From: Slack, Matthew L CIV SEA 04 04N
To: Lord, Jacques P CTR NAVFACHQ, BRAC PMO
Cc: Reisig, Mark; Dick Dubiel
Subject: FW: Draft FSA Scoping Survey Appendix A EMB comments
Date: Thursday, February 02, 2012 17:13:55
Attachments: FSA Appendix A EMB comments .pdf

FYI

-----Original Message-----
From: Wilson, Robert (CDPH-DDWEM) [mailto:Robert.Wilson@cdph.ca.gov]
Sent: Thursday, February 02, 2012 12:43
To: Slack, Matthew L CIV SEA 04 04N
Subject: Draft FSA Scoping Survey Appendix A EMB comments

Hi Matt,

EMB comments are highlighted in YELLOW (YELLOW).

Robert

Final

Task Specific Plan
Former Smelter Area Scoping Survey

Alameda Point
Alameda, California

February 18, 2011

Prepared for:
Department of the Navy
Base Realignment and Closure
Program Management Office West
San Diego, California

Prepared by:
ChaduxTt, a Joint Venture of St. George Chadux Corp. and Tetra Tech EM Inc.
1230 Columbia Street, Suite 1000
San Diego, California 92101

Prepared under:
Naval Facilities Engineering Command Southwest
Contract Number: N62473-07-D-3213
Delivery Order: 0025

CHAD-3213-0025-0031

FINAL

TASK SPECIFIC PLAN
FORMER SMELTER AREA SCOPING SURVEY

ALAMEDA POINT
ALAMEDA CALIFORNIA

FEBRUARY 2011

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Document Control Number: CHAD-3213-0025-0031

REVIEW AND APPROVAL

Mark R. Reisig

Mark Reisig, REA
Project Manager

Lawson Bailey

Lawson Bailey
Technical Lead

Richard W. Dubiel

Richard Dubiel, CHP
Site Project Manager

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ACRONYMS AND ABBREVIATIONS

α	Alpha
β	Beta
ε_i	Instrument efficiency
ε_s	Contaminated surface efficiency
B	Background count rate
b_i	Number of background counts in scan time interval
d'	Index of sensitivity
E	Detector efficiency
G	Source activity
i	Scan or observation interval
ρ or P	Probability
p	Surveyor efficiency factor
R_B	Background count rate
t	Time interval of detector over source
T_B	Background counting time
T_{S+B}	Sample counting time
W_A	Area of the detector window
$Z_{1-\alpha}$	Type I decision error level
$Z_{1-\beta}$	Type II decision error level
APP	Accident prevention plan
cm	Centimeter
cm^2	Square centimeter
cm/sec	Centimeter per second
Co-60	Cobalt 60
cpm	Count per minute
Cs-137	Cesium 137
dpm	Disintegration per minute
dpm/100 cm^2	Disintegration per minute per 100 square centimeter
DFW	Definable features of work
inch/sec	Inch per second
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum detectable concentration
MDCR	Minimum detectable count rate
min	Minute

N	Number of data points
NAS	Naval Air Station
NRC	Nuclear Regulatory Commission
pCi/g	Picocurie per gram
Pu-239	Plutonium 239
PSPC	Position sensitive proportional counter
Ra-226	Radium 226
RASO	Radiological Affairs Support Office
SCM	Surface contamination monitor
sec	Second
SIMS	Survey Information Management System
Sr-90	Strontium 90
SSHP	Site safety and health plan
SOP	Standard operating procedure
TSP	Task specific plan
UO_2	Uranium dioxide

1.0 INTRODUCTION

This task specific plan (TSP) provides task-specific details for the scoping survey at the Former Smelter Area at the former Naval Air Station (NAS) Alameda, now known as Alameda Point. The survey will be conducted in accordance with the general approach and methodologies that are given in the work plan for Basewide Radiological Surveys at former NAS Alameda (ChaduxTt 2010a) and standard operating procedures (SOP). The surveys will conform to the requirements of the site safety and health plan (SSHP) (ChaduxTt 2010b) and accident prevention plan (APP) (ChaduxTt 2010c) prepared for the survey program. No exceptions to the work plan, SOPs, SSHP or APP are noted.

1.1 SITE DESCRIPTION AND HISTORICAL SUMMARY

According to the Site-specific Historical Radiological Assessment (Weston Solutions, Inc 2007), the smelter that existed in the 1940s and early 1950s was removed before the mid-1950s. Proposed construction of a new Turbo Jet facility in 1949 showed metal scrap bins identified as Building 44 and a smelter that was unnumbered. The Turbo Jet facility was not actually built. The smelter was located just east of Building 66 in 1949. The metal scrap bins, which were the feed for the smelter, were demolished in the early 1950s. It is likely the smelter was abandoned at the same time. By 1954, Buildings 398 and 399 were shown on the station map in the location where the proposed Turbo Jet Overhaul facility was to be constructed with the smelter no longer present. Much of the area identified as the smelter area in the 1949 drawing is presently occupied by Buildings 398 and 399 as well as support equipment to those buildings. A concrete pad, west of Building 399 is identifiable in the photos showing smelter location and in later photos showing the site during the late 1950s. The concrete pad appeared to be a storage location for metal bins. The concrete slab is currently fully exposed. It is possible that radium components were melted down along with other metal components at the smelter location. Slag from the smelter operation would likely have been disposed in Installation Restoration Site 1. The location of the former smelter area relative to existing buildings is shown in Figure 1.

2.0 SURVEY DESCRIPTION

This scoping survey is being performed to assess if residual activity is above the established release criteria in accessible areas, as defined in Table 6-1 of the work plan (ChaduxTt 2010a) and to determine further actions that may need to be taken in the vicinity. Surveys will consist of gamma walkover surveys, soil sampling and sampling of drains in the area. The walkover surveys will be used to bias the sampling. Surveys will be performed within accessible areas immediately adjacent to the former smelter for the presence of Radium 226 (Ra-226), Cobalt 60 (Co-60), Cesium 137 (Cs-137), Strontium 90 (Sr-90), Plutonium 239 (Pu-239), and Uranium dioxide (UO_2). Scan surveys for both alpha (α) and beta (β) emitting radioisotopes will be performed on the concrete pad in the vicinity of Building 399. The areas to be surveyed, as well as indications of major obstructions such as cooling towers, receiver tanks and air handing equipment are shown in Figure 2.

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Intent of scoping survey is not to "release" a site.

2.1 SURVEY PREPARATION AND REMEDIATION ACTIVITIES

The smelter has been removed. Buildings 398 and 399 occupy a significant portion of the smelter area footprint. The area surrounding Building 399 consists of asphalt pavement and concrete. The concrete areas are designed pedestals for large equipment or to control leakage from process piping. Asphalt within the boundary of the survey will be removed to expose soil. Concrete that is not serving as a pedestal for equipment will also be removed.

2.2 RELEASE CRITERIA

The following are the release criteria for radionuclides of concern in soil (ChaduxTt 2010a):

- Ra-226 = 1.0 picocuries per gram (pCi/g) above background
- Co-60 = 0.0361 pCi/g
- Cs-137 = 0.113 pCi/g
- Sr-90 = 0.331 pCi/g
- Pu-239 = 2.59 pCi/g
- UO_2 = 0.398 pCi/g

The limits for the specific radionuclides to be addressed for the former smelter area are provided in Table 2.

2.3 REFERENCE AREA

The reference area will be selected with the concurrence of Navy Radiological Affairs Support Office. Reference data for the radionuclide of concern that exist in nature, Ra-226, were obtained from the abstract (Tetra Tech ECI 2010). Eighteen reference area samples from an area west of Building 3 and south of Building 4 were obtained and analyzed. This area was not identified in the HRA as being impacted. The analytical results for Ra-226 is summarized in Table 3-3 of the reference area document (Tetra Tech ECI 2010). Background activity for Ra-226 was determined to be 0.5602 pCi/g, resulting in a release criterion for Ra-226 of 1.5602 pCi/g. The analytical procedure used to determine Ra-226 may have introduced a small non-conservative factor. For purposes of this scoping survey, the non-conservative value will be applied. Further sampling may be required if sample activity challenges the release criteria.

Gamma walkover surveys will be performed in areas west of Building 3 or south of Building 4 to determine the relative response of the process in a known non-impacted area.

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See section 2.0

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What is the "non-conservative factor" based upon?

2.4 INVESTIGATION LEVELS

Investigation levels for the soil sample analytical results will be equal to the release criteria for the more restrictive isotope of concern in each area sampled.

2.5 SURVEY UNITS AND CLASSIFICATION

The Former Smelter Area is a 40,000 square foot area east of Building 66. Much of the area is occupied by new Buildings 398 and 399. There are several concrete pads that are pedestals for existing support equipment to Buildings 398 and 399. The area available for survey once the asphalt and concrete pavement is removed will be divided into a Class 1 area, Class 2 area and Class 3 area. The Class 1 area is located on the east side of Building 399. A 10 foot Class 2 buffer area will surround the Class 1 area. A Class 3 area is located west of Building 399. Figure 1 also identifies obstructions that will not be removed due to their support functions to Buildings 398 and 399. Gamma walk over surveys using a sodium iodide detector will be performed in all classification areas with exposed soil. Gamma walkover surveys are not quantitative, but will establish relative values across the exposed soil areas. The gamma scan values will be evaluated to determine the presence of outliers. Outlier locations, if present, will be used to bias soil sampling. Gamma scan methods are further discussed in Section 2.9. Soils samples will be obtained in each area, Class 1, 2, and 3 at systematic data collection points as modified by data obtained from the walk over surveys. Using a random start point, systematic data collection locations (N) will be laid out in a triangular grid pattern for the survey units using the computer process provided by Visual Sample Plan (Gilbert et al. 2001). In some cases, the number of data collection locations may exceed N. Locations for data collection locations are provided in Figures 3 through 6.

2.6 ESTABLISHING THE NUMBER OF MEASUREMENTS

Although some of the radionuclides of concern are found in background, the majority are not. Therefore determination of the number of soil samples will be based on contaminants not present in background. To determine the number of samples, N, to be taken per survey unit when the contaminant is not present in background, Equation 4-2 of the work plan (ChaduxTt 2010a) is used:

Equation 4-2 from the Work Plan (ChaduxTt 2010a)

$$N = \left(\frac{\left(Z_{1-\alpha} + Z_{1-\beta}\right)^2}{4\left(Sign\ \rho - 0.5\right)^2} \right) (1.2)$$

Where:

N = Number of data points

$Z_{1-\alpha}$ = Type I decision error level, 1.645

$Z_{1-\beta}$ = Type II decision error level, 1.645

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Sign ρ = random measurement probability, 0.945201

1.2 = 20 percent increase in number of samples over the minimum

The values used in the calculation are from Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance (Nuclear Regulatory Commission [NRC] 2000) and are based on a recommended value for the lower bound of the gray region of 1.6 as discussed in Section 4.2.1 of the work plan (ChaduxTt 2010a). Type I and Type II decision errors are based on 0.05 false negative and 0.05 false positive rates. The associated Z values are obtained from MARSSIM Table 5.2 (NRC 2000). The random measurement probability, Sign ρ, is from MARSSIM Table 5.4 (NRC 2000).

Using the defined values, the equation becomes:

$$N = \left(\frac{(1.645 + 1.645)^2}{4(0.945201 - 0.5)^2} \right)(1.2)$$

The calculation results in a value of N = 16.38. Therefore, a minimum of 17 soil samples will be obtained in each survey unit.

2.7 ALPHA AND BETA SCAN MEASUREMENTS

Scan measurements are performed to identify elevated areas of radioactivity within the survey unit. Alpha scans will be effective for identifying elevated concentrations of Ra-226, Pu-239 and UO_2. Beta scans will be effective in identifying elevated concentrations of Co-60, Cs-137 and Sr-90. Fifty percent of surfaces on the concrete pad Class 2 survey unit will be scanned with the surface contamination monitor (SCM) in the dynamic mode of operation.

The SCM utilizes a gas flow position sensitive proportional counter (PSPC). The PSPC functions as any gas flow proportional counter, using P-10 as the counting gas. As in any proportional counter, voltage plateaus are established for the detection of alpha or alpha plus beta particles. High voltage appropriate for the type of particles to be detected is applied to the single anode wire which runs the length of the detector. The SCM computer compares the pulse heights of pulses sensed at each end of the anode wire and establishes the location on the anode wire where the pulse was sensed. Although the available resolution is greater than 2,000 locations on the anode wire, the SCM computer will "bin" the data in 5 centimeters (cm) wide increments along length of the wire.

The SCM can be operated in both a dynamic or "rolling" mode or a static or "corner" mode. In the dynamic mode, the system uses a direct current powered drive motor affixed to a cart which contains all electronics and computer hardware, and a detector (or two) is mounted to the front of the cart. The SCM's design focuses on the elimination of human issues associated with performing surveys of large areas. The system is designed such that surveys are performed at constant speed, the detector held at a set distance from the surface being surveyed, and survey

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What is this "recommended value" based upon? If this value is placed for the "lower bound" a parameter, then what is the value of the "upper bound" of the grey region.

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data recorded automatically. In the dynamic mode, a precision wheel encoder is mounted to the cart axle to determine distance traveled by the cart. The encoder can measure to a small fraction of a centimeter and is used to trigger the computer to capture data for every 5 cm of travel of the SCM cart. The result is count data (counts) for every 5 cm "bin" for every 5 cm of travel, or a matrix of 25 square centimeters (cm^2) "pixels" of data. In the static mode, a preset time is applied to the collection of data from a stationary detector. Data is binned in a manner similar to the dynamic mode.

Data is transferred from the SCM to a processing station containing the Survey Information Management Systems (SIMS) software via removable media. SIMS software is used to "stitch" the individual strips of data to create a single survey of an entire area. The data collected in pixels is summed with adjacent pixels in a manner that will result in the evaluation of every possible 100 cm^2 area. When determining activity, each pixel is 25 percent of four overlapping 100 cm^2 areas. This process ensures that small areas of activity above limits are not missed through grid registration errors.

2.7.1 Alpha Scan Measurements

The SCM will be the primary instrument used to perform alpha surveys. The SCM will be used in the recount mode, using two detectors hard mounted to each other at a set distance. The system will be operated at a target speed of 0.5 inch per second (inch/sec) with detection probability of greater than 95 percent at the activity level of 100 disintegration per minute (dpm) per 100 cm^2 (dpm/100 cm^2). Locations with positive indication of activity greater than 100 dpm/100 cm^2 will be further evaluated using the SCM or direct measurement using the Ludlum 43-68 detector with the Ludlum 2221 ratemeter. The probability of detecting two counts due to a source is given by Equation 7-5 from the work plan (ChaduxTt 2010a) below.

Equation 7-5 from the Work Plan (ChaduxTt 2010a)

$$P(n \geq 2) = 1 - \left(1 + \frac{(GE + B)t}{60}\right) e^{\frac{-(GE+B)t}{60}}$$

Where:

$P(n \geq 2)$ = probability of getting two or more counts during the time interval t

t = time interval of detector over source in seconds (sec)

G = source activity (dpm)

E = detector efficiency (4π)

B = background count rate (count per minute [cpm])

60 = conversion factor, seconds to minutes

Since the detectors associated with the SCM are manufactured to the same specifications, the efficiency of each detector is similar. Therefore, the probability of obtaining two or more counts

on each detector as they traverse the same 100 dpm source is the square of the probability for a single detector.

Typical background values observed with the SCM are less than 1 cpm/100 cm^2. Efficiency (4π) of the SCM for alpha emitters has been measured at 25 percent or greater. The efficiency for a point source would be 50 percent. The detector width is 12 cm. Survey speed for alpha emitters is 1.25 centimeter per second (cm/sec) (0.5 inch/sec). Using these parameters, equation 7-5 from the work plan (ChaduxTt 2010a) becomes:

$$P(n \geq 2) = 1 - \left(1 + \frac{(100 * 0.5 + 1)9.6}{60}\right) e^{\frac{-(100*0.5+1)9.6}{60}}$$

Where:

$P(n \geq 2)$ = probability of getting two or more counts during the time interval t

t = 9.6 sec

G = 100 dpm

E = 0.5

B = 1 cpm

Therefore:

$$P(n \geq 2) = 0.9974 \text{ or } 99.74\%$$

The probability of both detectors responding with two or more counts from a point source of 100 dpm at a speed of 1.25 cm/sec (0.5 inch/sec) would be the square of a single detector, or:

$$P(\mathrm{n} \geq 2)_{\text{2 det}} = 99.48\%$$

Therefore, the scan speed for the SCM for alpha emitting nuclides will be 1.25 cm/sec (0.5 inch/sec).

2.7.2 Beta Scan Measurements

For beta surveys, the SCM will also be the primary instrument. On the concrete pad Class 2 area, the SCM will be used in the single detector mode operated on the alpha plus beta plateau at a target speed of 2 inch/sec (5 cm/sec). The minimum detectable count rate (MDCR) in a scan interval can be arrived at by multiplying the square root of the number of background counts (in the scan interval) by the detectability value associated with the desired performance (as reflected in *d'*) as shown in Equation 7-6 from the work plan (ChaduxTt 2010a) below:

Equation 7-6 from Work Plan (ChaduxTt 2010a)

$$MDCR = d'\sqrt{b_i}\left(\frac{60}{i}\right)$$

Where:

MDCR = minimum detectable number of net source counts in the scan interval (cpm)

d' = index of sensitivity (α and β errors [performance criteria])

b_i = number of background counts in scan time interval (count)

i = time interval of detector over source (sec)

60 = conversion factor, seconds to minutes

The required rate of true positives will be 95 percent, and the false positives will be 5 percent. From Table 6.5 of MARSSIM (NRC 2000), the value of d', representing this performance goal, is 3.28.

The scan minimum detectable concentration (MDC) is determined from the MDCR by applying conversion factors that account for detector and surface characteristics and surveyor efficiency. As discussed above, the MDCR accounts for the background level, performance criteria (d'), and observation interval. The observation interval during scanning is the actual time that the detector can respond to the contamination source. This interval depends on the scan speed, detector size in the direction of the scan, and area of elevated activity.

The scan MDC for structure surfaces is calculated using Equation 7-8 from the work plan (ChaduxTt 2010a) below:

Equation 7-8 from Work Plan (ChaduxTt 2010a)

$$Scan\ MDC = \frac{MDCR}{\sqrt{p}\,\varepsilon_i\,\varepsilon_s\,\frac{W_A}{100cm^2}}$$

Where:

MDCR = minimum detectable number of net source counts in the scan interval (cpm)

p = surveyor efficiency factor

ε_i = instrument efficiency (count per particle)

ε_s = contaminated surface efficiency (particle per disintegration)

W_A = active area of the detector window (cm^2)

In Equation 7-8, W_A is the size of the "active" area of the detector window. If the area of the detector window is less than 100 cm^2, it is necessary to convert the detector response to units of dpm/100 cm^2. For detectors with active areas greater than or equal to 100 cm^2, no correction is made.

The isotopes of concern for the Class 2 concrete pad area are Cs-137, Co-60 and Sr-90. Sr-90 has the most limiting release criteria; however, due to the high SCM efficiency for Sr-90, Co-60 will be most limiting in survey speed. Although the release criteria for Co-60 and Cs-137 are identical, scan speeds will be based on the efficiency of the SCM for Co-60 due to the lower energy beta resulting in lower detector efficiency.

For SCM scans for Co-60 in the Class 2 area:

$$MDCR = 3.28\sqrt{6.67}\left(\frac{60}{2}\right) = 254 \text{ cpm}$$

Where:

$d' = 3.28$

$b_i = 6.67$ counts (based on a 200 cpm background)

$i = 2$ sec (based on a scan speed of 5 cm/sec and detector width of 10 centimeters)

And:

$$Scan\ MDC = \frac{254}{\sqrt{1} * 0.404 * 0.25 * \frac{100}{100\,cm^2}} = 2{,}515 \text{ dpm}$$

Where:

$p = 1$

$\varepsilon_i = 0.404$

$\varepsilon_s = 0.25$

$W_A = 100$ cm^2

2.8 ALPHA AND BETA STATIC MEASUREMENTS

Alpha and beta static measurements will be obtained with the Ludlum 43-68 detector coupled to the Ludlum 2221 rate meter. The Ludlum 43-68 detector will be used to obtain fixed measurements at the number of locations identified in Section 2.5 or to investigate areas of elevated alpha activity as identified by the SCM.

2.8.1 Alpha Static Measurements

Based on standard MDC formulas, static measurements for alpha emissions from Ra-226, will require a 2 minute count time for the Ludlum 43-68. The instrument efficiency for the Ludlum 43-68 is approximately 25 percent, based on a Thorium 230 source. The MDC calculation for the specified count time from equation 7-10 of the work plan (ChaduxTt 2010a):

Equation 7-10 from Work Plan (ChaduxTt 2010a)

$$MDC = \frac{3 + 3.29\sqrt{R_B T_{S+B}\left(1 + \frac{T_{S+B}}{T_B}\right)}}{\varepsilon_i \varepsilon_s \frac{W_A}{100cm^2} T_{S+B}}$$

Where:

R_B = background count rate (cpm)

T_B = background counting time (minute [min])

T_{S+B} = sample counting time (min)

ε_i = instrument efficiency (count per particle)

ε_s = contaminated surface efficiency (particle per disintegration)

W_A = active area of the detector window (cm^2)

For the Ludlum 43-68 surveying for Ra-226, the equation becomes:

$$MDC = \frac{3 + 3.29\sqrt{(1)(2)\left(1 + \frac{(2)}{(2)}\right)}}{(0.25)(0.25)\frac{100\ cm^2}{100\ cm^2} * (2)}$$

MDC = 76.64 dpm

Where:

R_B = 1 cpm

T_B = 2 min

T_{S+B} = 2 min

ε_I = 0.25

ε_S = 0.25

W_A = 126 cm^2 (areas greater than 100 cm^2 default to 100 cm^2)

Therefore, the count time for Ra-226 with the Ludlum 43-68 will be 2 minutes.

The specified count times are based on the MDC formula, Equation 7-10 from the work plan (ChaduxTt 2010a). The count times are useful in determining an instruments ability to meet the required MDC. However, empirically derived values will provide a more accurate assessment of the MDC for a specified count time as recommended by MARSSIM (NRC 2000). Empirical values will be determined at Alameda Point in conjunction with reference area measurements. With concurrence of Radiological Affairs Support Office (RASO), count times determined based on empirical data will be used for static survey measurements.

2.8.2 Beta Static Measurements

Static measurement count times for the beta from Co-60 will be 30 seconds for the Ludlum 43-68 with the Ludlum 2221 rate meter.

For the Ludlum 43-68 surveying for Co-60, the MDC equation becomes:

$$MDC = \frac{3 + 3.29\sqrt{200 * 0.5 * \left(1 + \frac{0.5}{0.5}\right)}}{0.202 * 0.25 * \frac{100}{100\,cm^2} * 0.5} = 1{,}961 \text{ dpm}$$

Where:

R_B = 200 cpm

T_B = 30 sec or 0.5 min

T_{S+B} = 30 sec or 0.5 min

ε_i = 0.202

ε_s = 0.25

W_A = 126 cm^2 (areas greater than 100 cm^2 default to 100 cm^2)

Therefore, the count time for Co-60 with the Ludlum 43-68 in the static mode will be 30 seconds.

The specified count times are based on the MDC formula, Equation 7-10 from the work plan (ChaduxTt 2010a). The count times are useful in determining an instruments ability to meet the required MDC. However, empirically derived values will provide a more accurate assessment of the MDC for a specified count time as recommended by MARSSIM (NRC 2000). Empirical values will be determined at Alameda Point in conjunction with reference area measurements. With concurrence of RASO, count times determined based on empirical data will be used for static survey measurements.

2.9 GAMMA WALK OVER SURVEY

Gamma walk over surveys will be performed in each survey area. 100 percent of exposed soil in the Class 1 area will be surveyed. At least 50 percent of the exposed soil in the Class 2 area and 25 percent of the exposed soil in the Class 3 area will be surveyed. Surveys will be conducted using a 2 inch by 2 inch (diameter and thickness) sodium iodide detector coupled to a ratemeter and data recorder. Data will be recorded at timed intervals during the scan. The ratemeter will be will be operated in the open window (no electronic discrimination) mode. The walk over survey will be conducted by walking the area in lanes of 1 meter width at approximately 0.5 meter per second with the detector approximately 10 cm (4 inches) from the soil surface while moving the detector in a serpentine (S-shaped) fashion. Output from the gamma scan will be evaluated by analyzing the data in a Cumulative Frequency Distribution plot. Outliers indentified as departure toward extreme values be linked to the time of data collection, which will be linked to location. Those areas will be used to bias the soil sampling activities. Since the walkover gamma readings will be used as relative values, system sensitivity and MDC values are not critical and are therefore not discussed.

Gamma exposure readings using a calibrated microR meter, Ludlum Model 19, will be obtained at each of the soil sample locations in each area.

2.10 SOIL SAMPLING

Soil samples will be collected at each of the data collection locations identified in Figures 3 through 6 and at any location determined by the gamma walk over survey. Additional samples will be collected from any area identified in the gamma walkover survey. Samples will be obtained from the top six inches of soil in accordance with SOP 009, *Sampling Procedures for Radiological Surveys* (see Appendix B of the work plan [ChaduxTt 2010a]), and submitted to an off-site laboratory for radiological analysis. Analysis of results will be evaluated against soil criteria identified in Table 2.

2.11 SEDIMENT SAMPLING

Sediment samples will be collected from man holes that serve storm drains and sanitary drains in the vicinity of the Former Smelter Area. Samples will be collected in accordance with SOP-009, *Sampling Procedures for Radiological Surveys* (see Appendix B of the work plan [ChaduxTt 2010a]), and submitted to an off-site laboratory for radiological analysis. One sediment sample per drain will be collected if sediment is present. Analysis of results will be evaluated against soil criteria identified in Table 2.

3.0 SITE RESTORATION

Site restoration work will not be performed at the conclusion of surveying of the Former Smelter Area.

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Number: 1 Author: Administrator Subject: Highlight Date: 2/2/2012 9:28:56 -08'00'

Number: 2 Author: Administrator Subject: Sticky Note Date: 2/2/2012 9:33:23 -08'00'

What values are considered "extreme"? It appears that the gross gamma walk-over survey is not based upon a mean background gross gamma count. How was the scan speed derived for the extreme values?

4.0 FORMER SMELTER AREA REPORT

Results of the laboratory analysis of soil and sediment samples and the gamma walk over survey data will be presented in a Survey Report.

5.0 QUALITY CONTROL

The data quality objectives for the survey are provided in Table 3.

Definable features of work (DFW) establish the measures required to verify both the quality of work performed and compliance with project requirements. The DFW for this task is radiological surveys. Description of this DFW and the associated phases of quality control are presented in Table 4.

6.0 ENVIRONMENTAL PROTECTION

Environmental protection requirements are addressed in the work plan (ChaduxTt 2010a).

7.0 REFERENCES

ChaduxTt. 2010a. Final Work Plan for Basewide Radiological Surveys, Former Naval Air Station Alameda, Alameda, California. July 23.

ChaduxTt. 2010b. Final Site Safety and Health Plan for Basewide Radiological Surveys, Former Naval Air Station Alameda, Alameda, California. August 6.

ChaduxTt. 2010c. Final Accident Prevention Plan for Basewide Radiological Surveys, Former Naval Air Station Alameda, Alameda, California. August 6.

Gilbert et al. 2001. *Virtual Sample Plan.* Upgrade version 5.9 released October 29, 2009. Pacific Northwest National Laboratory. Principal authors of Version 5.9 Pulsipher, Wilson, et.al.

Nuclear Regulatory Commission (NRC). 2000. NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM),* Rev. 1.

Tetra Tech ECI. 2010. *Survey Unit Project Reports Abstract Installation Restoration Sites 5 and 10, Buildings 5 and 400 Storm Drain Line, Time-Critical Removal Action, Former Naval Air Station Alameda, Alameda, California.*

Weston Solutions, Inc. 2007. *Final Historical Radiological Assessment, Alameda Naval Air Station, Use of General Radioactive Materials, 1941 – 2005.*

FIGURES

Aerial View
Former Smelter Area
Outlined in black

N

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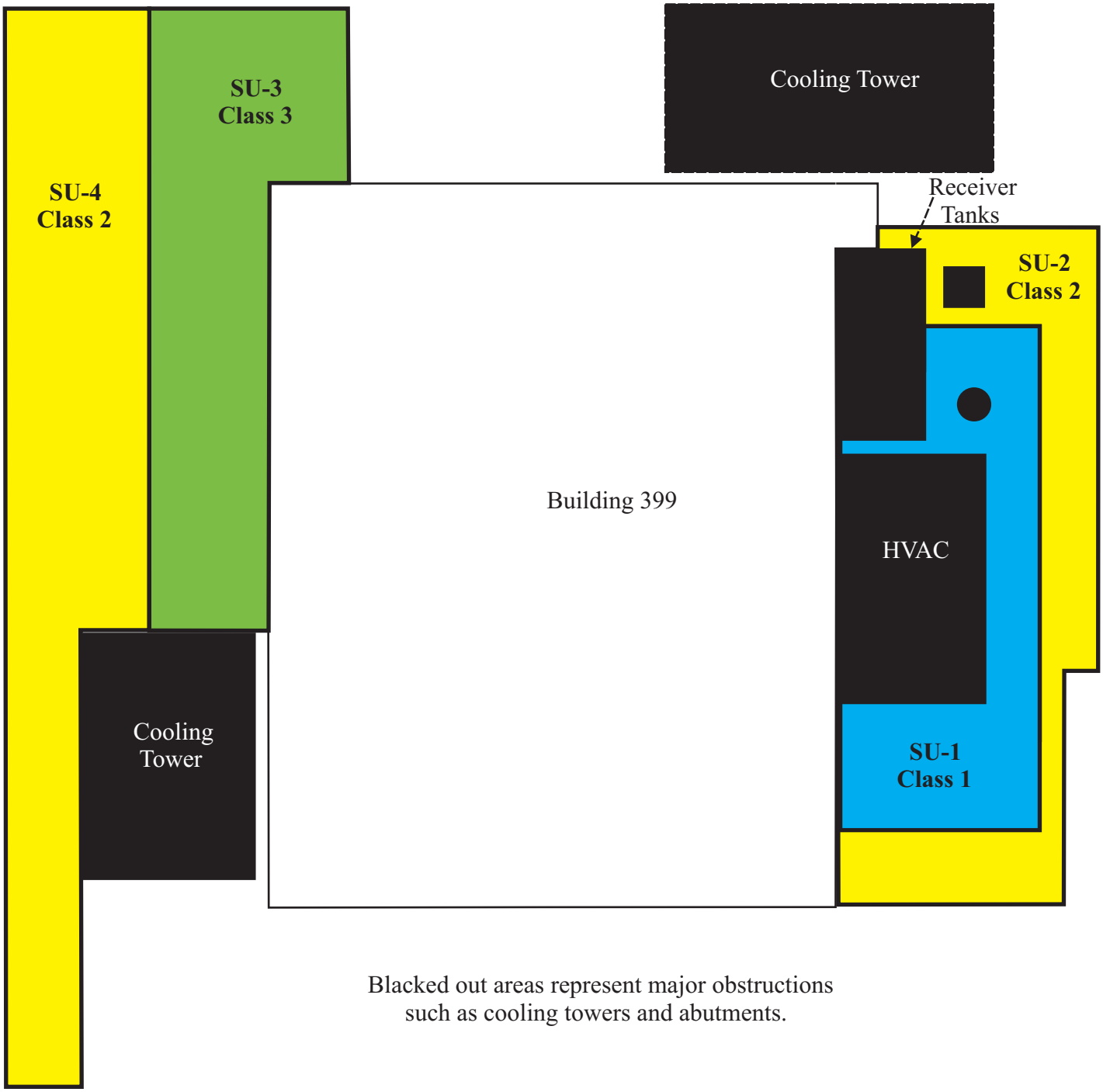
Alameda Point, Alameda, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 1
Former Smelter Area
Photograph

Rev 1

Floor: 341.5 m^2



Blacked out areas represent major obstructions
such as cooling towers and abutments.

CLASS 3 AREA

CLASS 2 AREA

CLASS 1 AREA

SU SURVEY UNIT

N

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Consulting Engineers and Scientists

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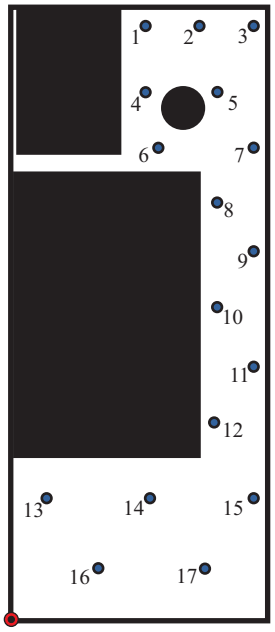
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 2
Former Smelter Area
Classification And Survey Units

Drawing Not To Scale | Rev 3

Floor: 39.96 m^2



Class 1: Floor

Sample Point

South West Corner Reference

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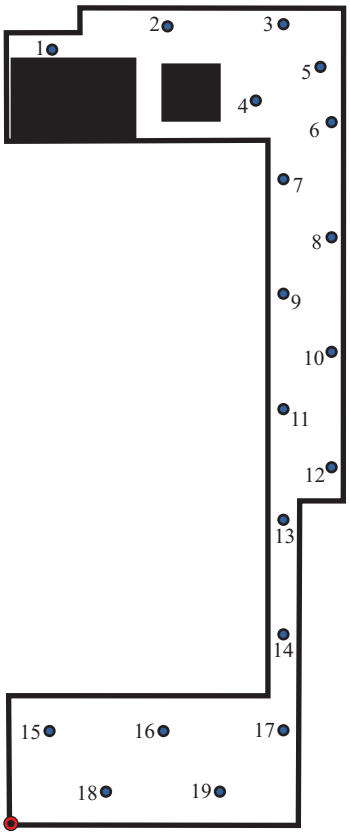
FIGURE 3
Former Smelter Area
Survey Unit 1
Sample Points

Drawing Not To Scale | Rev 3

Floor: 56.17 m^2



Class 2: Floor

Sample Point

South West Corner Reference

ChaduxTt JV
Consulting Engineers and Scientists

Alameda Point, Alameda, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 4
Former Smelter Area
Survey Unit 2
Sample Points

Drawing Not To Scale | Rev 3

Floor: 86.11 m^2

Class 3: Floor

Sample Point

South West Corner Reference

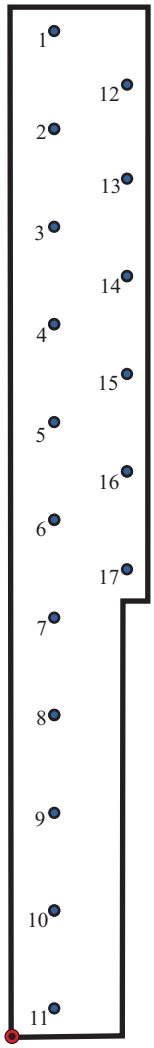
ChaduxTt JV
Consulting Engineers and Scientists

Alameda Point, Alameda, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 5
Former Smelter Area
Survey Unit 3
Sample Points

Drawing Not To Scale | Rev 2

Floor: 159.26 m^2



Class 2: Floor

Sample Point

South West Corner Reference

ChaduxTt JV
Consulting Engineers and Scientists

Alameda Point, Alameda, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 6
Former Smelter Area
Survey Unit 4
Sample Points

Drawing Not To Scale | Rev 1

TABLES

TABLE 1: APPLICABLE STANDARD OPERATING PROCEDURES
Task Specific Plan for the Former Smelter Area Scoping Survey, Alameda Point, Alameda, California

Procedure	Title	Rev
SOP 002	Radiation Work Permits	0
SOP 004	Project Dosimetry	0
SOP 006	Radiation and Contamination Surveys	1
SOP 007	Preparation of Portable Radiation and Contamination Survey Meters for Field Use	0
SOP 008	Air Sampling and Sample Analysis	0
SOP 009	Sampling Procedures for Radiological Surveys	2
SOP 010	RCA Posting and Access Control	0
SOP 011	Control of Radioactive Materials	1
SOP 012	Release of Materials and Equipment	0
SOP 016	Decontamination of Equipment and Tools	0
SOP 022	Radiological Clothing Selection, Monitoring and Decontamination	0
SOP 023	Source Control	0
SOP 024	Occurrence Reporting	1
RP-OP-017	Operation of the Ludlum Model 2929 Dual Scaler	1
RP-OP-025	Operation of the Ludlum Model 2221	0
RP-OP-026	Operation of the Ludlum Model 19	0
SCM-OPS-01	Position Sensitive Proportional Counters Purging	0
SCM-OPS-02	Position Sensitive Proportional Counters Plateau Determination	0
SCM-OPS-03	Position Sensitive Proportional Counters Position Calibration	1
SCM-OPS-04	Encoder Calibration	0
SCM-OPS-05	Position Sensitive Proportional Counters Efficiency Calibration	0
SCM-OPS-06	Position Sensitive Proportional Counters Quality Assurance	1
SCM-SETUP-01	Position Sensitive Proportional Counters Repair	0
SCM-SETUP-02	Hardware Setup	0
SCM-SETUP-03	Quality Assurance Testing of SCM	0

TABLE 2: PRIMARY RADIATION PROPERTIES AND RELEASE CRITERIA FOR RADIONUCLIDES OF CONCERN
Task Specific Plan for Former Smelter Area Scoping Survey, Alameda Point, Alameda, California

	Primary Radiation Properties		Release Criteria[a]				
			Materials & Equipment		Building Surfaces		Soil
Radionuclide	Half-Life	Type	Total Surface Activity	Removable Activity	Total Surface Activity	Removable Activity	Activity (pCi/g)
Co-60	5.26 years	Beta	5,000	1,000	5,000	1,000	0.0361
Cs-137	3.00E01 years	Beta	5,000	1,000	5,000	1,000	0.113
Pu-239	2.44E04 years	Alpha	100	20	100	20	2.59
Ra-226	1.6E03 years	Alpha Gamma[c]	100	20	100	20	1[b]
Sr-90	2.77E01 years	Beta	1,000	200	1,000	200	0.331
UO_2	7.10E08 years	Alpha Beta	5,000	1,000	488	98	0.398

Notes:

Cs-137 Cesium 137
Co-60 Cobalt 60
Pu-239 Plutonium 239
pCi/g picocurie per gram
Ra-226 Radium 226
Sr-90 Strontium 90
UO_2 Uranium Dioxide

a Units are disintegrations per minute per 100 square centimeters, unless otherwise specified.

b Goal is 1 pCi/g above background per agreement with U.S. Environmental Protection Agency.

c Ra-266 decays by alpha, but there are low abundance gammas from progeny. The primary means of decay is alpha, but surveying for Ra-226 in soil is done with a gamma sensitive detector.

Source:

ChaduxTt. 2010a. Final Work Plan for Basewide Radiological Surveys, Former Naval Air Station Alameda, Alameda, California. July 23.

TABLE 3: SUMMARY OF DATA QUALITY OBJECTIVES

Task Specific Plan for the Former Smelter Area Scoping Survey, Alameda Point, Alameda, California

STEP 1 Statement of Problem	STEP 2 Decisions	STEP 3 Inputs to the Decisions	STEP 4 Boundaries of Study	STEP 5 Decision Rules	STEP 6 Limits on Decision Errors	STEP 7 Optimizing the Sampling Design
The Former Smelter Area is listed in the Historical Radiological Assessment as an area impacted by radiological activities. The isotopes of concern are Cs-137, Co-60, Sr-90, UO_2, and Pu-239. It must be determined if the site-specific release criteria for these isotopes have been met or if remediation is warranted.	1 The primary use of the data expected to result from completion of this TSP is to determine if soil samples meet the release criteria and if further actions are needed in for future. Therefore the decision to be made can be stated as "Do the results of the survey meet the release criteria?" 4	Radiological surveys required to support the Scoping Survey of the Former Smelter Area will include: • 100 percent gamma walk over survey of Class 1 area. • 50 percent gamma walk over survey of Class 2 areas. • 25 percent gamma walk over survey of Class 3 areas. • A minimum of 17 systematic soil samples will be obtained in the Class 1 area, Class 2 area and Class 3 area. • One sediment sample will be collected from each drain if available. • 50 percent scan surveys of Class 2 areas. • A minimum of 17 systematic static measurements will be performed in Class 2 concrete pad. • One swipe to be analyzed for alpha and beta emitting nuclides at each systematic sample location on the Class 2 concrete pad.	The lateral and vertical spatial boundaries for this survey effort are confined to the area specified as the Smelter Area.	2 If the concentration of radioactivity in soil samples is less than the release criteria, and if further actions are needed. If the results of the survey exceed the release criteria, then the area will be investigated further. 3	Limits on decision errors are set at 5 percent as specified in the work plan (ChaduxTt 2010a).	Operational details for the radiological survey process have been developed. The theoretical assumptions are based on guidelines contained in MARSSIM (NRC 2000). Specific assumptions regarding types of radiation measurements, instrument detection capabilities, quantities and locations of data to be collected, and investigation levels are contained in this TSP and the work plan (ChaduxTt 2010a).

Notes:

Cs-137	Cesium 137	Ra-226	Radium 226
Co-60	Cobalt 60	Sr-90	Strontium 90
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual	TSP	Task specific plan
NRC	Nuclear Regulatory Commission	UO_2	Uranium dioxide
Pu-239	Plutonium 239		

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Number: 1 Author: Administrator Subject: Highlight Date: 2/2/2012 9:36:13 -08'00'

Number: 2 Author: Administrator Subject: Highlight Date: 2/2/2012 9:35:21 -08'00'

Number: 3 Author: Administrator Subject: Sticky Note Date: 2/2/2012 9:35:56 -08'00'

What about gross gamma values?

Number: 4 Author: Administrator Subject: Sticky Note Date: 2/2/2012 9:37:30 -08'00'

The intent of the scoping survey is not to release a site, but to determine if the site is considered as radiological "impacted" or "non-impacted".

TABLE 4: DEFINABLE FEATURES OF WORK FOR RADIOLOGICAL SURVEYS
Task Specific Plan for the Former Smelter Area Scoping Survey, Alameda Point, Alameda, California

ACTIVITY	PREPARATORY (Prior to initiating survey activity)	DONE	INITIAL (At onset of survey activities)	DONE	FOLLOW-UP (Ongoing during survey activities)	DONE
Radiological Surveys	• Verify that an approved TSP is in place. • Verify that the Remedial Project Manager and the Caretaker Site Office are notified about mobilization. • Verify that an approved Radiation Work Permit, if required, is available and has been read and signed by assigned personnel. • Verify that the work plan, SSHP, APP and TSP, have been reviewed. • Verify that personnel assigned are trained and qualified. • Verify that personnel have been given an emergency notification procedure. • Verify that workers assigned dosimeter have completed NRC Form 4. • Verify that relevant SOPs are available and have been reviewed for equipment to be used. • Verify that equipment is on site and in working order (initial daily check).		• Verify that radiological instruments are as specified in the work plan (ChaduxTt 2010a) and TSP. • Inspect Training Records. • Verify that reference area measurements have been obtained in accordance with the work plan (ChaduxTt 2010a). • Verify that daily checks were performed on all survey instruments. • Verify that instrument calibration and setup are current. • Verify that required dosimeter is being worn. • Verify that field logbooks and proper forms are in use. • Verify that samples and measurements are being collected in accordance with the TSP, work plan and applicable SOPs. • Verify the sample handling is in accordance with the work plan (ChaduxTt 2010a) and applicable SOPs.		• Verify that the site is properly posted and secured. • Conduct ongoing inspections of material and equipment. • Verify that daily instrument checks were obtained and documented. • Verify that survey results were documented. • Inspect chain-of-custody and survey logs for completeness. • Verify that survey activities conform to the TSP. • Verify that survey instruments are recalibrated after repairs or modifications.	

Notes:

APP Accident prevention plan
NRC Nuclear Regulatory Commission
SOP Standard operating procedure
SSHP Site safety and health plan
TSP Task specific plan