 Recommended for Confirmation Sampling

Former 500 Series Buildings Area Survey Units 1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 16, 18, 23, 24, and 27

The Former 500 Series Buildings Area encompasses both buildings and open space used by the Radiation Laboratory, precursor to NRDL, that were not included in the final status survey activities performed for

Building 521; Former Buildings Sites 503, 506, 507, 508, 509, 510/510A, 517, 520, and 529; and the Former Shack 79 and 80 Sites (TtEC, 2013e). The Former 500 Series Buildings Area was previously used as the site of the original Radiation Laboratory and NRDL administrative and laboratory facilities and outdoor storage (NAVSEA, 2004; TtEC, 2013e).

TtEC was contracted by the Navy to perform the Final Status Survey of the Former 500 Series Buildings Area. As identified in work planning documents, ROCs for the Former 500 Series Buildings Area are americium (Am)-241, Cs-137, plutonium (Pu)-239, Ra-226, and Sr-90. Initially, the Former 500 Series Buildings Area included two Class 2 Survey Units, which were divided into several Class 1 survey units after contamination was found. Subsequently, the Former 500 Series Buildings Area was comprised of 27 Class 1 soil survey units. Gamma scan surveys were performed for each Class 1 survey unit. A minimum of 36 systematic gamma static measurements, exposure rate measurements, and soil samples were collected from each survey unit. Each soil sample was analyzed at the onsite laboratory by gamma spectroscopy. Additionally, a minimum of two biased samples were collected during follow-up investigation based on review of the gamma scan data. Once final status survey analytical results were determined to be below the release criteria at the onsite laboratory, the samples were sent to the offsite laboratory for definitive analysis after a minimum of 21-day ingrowth for Ra-226 progeny for definitive analysis. A minimum of 10 percent of samples were also analyzed for Sr-90 and Pu-239 at the offsite laboratory.

Additionally, the storm drains and sanitary sewer lines in the Former 500 Series Buildings Area were removed by TtEC as a part of the storm drain and sanitary sewer line investigation. The investigation and removal resulted in the 21 trench survey units and the results were reported by TtEC, separately, in the SUPR for the respective trench survey unit. Furthermore, radiological activities associated with Building 521; Former Buildings Sites 503, 506, 507, 508, 509, 510/510A, 517, 520, and 529; and the Former Shack 79 and 80 Sites located within the Former 500 Series Buildings Area were performed. The investigation results were reported by TtEC, separately, in the final status survey reports for the respective building or building site.

The results of the evaluation indicate that the final systematic sample results from Survey Units 1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 16, 18, 23, 24, and 27 are suspect. The findings of the evaluations are summarized as follows:

- The gamma scan for SUs 1, 6, 7, 11, 12, 13, 16, and 18 identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased soil sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Additionally, final systematic sample results from SU 11 are inconsistent with final systematic sample results from Parcel E.
- The final systematic samples from SUs 2, 4, 8, 16, and 27 display characteristics indicative of at least two different data populations, which is an indication that a subset of final systematic samples are not representative of the respective survey unit.
- The final systematic sample results from SU 5 display characteristics inconsistent with biased sample results. There are expected differences between the biased and systematic sample results; however, a subset of final systematic sample results and biased sample results showed significantly higher concentrations of Ac-228, Bi-214, and K-40 than the other subset of final systematic samples.
- The gamma scan results from SUs 23 and 24 were not useful in identifying areas with potentially elevated sample results. Multiple rounds of sampling were performed in both survey units in

response to remediation of elevated concentrations of ROCs reported for a large number of samples, which is not reflective of the gamma scan results.

Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at Survey Units 1, 2, 4, 5, 6, 7, 8, 11, 12, 13, 16, 18, 23, 24, and 27 to document current site conditions.

Building 707 Triangle Area Survey Units 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 18, 19, 21, and 22, and ES 477

The Building 707 Triangle Area includes former Building 707 and associated kennels, the Building 707B and 707C Sites, and former Building 708, which is also known as Building 707A. The Building 707 Triangle Area was previously used as the NRDL Radioactive Waste Receiving, Packaging and Storage Area and is the location of a suspected septic tank and leach field from early operations (NAVSEA, 2004). The HRA identified Building 707 as previously used by the NRDL as a research facility for animal breeding and housing, a waste processing and storage facility, and formerly leased to Pet Express as an animal clinic; the Building 707B Site as previously used as a NRDL animal colony; the Building 707C Site as previously used for nuclear weapons test support and experimentation and as an equipment issue and receiving area; and Building 708 as previously used as a research animal facility, biomedical facility, and animal psychology facility (NAVSEA, 2004; TtEC, 2016).

In the late 1960s, Building 707 was surveyed and decontaminated by the NRDL Health Physics Division and released by the NRDL for unrestricted use based on release requirements of the period (TtEC, 2016). The Atomic Energy Commission conducted confirmatory surveys of the Building 707 concrete waste preparation pad in 1970 and the results of the survey confirmed that regulatory levels required for unrestricted use at that time were met. Surveys conducted by RASO at Building 707 in September 1978 indicated that radioactivity levels met the Nuclear Regulatory Commission guidelines at that time (TtEC, 2016). Investigations conducted from 1996 to 1997 to address concerns related to use, storage, and disposal of radioactive materials within the Building 707 concrete pad area, which included gamma walkover surveys and the collection of soil, asphalt, concrete and swipe samples for analysis, identified that additional investigations were needed after elevated Ra-226, Th-228, and Th-232 concentrations were reported (TtEC, 2016). The follow-on investigation, which included collection of concrete and soil samples at the Building 707 concrete pad, identified the presence of Cs-137 above the release criterion. A removal action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 was recommended and subsequently completed in 2001 (TtEC, 2016). In 2002, the Navy contracted New World Technologies to perform a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) survey of the Building 707 Triangle Area to determine whether residual radiological contamination was present, which included gamma scans, gamma static readings, alpha-beta static readings, dose rate measurements, alpha-beta swipes, and sample analysis. Survey and sample results indicated the presence Cs-137 concentrations exceeding release criteria under the concrete pad and in drain lines (TtEC, 2016).

TtEC was contracted by the Navy to perform the Final Status Survey of the Building 707 Triangle Area. As identified in work planning documents, ROCs for the Building 707 Triangle Area are Cs-137, Pu-239, Ra-226, Sr-90, and uranium(U)-235. Initial field activities performed at the Building 707 Triangle Area included excavation of the Building 707 Triangle Area sanitary sewer lift station sump and associated vault, removal of debris, and survey of miscellaneous materials and equipment prior to offsite removal. In April 2010, interior and exterior walls and floors of Buildings 707 and 708 were surveyed and subsequently demolished after results did not reveal activity above the release criteria. In June 2010, a Final Status Survey of the remaining concrete and asphalt surfaces was initiated to measure the concentration of surface radioactivity on the concrete pads and asphalt surfaces within the Building 707 Triangle Area, prior to demolition and removal. The former Building 707 and 708 concrete pads were surveyed as separate Class 1 survey units, the concrete pads adjacent to the former Building 707

footprint and the floor gutters around the former animal runs were surveyed as separate Class 1 survey units, and the remaining asphalt surfaces within the Building 707 Triangle Area were divided into six Class 1 survey units. The Building 707 Triangle Area concrete pads and asphalt surfaces were removed following surveys confirming the surfaces were less than the release criteria for all ROCs. The concrete pads and asphalt surfaces in contact with the soil were removed and maintained onsite pending results of the underlying soil surveys (TtEC, 2016).

In order to perform the Final Status Survey of the soil at the Building 707 Triangle Area, the site was divided into 27 Class 1 soil survey units. Gamma scan surveys were performed over 100 percent of the Class 1 survey units using a RASO-approved drive-over-array system. Measurements exceeding the investigation level were reported for all survey units, with the exception of SUs 12, 19, and 23. Gamma static measurements and biased soil samples were collected in locations corresponding to elevated scan measurements. Exposure rate measurements were also collected at specified systematic locations in the Class 1 survey units. Each soil sample was analyzed at the onsite laboratory by gamma spectroscopy and at least 10 percent of the samples were also analyzed at the offsite laboratory. Additionally, as stated in the task-specific plan for the Building 707 Triangle Area, 100 percent of the samples were analyzed for total Sr/Sr-90 at the offsite laboratory if initial samples were analyzed at the onsite laboratory.

Additionally, the storm drains and sanitary sewer lines associated with the Building 707 Triangle Area were removed by TtEC in accordance with the Storm Drain Removal Work Plan (TtEC, 2010). The survey units (SUs 12 and 19) were created from the removal of the sanitary sewer piping, manholes, and lift station pump. SUs 12 and 19 were backfilled with soil from ES 487 and ES 478 and ES 479, respectively.

The results of the evaluation indicate that the final systematic sample results from SUs 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 18, 19, 21, and 22, and ES 477 are suspect. The findings of the evaluations are summarized as follows:

- The gamma scan for SUs 1, 2, 4, 6, 11, and 18, and ES 477 identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. Similarly, while the results of a gamma scan for SU 12 are not provided in available documentation, biased samples were collected in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results.
- The final systematic sample results from SU 7 display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units.
- A subset of sample results for samples collected from SU 19 were anomalous. Additionally, one final systematic samples was analyzed several days after the other samples were counted. Gamma static measurements from SU 19 were inconsistent with sample results collected from the same location.
- The final 4 systematic samples and final 4 biased sample results from SU 13 show a significantly lower Cs-137 concentration when compared to the rest of the final systematic sample results. This is an indication of a subset of sample results not being representative of the respective survey unit. Similarly, the sample results for a subset of samples collected in order to potentially replace previously collected samples with anomalous results collected from SU 5, 8, and 14, were inconsistent with the sample results of other samples collected in the survey unit. This is an indication that a subset of sample results from SU 5, 8, and 14 are not representative of the respective survey unit.

- Elevated ROC concentrations were identified in sample results from SU 21. Samples were collected following remediation; however, these samples were collected after final systematic samples were collected. Additionally, the final systematic sample results from SU 21 are inconsistent with final systematic sample results collected from Parcel E and sample results from samples collected previously in SU 21.
- Samples collected from SUs 3 and 13 were confirmed as anomalous and the sample data were rejected. However, sample collection and remedial activities continued at SU 22 after the replacement samples were collected. Additionally, review of the gamma scan and sample results from SUs 3 and 22 indicate locations where the gamma scan exceeded the investigation level were not investigated appropriately.

Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 18, 19, 21, and 22, and ES 477 to document current site conditions.

Building 414 Survey Units 7, 9, 11, 12, and 13

Building 414 was previously used as a public works/supply storehouse, as an LLRW storage area for investigation derived waste with Ra-226, and as a contractor storage area (NAVSEA, 2004; TtEC, 2011a). In 2002, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of Building 414; however, following research performed for the HRA, the survey was later considered insufficient by the Navy to recommend unrestricted release (NAVSEA, 2004; TtEC, 2011a).

TtEC was contracted by the Navy to perform a Final Status Survey of Building 414 under MARSSIM guidance. To perform the Final Status Survey, the floors and walls within Building 414 were divided into 19 Class 1 survey units (SUs 1 through 19) and one Class 2 survey unit, which included the area 2 to 4 meters above the respective floor surfaces. As identified in work planning documents, ROCs for Building 414 are Cs-137 and Ra-226. The investigation activities associated with the Class 1 (14 through 19) and Class 2 survey units located in the interior of Building 414 is under evaluation and will be reported separately.

The interior of Building 414 included soil fill on the ground surface with approximately 6 inches of gravel covering the floor. Trash and debris within Building 414 were surveyed for disposal (including recycling, placement in a landfill or placement into an LLRW bin) and approximately 809 cubic yards of gravel surface material were removed and staged for recycling. The soil comprising the floor in the interior of Building 414 was divided into soil SUs 1 through 13. Gamma scan and gamma static measurements and a minimum of 20 systematic samples were collected from all 13 soil survey units. Each sample was analyzed at the onsite laboratory by gamma spectroscopy, and at least 10 percent of the samples were also analyzed at the offsite laboratory.

Additionally, the storm drains and sanitary sewer lines associated with Building 414 were removed by TtEC as a part of the storm drain and sanitary sewer line investigation. The investigation and removal resulted in one trench survey unit (TU 155), and the results were reported by TtEC, separately, in the SUPR for TU 155.

The results of the evaluation indicate that the final systematic sample results from SUs 9, 11, 12, and 13 are suspect. The final systematic sample results display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 9, 11, 12, and 13 to document current site conditions.

Former Building 506 Site Survey Units 1, 4, and 5

The Former Building 506 Site was previously used as NRDL Biology, Chemistry, and Health Physics Laboratories; NRDL Animal, Nuclear, and Physical Chemistry Laboratories; a Radiochemistry Laboratory; NRDL Instrument Repair, Darkroom, and Densitometer for film badges, Counting Room, Electro-Physical and Surface Chemistry Laboratories, Personnel Decontamination; and also served as the Radiation Laboratory (preceded NRDL) and NRDL Headquarters and Main Facility. A pad formerly used to store radioactive waste containers was located behind the Former Building 506 and a radioactive waste storage tank was associated with the Former Building 506 (NAVSEA, 2004; TtEC, 2013c). Previous radiological investigations not performed by TtEC date back to 1969. In 2001, the Navy contracted New World Technology, Inc. to perform a MARSSIM Class 3 survey of the Former Building 506 Site.

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 506 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2013c). As identified in work planning documents, ROCs for the Former Building 506 Site are Am-241, Cs-137, Pu-239, Ra-226, Sr-90, and tritium (hydrogen-3 or H-3). The Former Building 506 Site was divided into five Class 1 survey units (SUs 1 through 5). Gamma scan and gamma static measurements and a minimum of 20 systematic samples were collected from all five of the survey units. Each sample was analyzed at the onsite laboratory by gamma spectroscopy and 100 percent of the final systematic samples were also analyzed at the offsite laboratory by gamma spectroscopy. Additionally, 100 percent of the final systematic samples were analyzed for total Sr/Sr-90 at the offsite laboratory, at least 10 percent of the final systematic samples were analyzed for H-3 and Pu-239 at the offsite laboratory.

Excavation was initiated to confirm the presence of the waste tank associated with the Former Building 506 Site; however, the waste tank could not be located. Metal piping debris was identified and removed and the area in the vicinity was surveyed, sampled, and remediated. The Final Status Survey for the Former Building 506 Site stated that the area formerly containing the radioactive waste storage tank was thoroughly remediated and suitable for free release.

The results of the evaluation indicate that the final systematic sample results from SUs 1, 4, and 5 are suspect. The final systematic sample results from SUs 4 and 5 display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units. The final systematic samples from SU 1 are inconsistent with final systematic sample results from Parcel E. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 1, 4, and 5 to document current site conditions.

Former Building 507 Site Survey Unit 1

The Former Building 507 Site was previously used as NRDL biology laboratories, NRDL change house and animal quarters, a Radiological Decontamination Center, Biochemistry Branch, Physiology-Psychology Branch, and Experimental Pathology Branch (NAVSEA, 2004; TtEC, 2013b). NRDL surveyed Former Building 507 in 1955 and free released the building based on survey results and release requirements of the period. PRC Environmental Management, Inc. (PRC) performed radiological investigations between 1996 and 1997 that included the former Building 507, with the objective of eventual release for unrestricted use of all remaining buildings and sites in Parcels D and E with a history of use, storage, and disposal of radioactive material during NRDL operations. The reported results of this investigation recommended that former Building 507 be released for unrestricted public use. In 2002, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of the Former Building 507 Site. Elevated Ra-226 concentrations were identified in soil samples and the areas were remediated and resurveyed.

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 507 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2013b). As identified in work planning documents, ROCs for

the Former Building 507 Site are Cs-137, Pu-239, Ra-226, and Sr-90. The Former Building 507 Site included one Class 1 survey unit (SU 1). Gamma scan and gamma static measurements were taken, and 38 samples were collected: 2 biased samples to identify potentially elevated radionuclide concentrations and 36 final systematic samples. Each soil sample was analyzed at the onsite laboratory by gamma spectroscopy. The final systematic samples were also analyzed at the offsite laboratory by gamma spectroscopy. Additionally, four samples were analyzed at the offsite laboratory for total Sr/Sr-90 and four samples were analyzed at the offsite laboratory for isotopic plutonium analysis.

Additionally, the storm drains and sanitary sewer lines associated with the Former Building 507 Site were removed by TtEC as a part of the storm drain and sanitary sewer line investigation. The investigation and removal resulted in one trench survey unit (TU 306), and the results were reported by TtEC, separately, in the SUPR for TU 306.

The results of the evaluation indicate that the final systematic sample results from SU 1 are suspect. The gamma scan for identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Therefore, confirmation sampling and analysis by an independent, certified laboratory are recommended to document current site conditions.

Former Building 509 Site Survey Unit 2

The Former Building 509 Site was previously used as a library (NAVSEA, 2004; TtEC, 2012c). There is no reference to the Former Building 509 in the building-by-building release survey of NRDL facilities in 1955 (NAVSEA, 2004). PRC performed radiological investigations between 1996 to 1997 with the objective of eventual release for unrestricted use of all remaining buildings and sites in Parcels D and E with a history of use, storage, and disposal of radioactive material during NRDL operations. Although there was no reference to NRDL operations at the former Building 509, it was directly adjacent to Former Building 517, which was included in the PRC investigations. The investigation identified anomalous count rates from gamma scan and gamma static surveys and the reported results of the investigation recommended that the anomalous count rates at Buildings 509 and 517 be assessed for a potential removal action. In 2002, the Navy contracted New World Technology, Inc. to perform a MARSSIM Final Status Survey of the Former Building 509 Site. Elevated Ra-226 concentrations were identified in soil samples and it was determined that survey and sample results from the survey exceeded release criteria and the site was not released for unrestricted use.

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 509 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2012c). As identified in work planning documents, ROCs for the Former Building 509 Site are Cs-137, Ra-266, and Sr-90. The Building 509 Site was divided into two Class 1 survey units. SU 1 included a concrete slab and once the survey and removal of the slab was completed, the soil beneath the slab was designated SU 2. This evaluation focused on the survey of SU 2. Gamma scan and gamma static measurements were taken, and 41 samples were collected: 5 biased samples to identify potentially elevated radionuclide concentrations in soil and 36 final systematic samples. Each sample was analyzed at the onsite laboratory by gamma spectroscopy. The final systematic samples were also analyzed at the offsite laboratory by gamma spectroscopy. Additionally, four samples were analyzed at the offsite laboratory for total Sr/Sr-90.

The results of the evaluation indicate that the final systematic sample results from SU 2 are suspect. The gamma scan for identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples

were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Therefore, confirmation sampling and analysis by an independent, certified laboratory are recommended to document current site conditions.

Former Building 510/510A Site Survey Unit 1

The Former Building 510/510A Site includes the Former Buildings 510 and 510A. Former Building 510 was previously used as a NRDL Radiation Facility, for weapons test sample storage, a non-NRDL training facility, a Nuclear Radiation Branch, the Research Engineering Section Physics Branch and as glassblowing, woodworking, and machine shops (NAVSEA, 2004; TtEC, 2013a). Former Building 510A, located adjacent to Building 510, was previously used as the NRDL Kevatron Facility, NRDL X-Ray Facility, Supervisor of Shipbuilding, conversion, and Repair record storage, and a Fire Research Facility (NAVSEA, 2004; TtEC, 2013a). NRDL surveyed Former Building 510 in 1955 and free released the building based on survey results and release requirements of the period. The Kevatron particle accelerator used in Former Building 510A was used to irradiate targets, including animals and radioactive materials; however, the machine itself did not contain radioactive materials nor could it accelerate particles at an energy level to activate building materials (TtEC, 2013a). PRC performed radiological investigations between 1996 to 1997, that included the Former Buildings 510 and 510A, with the objective of eventual release for unrestricted use of all remaining buildings and sites in Parcels D and E with a history of use, storage, and disposal of radioactive material during NRDL operations. The reported results of this investigation recommended that the Former Buildings 510 and 510A be released for unrestricted public use. In 2002, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of the Former Building 510 and 510A Sites. Available documentation indicates a Class 3 survey was completed at the Former Building 510 Site but no further information was provided regarding the investigation results at the Former Building 510A Site.

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 510/510A Sites (the locations of former Buildings 510 and 510A were combined for the survey) using MARSSIM guidance (DoD et al., 2000; TtEC, 2013a). As identified in work planning documents, ROCs for the Former Building 510/510A Site are Cs-137, Pu-239, Ra-226, and Sr-90. The Former Building 510/510A Site included one Class 1 survey unit (SU 1). Gamma scan and gamma static measurements were taken, and 38 samples were collected: 2 biased samples to identify potentially elevated radionuclide concentrations in soil and 36 final systematic samples. Each sample was analyzed at the onsite laboratory by gamma spectroscopy. The final systematic samples were also analyzed at the offsite laboratory by gamma spectroscopy. Additionally, four samples were analyzed at the offsite laboratory for total Sr/Sr-90 and four samples we analyzed at the offsite laboratory for isotopic plutonium analysis.

The results of the evaluation indicate that the final systematic sample results from SU 1 are suspect. The final systematic sample results display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units. Additionally, the gamma scan identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Therefore, confirmation sampling and analysis by an independent, certified laboratory are recommended to document current site conditions.

Former Building 520 Site Survey Units 4 and 5

The Former Building 520 Site was previously used as the Shipyard Dental Clinic and NRDL Administrative Offices (NAVSEA, 2004; TtEC, 2013d). In 2001, the Navy contracted New World Technology, Inc. to

perform a MARSSIM survey of the Former Building 520 Site and Ra-226 contamination was found near the foundation.

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 520 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2013d). As identified in work planning documents, ROCs for the Former Building 520 Site are Cs-137, Ra-226, and Sr-90. The Former Building 520 Site was divided into five Class 1 soil survey units (SUs 1 through 5). Gamma scan and gamma static measurements and a minimum of 20 systematic soil samples were collected from each survey unit. Each sample was analyzed at the onsite laboratory by gamma spectroscopy. The final systematic samples were also analyzed at the offsite laboratory by gamma spectroscopy. Additionally, all final systematic samples were analyzed at the offsite laboratory for total Sr/Sr-90 analysis.

The results of the evaluation indicate that the final systematic sample results from SUs 4 and 5 are suspect. The final systematic sample results display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 4 and 5 to document current site conditions.

Former Building 529 Site Survey Unit 1

The Former Building 529 Site was previously used as the NRDL Isotope Storage Facility and as the site of a neutron generator with a H-3 target (NAVSEA, 2004; TtEC, 2012b). During renovation of the building prior to installation of the neutron generator, the isotope storage vault was filled with compacted sand and capped with 8 inches of concrete (NAVSEA, 2004; TtEC, 2012b). Previous radiological investigations not performed by TtEC date back to 1969. In 2001, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of the Former Building 529 Site. Contaminated underground piping was found and left in place.

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 529 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2012b). As identified in work planning documents, ROCs for the Former Building 529 Site are Cs-137, H-3, Ra-226, and Sr-90. The Former Building 529 Site, which includes the footprint of the Former Building 529, includes one Class 1 soil survey unit. Gamma scan and gamma static measurements were taken, and 31 samples were collected: 11 biased samples to identify potentially elevated radionuclide concentrations in soil and 20 final systematic samples. Each sample was analyzed at the onsite laboratory by gamma spectroscopy. The final systematic samples were also analyzed at the offsite laboratory by gamma spectroscopy. Additionally, all final systematic samples were analyzed at the offsite laboratory for total Sr/Sr-90 and two final systematic samples were analyzed at the offsite laboratory for H-3.

The isotope storage vault and concrete foundation from the Former Building 529 Site were surveyed and removed from the Former Building 529 Site prior to commencement of Final Status Survey field activities. Additionally, the storm drains and sanitary sewer lines associated with the Former Building 529 Site were removed by TtEC as a part of the storm drain and sanitary sewer line investigation. The investigation and removal resulted in one trench survey unit (TU 241), and the results were reported by TtEC, separately, in the SUPR for TU 241.

The results of the evaluation indicate that the final systematic sample results from SU 1 are suspect. The final systematic sample results display characteristics inconsistent with final systematic sample results from Parcel E. Additionally, the gamma scan for identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in

areas to avoid potentially elevated soil sample results. Therefore, confirmation sampling and analysis by an independent, certified laboratory are recommended to document current site conditions.

Former Building 701 Site Survey Units 1, 3, 6, and 7

The Former Building 701 Site was previously used by NRDL as a temporary storage facility for samples (NAVSEA, 2004; TtEC, 2011c). PRC performed a survey of the Former Building 701 Site in 1992 and no anomalies were noted. In 2002, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of the Former Building 701 Site; however, the survey was later considered insufficient by the Navy to recommend unrestricted release (NAVSEA, 2004; TtEC, 2011c).

The Navy contracted TtEC to perform a Final Status Survey of the Former Building 701 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2011c). As identified in work planning documents, ROCs for the Former Building 701 Site are Cs-137, Pu-239, Ra-226, and Sr-90. The Former Building 701 Site, which includes the footprint of the former building, was originally divided into one Class 1 (SU 1) and one Class 2 (SU 2) soil survey unit. Initial sampling at SU 2 identified elevated Ra-226 and Cs-137 concentrations in soil samples. Remediation was performed and SU 2 was split into two Class 1 survey units (SU 3 and SU 4), and a Class 2 SU (SU 5) was established as the area extending 2 meters beyond the Class 1 survey units. Sampling of SU 5 identified elevated Cs-137 concentrations in soil samples. Remediation was performed and SU 5 was reclassified as a Class 1 survey unit (SU 6) and a Class 2 SU (SU 7) was established as the area extending 2 meters beyond SU 6. The final configuration of the Former Building 701 Site included four Class 1 soil survey units (SUs 1, 3, 4, and 6) and one Class 2 soil survey unit (SU 7). Gamma scan and gamma static measurements and a minimum of 18 systematic samples were collected from each survey unit. Each sample was analyzed at the onsite laboratory by gamma spectroscopy. A minimum of 10 percent of the samples were sent to the offsite laboratory for analysis by gamma spectroscopy. Additionally, a minimum of 10 percent of samples were analyzed for Pu-239 and Sr-90 by the offsite laboratory. If elevated Cs-137 or Am-241 concentrations were identified during the gamma spectroscopy analysis at the onsite laboratory, additional samples were analyzed for Pu-239 and Sr-90.

The results of the evaluation indicate that the final systematic sample results from SUs 1, 3, 6, and 7 are suspect. Gamma scan or gamma static measurements were identified above the investigation level, which prompted the collection of biased soil samples, in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 1, 3, 6, and 7 to document current site conditions.

Building 704 Site Survey Units 1, 3, and 4

The Building 704 Site was previously used by NRDL and includes two areas in the HRA; an area designated as a radioactive materials storage facility for samples and for animal pens (NAVSEA, 2004; TtEC, 2011d). Building 704 is a metal-sheathed shop building and acts as a marker for these two areas and was not designated as impacted in the HRA. There are no documented radiological investigations of the Building 704 Site.

The Navy contracted TtEC to perform a Final Status Survey of the Building 704 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2011d). As identified in work planning documents, ROCs for the Former Building 704 Site are Cs-137, Pu-239, Ra-226, and Sr-90. The Building 704 Site, which includes the former radioactive materials storage facility and animal pens adjacent to Building 704, was initially divided into one Class 1 (SU 1) and one Class 2 (SU 2) soil survey unit. Based on sampling and gamma scan data collected in SU 1, the boundary of SU 1 was extended. Initial sampling in SU 1 and SU 2 identified elevated Cs-137 concentrations in soil samples. Remediation was performed and SU 2 was reclassified as

a Class 1 soil survey unit (SU 3) and a new Class 2 soil survey unit (SU 4) was established as the area extending beyond SU 3. The final configuration of the Building 704 Site included two Class 1 soil survey units (SUs 1 and 3) and one Class 2 soil survey unit (SU 4). Gamma scan measurements were only collected over the areas initially designated as SU 1 and SU 2. Gamma static measurements were collected and a minimum of 18 systematic samples were collected from each survey unit. Each soil sample was analyzed at the onsite laboratory by gamma spectroscopy. A minimum of 10 percent of samples were sent to the offsite laboratory for analysis by gamma spectroscopy. Additionally, a minimum of 10 percent of samples were analyzed by Pu-239 and Sr-90 by the offsite laboratory. If elevated Cs-137 or Am-241 concentrations were identified during the gamma spectroscopy analysis at the onsite laboratory, additional samples were analyzed for Pu-239 and Sr-90.

The results of the evaluation indicate that the final systematic sample results from SUs 1, 3, and 4 are suspect. The gamma scan performed at SUs 1 and 4 identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. The gamma scan performed at SU 3 identified measurements above the investigation level; however, no biased samples were collected. This is an indication of a failure to investigate elevated gamma scan measurements. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 1, 3, and 4 to document current site conditions.

Former Shack 79 and 80 Sites Survey Units 1, 2, and 3

The Former Shack 79 and 80 Sites include two areas identified in the HRA; the Former Shack 79, which was previously used for NRDL support for radioactive material, and the Former Shack 80, which was previously used for NRDL support and is reported to have been relocated behind from behind the Former Building 506 to the Building 704 area for "lab operations" (NAVSEA, 2004; TtEC, 2014b). In 2001, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of the Former Shack 79 and 80 Sites. Elevated Cs-137 concentrations in soil were reported at several locations within the Former Shack 80 Site (NAVSEA, 2004).

The Navy contracted TtEC to perform a Final Status Survey of the Former Shack 79 and 80 Sites using MARSSIM guidance (DoD et al., 2000; TtEC, 2014b). As identified in work planning documents, ROCs for the Former Shack 79 and 80 Sites are Cs-137, Ra-226, and Sr-90. The Former Shack 79 and 80 Sites, which includes the footprints of the Former Shack 79 and Former Shack 80, was divided into three Class 1 soil survey units (SUs 1, 2, and 3). Gamma scan and gamma static measurements and a minimum of 20 systematic samples were collected from each survey unit. Each soil sample was analyzed at the onsite laboratory for analysis by gamma spectroscopy. Additionally, at a minimum, all final systematic samples were analyzed at the offsite laboratory by gamma spectroscopy and analyzed for total Sr/Sr-90 by the offsite laboratory.

The storm drains and sanitary sewer lines associated with the Former Shack 79 and 80 Sites were removed by TtEC as a part of the storm drain and sanitary sewer line investigation. The investigation and removal resulted in two trench survey units (TUs 225 and 307), and the results were summarized in the FSSR for the Former Shack 79 and 80 Sites but reported by TtEC, separately, in the SUPRs for TU 225 and 307.

The results of the evaluation indicate that the final systematic sample results from SUs 1, 2, and 3 are suspect. The final systematic sample results from SUs 1 and 2 display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units. The final systematic samples from SU 3 display characteristics indicative of at least two different data populations, which is an indication that a subset

of final systematic samples is not representative of the respective survey unit. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 1, 2, and 3 to document current site conditions.

IR Site 4 Former Scrap Yard Site and Former Building 807 Site Survey Units 4, 5, 6, 8, and 9

The IR Site 4 Former Scrap Yard Site and Former Building 807 Site includes the Former Scrap Yard which was previously used as a post-disassembly area for metals, equipment, and other unusual items from the salvage yard that potentially contained Ra-226 devices and other contaminants and the Former Building 807 Site, which was previously used as a scrap yard processing shed and potentially received scrap metals from ship decontamination efforts (NAVSEA, 2004; TtEC, 2012a). The site is currently an open area. In 2001, the Navy contracted New World Technology, Inc. to perform a MARSSIM survey of the IR Site 4 Former Scrap Yard. Gamma scan surveys and soil sampling identified elevated Cs-137 and Ra-226 concentrations in soil and the site boundary was expanded. Remediation was performed and the site was resurveyed; however, additional areas of elevated radionuclide concentrations were identified but were not remediated because it was out of the scope of the contract (NAVSEA, 2004; TtEC, 2012a).

The Navy contracted TtEC to perform a Final Status Survey of the IR Site 4 Former Scrap Yard Site and Former Building 807 Site using MARSSIM guidance (DoD et al., 2000; TtEC, 2014b). As identified in work planning documents, ROCs for the IR Site 4 Former Scrap Yard Site and Former Building 807 Site are Cs-137, Ra-226, and Sr-90. The IR Site 4 Former Scrap Yard Site and Former Building 807 Site, which includes IR Site 4 and the footprint of the Former Building 807, was initially divided into seven Class 1 survey units (SUs 1 through 7) and one Class 2 survey unit (SU 8). Initial sampling in SUs 4, 6, 7, and 8 identified elevated Cs-137 or Ra-226 concentrations in soil samples. Remediation was performed and based on available survey unit arrangement figures provided in the FSSR, the survey units were reorganized and an additional Class 1 survey unit (SU 9) was created. Initial sampling in SU 9 identified elevated Cs-137 concentrations in soil samples and remediation was performed. The final configuration of IR Site 4 Former Scrap Yard Site and Former Building 807 Site included nine Class 1 soil survey units (SUs 1 through 9) and one Class 2 soil survey unit (SU 10), which extended 2 meters from the survey units where remediation was performed.

Gamma scan and gamma static measurements and a minimum of 20 systematic samples were collected from each survey unit. Each soil sample was analyzed at the onsite laboratory for analysis by gamma spectroscopy. The work was performed between 2010 and 2011. Prior to January 2011, a minimum of 10 percent of samples were also analyzed at the offsite laboratory by gamma spectroscopy. After January 2011, once final systematic sample results from the onsite laboratory were confirmed to be below the release criteria by the onsite laboratory, all final systematic samples were also analyzed by the offsite laboratory by gamma spectroscopy. Additionally, a minimum of 10 percent of samples collected were analyzed for total Sr/Sr-90 by the offsite laboratory and additional samples were analyzed for Sr-90 if elevated levels of Cs-137 were identified during the gamma spectroscopy analysis at the onsite laboratory.

The sewer system and sump pump associated with the IR Site 4 Former Scrap Yard Site and Former Building 807 Site were removed by TtEC as a part of the storm drain and sanitary sewer line investigation. The investigation and removal resulted in one trench survey unit (TU 201), and the results were reported by TtEC, separately, in the SUPRs for TU 201.

The results of the evaluation indicate that the final systematic sample results from SUs 4, 5, 6, 8, and 9 are suspect. The final systematic sample results from SUs 4, 6, and 9 display characteristics inconsistent with previous sets of systematic sample results, which is an indication the final systematic sample results are not representative of the respective survey units. The final systematic and second set of systematic sample results from SU 8 display characteristics inconsistent with the initial set of systematic samples, which is an indication that at least one set of systematic samples collected from SU 8 are not

representative of the respective survey unit. Additionally, the gamma scan for SU 5 identified measurements above the investigation level, which prompted the collection of biased soil samples in addition to the final systematic samples. However, none of these biased sample results identified activity above the release criteria for any ROC. The concern is that the biased samples were not collected at the locations of the highest gamma scan measurement. This narrative is consistent with the allegation that biased samples were collected in areas to avoid potentially elevated soil sample results. Therefore, it is recommended that confirmation sampling and analysis by an independent, certified laboratory be performed at SUs 4, 5, 6, 8, and 9 to document current site conditions.

4.2 Conclusions and Recommendations

This evaluation of Parcel E soil data found evidence that potential manipulation and falsification was not limited to the survey units addressed by TtEC in their *Investigation Conclusion, Anomalous Soil Samples* report (TtEC, 2014a). Subsequently, former workers at HPNS alleged additional and more widespread data manipulation and falsification.

The areas evaluated in Parcel E included 57 trench units, 96 fill units, and 16 current and former building sites with 104 soil survey units. More than 11,000 soil samples were collected from these areas from 2010 through 2016. Based solely on a review of the data previously collected by TtEC and the findings of the data evaluations, the following recommendations are provided:

- Trench units - There was no evidence of potential data manipulation or falsification identified at 31 of the 57 trench units evaluated; therefore, no further action is recommended. There was evidence of potential data manipulation or falsification at the remaining 26 trench units, and confirmation sampling is recommended for of these units.
- Fill units - There was no evidence of potential data manipulation or falsification identified at 32 of the 96 fill units evaluated; therefore, no further action is recommended. There was evidence of potential data manipulation or falsification at the remaining 64 fill units used as backfill for 32 trench survey units, and confirmation sampling is recommended. Of the 64 fill units, 60 were recommended for confirmation sampling based on evidence of biased sample collection at locations to potentially avoid the highest gamma scan measurements.
- Current and Former Building Sites – At 14 buildings, representing 102 survey units, there was evidence of potential data manipulation or falsification at 61 survey units and confirmation sampling is recommended; and there was no evidence of potential data manipulation or falsification identified at the remaining 41 survey units and no further action is recommended. At 2 buildings, representing 2 survey units, there was no evidence of potential data manipulation or falsification and no further action is recommended.

Because the Navy cannot provide assurance that the evaluation identified every instance of potential data manipulation or falsification, it is recommended that the Navy and regulatory agencies work collaboratively to initiate a sample collection program to confirm protectiveness of human health and the environment. The sampling program should be based on the findings of this report and consider that naturally occurring Ra-226 may exceed the release criterion without being indicative of site-related contamination.

Legend:

PARCEL

- B
- C
- D-2
- E
- G
- UC-1
- UC-2
- UC-3

BASE MAP SOURCE:
Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

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1 inch = 800 feet

Overview Map

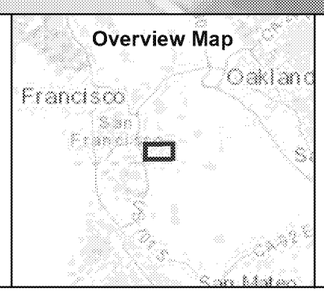
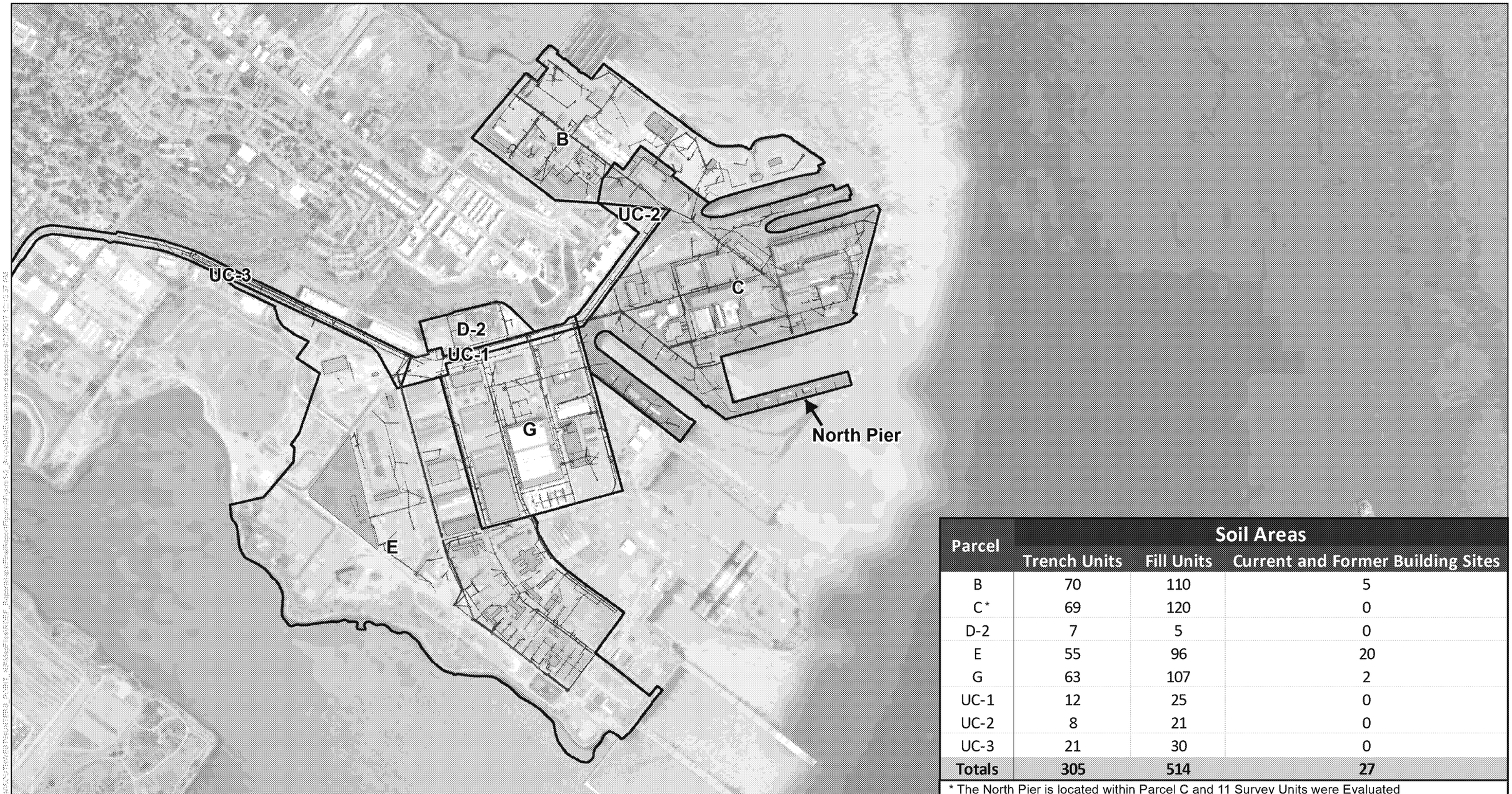


Figure 1-1
HPNS and Parcel Locations
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California



Parcel	Soil Areas		
	Trench Units	Fill Units	Current and Former Building Sites
B	70	110	5
C*	69	120	0
D-2	7	5	0
E	55	96	20
G	63	107	2
UC-1	12	25	0
UC-2	8	21	0
UC-3	21	30	0
Totals	**305**	**514**	**27**

* The North Pier is located within Parcel C and 11 Survey Units were Evaluated

Legend:

- Trench Unit
- Trench and Fill Unit
- Current and Former Building Site
- Parcel

BASE MAP SOURCE:
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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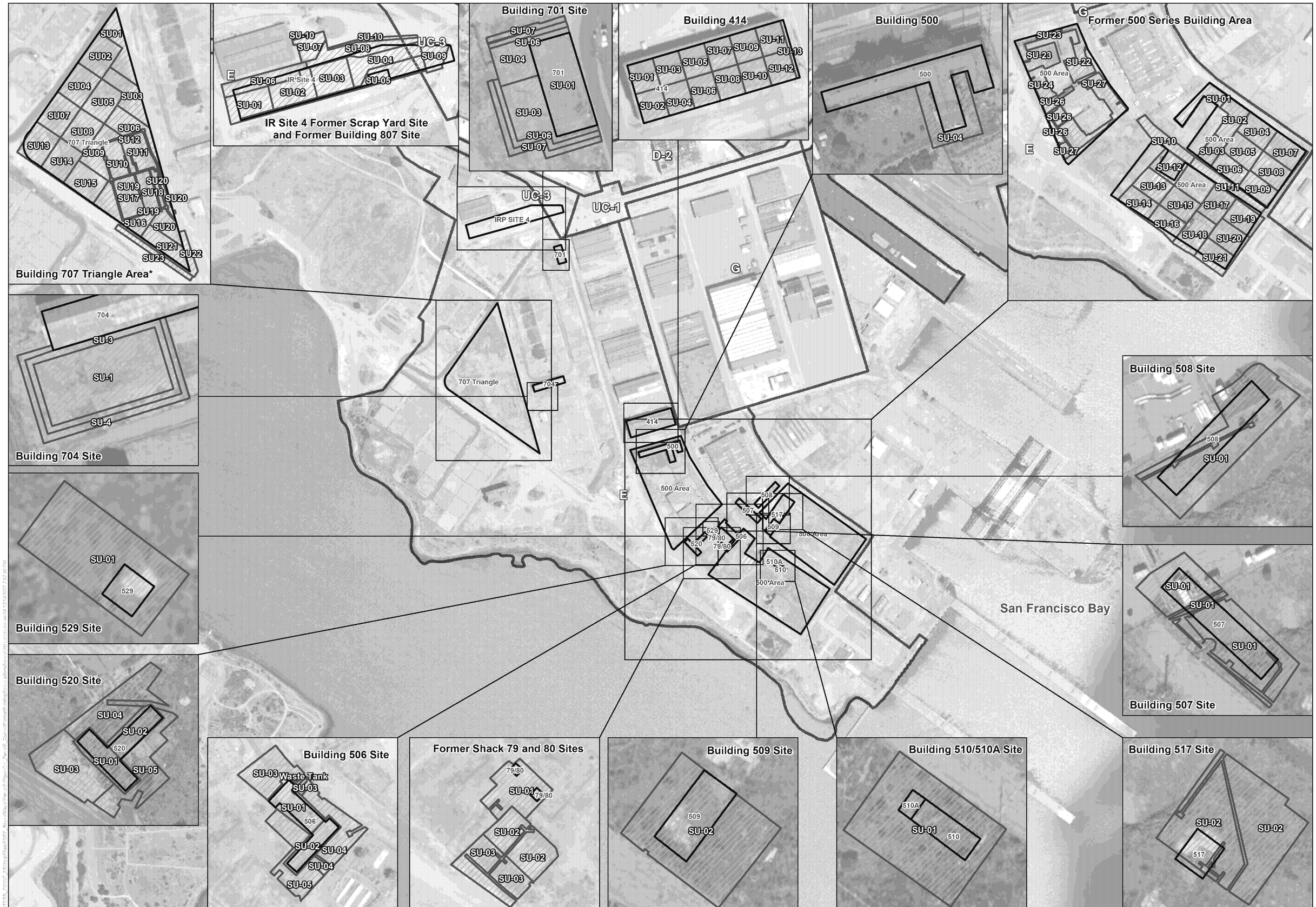
1 inch = 800 feet

Figure 1-2
Scope of Data Evaluation
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California



Legend:

- Parcels
- Current and Former Building Sites
- Survey Units where soil samples were collected

Building 707 Triangle Area Notes:
* Soil sample data from 3 excavated soil units, ES 477, ES 478, and ES 481, associated with the Building 707 Triangle Area were also evaluated

N

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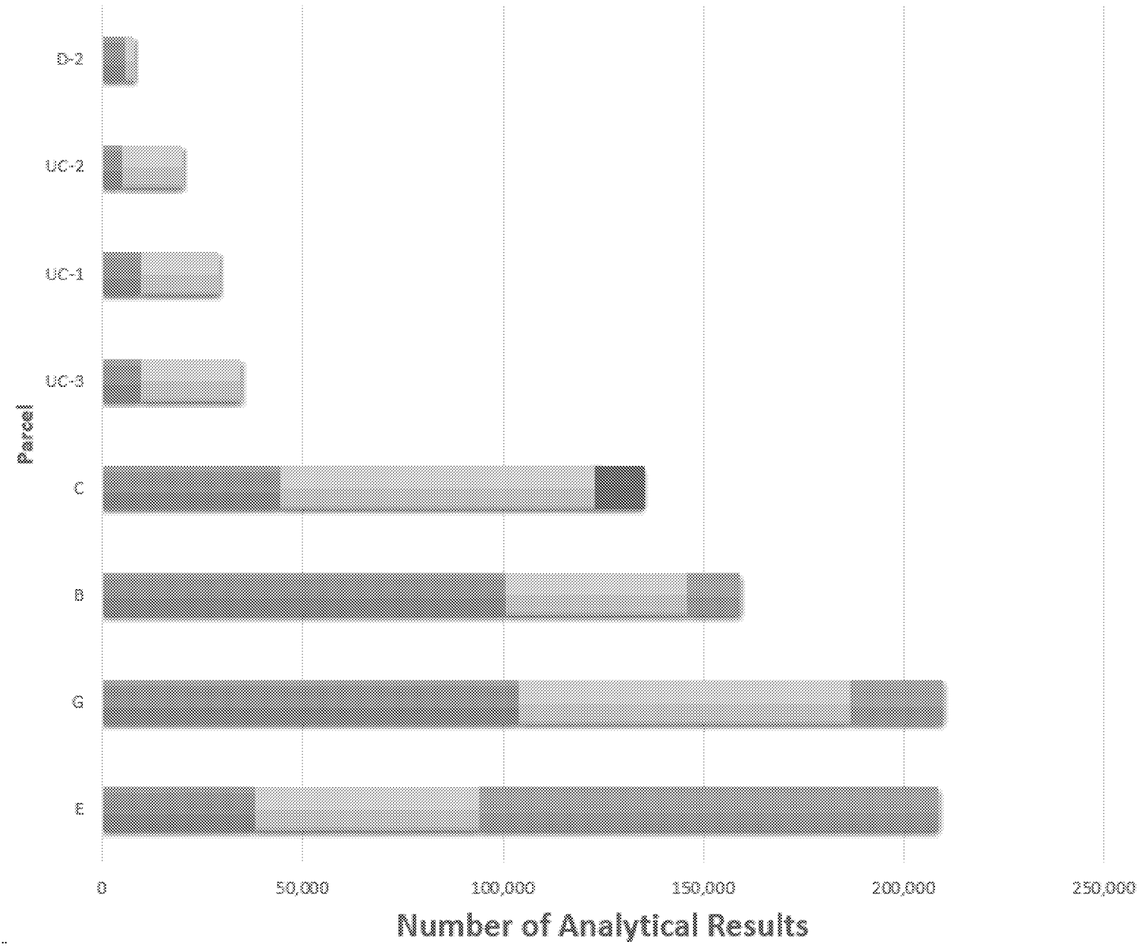
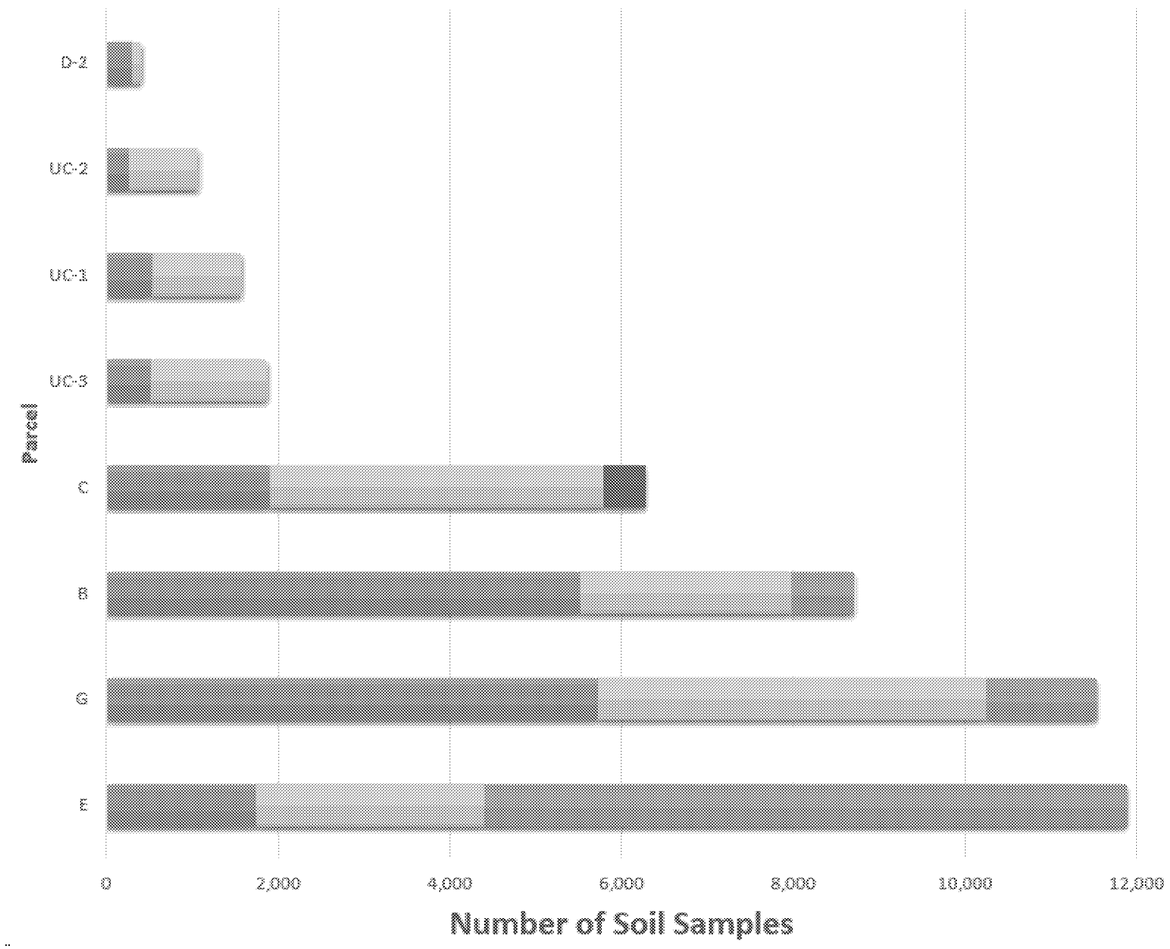
1 inch = 500 feet

BASE MAP SOURCE:
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 2-1
Parcel E Current and Former Building Locations and Survey Units
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California

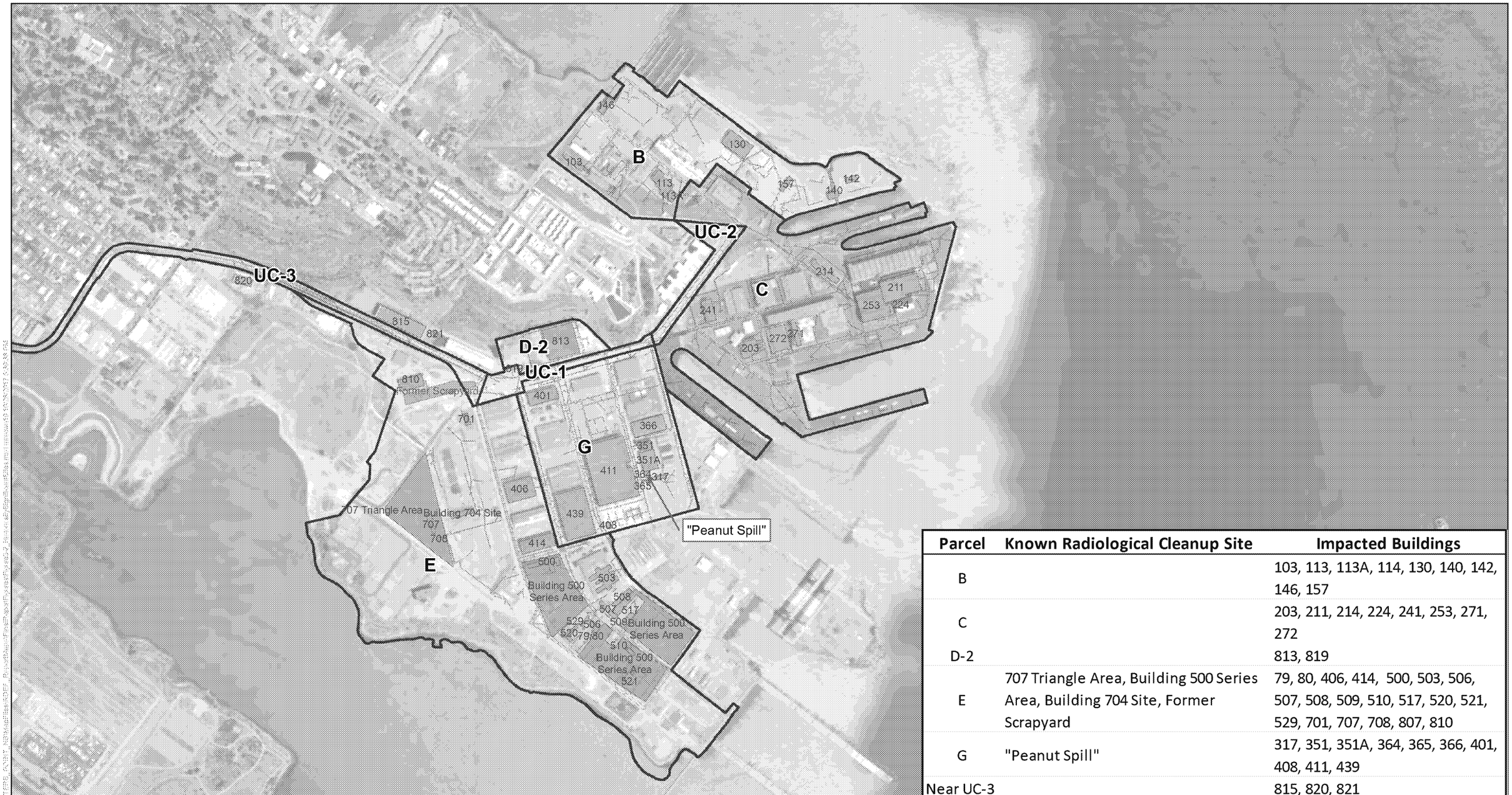




Legend:

- Trench Unit
- Fill Unit
- Current and Former Building Site
- North Pier

Figure 3-1
FRED Soil Sample Summary
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California



Parcel	Known Radiological Cleanup Site	Impacted Buildings
B		103, 113, 113A, 114, 130, 140, 142, 146, 157
C		203, 211, 214, 224, 241, 253, 271, 272
D-2		813, 819
E	707 Triangle Area, Building 500 Series Area, Building 704 Site, Former Scrapyard	79, 80, 406, 414, 500, 503, 506, 507, 508, 509, 510, 517, 520, 521, 529, 701, 707, 708, 807, 810
G	"Peanut Spill"	317, 351, 351A, 364, 365, 366, 401, 408, 411, 439
Near UC-3		815, 820, 821

Legend:

- Known Radiological Cleanup Sites
- Impacted Building
- Trench Unit
- Parcel

BASE MAP SOURCE:
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0 400 800 1,600 Feet

1 inch = 800 feet

Figure 3-2
Historically Significant Sites
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California

Legend:

- Trench Unit
- Trench and Fill Unit
- Current and Former Building
- Survey Units
- Parcel E

Building 707 Triangle Area Notes:
* Soil sample data from 3 excavated soil units, ES 477, ES 478, and ES 481, associated with the Building 707 Triangle Area were also evaluated

N

0 200 400 800 Feet

1 inch = 500 feet

BASE MAP SOURCE:
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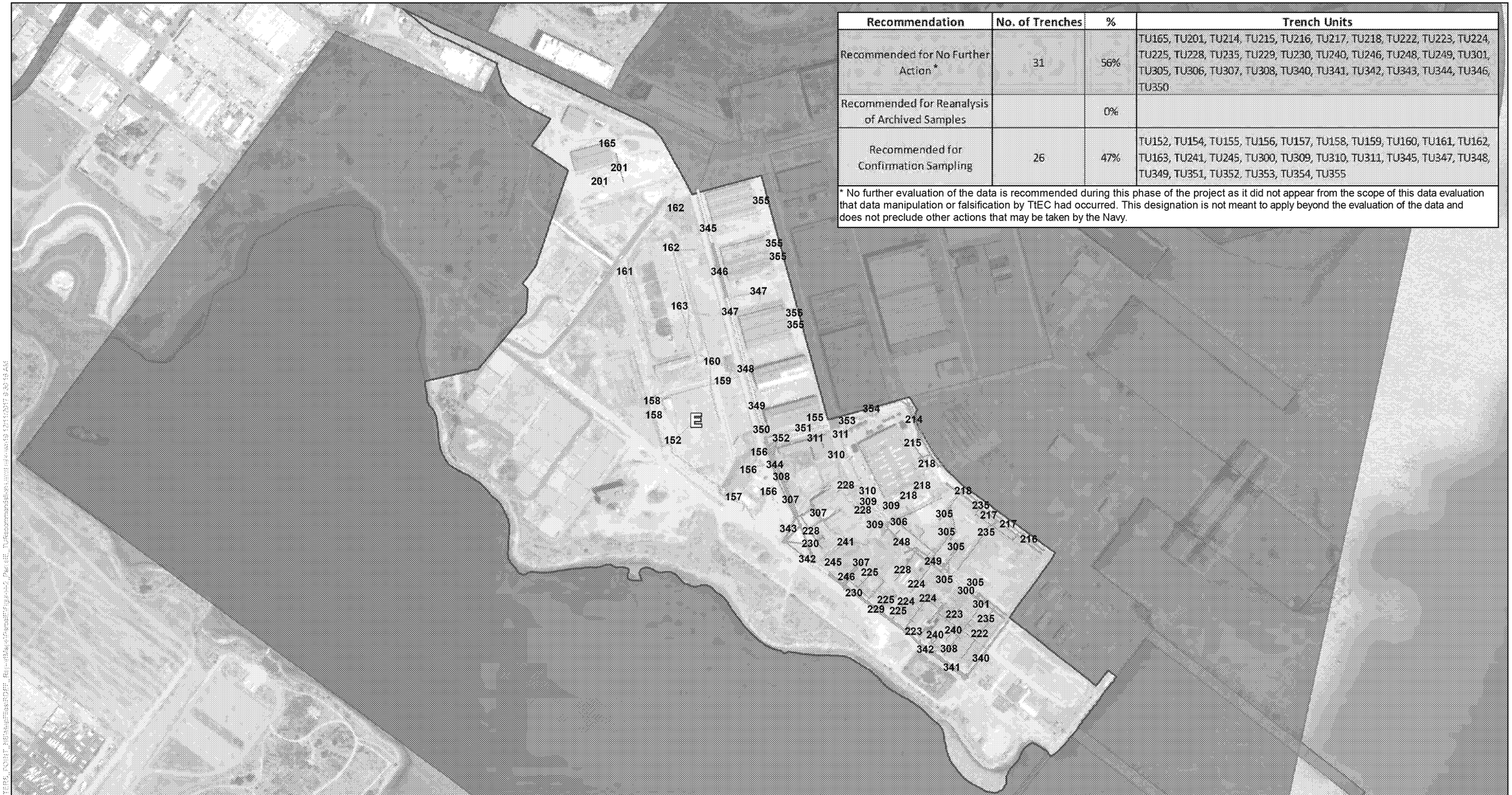
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4-1
Areas Evaluated in Parcel E
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California

Recommendation	No. of Trenches	%	Trench Units
Recommended for No Further Action*	31	56%	TU165, TU201, TU214, TU215, TU216, TU217, TU218, TU222, TU223, TU224, TU225, TU228, TU235, TU229, TU230, TU240, TU246, TU248, TU249, TU301, TU305, TU306, TU307, TU308, TU340, TU341, TU342, TU343, TU344, TU346, TU350
Recommended for Reanalysis of Archived Samples		0%	
Recommended for Confirmation Sampling	26	47%	TU152, TU154, TU155, TU156, TU157, TU158, TU159, TU160, TU161, TU162, TU163, TU241, TU245, TU300, TU309, TU310, TU311, TU345, TU347, TU348, TU349, TU351, TU352, TU353, TU354, TU355

* No further evaluation of the data is recommended during this phase of the project as it did not appear from the scope of this data evaluation that data manipulation or falsification by TtEC had occurred. This designation is not meant to apply beyond the evaluation of the data and does not preclude other actions that may be taken by the Navy.



Legend:

- Recommended for No Further Action
- Recommended for Confirmation Sampling
- Parcel E

BASE MAP SOURCE:
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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0 250 500 1,000 Feet

1 inch = 500 feet

Figure 4-2
Parcel E Trench Unit Recommendations
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California

Recommendation	No. of Fill Units	%	Fill Units
Recommended for No Further Action*	32	33%	ES245 (TU152), ES248 (TU156), ES259 (TU161), ES569 (TU228), ES573 (TU223), ES586 (TU225), ES587 (TU228), ES625 (TU235), ES656 (TU245), ES658 (TU246), ES684 (TU246), ES685 (TU246), ES698 (TU308), ES699 (TU300), ES753 (TU348), ES835 (TU346), ES837 (TU348), ES838 (TU346), ES841 (TU346), ES842 (TU348), ES869 (TU344), ES870 (TU344), ES871 (TU344), ES879 (TU346), ES895 (TU348), ES896 (TU347), ES897 (TU347), ES901 (TU348), ES902 (TU349), ES907 (TU352), ES909 (TU351), ES915 (TU344)
Recommended for Reanalysis of Archived Samples		0%	
Recommended for Confirmation Sampling	64	67%	ES244 (TU152), ES249 (TU159), ES255 (TU158), ES258 (TU158), ES261 (TU163), ES263 (TU162), ES264 (TU162), ES265 (TU163), ES519 (TU214), ES520 (TU214), ES521 (TU214), ES522 (TU215), ES523 (TU215), ES525 (TU218), ES527 (TU216), ES528 (TU216), ES529 (TU216), ES530 (TU217), ES531 (TU217), ES532 (TU217), ES533 (TU218), ES537 (TU222), ES570 (TU223), ES624 (TU235), ES653 (TU241), ES654 (TU241), ES657 (TU245), ES681 (TU301), ES683 (TU245), ES686 (TU248), ES687 (TU248), ES688 (TU246), ES689 (TU301), ES690 (TU249), ES704 (TU300), ES710 (TU300), ES714 (TU306), ES715 (TU307), ES839 (TU346), ES857 (TU340), ES858 (TU340), ES859 (TU340), ES860 (TU341), ES861 (TU341), ES862 (TU341), ES863 (TU341), ES864 (TU341), ES865 (TU342), ES866 (TU342), ES867 (TU343), ES872 (TU344), ES873 (TU343), ES875 (TU343), ES876 (TU343), ES877 (TU343), ES878 (TU342), ES881 (TU345), ES883 (TU345), ES908 (TU352), ES910 (TU350), ES911 (TU350), ES912 (TU350), ES915 (TU344), ES916 (TU353)

* No further evaluation of the data is recommended during this phase of the project as it did not appear from the scope of this data evaluation that data manipulation or falsification by TtEC had occurred. This designation is not meant to apply beyond the evaluation of the data and does not preclude other actions that may be taken by the Navy.

Legend:

- Recommended for No Further Action
- Recommended for Confirmation Sampling
- Parcel E

BASE MAP SOURCE:
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

Feet
0 250 500 1,000
1 inch = 500 feet

Figure 4-3
Parcel E Fill Unit Recommendations
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California

Recommendation	No. of SU	%	Building (SUs)
No Further Action*	43	41%	414 (SU1), 414 (SU2), 414 (SU3), 414 (SU4), 414 (SU5), 414 (SU6), 414 (SU8), 414 (SU10), 500 (SU4), 500SBA (SU3), 500SBA (SU9), 500SBA (SU10), 500SBA (SU14), 500SBA (SU15), 500SBA (SU17), 500SBA (SU19), F500SBA (SU20), 500SBA (SU21), 500SBA (SU22), F500SBA (SU26), 506 (SU2), 506 (SU3), 506 (waste tank), 508 (SU1), 517 (SU2), 520 (SU1), 520 (SU2), 520 (SU3), 701 (SU4), B707TA (SU9), B707TA (SU10), B707TA (SU15), B707TA (SU16), B707TA (SU17), B707TA (SU20), B707TA (SU23), B707TA (ES478), B707TA (ES481), IR4/807 (SU1), IR4/807 (SU2), IR4/807 (SU3), IR4/807 (SU7), IR4/807 (SU10)
Recommended for Reanalysis of Archived Samples		0%	
Recommended for Additional Confirmation Sampling	61	59%	79/80 (SU1), 79/80 (SU2), 79/80 (SU3), 414 (SU7), 414 (SU9), 414 (SU11), 414 (SU12), 414 (SU13), 500SBA (SU1), 500SBA (SU2), 500SBA (SU4), 500SBA (SU5), 500SBA (SU6), 500SBA (SU7), 500SBA (SU8), 500SBA (SU11), 500SBA (SU12), 500SBA (SU13), 500SBA (SU16), 500SBA (SU18), 500SBA (SU23), 500SBA (SU24), 500SBA (SU27), 506 (SU1), 506 (SU4), 506 (SU5), 507 (SU1), 509 (SU2), 510/510A (SU1), 520 (SU4), 520 (SU5), 529 (SU1), 701 (SU1), 701 (SU3), 701 (SU6), 701 (SU7), 704 (SU1), 704 (SU3), 704 (SU4), B707TA (SU1), B707TA (SU2), B707TA (SU3), B707TA (SU4), B707TA (SU5), B707TA (SU6), B707TA (SU7), B707TA (SU8), B707TA (SU11), B707TA (SU12), B707TA (SU13), B707TA (SU14), B707TA (SU18), B707TA (SU19), B707TA (SU21), B707TA (SU22), B707TA (ES477), IR4/807 (SU4), IR4/807 (SU5), IR4/807 (SU6), IR4/807 (SU8), IR4/807 (SU9)

* No further evaluation of the data is recommended during this phase of the project as it did not appear from the scope of this data evaluation that data manipulation or falsification by TtEC had occurred. This designation is not meant to apply beyond the evaluation of the data and does not preclude other actions that may be taken by the Navy.

Legend:

- Recommended for No Further Action
- Recommended for Additional Confirmation Sampling
- Parcel E

Building 707 Triangle Area Notes:
* Soil sample data from 3 excavated soil units, ES 477, ES 478, and ES 481, associated with the Building 707 Triangle Area were also evaluated

N

0 200 400 800 Feet

1 inch = 500 feet

BASE MAP SOURCE:
Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4-4
Parcel E Current and Former Building Site Survey Unit Recommendations
Radiological Data Evaluation Findings Report
Former Hunters Point Naval Shipyard
San Francisco, California

SECTION 5

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Appendix A
K-S Test Results

Appendix A (K-S Test Results) is provided as a separate PDF on the enclosed CD-ROM.

Appendix B
Example Data Evaluation Form

Appendix B
Data Evaluation Form

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Section I: Reason For Evaluation (Summary of Flagged Data):										
1) K-S Test: Pass/Fail?									Pass ☐	Fail ☐
Units Evaluation Flags										
Ac-228	Bi-212	Bi-214	Cs-137	K-40	Pb-212	Pb-214	Ra-226	Total		
Days Evaluation Flags										
Ac-228	Bi-212	Bi-214	Cs-137	K-40	Pb-212	Pb-214	Ra-226	Total		
2) Logic Tests: Pass/Fail?									Pass ☐	Fail ☐
Logic Test 1: Were FSS samples collected on the same day? **Observation:**									Yes ☐	No ☐
Logic Test 2: Were FSS samples collected on the same day or after confirmatory/biased samples were collected? **Observation:**									Yes ☐	No ☐
Logic Test 3: Were samples collected before they were counted? **Observation:**									Yes ☐	No ☐
Logic Test 4: Were all FSS samples analyzed within 2 working days? **Observation:**									Yes ☐	No ☐
Logic Test 5: Were samples counted within 2 weeks of sample collection? **Observation:**									Yes ☐	No ☐
Logic Test 6: Is the mass of the sample reported by the onsite lab the same as the mass reported by the offsite lab? **Observation:**									Yes ☐	No ☐
3) Time Series Plots: Pass/Fail?									Pass ☐	Fail ☐
Bi-214	Anomalies or unusual trends identified?								No ☐	Yes ☐
	Notes:									
Ac-228	Anomalies or unusual trends identified?								No ☐	Yes ☐
	Notes:									
K-40	Anomalies or unusual trends identified?								No ☐	Yes ☐
	Notes:									
4) Historically Significant Site Location: Yes/No?									No ☐	Yes ☐
Was a known radiation cleanup performed at (or near) this site? If yes, where?									No ☐	Yes ☐
Is the sewer line connected to or downstream from a radiologically-impacted building? If yes, which building?									No ☐	Yes ☐
5) Allegation: Yes/No?									No ☐	Yes ☐
If yes, description:										

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Section II: Evaluations Performed			
1) Other Statistics Results		Pass ☐	Fail ☐
Box Plots	Anomalies or unusual trends identified?	No ☐	Yes ☐
	Notes:		
Normal Quantile Plots	Anomalies or unusual trends identified?	No ☐	Yes ☐
	Notes:		
2) Additional Database Review Performed?		No ☐	Yes ☐
Review objectives:			
Observations:			
3) Adjacent Survey/Trench Unit Review		Pass ☐	Fail ☐
List of Adjacent Units:			
Was a review of adjacent unit's data performed?			
Anomalies or unusual trends identified?		No ☐	Yes ☐
Notes:			
4) SUPR or FSSR Review Performed?			
Summary of Excavation Survey / Sampling Activities			
Gamma Static Data Observations:			
Gamma Scan Data Observations:			
List of Excavation Survey / Overburden Units Used for Backfill			
Onsite / Offsite Lab Data Comparison:			
Scan / Static Surveyor Name:			
Sampler / Surveyor Name:			
5) RACR or CSR Review Performed?			
List of Excavation Survey / Overburden Units Created from Excavation:			

Section III: Conclusions and Recommendations
Summary of Findings:

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Section III: Conclusions and Recommendations			
☐ No Further Action	☐ Reanalyze Archived Samples	☐ Confirmation Sampling	☐ Physical Inspection of Archived Samples
☐ Other Recommendations:			
Additional Information Required:			

Completed by: _____ **Date:** _____

Reviewed by: _____ **Date:** _____

Approved by: _____ **Date:** _____

Acronyms:

Ac	Actinium (e.g., Ac-228)
B	Former Building (or other site) Surface Soil Survey Unit
Bi	Bismuth (e.g., Bi-214)
Cs	Cesium (e.g., Cs-137)
CSR	Construction Summary Report
ES	Excavation Survey Unit
FSS	Final Status Survey
FSSR	Final Status Survey Report
K	Potassium (e.g., K-40)
OB	Overburden Unit
Pb	Lead (e.g., Pb-212)
Ra	Radium (e.g., Ra-226)
RACR	Remedial Action Completion Report
S	Sewer or Storm Drain Removal Survey Unit
SUPR	Survey Unit Progress Report
TU	Trench Unit

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Time-Series Plots

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Box Plots

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Normal Quantile Plots

Data Evaluation Documentation and Findings

Parcel:		Unit:	

Map

Appendix C
Data Evaluation Forms

Appendix C (Data Evaluation Forms) is provided as a separate PDF on the enclosed CD-ROM.