LMS/AMC/S07053

Post-Closure Monitoring and Inspection Plan for Amchitka Island Mud Pit Release Sites, Well Abandonment, and Infantry Road Repair Amchitka, Alaska

March 2011

Approved for public release; further dissemination unlimited

U.S. DEPARTMENT OF ENERGY | Legacy Management

Available for sale to the public from:

U.S. Department of Commerce
National Technical Information Service
5301 Shawnee Road
Alexandria, VA 22312
Telephone: 800.553.6847
Fax: 703.605.6900
E-mail: orders@ntis.gov
Online Ordering: *http://www.ntis.gov/help/ordermethods.aspx*

Available electronically at *http://www.osti.gov/bridge*

Available for a processing fee to U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
Phone: 865.576.8401
Fax: 865.576.5728
Email: reports@adonis.osti.gov

LMS/AMC/S07053

Post-Closure Monitoring and Inspection Plan for Amchitka Island Mud Pit Release Sites, Well Abandonment, and Infantry Road Repair Amchitka, Alaska

March 2011

This page intentionally left blank

Contents

Figures

Tables

Appendixes

Abbreviations

ATVs	all-terrain vehicles
DOE	U.S. Department of Energy
EM	Office of Environmental Management
ft	foot (feet)
GPS	Global Positioning System
LM	Office of Legacy Management
MM	Mile Marker
NNSA/NSO	U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office
NNSA/NV	U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office
SGZ	Surface Ground Zero
USFWS	U.S. Fish and Wildlife Service

This page intentionally left blank

1.0 Introduction

1.1 Scope and Objective

In 2001, the U.S. Department of Energy (DOE) remediated six areas associated with the Amchitka mud pit release sites located on Amchitka Island, Alaska. The objective of the remediation, conducted by the DOE National Nuclear Security Administration Nevada Operations Office (NNSA/NV) (now the NNSA Nevada Site Office [NNSA/NSO]), was to eliminate human and ecological exposure to contaminants associated with drilling mud by capping the drilling mud pits (NNSA/NV 2001).

To ensure the integrity and effectiveness of the remedial action, the mud pit sites will be inspected every 5 years as part of the DOE Office of Legacy Management (LM) Long-Term Surveillance and Maintenance Plan for Amchitka Island (DOE 2008a). This plan outlines the specific monitoring and inspection requirements for the mud pit caps and provides the procedures for conducting the inspections. Also included in this plan is scope to inspect and abandon three wells, make minor repairs to Infantry Road, and make modifications to the Milrow Surface Ground Zero (SGZ) plaque.

1.2 Background

Amchitka Island is located near the far west end of the Aleutian Islands, approximately 1,340 miles west-southwest of Anchorage, Alaska. From World War II until the early 1990s, the island was used by multiple U.S. government agencies for a variety of military and research activities. Amchitka is currently uninhabited and is part of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge, which is administered by the U.S. Fish and Wildlife Service (USFWS).

The mud pit release sites addressed by this plan are the result of drilling performed in support of three underground nuclear tests conducted on Amchitka during the late 1960s and early 1970s by the U.S. Department of Defense and the U.S. Atomic Energy Commission (predecessor agency to DOE). Long Shot (approximately 80 kilotons) was detonated on October 29, 1965. Milrow (approximately 1,000 kilotons) was detonated on October 2, 1969. Cannikin (less than 5 megatons) was detonated on November 6, 1971. In addition to these three sites, drilling was performed at three other sites (D, E, and F) where nuclear testing was considered but not performed. Figure 1 depicts the locations of these sites.

The activities at these six sites resulted in 12 drilling mud pits, where the drilling spoils were stored. The large-diameter emplacement boreholes were drilled using methods that employed large quantities of drilling mud (a mixture of bentonite, diesel fuel, and other compounds including chrome lignosulfonate and chrome lignite) to control viscosity and mitigate loss of drilling mud in the boreholes. The composition of the drilling mud used at Amchitka included 91 to 93 percent water, 6 to 8 percent oil, and other additives including cement, bentonite, paper, chrome lignosulfonate, chrome lignite, and sodium bicarbonate (DOE 2008b). The drilling mud was commonly stored near the drill sites, in bermed pits excavated to hold large quantities of drilling fluid produced from drilling the boreholes.

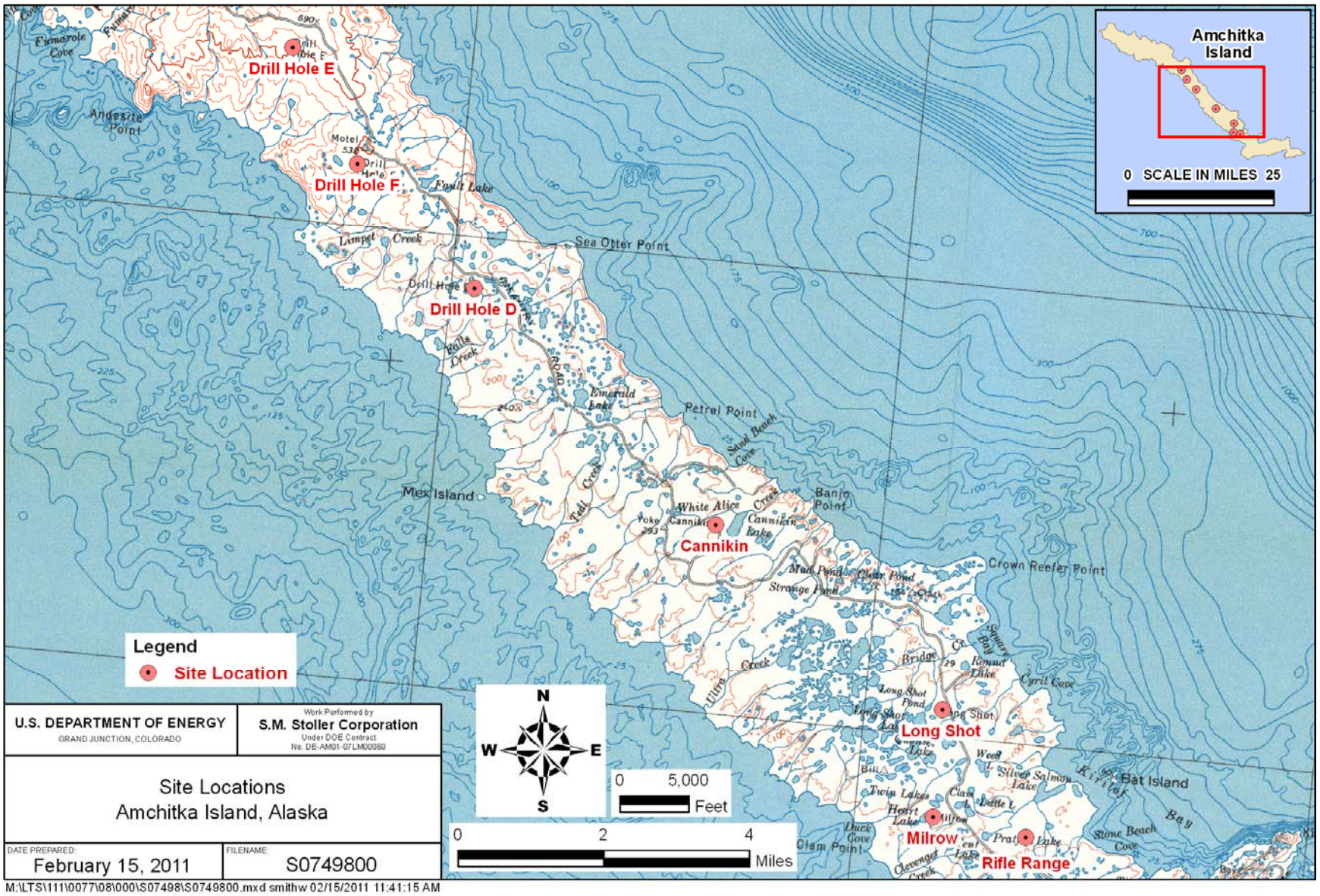


Figure 1. Proposed Nuclear Testing Sites

During remediation, each mud pit was stabilized by removing standing water and mixing solidification soils into the drilling mud. Once the drilling mud was stabilized, a geosynthetic cap constructed of soil layers and a 30-mil (0.003-inch-thick) geomembrane cover was installed according to the *Remedial Action Work Plan Amchitka Island Mud Pit Closures* (NNSA/NV 2001) requirements. All mud pit caps were revegetated using a seed mat product, North American Green SC150. The SC150 mat consisted of a control blanket manufactured with a built-in USFWS-approved seed mix. Drainage ditches and energy dissipaters were installed around the capped area to buffer the spread of water runoff from the cap. Table 1 summarizes the mud pit sites, including USFWS survey monument locations and elevations, along with the number of caps and energy dissipaters installed at each site.

A final survey of all work areas was completed, and the resulting as-built drawings were included in the *Amchitka Island Surface Closure Report* (NNSA/NV 2003). These drawings indicate final locations and elevations of all mud pit caps, drainage areas, and borrow soil areas. These drawings will be used to provide baseline reference conditions for the mud pit site inspections.

Table 1. Amchitka Mud Pit Sites Closure Summary

Mud Pit Site	Location on Infantry Road	USFWS Survey Monument[a]	Number of Mud Pits	Number of Caps Installed	Number of Energy Dissipaters Installed
Milrow	Mile Marker 2.4	Northing: 187,163.93 Easting: 2,187,922.29 Elevation: 55.88	1	1	2
Long Shot	Mile Marker 4.6	Northing: 196,199.27 Easting: 2,181,923.93 Elevation: 140.24	2 (East and West)	1 (East and West combined)	1
Cannikin—North/South Site	Mile Marker 10.4	Northing: 207,336.49 Easting: 2,165,121.83 Elevation: 255.87	2 (North and South)	1 (South consolidated into North)	1
Cannikin—Ground Zero Site	Mile Marker 10.4	Northing: 209,413.21 Easting: 2,165,078.89 Elevation: 202.11	1	1	2
Drill Site D	Mile Marker 16.1	Northing: 226,896.76 Easting: 2,147,772.85 Elevation: 304.75	3 (South, Northwest and Northeast)	2 (South; Northwest and Northeast combined)	2
Drill Site F	Mile Marker 18.8	Northing: 235,803.50 Easting: 2,139,216.90 Elevation: 480.96	1	1	1
Drill Site E	Mile Marker 20.25	Northing: 244,303.70 Easting: 2,134,932.10 Elevation: 524.52	2 (North and South)	1 (South only; North—no further action)	1

[a] Horizontal datum AK State Plane 1983, NAD 83; Vertical datum NAVD 29

2.0 Post-Closure Monitoring and Inspection Requirements

The cap inspections will be conducted every 5 years as provided for in the Long-Term Surveillance and Maintenance Plan (DOE 2008a) and the *Post-Closure Monitoring and Inspection Plan for Amchitka Island Mud Pit Release Sites* (DOE 2005). Post-closure monitoring and inspections of the mud pit sites are intended to determine whether:

- The geosynthetic caps are performing as designed.
- The geosynthetic caps are subsiding or eroding.
- The drainage ditches and/or energy dissipaters are eroding.
- The vegetation is established and stable.
- Modifications to the administrative controls are needed.

The mud pit inspections will include the following activities:

- Cap integrity monitoring (subsidence and erosion)
- Vegetative cover monitoring
- Photographic documentation

2.1 Preliminary Activities

Certain activities must be completed prior to commencing inspection activities. These preliminary activities are identified in the following sections.

2.1.1 Access to the Maritime National Wildlife Refuge, Amchitka Island

Amchitka Island is part of the Alaska Maritime National Wildlife Refuge, which is administered by USFWS. Access to the island is currently restricted to government agencies and entities specifically approved by USFWS. LM will submit a Special Use Permit application to USFWS to obtain authorization to access the island and conduct monitoring activities. LM and/or its contractors may not access the island until USFWS authorization is given through issuance of the Special Use Permit.

2.1.2 Project Personnel

All project personnel will be trained and qualified to perform their assigned tasks. Objective evidence of qualifications may include academic credentials, personal résumés, registrations and licenses, and training records.

Personnel qualifications shall be evaluated against assigned responsibilities, and any identified training needs will be addressed. Training will be based on regulatory requirements, scopes of work, and applicable work instructions. Table 2 identifies the key project personnel proposed to conduct the cap inspections. Additional personnel may be assigned as required by the project.

Table 2. Key Project Personnel

Key Personnel	Proposed Inspection Tasks[a]
Geologist	Inspect cap integrity, record findings, and perform repairs as required by this Plan
Engineer	Perform surveying, photograph cap areas, and log results as required by this Plan
Biologist	Inspect vegetation cover over each cap, record findings, and revegetate as required by this Plan

[a] Tasks may be assigned at the discretion of the performing entity and/or as required by field conditions.

2.2 Cap Integrity Monitoring

A physical inspection of each mud pit site will be conducted and will consist of visual observations and photo-documentation of the caps, energy dissipators, and areas adjacent to the cap. Notable damage to or degradation of the cap (e.g., subsidence, rills, erosion, animal burrows), loss of vegetation over significant portions of the cap, erosion along the base of or adjacent to the cap, or erosion of drainage ditches or energy dissipaters will be documented and reported. All findings from the site inspections will be documented on a post-closure monitoring checklist (see Appendix A) for submittal to DOE and for future reference and monitoring.

Cap inspections will follow the protocol outlined in Section 2.2.1.1, "Inspection Protocol," and will consist of on-site visual inspections along transects at predetermined intervals, photographing each site from predetermined photopoints, collecting subsidence and erosion measurements as necessary, making cover vegetation estimates, and photographing and staking deficient areas both on and adjacent to the cap.

2.2.1 Subsidence and Erosion

Each mud pit cap will be inspected for evidence of the following items:

- Areas of subsidence (settling)
- Cracks or small channels
- Ponding water
- Intrusion by humans or animals
- Trails or tracks showing human or animal activity

The area surrounding and adjacent to each cap, including drainage ditches and energy dissipators, will be inspected for the following items:

- Sediment fill or clogging
- Cracks or small channels
- Ponding water
- Intrusion by humans or animals

The inspection will document the location and amount of subsidence and/or erosion and any other deficiencies observed. Measurements will be taken to determine what corrective action is necessary (see Section 2.3).

2.2.1.1 Inspection Protocol

Table 3 outlines the proposed inspection specifications for each site. Actual field conditions may dictate a different specification(s) for a given site, and minor modifications to the specifications may be warranted (and documented) at the time of the inspection. Figure 2 provides an example of the proposed cap inspection pattern for each site. The 20-foot (ft) spacing between transect lines is proposed to ensure adequate visual coverage of each cap, but spacing may be adjusted based on site conditions. Use of a global positioning system (GPS) unit is proposed to stake the endpoints of the transects. A compass may be used to help the inspector stay on a straight course along each transect.

The inspection will begin at a predetermined corner of the cap and proceed in a predetermined direction and pattern (see Appendix B). All subsequent inspections of the cap will be conducted the same way, starting at the same point and proceeding in the same direction and pattern. The inspection starting and ending points and the transect line stakes will be recorded using GPS and documented on an attachment to the inspection form, using the corresponding mud pit site drawing found in Appendix B of this plan. The direction and pattern of the inspection will also be documented on the corresponding drawing. Documentation will consist of completing the post-closure monitoring checklist; measuring, photographing, surveying, and staking any deficient conditions; and recording inspection direction, pattern, and GPS readings on the corresponding mud pit site drawing. Inspection of drainage ditches and energy dissipaters will also be conducted in a predetermined, repeatable pattern and documented on the corresponding site drawing. Maps for each mud pit site indicating the proposed starting points, vegetative cover transects, and photopoints are included in Appendix B.

2.2.2 Vegetative Cover

The cap will be inspected to document percentage of vegetation on the cover, weeds, excessive grazing, disease, pests, and plant die-out. The percentage of vegetation on the cap will be estimated as identified in Appendix C, and the results will be attached to the completed post-closure monitoring checklist. Documentation will consist of completing a percentage of vegetative cover worksheet, and measuring, photographing, and staking any deficient conditions, as described in Section 2.2.2.1.

2.2.2.1 Inspection Protocol

Each cap will be divided into transects for purposes of reporting vegetation growth for that cap. The vegetative-cover inspection will begin at the same point and proceed in the same direction and pattern as the cap inspection (Table 3). All subsequent vegetation inspections will be conducted the same way, starting at the same point and proceeding in the same pattern. The vegetative-cover transects may be adjusted to overlap with the cap inspection transects if the transect lines are close to each other. The transects, the starting and ending points, and the direction and pattern of the inspection will be documented on an attachment to the checklist, using the corresponding mud pit site drawing in Appendix B. Appendix B drawings show the vegetative-cover grid area, transect/photopoints, starting point, and visual inspection route from the 2006 inspection. When possible, these transects, routes, and points will be replicated for the 2011 inspection. A worksheet indicating percentage of vegetation cover (Appendix C) will also be completed and attached to the completed monitoring checklist. Appendix B indicates the proposed transect locations for each cap.

Table 3. Proposed Cap Inspection Specifications

Mud Pit Site Name	Perimeter Inspection Starting Point[a]	Cap Inspection Pattern	Vegetative Cover Transects[b]	Photopoints[c]
Milrow Rifle Range	South end of cap (on north side of energy dissipater)	• Begin at perimeter inspection starting point • Proceed northeast to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 4 transects (2 NW-SE, 2 SW-NE) • 9 total grid areas	4
Long Shot	Southeast corner of cap (just north of energy dissipater)	• Begin at perimeter inspection starting point • Proceed north to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 5 transects (3 N-W, 2 E-W) • 12 total grid areas	6
Cannikin North/South	Southeast corner of cap (just north of energy dissipater)	• Begin at perimeter inspection starting point • Proceed north to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 2 transects (1 NW-SE, 1 SW-NE) • 4 total grid areas	4
Cannikin Ground Zero	Easternmost corner of cap (at south end of energy dissipater)	• Begin at perimeter inspection starting point • Proceed northwest to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 5 transects (3 NW-SE, 2 SW-NE) • 12 total grid areas	6
Drill Site D – Northeast mud pit	Southeast corner of cap	• Begin at perimeter inspection starting point • Proceed north to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects to bend in cap, then proceed in NE-SW pattern • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 7 transects (6 SW-NE, 1 NW-SE) • 14 total grid areas	9
Drill Site D – Southwest mud pit	Southernmost edge of cap	• Begin at perimeter inspection starting point • Proceed northeast to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 5 transects (4 SW-NE, 1 NW-SE) • 8 total grid areas	6
Drill Site F	Far east side of cap	• Begin at perimeter inspection starting point • Proceed north to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 3 transects (2 N-S, 1 E-W) • 6 total grid areas	4
Drill Site E	Far northwest corner of cap	• Begin at perimeter inspection starting point • Proceed east to opposite side of cap • Continue to traverse and inspect cap on 20-ft transects until entire cap is inspected	• 2 transects (1 NW-SE, 1 SW-NE) • 4 total grid areas	4

[a] All perimeter inspections will be conducted in a counterclockwise direction. See Appendix B for corresponding drawings.
[b] Number of transects is minimum number recommended.
[c] Number of photopoints is minimum number recommended. Photopoints are numbered in a counterclockwise direction.

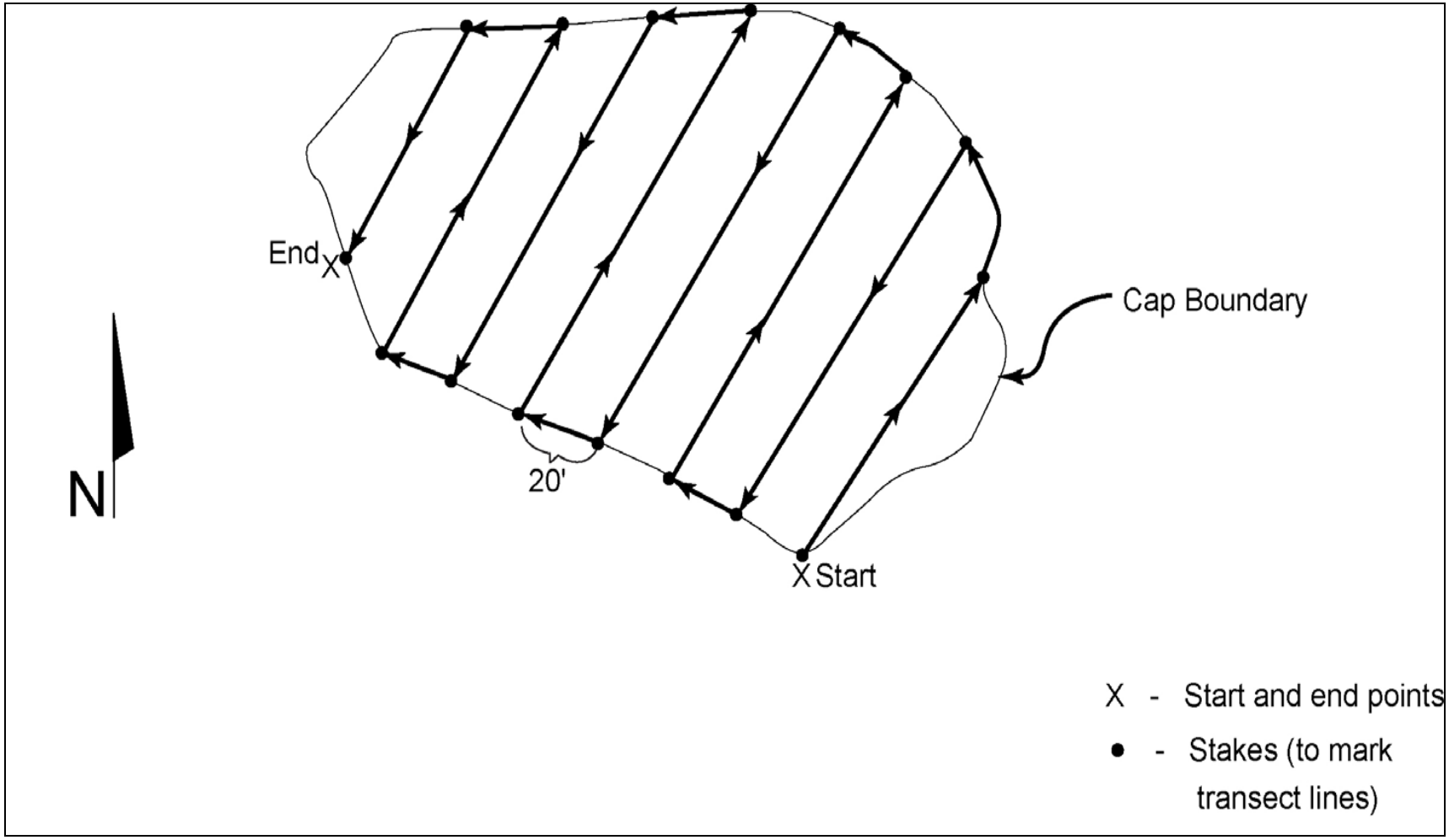


Figure 2. Example of Cap Inspection Pattern on 20-ft Transects

2.2.3 Photographic Documentation

Photographs will be taken during the inspection, at pre-established photopoints. During each subsequent inspection, photographs will be retaken from the same photopoints so that differences over time can be documented and referenced. The minimum number of permanent directional photopoints proposed for each site is listed in Table 3, and their proposed locations are indicated on the drawings in Appendix B. Each permanent photopoint will be staked, and the coordinates established using GPS and documented for future reference.

Each photograph will be logged on a photograph log (see Appendix D). A digital camera or 35-millimeter camera may be used. If digital images are made, they will be downloaded on a daily basis and archived.

Deficient areas will also be photographed and logged. The number and direction of these photos will be determined in the field on a case-by-case basis, and will be such that the deficiency can be accurately viewed and documented.

2.3 Site Maintenance and Repair

Repair of deficient site conditions will be categorized as either maintenance or structural. Deficiencies in a cap, energy dissipater, or drainage ditch will be evaluated, assigned to the appropriate repair category, and repaired as described below.

2.3.1 Maintenance Repairs

Site deficiencies that are considered maintenance repairs result from typical site conditions, including normal weather conditions, seasonal vegetation growth/die-out, and normal animal activity, and are minor in nature. If possible, these deficiencies will be corrected during the inspection. Those maintenance repair deficiencies that cannot be corrected at the time of the inspection will be noted and corrected at the next 5-year inspection. Table 4 provides examples of conditions that may require maintenance repairs, associated repairs, and agency notification requirements.

2.3.2 Structural Repairs

Site deficiencies that are considered structural repairs result from atypical site conditions, including severe weather conditions, excessive vegetation growth/die-out, excessive animal activity, and vandalism. These conditions are considered significant and cannot be corrected during the inspection. Examples of structural repairs are provided in Table 4.

Table 4. Examples of Deficiencies Requiring Maintenance or Structural Repairs

Deficient Condition	Repair Action	Repair Schedule	Agency Notification
Maintenance Repair			
Cracks, subsidences, erosional rills, and/or animal burrows <15 centimeters (6 inches) deep and extending <1 meter (3 ft).	Backfill with soil, compact to re-establish grade, and seed and mulch to re-establish vegetation (if applicable).	Repair by hand during site inspection visit.	None. Document deficiency and corrective action in inspection report.
Cracks, subsidences, erosional rills and/or animal burrows >15 centimeters (6 inches) deep and extending >1 meter (3 ft), but not intruding into the cap geomembrane layer, energy dissipaters or drainage ditches.	Backfill with soil, compact to re-establish grade, and seed and mulch to re-establish vegetation (if applicable).	Evaluate and repair by hand during site inspection visit or as site conditions allow.	Document deficiency and corrective action in inspection report. Plan for subsequent action at next 5-year inspection.
Vegetative cover <50% on cap grid.	Seed and mulch to re-establish vegetation.	Evaluate and repair by hand during site inspection visit or as site conditions allow.	Document deficiency and corrective action in inspection report. Plan for subsequent action at next 5-year inspection.
Moved or missing survey points (i.e., photopoints, transect line stakes)	Re-establish survey points.	Repair during site inspection visit.	None. Document deficiency and corrective action in inspection report.
Structural Repair			
Cracks, subsidences, erosional rills and/or animal burrows >15 centimeters (6 inches) deep and extending >1 meter (3 ft), intruding into the cap geomembrane layer, energy dissipaters, and/or drainage ditches.	Repair/reconstruct underlying structural layer, backfill with soil, compact to re-establish grade, and seed and mulch to re-establish vegetation (if applicable). Resurveying of grade might be required.	Evaluate and repair as possible by hand during site inspection visit or as site conditions allow. Need for further action will be discussed with stakeholders.	Document deficiency and prepare corrective action plan in inspection report or as stand-alone document. Develop consensus with stakeholders as to further action.
Flood damage to site in form of new channels or debris deposits.	Repair/reconstruct underlying structural layer, backfill with soil, compact to re-establish grade, and seed and mulch to re-establish vegetation (if applicable). Resurveying of grade might be required.	Evaluate and repair as possible by hand during site inspection visit or as site conditions allow. Need for further action will be discussed with stakeholders.	Document deficiency and prepare corrective action plan in inspection report or as stand-alone document. Develop consensus with stakeholders as to further action.
Manmade or animal intrusions resulting in removal of cover materials.	Repair/reconstruct underlying structural layer, backfill with soil, compact to re-establish grade, and seed and mulch to re-establish vegetation (if applicable). Resurveying of grade might be required.	Evaluate and repair as possible by hand during site inspection visit or as site conditions allow. Need for further action will be discussed with stakeholders.	Document deficiency and prepare corrective action plan in inspection report or as stand-alone document. Develop consensus with stakeholders as to further action.

Table 4 (continued). Examples of Deficiencies Requiring Maintenance or Structural Repairs

Deficient Condition	Repair Action	Repair Schedule	Agency Notification
Encroachment of stream channels or gullies into cap materials.	Repair/reconstruct underlying structural layer, backfill with soil, compact to re-establish grade, and seed and mulch to re-establish vegetation (if applicable). Resurveying of grade might be required.	Evaluate and repair as possible by hand during site inspection visit or as site conditions allow. Need for further action will be discussed with stakeholders.	Document deficiency and prepare corrective action plan in inspection report or as stand-alone document. Develop consensus with stakeholders as to further action.

Structural repairs might involve regrading an area to modify drainage to reduce run-off and/or erosion problems. All repair work will attempt to preserve the original cover as-built design; however, permanent modification might be required to prevent a reoccurrence of detrimental site conditions. In that case, the area will be resurveyed to establish new baseline conditions. The method of and schedule for repairs will be developed in consultation between the Alaska Department of Environmental Conservation and DOE.

2.4 Recordkeeping and Reporting

2.4.1 Permanent File

LM will maintain a permanent file containing the mud pit sites inspection reports and other supporting documentation of the long-term surveillance activities. The repository for this file is located at the LM office in Grand Junction, Colorado. The information placed in the site file will include:

- Documentation of inspection results (e.g., checklists, drawings, survey results, photographs).
- Supporting information to help forecast future site surveillance and monitoring needs.
- Reports to stakeholders regarding mud pit cap integrity, performance, and deficiencies.

LM will update this file as necessary after the cap inspections, maintenance activities, or corrective actions are complete. These records will be maintained in accordance with DOE directives to ensure their proper handling, maintenance, and disposition, and with the archival procedures set forth in Title 41 *Code of Federal Regulations* Part 101 (41 CFR 101), "Federal Property Management Regulations," and 36 CFR Parts 1220-1239, Subchapter B, "Records Management." This file will be available for public review.

2.4.2 Inspection Reports

The cap inspection activities, observations, and deficiencies will be documented using inspection checklists, site drawings, photographs and photo logs, vegetative cover logs, and field notes. The entity performing the inspections will prepare an inspection report following completion of each 5-year review and will submit this report to LM for review and approval. The report will also contain the results of follow-up inspections and/or maintenance performed since the previous inspection. LM will, in turn, submit the report to Alaska Department of Environmental Conservation within 90 days of completion of the inspection for information and review.

If corrective action is required to repair damage to a site during an inspection, a corrective action plan and subsequent corrective action report may also be prepared, at the discretion of LM. The corrective action documents may be submitted separately from the inspection report or as an attachment to it.

3.0 Well Abandonment

Three wells will be inspected on Amchitka in 2011. Two of these wells are groundwater monitoring wells located at the Long Shot Site, and the third is a hydrologic test well located at Drill Site E. The two groundwater monitoring wells at the Long Shot Site are GZ-1 and GZ-2 and were part of the U.S. Environmental Protection Agency's Long-Term Hydrologic Monitoring Program (DOE 1982). The wells are 2 inches in diameter and are inside a 4-inch protective casing. The depths of GZ-1 and GZ-2 are 100 ft and 50 ft, respectively. Figure 3 and Figure 4 are photographs of these two wells. The Site E well is exploratory hole UAE-7c/h (also called Site E Hydro Exploratory Hole) that was drilled to 7,495 ft, plugged back to 1,040 ft, and then sidetracked for UAE-7H to a final depth of 6,273 ft (Fenix & Scission 1972). At ground level, this is an 8-5/8-inch cored hole. The surface expression of this exploratory hole is shown in Figure 5 and Figure 6.

Figure 3. Long Shot Wells GZ-1 and GZ-2

Figure 4. Long Shot Wells GZ-1 and GZ-2 Viewed from Atop the Long Shot Earthen Cover

Figure 5. Drill Site E Well UAE-7c/h

Figure 6. Drill Site E Well UAE-7c/h

A borehole video camera will be placed down each of the 2-inch wells to determine the competency of each of the wells. If a well is determined to be compromised (e.g., can't get the borehole camera to total depth), the well will be abandoned. The 2-inch wells will be abandoned by either pulling the protective casing out of the borehole or cutting the outside protective casing at ground level. Once the protective casing has been removed, the 2-inch well will be cut off at ground level and filled with bentonite hole plug from bottom to top. It is estimated that the 50- and 100-ft wells will take two to four 5-gallon buckets of hole plug, respectively, to fill each 2-inch well.

The UAE-7c/h open casing will have a metal plate attached to the top of the casing and secured in place by bolts that will extend through the metal plate and through the existing holes in the flange around the top of the casing.

4.0 Infantry Road Repair

LM's Site F is more than 24 miles from Constantine Harbor. To get from the harbor to Site F, as well as to all LM sites on the island, field personnel will use Infantry Road for access. Since 2006, LM has been on-island twice and has noted several areas of Infantry Road that make vehicle access difficult or impossible because of deterioration of the roadbed. LM's mission does not include repair of the Infantry Road roadbed but does include getting access to the DOE sites.

During LM's last trip to Amchitka Island in the summer of 2008, Infantry Road was impassable near Mile Marker (MM) 8 and marginally passable just south of the Long Shot Site near MM 4. At both locations, the roadbed has been, or soon will be, washed out. The washout appears to be due to inadequate culvert size to handle peak stream flow beneath the roadbed. During peak stream flows, water backs up on the upstream side of the roadbed until the surface water level begins to flow over the top of the roadbed, causing erosion on both sides, but primarily on the downstream side, of the roadbed. Figure 7 shows the partial roadbed washout near MM 4, and Figure 8 shows the roadbed washout near MM 8.

When personnel from DOE's Office of Environmental Management (EM) were on-island to perform the cap inspection in 2006, the roadbed near MM 8 was not yet completely washed out, and its condition was similar to that of the roadbed near MM 4 in 2008. For the 2011 on-island work, it is likely that the roadbed will be completely washed out near MM 4.

Figure 7. Infantry Road Partial Washout near MM 4

Figure 8. Infantry Road Washout near MM 8

To get around the washout near MM 8 in 2008, the three all-terrain vehicles (ATVs) used for transportation had to detour around the washout and ford the stream at a safe location. Figure 9 shows the stream crossing just downstream of the MM 8 roadbed washout.

In 2011, four-wheel-drive utility vehicles will be used instead of ATVs, and one of the utility vehicles will be a four-passenger vehicle. This change of vehicle type will lessen the off-road maneuverability that the previous ATVs provided, and more care must be taken in choosing a safe, passable stream crossing. The utility vehicles can probably use the same stream crossing at MM 8 that the ATVs used, but the stream crossing at MM 4 may require some existing road embankment modification to facilitate a safe crossing.

In 2008, the area around MM 4 was scouted briefly for a potential stream crossing. The terrain near MM 4 has many small streams that have incised the local topography and have created steep-banked stream terraces. To ensure a safe stream crossing, a skid steer loader will be available for minor excavation work within the footprint of the roadway such as cutting back the road embankment to allow the utility vehicles to cross the stream safely.

Figure 9. Stream crossing near MM 8

5.0 Milrow SGZ Plaque Repair

Sometime prior to EM's 2006 inspection of the sites on Amchitka, the SGZ plaque at Milrow had been removed. One of the informal recommendations of the 2006 inspection was to replace the SGZ marker as soon as possible. When LM representatives visited Amchitka in 2008 to reseed several of the earthen covers, plans were made to place a new SGZ plaque at Milrow. That task was partially completed in 2008, but the foundation of the plaque required more concrete than was brought in 2008. The concrete form and SGZ plaque were left in place, and the additional concrete is planned be added to the base of the SGZ plaque during the next site inspection. Figure 10 shows the 2 × 6 form, approximately 34 inches by 22 inches in area, that the SGZ plaque rests on. Additional concrete will be added to bring the base up into contact with the bottom of the plaque.

Figure 10. Setting Milrow Plaque-1

6.0 References

DOE (U.S. Department of Energy), 1982. *Long-Term Hydrologic Monitoring Program Amchitka Island, Alaska,* NVO-242.

DOE (U.S. Department of Energy), 2005. *Post-Closure Monitoring and Inspection Plan for Amchitka Island Mud Pit Release Sites*, DOE/NV-1054, Rev 1, National Nuclear Security Administration Nevada Site Office (DOE/NSO), November.

DOE (U.S. Department of Energy), 2008a. *Long-Term Surveillance and Maintenance Plan for the U.S. Department of Energy Amchitka, Alaska, Site*, LMS/AMC/S01980, Office of Legacy Management, Grand Junction, Colorado, September.

DOE (U.S. Department of Energy), 2008b. *Record of Decision for Amchitka Surface Closure, Alaska*, LMS/AMC/S04623 Office of Legacy Management, Grand Junction, Colorado, August.

Fenix & Scission, Inc., 1972. *Abandonment of Drilled Holes Amchitka Island Alaska*, April.

NNSA/NV (U.S. Department of Energy, National Nuclear Security Administration Nevada Operations Office), 2001. *Remedial Action Work Plan Amchitka Island Mud Pit Closures,* Rev. 1, DOE/NV-682, Las Vegas, NV.

NNSA/NV (U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office), 2003. *Amchitka Island Surface Closure Report*, Rev. 1, DOE/NV-819, Las Vegas, NV.

Appendix A

Amchitka Mud Pit Release Sites
Post-Closure Monitoring Checklist

This page intentionally left blank

AMCHITKA MUD PIT SITES POST-CLOSURE MONITORING CHECKLIST

Mud Pit Site:	Date of Inspection:
Responsible Agency:	Project Manager:
Inspector (name, title, organization):	

A. General Instructions

1. All checklist items must be completed and detailed comments made to document the results of the site inspection.
2. The completed checklist is part of the field record of the inspection. Additional pages should be used as necessary to ensure that a complete record is made. Number and attach the additional pages upon completion of the inspection.
3. Any checklist line item marked by an inspector in a SHADED BOX must be fully explained or an appropriate reference to previous reports provided. The explanation should include the inspector's rationale for conclusions and recommendations, if appropriate. Explanations are to be placed on additional attachments and cross-referenced appropriately, and may take the form of sketches, measurements, and/or annotated site maps.
4. The site inspection is a walking inspection of the entire site, including the perimeter and sufficient transects to be able to inspect the entire surface and all features specifically described in this checklist. Attach a drawing indicating the starting and ending points and the direction and pattern of the inspection.
5. A standard set of color 35 mm photographs (or equivalent) is required. In addition, all anomalous features or new features (such as changes in adjacent area land use) are to be photographed. A photo log entry will be made for each photograph taken.

B. Preparation (to be completed prior to site visit)	YES	NO	EXPLANATION
1. Site as-built plans and site base map reviewed			
2. Previous inspection reports reviewed			
a. Were anomalies or trends detected on previous inspections?			
b. Was maintenance performed on areas with anomalies?			
3. Site maintenance and repair records reviewed			
a. Has site repair resulted in a change from as-built conditions?			
b. Are revised as-builts available that reflect repair changes?			

C. Site Inspection (to be completed during inspection)	YES	NO	EXPLANATION
1. Adjacent offsite features within mud pit site area			
a. Changes in use of adjacent area?			
b. Any new roads or trails?			
c. Change in the position of nearby washes?			
d. Erosion/deposition of nearby washes?			
e. New drainage channels?			
f. Change in surrounding vegetation?			
2. Security markers; signs			
a. Displacement of site markers, boundary markers, or monuments?			
b. Signs damaged or removed?			
3. Cap			
a. Evidence of subsidence?			
b. Evidence of cracking?			
c. Evidence of erosion (wind or water)?			
d. Evidence of animal burrowing?			
e. Are site markers disturbed? By man?_____ By natural processes?_____			
f. Do natural processes threaten the integrity of cap or site marker?			

AMCHITKA MUD PIT SITES POST-CLOSURE MONITORING CHECKLIST (continued)

Mud Pit Site:	Date of Inspection:

C. Site inspection (continued)	YES	NO	EXPLANATION
4. Vegetative cover			
a. Is plant cover adequate to prevent erosion?			
b. Are weedy annual plants present? Do they require removal?			
c. Evidence of animals on cap?			
d. Evidence of excessive plant mortality?			
e. Has a vegetative cover log been completed?			
5. Photo Documentation			
a. Has a photo log been prepared?			
b. How many photos were taken? _____			

D. Field Conclusions			
1. Imminent hazard to integrity of cap? (If yes, immediate report required. Note the person or agency the report will be made to.)			
2. Are more frequent inspections required?			
3. Are existing maintenance actions satisfactory?			
4. Are existing repair actions satisfactory?			
5. Is other maintenance/repair necessary?			
6. Rationale for field conclusions:			
7. Factors contributing to or impacting inspection:			

E. Certification

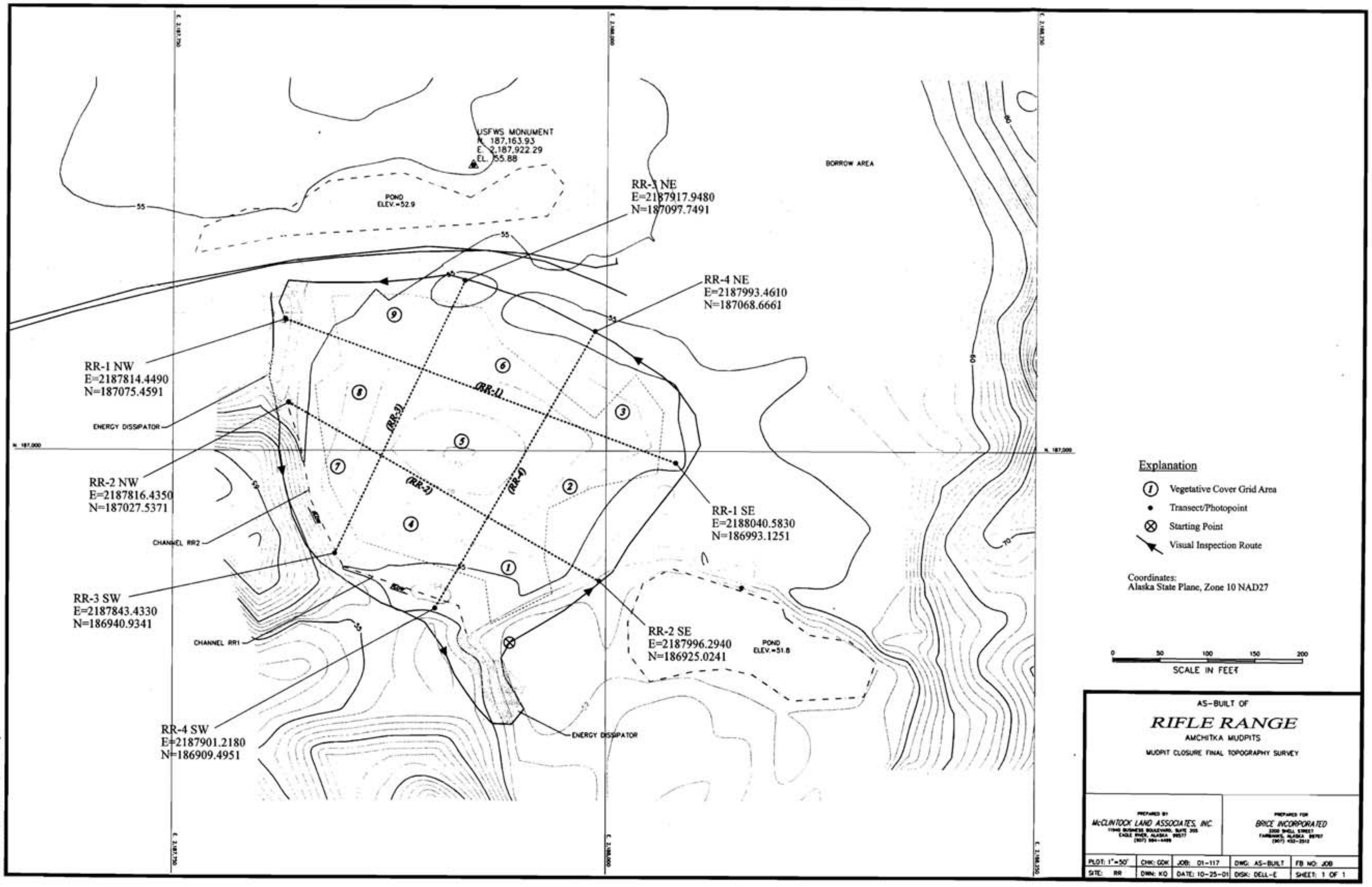
I certify that I have conducted an inspection of the _____ Mud Pit Site cap in accordance with the Monitoring and Inspection Plan for the Amchitka Mud Pit Release Sites, Rev. ___, dated _____, as recorded on this checklist, attached sheets, field notes, vegetative cover log, photo logs, and photographs.

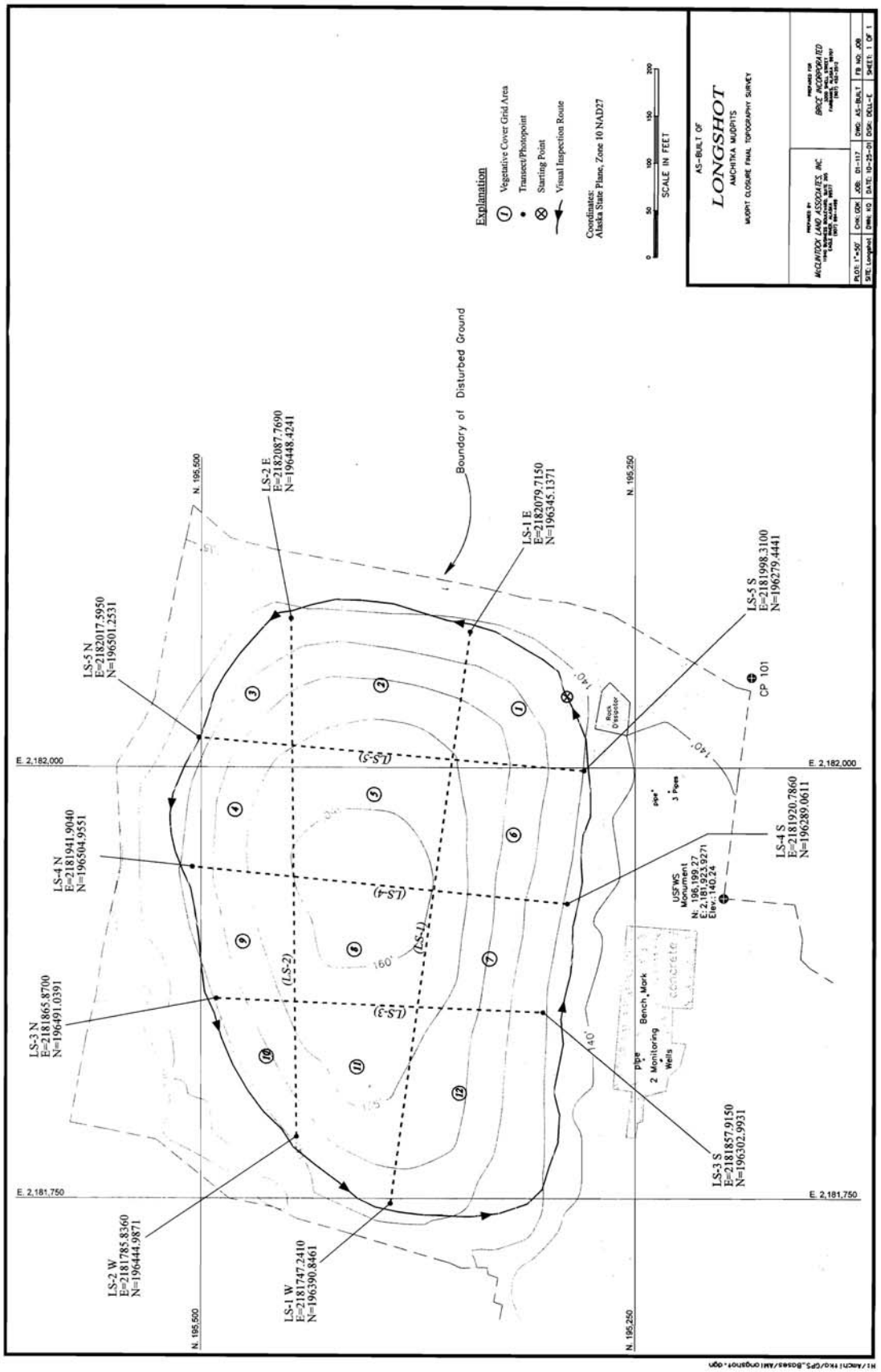
Inspector Printed Name:	Inspector Signature:
Title:	Date:

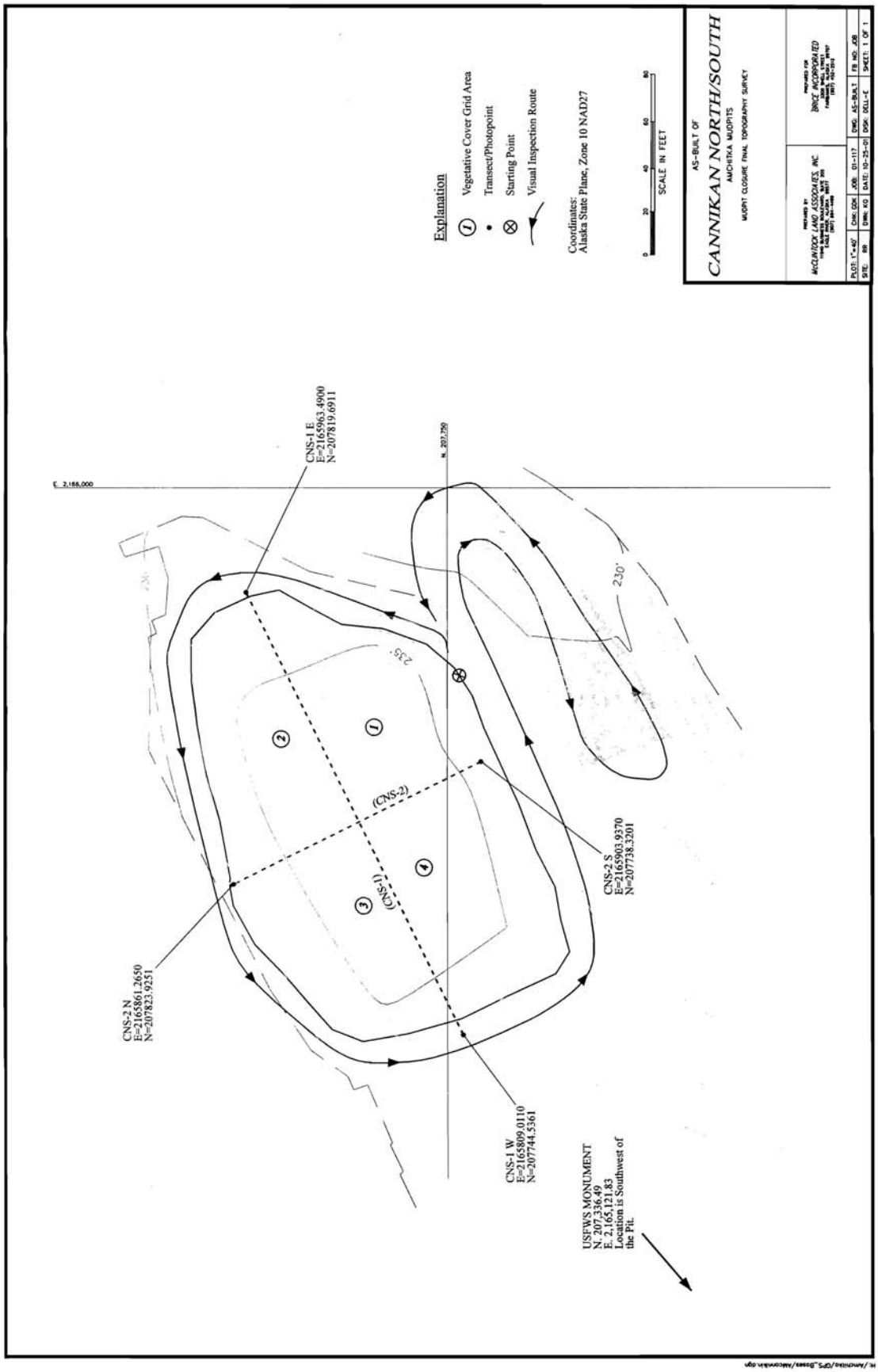
Appendix B

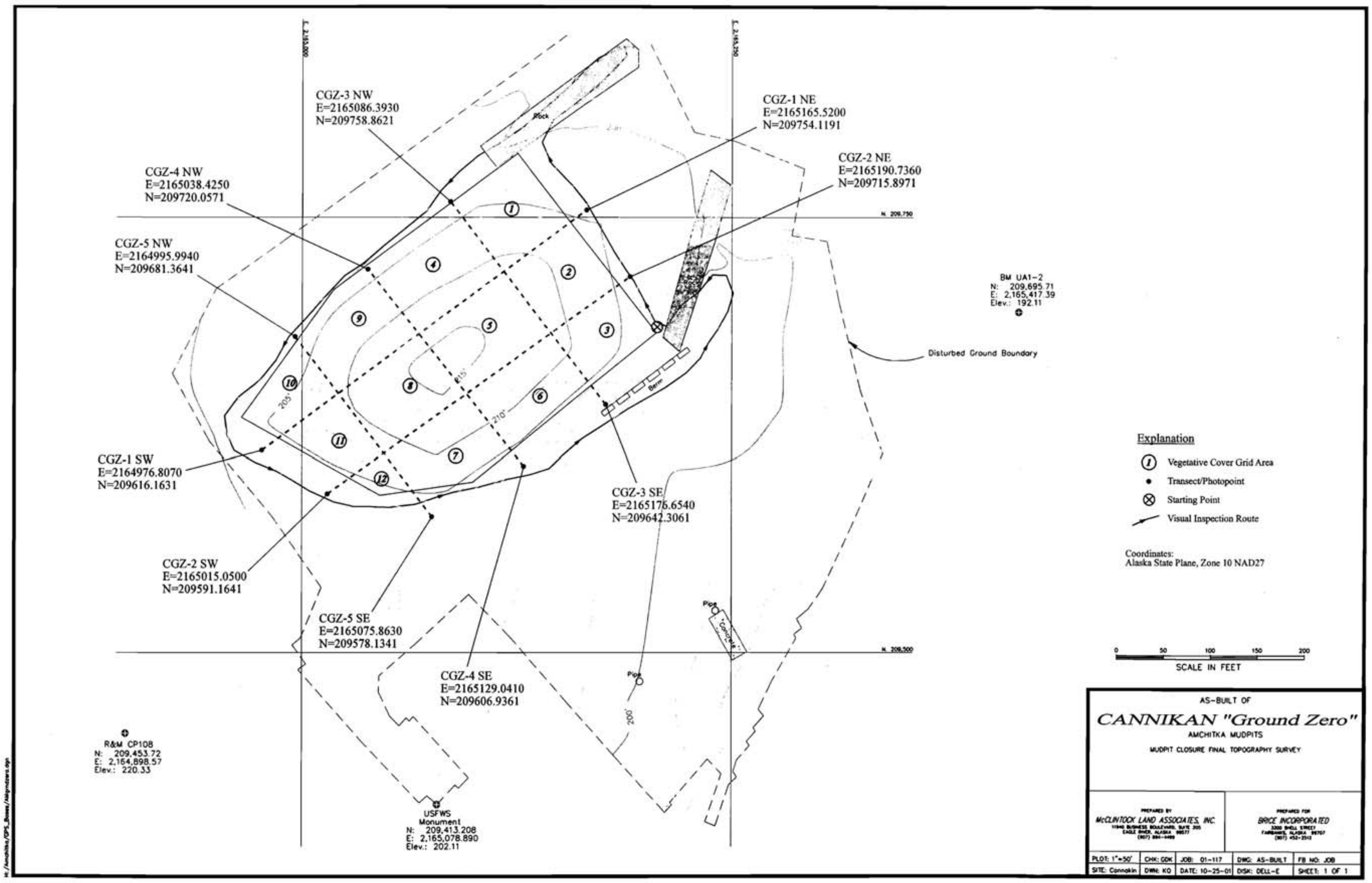
Amchitka Mud Pit Release Sites
Site Drawings

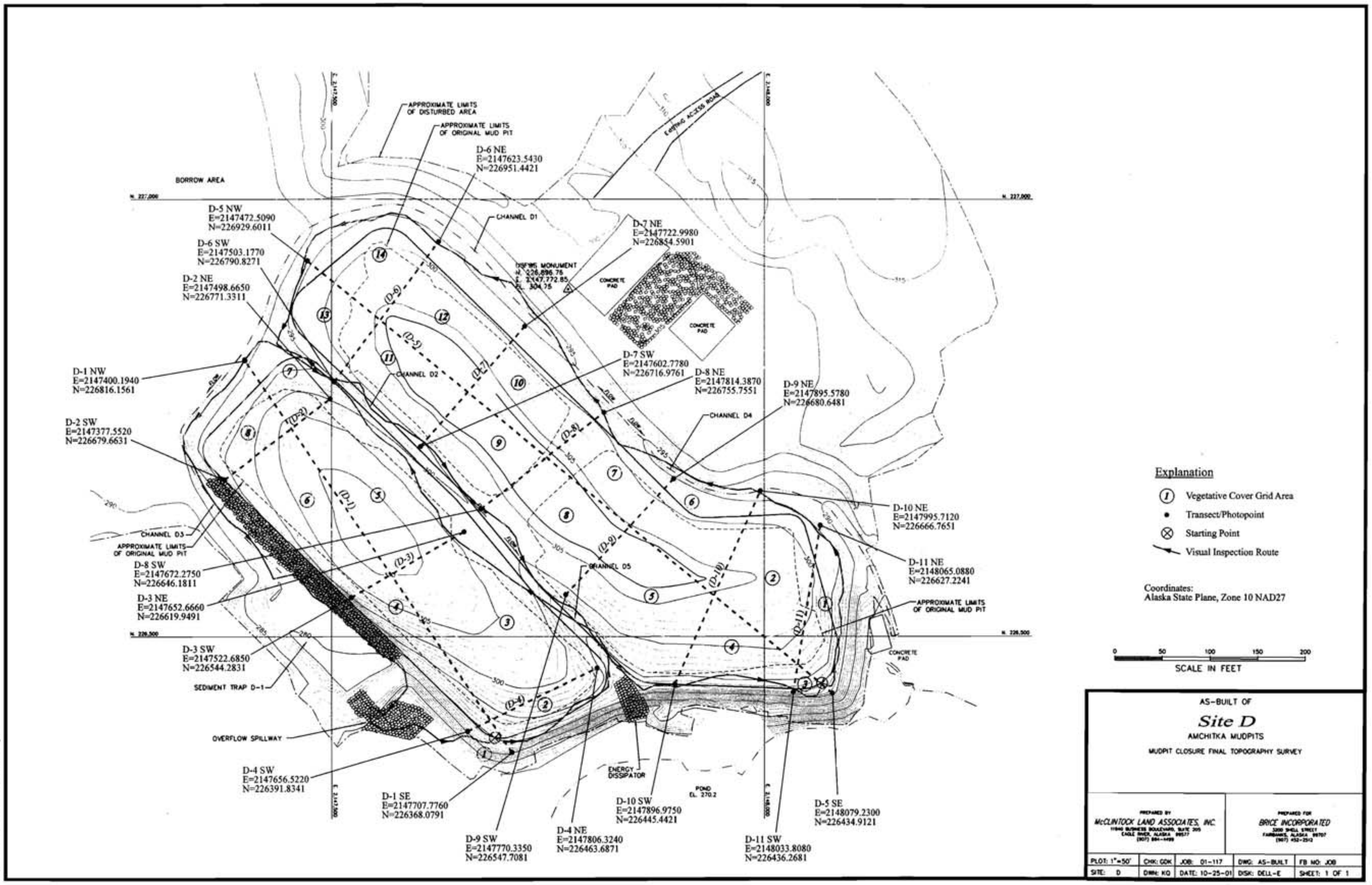
This page intentionally left blank


USFWS MONUMENT
N 187,163.93
E 2,187,922.29
EL. 55.88
POND
ELEV.=52.9
BORROW AREA
RR-3 NE
E=2187917.9480
N=187097.7491
RR-4 NE
E=2187993.4610
N=187068.6661
RR-1 NW
E=2187814.4490
N=187075.4591
ENERGY DISSIPATOR
RR-2 NW
E=2187816.4350
N=187027.5371
CHANNEL RR2
RR-3 SW
E=2187843.4330
N=186940.9341
CHANNEL RR1
RR-4 SW
E=2187901.2180
N=186909.4951
RR-1 SE
E=2188040.5830
N=186993.1251
RR-2 SE
E=2187996.2940
N=186925.0241
POND
ELEV.=51.8
ENERGY DISSIPATOR
(RR-1)
(RR-2)
(RR-3)
(RR-4)
Explanation
Vegetative Cover Grid Area
Transect/Photopoint
Starting Point
Visual Inspection Route
Coordinates:
Alaska State Plane, Zone 10 NAD27
SCALE IN FEET
AS-BUILT OF
RIFLE RANGE
AMCHITKA MUDPITS
MUDPIT CLOSURE FINAL TOPOGRAPHY SURVEY
PREPARED BY
McCLINTOCK LAND ASSOCIATES, INC.
PREPARED FOR
BRICE INCORPORATED
PLOT: 1"=50'
CHK: GDK
JOB: 01-117
DWG: AS-BUILT
FB NO: JOB
SITE: RR
DWN: KQ
DATE: 10-25-01
DISK: DELL-E
SHEET: 1 OF 1
H:/Amchitka/GPS_Bases/AMrifle.dgn

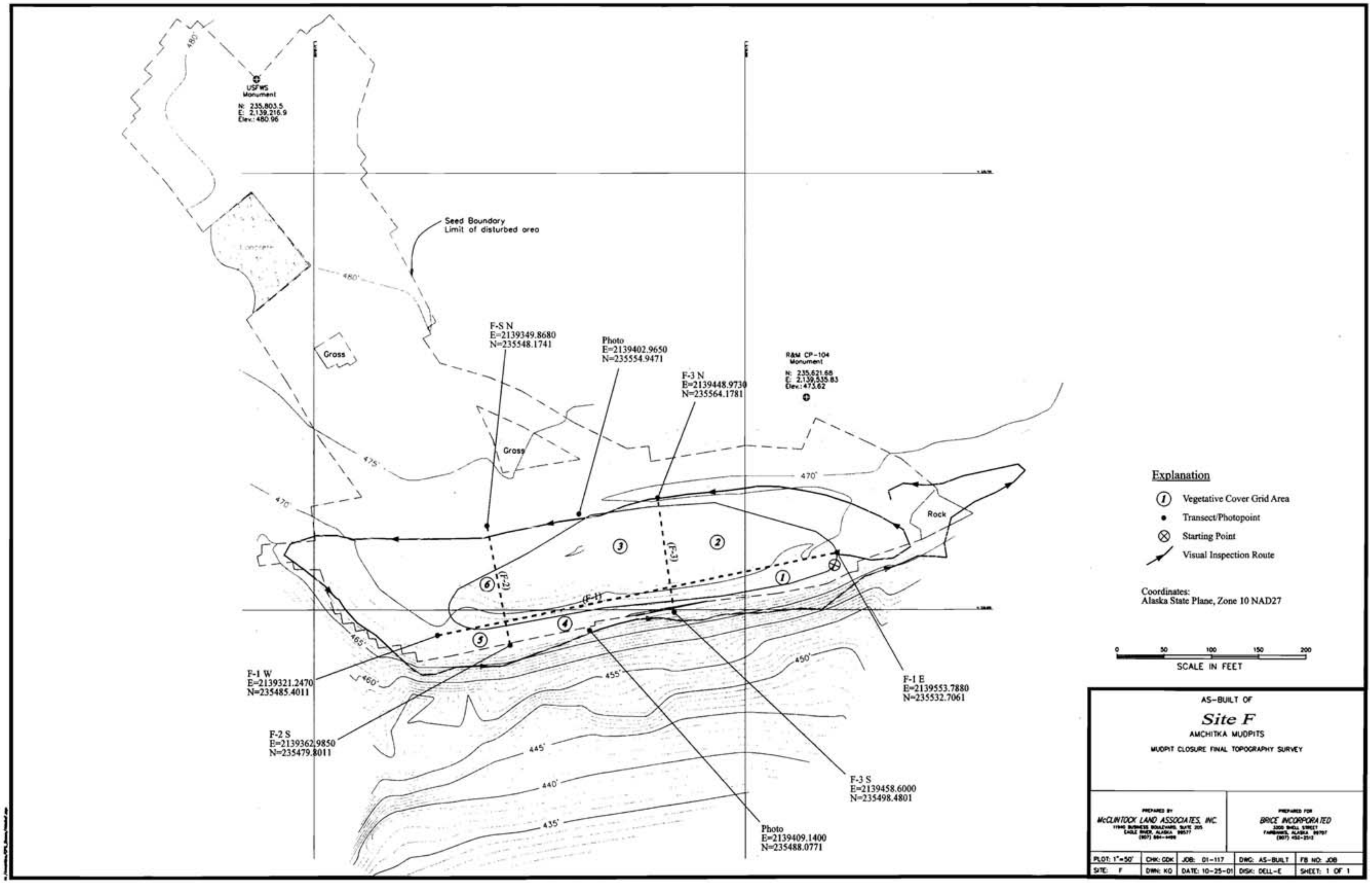

AS-BUILT OF
LONGSHOT
AMCHITKA MUDPITS
MUDPIT CLOSURE FINAL TOPOGRAPHY SURVEY
SCALE IN FEET
Explanation
Vegetative Cover Grid Area
Transect/Photopoint
Starting Point
Visual Inspection Route
Coordinates:
Alaska State Plane, Zone 10 NAD27
Boundary of Disturbed Ground
LS-1 E
E=2182079.7150
N=196345.1371
LS-2 E
E=2182087.7690
N=196448.4241
LS-3 N
E=2181865.8700
N=196491.0391
LS-4 N
E=2181941.9040
N=196504.9551
LS-5 N
E=2182017.5950
N=196501.2531
LS-1 W
E=2181747.2410
N=196390.8461
LS-2 W
E=2181785.8360
N=196444.9871
LS-3 S
E=2181857.9150
N=196302.9931
LS-4 S
E=2181920.7860
N=196289.0611
LS-5 S
E=2181998.3100
N=196279.4441
CP 101
USFWS Monument
N: 196,199.27
E: 2,181,923.9271
Elev.: 140.24
Rock Disaster
3 Pipes
pipe
Bench Mark
2 Monitoring Wells
concrete
E. 2,182,000
E. 2,181,750
N. 195,500
N. 195,250

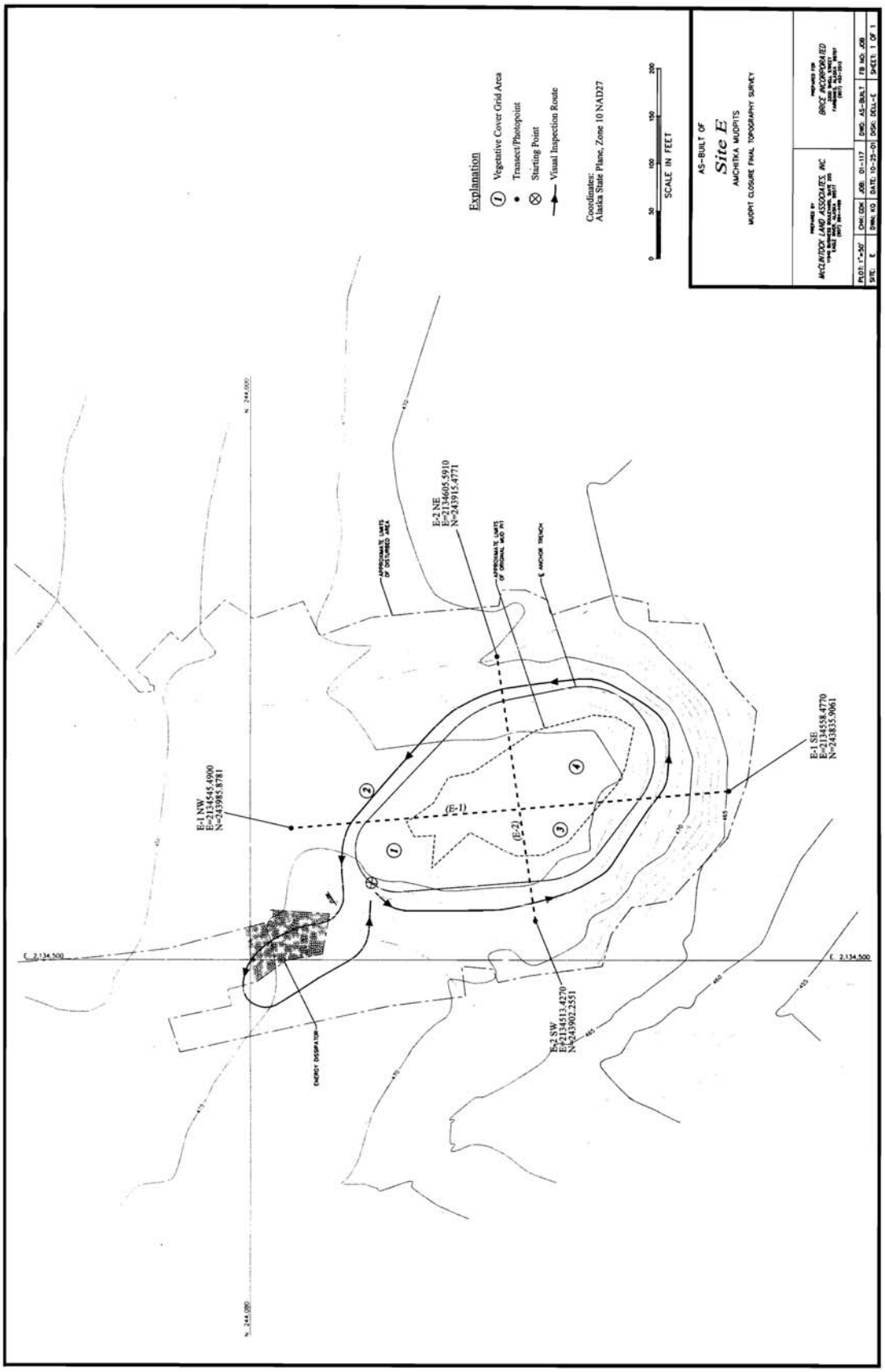

AS-BUILT OF
CANNIKAN NORTH/SOUTH
AMCHITKA MUDPITS
MUDPIT CLOSURE FINAL TOPOGRAPHY SURVEY
PREPARED BY
McCLINTOCK LAND ASSOCIATES, INC.
PREPARED FOR
BRICE INCORPORATED
PLOT: 1"=40'
SITE: 89
CHK: GDK
DRN: KG
JOB: 01-117
DATE: 10-25-01
DWG: AS-BUILT
DSN: XSLL-C
FB NO. JOB
SHEET: 1 OF 1
Explanation
Vegetative Cover Grid Area
Transect/Photopoint
Starting Point
Visual Inspection Route
Coordinates:
Alaska State Plane, Zone 10 NAD27
SCALE IN FEET
0
20
40
60
80
E. 2,166,000
N. 207,759
CNS-1 E
E=2165963.4900
N=207819.6911
CNS-2 N
E=2165861.2650
N=207823.9251
CNS-2 S
E=2165903.9370
N=207738.3201
CNS-1 W
E=2165809.0110
N=207744.5361
(CNS-2)
(CNS-1)
230'
235'
USFWS MONUMENT
N. 207,336.49
E. 2,165,121.83
Location is Southwest of
the Pit.


CGZ-3 NW
E=2165086.3930
N=209758.8621
CGZ-1 NE
E=2165165.5200
N=209754.1191
CGZ-2 NE
E=2165190.7360
N=209715.8971
CGZ-4 NW
E=2165038.4250
N=209720.0571
CGZ-5 NW
E=2164995.9940
N=209681.3641
CGZ-1 SW
E=2164976.8070
N=209616.1631
CGZ-2 SW
E=2165015.0500
N=209591.1641
CGZ-5 SE
E=2165075.8630
N=209578.1341
CGZ-4 SE
E=2165129.0410
N=209606.9361
CGZ-3 SE
E=2165176.6540
N=209642.3061
BM UA1-2
N: 209,695.71
E: 2,165,417.39
Elev.: 192.11
Disturbed Ground Boundary
R&M CP108
N: 209,453.72
E: 2,164,898.57
Elev.: 220.33
USFWS
Monument
N: 209,413.208
E: 2,165,078.890
Elev.: 202.11
Rock
Berm
Pipe
Concrete
N. 209,750
N. 209,500
205'
210'
215'
200'
Explanation
Vegetative Cover Grid Area
Transect/Photopoint
Starting Point
Visual Inspection Route
Coordinates:
Alaska State Plane, Zone 10 NAD27
SCALE IN FEET
0
50
100
150
200
AS-BUILT OF
CANNIKAN "Ground Zero"
AMCHITKA MUDPITS
MUDPIT CLOSURE FINAL TOPOGRAPHY SURVEY
PREPARED BY
McCLINTOCK LAND ASSOCIATES, INC.
PREPARED FOR
BRICE INCORPORATED
PLOT: 1"=50'
CHK: GDK
JOB: 01-117
DWG: AS-BUILT
FB NO: JOB
SITE: Cannakin
DWN: KO
DATE: 10-25-01
DISK: DELL-E
SHEET: 1 OF 1



H:/Amchitka/GPS_Bases/AMsiteD.dgn


USFWS Monument
N: 235,803.5
E: 2,139,216.9
Elev.: 480.96
480'
Seed Boundary
Limit of disturbed area
Concrete
Grass
475'
470'
465'
460'
455'
450'
445'
440'
435'
F-S N
E=2139349.8680
N=235548.1741
Photo
E=2139402.9650
N=235554.9471
F-3 N
E=2139448.9730
N=235564.1781
R&M CP-104 Monument
N: 235,621.68
E: 2,139,535.83
Elev.: 473.62
Rock
(F-1)
(F-2)
(F-3)
F-1 W
E=2139321.2470
N=235485.4011
F-2 S
E=2139362.9850
N=235479.8011
Photo
E=2139409.1400
N=235488.0771
F-3 S
E=2139458.6000
N=235498.4801
F-1 E
E=2139553.7880
N=235532.7061
Explanation
Vegetative Cover Grid Area
Transect/Photopoint
Starting Point
Visual Inspection Route
Coordinates:
Alaska State Plane, Zone 10 NAD27
0 50 100 150 200
SCALE IN FEET
AS-BUILT OF
Site F
AMCHITKA MUDPITS
MUDPIT CLOSURE FINAL TOPOGRAPHY SURVEY
PREPARED BY
McCLINTOCK LAND ASSOCIATES, INC.
PREPARED FOR
BRICE INCORPORATED
PLOT: 1"=50'
CHK: GDK
JOB: 01-117
DWG: AS-BUILT
FB NO: JOB
SITE: F
DWN: KO
DATE: 10-25-01
DISK: DELL-E
SHEET: 1 OF 1


AS-BUILT OF
Site E
AMCHITKA MUDPITS
MUDPIT CLOSURE FINAL TOPOGRAPHY SURVEY
PREPARED BY
MCCLAIN ROCK LAND ASSOCIATES, INC.
PREPARED FOR
BRICE INCORPORATED
SCALE: 1"=50'
DWG. NO.
CHK. CDM
JOB: 01-117
DWG: AS-BUILT
FB NO. 109
DATE: 10-25-01
DSN: DEL-E
SHEET: 1 OF 1
Explanation
1 Vegetative Cover Grid Area
Transect/Photopoint
Starting Point
Visual Inspection Route
Coordinates:
Alaska State Plane, Zone 10 NAD27
SCALE IN FEET
0
50
100
150
200
E-1 NW
E=2134545.4900
N=243985.8781
E-2 NE
E=2134605.5910
N=243915.4771
E-1 SE
E=2134558.4770
N=243835.9061
E-2 SW
E=2134513.4270
N=243902.2551
APPROXIMATE LIMITS OF DISTURBED AREA
APPROXIMATE LIMITS OF ORIGINAL MUD PIT
E. ANCHOR TRENCH
ENERGY DISSIPATOR
(E-1)
(E-2)
E. 2,134,500
N. 244,000
N. 244,080

This page intentionally left blank

Appendix C

Amchitka Mud Pit Release Sites
Percentage of Vegetative Cover Worksheet

This page intentionally left blank

Vegetative Cover Log

Mud Pit Site:

Grid Area	% Vegetative Cover (check one)				Plant type(s)	Comments
	0-25	25-50	50-75	75-100		

This page intentionally left blank

Appendix D

Photograph Log

This page intentionally left blank

PHOTOGRAPH LOG

Mud Pit Site:				
Date	**Photo #**	**GPS Location***	**Direction of Photo**	**DESCRIPTION (Note if photopoint)**

*GPS location datum AK State Plane 1983

This page intentionally left blank