Final Survey Mapping Plan

Unexploded Ordnance (UXO) Model Cleanup

Kaho'olawe Island, Hawaii

PACDIV Contract No. N62742-93-D-0610, Delivery Order No. 0015
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1.0 SURVEY AND MAPPING PLAN

The following outlines the specific survey and mapping requirements required under the model cleanup project.

2.0 TASK DESCRIPTION

BPI shall survey the OEW clearance boundaries of each of the aforesaid areas from composite maps compiled on an Intergraph software based Geographic Information System (GIS). BPI shall define the perimeter corners of the clearance areas and the corners of all investigation grids with visible temporary markers. BPI shall survey the location of all confirmed OEW items found during surface clearance operations within each project area and any planimetric features, fence lines, and/or other significant land features not shown on existing mapping of each of the investigation areas. In the event multiple confirmed OEW items are found within a small area, the perimeter of the area shall be located. This information will be entered into the appropriate location-specific GIS for historical reference and used in conjunction with geophysical survey findings to prepare anomaly excavation maps for intrusive investigations.

BPI will survey and mark the location of all anomalies to be excavated in Level II clearance subareas utilizing the excavation map(s) prepared on the GIS. All confirmed OEW found during intrusive investigations will be located and their positions entered into an Ordnance Information System (OIS) for final reporting.

Any Open Burning/Open Detonation (OB/OD) disposal area(s) established and/or used by BPI as well as the location of all items identified as not safe to transport and destroyed in place by detonation shall be surveyed and recorded in the GIS. In addition, the location of the UXO Explosive Holding Area established for temporary storage of OEW found during clearance operations and the storage magazines for commercial explosives shall be documented.

The surveyed horizontal geographic position and state plane coordinates for all of the above described items shall be referenced to permanent or semi-permanent control points existing on Kaho`olawe Island and shall be accurate to one-quarter meter (0.25 m), plus or minus. A topographic survey of cleared areas will be completed with two foot contours (+ or - 1/4 foot) and will be provided at the conclusion of this project. The depth of subsurface UXO investigated shall be documented by a UXO Specialist to an accuracy of 2 inches, plus or minus.

3.0 PERSONNEL EQUIPMENT, AND PROCEDURES

3.1 Personnel

A Project Manager for Surveying and Mapping will be selected for this UXO Model Cleanup contract. The Project Manager for Surveying and Mapping will be a Professional Land Surveyor who will be responsible for the technical competency of all survey and mapping efforts. Field survey and

mapping operations will be completed by multiple survey teams, each assigned to specific subareas. Each team will consist of a Surveyor, Surveyor Aide, and UXO Specialist meeting the qualification requirements set forth in SOW.

The GIS will be managed by an operator with a minimum of 3 years of direct experience managing a computerized GIS within a Microstation MGE environment.

3.2 Equipment

Each survey team will be equipped with a total station with automated data collector [Topcon GTS-302B w/ CMT-MC Data Collector, or equal], carrier phase global positioning system [Trimble 4000 Series or equal], magnetometer [Schonstedt, or equal], portable computer, and adequate supplies and safety equipment.

All survey and mapping activities for Kaho`olawe Island will be coordinated through the local BPI office established for this contract. The GIS will also be located in the local office to provide direct daily accessibility and interaction with surface and subsurface investigation teams, geophysical survey efforts, and location survey and mapping personnel. GIS equipment includes an Intergraph TD-2 GIS Workstation with a Microsoft Windows NT operating system running Microstation PC Version 5 software. The Intergraph Modular GIS Environment (MGE) family of mapping and GIS software products such as MGE Basic Nucleus (MGNUC), MGE Projection Manager (MSPM), and MGE Map Finisher (MGFN) will be utilized.

3.3 Procedures

An electronic copy of recent aerial mapping of Kaho`olawe covering the Hakioawa Area and the Main Road System and Base Camp Areas will be provided by the Navy. This mapping should be referenced to the Hawaii State Plane Coordinate System - Zone 2 (5102) Grid System and the North American Datum of 1983 [NAD83] and will serve as the base design file in the GIS. Any available electronic formatted archival mapping (soil classifications; Historic, Cultural, and Archaeological areas; environmentally sensitive locations; areas of spiritual significance; and military operational plans) will be entered into the GIS. The GIS operator will use the MSPM software to rectify and integrate the archival mapping file(s) by matching a minimum of three (3) points common to the archival mapping and the recent aerial mapping and applying a least squares adjustment to the archival mapping file.

Based on this data, a definitive boundary of each operational area will be outlined and an investigation grid alignment superimposed where appropriate. A "working" map of each Area will be prepared with coordinates for search areas listed. Primary control monuments existing on Kaho`olawe will be used as survey reference points for all land surveying efforts. Semi-permanent control points will need to be established at each Area and Subarea prior to commencing any perimeter or grid layout. GPS equipment will be used for the establishment of horizontal position on the new semi-permanent control points. The surveyor will use the working map provided by the GIS operator to survey and

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mark the location of each the grids. The markers used to define each grid shall remain throughout the duration of surface and subsurface investigation and removal actions and will be removed only upon completion of these efforts.

Search maps showing the location of each anomaly of interest will be prepared and forwarded to the survey team. Using a total station, the survey team will stake the location of each anomaly of interest for excavation by the intrusive investigation team. The position of all confirmed OEW items found as well as all those other items defined in Paragraph 2.0 will be located by the surveyor for entry into the GIS. These locations will be accomplished by the surveyor utilizing carrier phase GPS or total station equipment to an accuracy of one-quarter meter (0.25 m), plus or minus. The depth of subsurface UXO investigated shall be documented by a UXO Specialist to an accuracy of 2 inches, plus or minus. Topographic elevations of cleared areas will be documented in two foot contours (+ or - 1/4 foot) and will be provided at the conclusion of this project. Final mapping of each Area will be completed in accordance with the specific requirements outlined below.

4.0 SAFETY

During all field and intrusive activities, all surveying. mapping, and geophysical crew(s) shall be accompanied by a UXO Specialist who shall clear each area prior to commencing work. A magnetometer shall be used to survey and clear the location for the establishment of any monuments, hubs, stakes, witness posts, or other intrusive markers (temporary or permanent) prior to installing same.

5.0 CONTROL POINTS

Semi-permanent control points will be required at Area and Subarea. Each shall consists of a metal pipe or rod (30" long) with a plastic cap containing an identification reference. Existing primary control monuments of Third Order, Class I or better, will be used as survey reference points for all new control points. Plastic or wooden hubs may be used for any tertiary control points.

5.1 Accuracy

Horizontal control of Class I, Third Order or better shall be established for all new semi-permanent and tertiary control points. Horizontal control shall be referenced to the North American Datum of 1983 [NAD83] and the Hawaii State Coordinate System - Zone 2 (5102). Data conversions from the metric system to the English system shall use the U.S. Survey Foot definition (1 meter = 39.37 inches exactly). All drawings and calculations shall contain a prominent note stating same.

5.2 Monument Caps

Semi-permanent control points consist of a metal pipe or rod (30" long) with a plastic cap containing an identification reference.

5.3 Plotting

All control points (permanent, semi-permanent, and tertiary) recovered and/or established at each Area or Subarea shall be plotted at the appropriate coordinate point on a reproducible (mylar) planimetric or topographic map at a metric scale no smaller than 1:2,000.

5.4 Description Cards

A tabulated list and a "Description Card" of all control points established or used for this project shall be prepared and submitted. The Description Card shall show a north arrow; a sketch of each monument and its location relative to reference marks, buildings, roads, towers, trees, etc.; a typed description telling how to locate the monument from a well known and identifiable point; the monument's name or number; and the final adjusted coordinates in meters and feet (to the closest 0.001 m and 0.01 ft). The Description Cards shall be 5 inches by 8 inches describing one monument per card or an 8-1/2 inch by 11 inch sheet of bond paper may be used to describing two monuments.

5.5 Quality Control

Initial quality control checks will start in the first days on the island. The BPI survey teams will each be verifying the electronic files provided by the Navy and loaded to form our base GIS mapping system. The teams will set up on one of the existing control monuments and traverse to a minimum of three boundary pipes set up by others and verify their geographic positions. This will be repeated in several areas of the island to confirm the accuracy of the previous survey efforts and BPI's survey procedures.

Each BPI survey crew will also perform daily quality control checks by observing the horizontal relationship between three existing boundary pipes, and comparing field results with coordinate relationships provided by the Navy. Additional checks will be made as the daily data is loaded into the GIS and the appropriate area and grid data in fact falls inside the baseline map area. Periodically locations of HCR sites will be located by a second BPI survey team to verify it's location.

6.0 MAPPING

The location, identification, coordinates, and elevations of all the control points recovered and/or established at each of the project areas shall be plotted on a reproducible (mylar) planimetric map at a metric scale no smaller than 1:2,000. Each control point shall be identified on the map by its name or number and the final adjusted coordinates (to the closest 0.001 m and 0.01 ft) referenced to the North American Datum of 1983 [NAD83] and the Hawaii State Coordinate System - Zone 2 (5102). Each map shall include a grid north, a true north, and a magnetic north arrow with the differences between them shown in minutes and seconds. Metric grid lines and tic marks in feet with their respective grid values shall be shown at systematic intervals on the edges of the map. Also, a legend showing the standard USGS symbols used for the mapping and a map index showing the area in relationship to any other location within the limits of the project area shall be shown. In addition, the

corners of each clearance area investigated and each confirmed OEW item shall be located in the field to the closest one-quarter of a meter (0.25 m) and plotted and identified on the map. A tabulation of all confirmed OEW items located shall also be provided showing the identification number, the coordinates referenced to NAD83 and the Hawaii State Coordinate System - Zone 2 (5102), and a description of the item including whether it was found on or below the ground surface. In cases of multiple confirmed OEW items within a small area, the coordinates on the corners of the area will be shown.

7.0 DIGITAL DATA

All Digital Data design files shall be created in conformity with those specific file requirements outlined in Paragraph 8.0 below.

8.0 DIGITAL FORMAT FOR INTERGRAPH DATA SURVEY/MAPPING

8.1 Design File Requirements

Design file requirements are as follows:

- The surface features shall be placed into an Intergraph IGDS 2D design file.
- Design file units shall be MU=1 M., SU=10th, PU=10.
- The standard global origin of 0, 0, -21474836.48 to be used for surveying/mapping drawings is zero "X" and "Y" coordinate at the lower left corner of the "X-Y" plane with the "Z" coordinate in the center of the "Z" range. This will allow "X-Y-Z" coordinates from 0, 0, 0 to 42949672, 42949672, 21474836.48 which should be sufficient for the majority of needs.
- Compress all design files. Design files shall be submitted with the entire sheet in view 5 and the title block in view 1. Only views 1 and 5 will be active. All locks will be off except snap, and all displays will be on except text nodes and grid. All fonts will be downloaded and unused levels will be off.
- Angular data read-out will be degrees, minutes, and seconds to one decimal place.
- Each sheet will be no larger than a standard metric A-1 size which is 841 mm by 594 mm (33.1 inches by 23.4 inches). Each sheet shall also have a standard border; revision block; title block; index sheet layout; legend; grid lines; grid tic layout; scale bar; and True North, Magnetic North, and Grid North arrows with the differences shown in minutes and seconds. The direction of north will run from bottom of the file to the top, with no skew, where practical.

8.2 Level Assignments

Level assignments, colors, line weights, and line codes (styles) as shown in Table 1 below shall be used.

8.3 Survey/Mapping Drafting Practices

- A sheet index for the project shall be prepared that includes enough of the planimetric data to indicate the sheet's geographical location in the project area, and the location of the sheet relative to all other sheets in the project. The sheet index, showing all sheets in the project, is to be shown in the legend of each sheet, with the current sheet crossed-hatched or heavily outlined. If required, a separate file may be utilized for the index.
- All text will be Font 3.
- Planimetric data shall be digitized and furnished to the Navy. The primary files shall contain all survey data. The individual sheet design files, as required, will use the primary file as a reference and will include the specific information required to plot the individual survey drawing sheets with sheet borders, title, legend, scale bars, and north arrows. All files shall be referenced to NAD83 and the Hawaii State Coordinate System - Zone 2 (5102). Two copies of the magnetic tapes or 3-1/2" floppy disk(s) containing all the source files required to produce the final drawing(s) shall be provided. The level/feature information as shown in Table 1 below shall be used in creating these files.
- All unique cell libraries, user commands, color tables, menus, etc., created as part of this scope are to be delivered as part of the final submittal. A brief narrative explaining the function of each and how it was used shall also be required and included. In addition, a description of how the individual design files are assembled to produce the final plot(s); i.e. design file name, reference name(s), color table, etc. shall be provided.

9.0 GEOGRAPHIC INFORMATION SYSTEM (GIS) INCORPORATION

BPI will take the GIS data, manual, file, and database structure from the Huntsville Division Ordnance GIS standard and apply it to this project to the extent applicable. The standard will be used as a starting point to load data and to create a GIS tailored to the investigative needs at Kaho`olawe Island. All digital data shall be created using Microstation 5.0 and MGE GIS tools to allow it to be loaded directly into the Ordnance GIS standard created under the USAEDH Fort Monroe Project.

10.0 COMPUTER FILES

All final text generated will be furnished to the Contracting Officer in WordPerfect software, IBM PC compatible format. All GIS data, drawings, design drawings, and survey data will be submitted in the proper format and media that will permit their loading, storage, and use without modification or additional software on a computer equipped with the database structure from the Huntsville Division Ordnance GIS standard. Data will be submitted on system compatible 10 GB, 8 mm digital tape or 3.5" HD floppy disk(s).

11.0 ITEMS AND DATA (DELIVERABLES)

The following items and data shall be submitted to OHM:

- A set of electronic design files will be delivered to the Navy weekly and at the conclusion of the project in the UTM coordinate system for their records and QA by their survey contractor.
- The original copies of all field books, layout sheets, computation sheets, abstracts, and computer printouts. All of these items shall be suitably bound, and clearly marked and identified.
- A tabulated list of all control points established and/or used for this survey showing the adjusted coordinates in meters and feet.
- A tabulated list of all confirmed OEW items located in the field showing the data identified in Paragraph 6 above.
- A "Report on Establishment of Survey Mark" (Description Card) on each permanent control monument established and/or used for the survey. In addition to the name or ID number of the monument, the cards shall show the adjusted coordinates, a typed description for locating the monument, and a sketch showing how to locate the monument.
- All unique items created and/or used to create the end product and the narrative and description required by Paragraph 8.3.4 above.
- Map(s) shall be provided in accordance with Paragraph 8.0. The map(s) shall show location of the areas searched, search pattern, and significant findings as well as all significant surface features within and adjacent to the project area. All maps shall be drawn at a metric scale no smaller than 1:2,000 on standard metric A-1 size reproducible (mylar) drawings or smaller, or alternate pre-approved scale and size, generated by the CADD system. One original mylar and five blueline prints of each final map shall be delivered.
- Two copies of each magnetic data tape or floppy disk(s) as specified in Paragraph 10 above.

12.0 SCHEDULE

All work and services under this task shall be completed and all items and data listed in paragraph 11 above submitted no later than fourteen (14) days after completion of each Subarea.

TABLE 1
Survey Mapping Level Assignments
and Level Symbology

Level	Description	Line Code	Line Weight	Color
1	Sheet Dependent Info	0	0	4
2	Coordinate Grid Ticks	0	0	2
3	Coordinate Grid Annotation Text	0	0	2
4	Buildings	0	2	4
5	Building Annotation	0	0	4
6	Road Centerline	0	0	4
7	Rds., RR and Centerline Annotation	0	0	4
8	Rds., Parking, Wlks., RR. Trls.	0	1	4
9	Concrete Joint Layout	0	0	4
10	Concrete Joint Elev's	0	0	4
11	Runway, Taxiway & Aprons	0	1	5
12	Runway Annotation	0	0	5
13	Pavement Markings, Signs	0	0	5
14	Structures, Headwalls	0	1	6
15	Structure Annotation	0	0	6
16	Culverts	0	1	4
17	Culvert Annotation	0	0	4
18	Riprap	0	1	2
19	Water Features	0	1	1
20	Water Features Annot.	0	0	1
21	Vegetation	0	0	2
22	Vegetation Annot.	0	0	2
23	Fences	0	0	1
24	Fence Annotation	0	0	1
25	Boundary Line/Cadastral	0	2	6
26	Boundary Lines/Cad. Annotations	0	0	6
27	Survey Cntrl Pts, Baselines	0	0	5
28	Survey Control Point Annotation	0	0	5
29	Break Lines	0	0	4
30	Spot Elevations	0	0	4
31	Major Contours	0	2	6
32	Contour Annotation	0	0	6

TABLE 1
Survey Mapping Level Assignments
and Level Symbology

Level	Description	Line Code	Line Weight	Color
33	Minor Contours	0	0	3
34	Soil Borings & Text	0	0	6
35	Storm Sewer, Manholes	0	0	2
36	Storm Sewer, Lines, & Annotation	0	0	2
37	Sanitary Manholes	0	0	4
38	Sanitary Lines & Annotation	0	0	4
39	Water Tanks & Fire Hydrants	0	0	1
40	Water Lines & Annotation	0	0	1
41	Gas Line, Features, & Valves	0	0	3
42	Gas Lines & Annotation	0	0	3
43	Power Lines, Lights, & Telephone Poles	0	0	5
44	Power Lines & Annotation	0	0	5
45	Steam Line, Features, & Valves	0	0	6
46	Steam Line Annotation	0	0	6
47	Cross Sections & Profiles	0	0	4
48	Details & Inserts	0	0	0
49	Soundings	0	0	1
50	Channel Lines & Disposal Areas	0	1	4
51	Channel Line Annotation	0	0	4
52	Navigation Aids & Annotation	0	1	6
53	Levees, Dikes, & Annotations	0	1	4
54	Pipe Lines, Structures, Bridge	0	1	6
55	Pipe Line Annotation	0	0	6
56	Stationing & Mile Markers	0	1	5
57	Revetments & Annotation	0	1	2
58	Vessel Track Line	0	1	2
59	Border/Title/ Legend/ North Arrow	0	1	4
60	Concentrated Spot Elevations	0	0	4

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Survey Mapping Level Assignments
and Level Symbology

Level	Description	Line Code	Line Weight	Color
61	Impact Area	0	1	6
62	SDZ (Surface Danger Zone)	0	1	6
63	Documentation	0	0	4

NOTE: Obscured areas, unknowns, and dirt roads will be dashed.
(LC=3, long dashed)