ESHID-602010

Los Alamos
NATIONAL LABORATORY
EST. 1943

Associate Directorate for Environmental Management
P.O. Box 1663, MS M992
Los Alamos, New Mexico 87545
(505) 606-2337

Environmental Management
1900 Diamond Drive, MS M984
Los Alamos, New Mexico 87544
(505) 665-5658/FAX (505) 606-2132

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John Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Solid Waste Management Unit Assessment Report Work Plan for the Los Alamos Canyon Borrow Pit, Revision 1

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the Solid Waste Management Unit Assessment Report Work Plan for the Los Alamos Canyon Borrow Pit, Revision 1. During a September 9, 2016, meeting with New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB), representatives in Santa Fe, New Mexico, NMED-HWB staff provided verbal comments on the solid waste management unit assessment report (SAR) work plan for the Los Alamos Canyon borrow pit, submitted by the Los Alamos National Laboratory (the Laboratory) in August 2016. NMED-HWB staff recommended that the Laboratory submit Revision 1 to the SAR work plan to provide additional details on the locations and depths of proposed sampling and to correct errors in contour elevations in the as-built drawings. The enclosed revised document includes these changes.

If you have any questions, please contact Steve Veenis at (505) 667-0013 (veenis@lanl.gov) or Cheryl Rodriquez at (505) 665-5330 (cheryl.rodriquez@em.doe.gov).

Sincerely,

Bruce Robinson, Program Director
Environmental Remediation Program
Los Alamos National Laboratory

Sincerely,

David S. Rhodes, Director
Office of Quality and Regulatory Compliance
Environmental Management
Los Alamos Field Office

BR/DR/SV:sm

Enclosure: Solid Waste Management Unit Assessment Report Work Plan for the Los Alamos Canyon Borrow Pit, Revision 1 (EP2016-0135)

Cy: (w/enc.)
Cheryl Rodriquez, DOE-EM-LA
Steve Veenis, ADEM ER Program

Cy: (w/electronic enc.)
Laurie King, EPA Region 6, Dallas, TX
Raymond Martinez, San Ildefonso Pueblo
Dino Chavarria, Santa Clara Pueblo
Steve Yanicak, NMED-DOE-OB, MS M894
emla.docs@em.doe.gov
Public Reading Room (EPRR)
PRS Database
ADESH Records

Cy: (w/o enc./date-stamped letter emailed)
lasomailbox@nnsa.doe.gov
Peter Maggiore, DOE-NA-LA
Kimberly Davis Lebak, DOE-NA-LA
David Rhodes, DOE-EM-LA
Tadz Kostrubala, ADEM ER Program
Bruce Robinson, ADEM ER Program
Randy Erickson, ADEM
Jocelyn Buckley, ADESH-EPC-CP
Mike Saladen, ADESH-EPC-CP
John Bretzke, ADESH-EPC-DO
Michael Brandt, ADESH
William Mairson, PADOPS
Craig Leasure, PADOPS

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November 2016
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Solid Waste Management Unit Assessment Report Work Plan for Los Alamos Canyon Borrow Pit, Revision 1

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Associate Directorate for Environmental Management

EP2016-0135

Solid Waste Management Unit Assessment Report Work Plan for Los Alamos Canyon Borrow Pit, Revision 1

November 2016

Responsible project manager:

Steve Veenis	*Steve Veenis*	Project Manager	Environmental Remediation Program	11.14.16
Printed Name	Signature	Title	Organization	Date

Responsible LANS representative:

Randall Erickson	*[signature] for*	Associate Director	Associate Directorate for Environmental Management	11/15/16
Printed Name	Signature	Title	Organization	Date

Responsible DOE-EM-LA representative:

David S. Rhodes	*[signature]*	Office Director	Quality and Regulatory Compliance	11-18-2016
Printed Name	Signature	Title	Organization	Date

EXECUTIVE SUMMARY

A former borrow pit in Los Alamos Canyon has been used for the final disposition of sediment removed from the Los Alamos Canyon low-head weir basins, which captured sediment during ephemeral flow events and required excavation to maintain sediment-capture capacity. Sediment was emplaced in the borrow pit in 2011, 2012, 2013, and 2014. Analysis of sediment samples collected from the weir basins in 2013 and 2014, before excavation, indicates the sediments are not likely to pose an unacceptable risk to human health. The sediments removed in 2011 and 2012 were not sampled because of post–Las Conchas Fire Emergency actions. The New Mexico Environment Department Hazardous Waste Bureau (NMED-HWB) directed Los Alamos National Laboratory (the Laboratory) to prepare a solid waste management unit assessment report (SAR) work plan to investigate the sediments placed in the borrow pit and to determine whether the site should be designated a solid waste management unit or an area of concern. This work plan identifies the investigation activities proposed to collect the data needed to investigate the area and to prepare a SAR. The proposed investigation activities include collecting sediment samples from within the borrow pit; analyzing the samples collected for inorganic, organic, and radionuclide constituents; evaluating the analytical data to identify chemicals of potential concern (COPCs); and screening of potential human health risks and doses associated with COPCs. This SAR work plan also provides a history of activities that have occurred at the borrow pit associated with the emplacement of sediment removed from the sediment basins and as-built information and photographs of current conditions at the site.

During a September 9, 2016, meeting with NMED-HWB representatives in Santa Fe, New Mexico, NMED-HWB staff provided verbal comments on the SAR work plan submitted in August. NMED-HWB staff recommended that the Laboratory submit Revision 1 to the SAR Work Plan. Revision 1 to the SAR work plan provides additional details on the locations and depths of proposed sampling and fixes errors in contour elevations in as-built drawings.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC (LANS). The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers approximately 39 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above mean sea level.

The Laboratory is participating in a national effort by DOE to reduce risk to human health and the environment at its facilities. The goal of the Laboratory's effort is to ensure that past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. The sites under investigation are designated as solid waste management units (SWMUs) and areas of concern (AOCs).

This SWMU assessment report (SAR) work plan addresses a former borrow pit located within Los Alamos Canyon at the Laboratory (Figure 1.0-1). This borrow pit was used to permanently emplace sediments removed from basins located immediately upgradient of the Los Alamos Canyon low-head weir, which was constructed to reduce downstream flood potential beyond the Laboratory boundary post–Cerro Grande fire. The sediments emplaced within the borrow pit are potentially contaminated with hazardous chemicals and radionuclides. For this reason, the sediments placed in the borrow pit are being evaluated as a potential SWMU or AOC. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 458.1, Administrative Change 3, "Radiation Protection of the Public and the Environment," and DOE Order 435.1, "Radioactive Waste Management." Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy. The purpose of this SAR work plan is to comply with Section X.C of the 2016 Compliance Order on Consent, which states that "DOE shall develop and implement a preliminary screening plan (including sampling and investigation activities and schedule for those activities) for such newly discovered potential SMWU or AOC, and provide NMED with the results of the preliminary screening." The results of investigation activities identified in this work plan will be submitted to NMED in a SAR.

1.1 Work Plan Overview

A report of the 2013 sampling and excavation activities was submitted to NMED (LANL 2013, 251741). A notice of disapproval (NOD) for the 2013 excavation report was issued by NMED (NMED 2015, 600271), requesting additional information related to the borrow pit and the sediments. A response to the NOD and a revised excavation report were submitted to NMED in 2015 (LANL 2015, 600513). An NOD for the revised report was issued by NMED on December 1, 2015 (NMED 2015, 601032), directing the Laboratory to submit Revision 2 of the 2013 excavation report and to prepare a SAR for the sediments placed in the borrow pit.

The requirements for Revision 2 of the excavation report and the SAR were discussed during a June 21, 2016, meeting between representatives of the NMED Hazardous Waste Bureau (NMED-HWB), NMED Surface Water Quality Bureau, DOE, and LANS. NMED-HWB requested that the response to the NOD be addressed in a SAR work plan. Using this approach, NMED indicated that Revision 2 would not be required, and once investigation activities proposed in the SAR work plan were complete, the results should be submitted in a SAR. NMED-HWB representatives indicated that the sediments within the borrow pit would be need to be sampled to adequately characterize the material to prepare the SAR. Therefore, this work plan has been prepared to support the preparation of the SAR for the Los Alamos Canyon borrow pit.

Section 2 of this SAR work plan provides a description and history of the borrow pit, summarizes previous characterization of the sediments placed in the borrow pit, and presents analytical data for the sediments. Section 3 describes the proposed investigation activities, including sampling and analysis and data evaluation. Section 4 presents a milestone schedule for conducting the investigation activities and preparing the SAR.

Appendix A contains acronyms and abbreviations, a metric conversion table, and data qualifier definitions. Appendix B contains site photographs. Appendix C presents as-built drawings of the borrow pit and associated runoff controls. Appendix D presents the analytical data from previous sediment sampling. Appendix E presents the results of sediment runoff modeling using Revised Universal Soil Loss Equation 2 (RUSLE2) software.

1.2 Work Plan Objectives

The objectives of the investigation described in this work plan are to characterize hazardous and radionuclide constituents potentially present in the borrow pit sediments and to evaluate whether these sediments potentially pose an unacceptable risk to human health. The work plan identifies the activities that will be performed to meet these objectives.

2.0 BACKGROUND

2.1 General Site Information

The Los Alamos Canyon borrow pit consists of a pit located in Los Alamos Canyon approximately one-half mile west of the Laboratory boundary at NM 4 (Figure 1.0-1). In late spring/early summer of 2011, 2012, 2013, and 2014, sediments were removed from basins located behind the Los Alamos Canyon low-head weir and placed in the borrow pit. Sediments were removed annually to increase the storm water detention capacity of the Los Alamos weir before each corresponding year's monsoon season. The pit is located above the 100-yr flood plain and is proposed as the location for the final disposition of sediments excavated from the three basins[1] behind the Los Alamos Canyon low-head weir (Figure 2.1-1).

Following placement in the pit, sediments have been stabilized by revegetation to prevent erosion. A runoff control berm below the sediments provides further protection against off-site transport of surface eroded sediments. Surface dimensions of the sediments placed in the borrow pit is approximately 230 ft in the downslope orientation (generally east-west direction) and 170 ft in the cross-slope direction (generally north-south direction). The deepest depth of sediments is estimated to be 12 ft and the average depth is 5 to 8 ft. Sediment depth tapers on all sides to native ground. Appendix C of this report shows a plan view and cross-section of the area.

The borrow pit has been used only to manage sediments removed from behind the Los Alamos Canyon low-head weir. No other materials have been managed or placed at the site. These sediments consist of

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[1] The three basins of the Los Alamos weir are identified from west to east and upgradient to downgradient as the upper basin (basin 1), middle basin (basin 2), and lower basin (basin 3), with the lower basin directly upgradient of the Los Alamos weir gabion structure.

soils and canyon sediments originating in the watershed upstream of the weir. These materials were eroded and transported downstream during precipitation events and deposited in the basins behind the weir. The upstream watershed includes portions of the Laboratory, portions of the Los Alamos townsite, and U.S. Forest Service land.

Visual inspection of the borrow pit occurs biannually and after every flow event greater than 50 cubic feet per second at gage station E042.1. If erosion or any other issues are noted that require follow-up maintenance, maintenance is scheduled and conducted. The latest visual inspection report is presented in Appendix E.

2.2 History of Placement of Sediments in the Borrow Pit

The borrow pit has been used four times for disposition of sediments removed from the Los Alamos Canyon low-head weir sediment basins. An estimated 16,400 yd^3 of Los Alamos weir sediments was placed in the borrow pit between 2011 and 2014[2]. Several removal activities were preceded by on-site sampling of the material. Sediment disposition–related activities at the borrow pit are described below by year and are summarized in Table 2.2-1.

2011

The first placement of sediments into the borrow pit occurred in July 2011, immediately following the Las Conchas wildfire in June 2011. Sediment was removed from all three basins behind the weir as a post-fire response action in anticipation of post-fire flooding. Approximately 1200 yd^3 of sediments was removed and placed at the borrow pit. The 2011 excavation activities are shown in Figure B-1 in Appendix B. Before emplacement of the sediment in 2011, a demarcation of original ground was made by placing an 80- by 100-ft 12-mil polyethylene nylon reinforced plastic sheet. The sediment was placed on the demarcation liner and compacted in lifts. Afterwards, the sediment pile was sprayed with tackifier to prevent wind or water erosion. These activities were described in a report submitted to NMED summarizing post–Las Conchas mitigation actions (LANL 2011, 206488). The sediments were stabilized by reseeding, and a berm was constructed below the sediments to contain runoff. No sediment samples were collected to represent concentrations of constituents in 2011 excavation material placed in the borrow pit.

2012

In August 2012, approximately 2000 yd^3 of sediments was removed from the Los Alamos weir basins and placed in the borrow pit. Sampling was also not performed before 2012 excavation activities were undertaken. Sediment was removed from the upper and middle basins to increase storm water ponding capacity. Excavation activities in 2012 are shown in Figures B-2 through B-4 in Appendix B. Sediments were not removed from the lower basin because of ponding conditions (Figure B-3). Before the sediments were emplaced, the demarcation liner installed in 2011 was extended, and the extended edge of the liner is visible in Figure B-4. Excavated sediment was placed and compacted in lifts on top of 2011 sediments in the borrow pit. The sediments were stabilized by reseeding, and berm maintenance was conducted.

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[2] Sediment removal and placement estimates are based on the size and number of trucks used to transport material to the borrow pit during removal activities. Estimates are based on truck volumes of sediments; actual compacted volumes are approximately three-quarter times the reported trucked volume.

2013

In April 2013, approximately 6000 yd^3 of sediments was removed from the Los Alamos weir sediment basins and emplaced at the borrow pit. Excavation activities in 2013 are shown in Figures B-5 through B-7. Sediments from the lower basin that had accumulated following the Las Conchas wildfire floods were excavated. The sediments were placed over the sediments deposited in 2012, compacted in lifts, and seeded. Maintenance was also performed on the runoff retention berm.

Six composite sediment samples were collected in January 2013 before removal activities and are discussed in section 2.4 of this work plan. The 2013 sediment removal and characterization activities were described in detail in the excavation report submitted to NMED (LANL 2013, 251741) and a revision to the report (LANL 2015, 600513).

2014

In April 2014, approximately 7200 yd^3 of sediment deposition caused by the catastrophic floods of September 2013 was removed from the upper and middle sediment basins and placed in the borrow pit. Excavation activities in 2014 are shown in Figures B-8 through B-10. The sediments were placed over the 2013 sediments, compacted, and hydroseeded. Maintenance was also performed on the runoff retention berm. Twelve composite sediment samples were collected before removal activities and the results of sampling are discussed in section 2.4 of this work plan.

2015

No excavation activities occurred at the Los Alamos weir in 2015. However, in November 2015, additional clean-fill material was placed on the runoff retention berm, raising the berm height and the deepest ponding depth behind the berm to approximately 2 ft. The berm was seeded and covered with erosion-control matting. Figure B-11 shows the runoff retention berm immediately after construction.

2.3 Current Conditions

Current site conditions as of June 2016 are shown Figures B-12 through B-14 in Appendix B. As-built drawings of the sediments emplaced in the borrow pit, as well as erosion controls installed at the borrow pit, are presented in Appendix C. Appendix C includes all the technical specifications for placement of borrow pit material and installation of storm water controls. The area is well vegetated with no visual evidence of rilling or erosion. The latest visual inspection report can be found in Appendix E.

2.4 Results of Previous Sampling

2.4.1 Sediment Sampling

The excavation activities performed in 2011 and 2012 were part of emergency actions taken after the Las Conchas wildfire, and sampling of the sediments was not performed. The sediments in the basins behind the weir were sampled before the 2013 and 2014 excavations. Figures 2.4-1 and 2.4-2 show the 2013 and 2014 sampling locations of the composite samples collected. Tables 2.4-1 and 2.4-2 list the composite subsample points grouped by location identification number (labeled “Location ID”). Sample compositing occurred by mixing all samples subsample points, presented in the table under the column labeled “Subsample Point ID,” and submitting that samples for analysis with the Location ID presented in the corresponding row in the table.

Preliminary screening of the analytical results from sediment samples collected in 2013 and 2014 show that hazardous constituents and radionuclides were detected below residential screening levels. Screenings were performed by comparing detected concentrations and activities to residential soil screening levels (SSLs) and screening action levels (SALs). Details of these sampling events and the screenings are presented below.

In 2013, composite samples were collected from each of six locations. Samples were analyzed for target analyte list (TAL) metals, total cyanide, dioxins and furans, herbicides, pesticides, polychlorinated biphenyls (PCBs), americium-241, gamma-emitting radionuclides, isotopic plutonium, strontium-90, and tritium. Table 2.4-3 summarizes the samples collected and analyses requested in 2013. Table 2.4-4 presents inorganic chemicals detected above background values (BVs) for canyon sediments (LANL 1998, 059730). Table 2.4-5 presents detected organic chemicals, and Table 2.4-6 presents the toxic equivalency (TEQ) of detected dioxin and furan congeners. Table 2.4-7 presents radionuclides detected or detected above BVs/fallout values (FVs). Analytical data are provided in Appendix D.

Inorganic chemicals detected above BVs in 2013 include barium, beryllium, calcium, cobalt, copper, cyanide, iron, lead, manganese, nickel, and zinc (Table 2.4-4). None of the inorganic chemicals detected above BVs were detected above residential SSLs (NMED 2015, 600915). Organic chemicals detected in 2013 include 4-(2,4-dichlorophenoxy)butyric acid (2,4-DB); 4,4’-dichlorodiphenyldichloroethylene (4,4’-DDE); 4,4’-dichlorodiphenyltrichloroethane (4,4’-DDT); methylchlorophenoxypropionic acid (MCPP); and six dioxin and furan congeners (and Table 2.4-5). None of the organic chemicals were detected above residential SSLs, and the TEQ of the detected dioxin and furan congeners was less than the residential SSL for 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) (Table 2.4-6). Radionuclides detected above FVs in 2013 include americium-241, cesium-137, and plutonium-239/240. No radionuclides detected above FVs were detected above residential SALs (Table 2.4-7) (LANL 2015, 600929).

In 2014, composite samples were collected from each of 12 locations and analyzed for gamma-emitting radionuclides, strontium-90, tritium, americium-241, isotopic plutonium, TAL metals, pesticides/PCBs, herbicides, dioxins and furans, and total cyanide. Table 2.4-8 summarizes the samples collected and analyses requested. No inorganic chemicals were detected above BVs. Table 2.4-9 presents detected organic chemicals, and Table 2.4-10 presents the TEQs of detected dioxin and furan congeners. Table 2.4-11 presents radionuclides detected or detected above BVs/FVs. Analytical data are provided in Appendix D.

Organic chemicals detected in 2014 include Aroclor-1260; 4,4’-DDE; 4,4’-DDT; dieldrin; and 13 dioxin and furan congeners (Table 2.4-10). None of the organic chemicals were detected above residential SSLs, and the TEQ of the detected dioxin and furan congeners was less than the residential SSL for 2,3,7,8-TCDD. Radionuclides detected above FVs in 2014 include americium-241, plutonium-238, and plutonium-239/240 (Table 2.4-11). No radionuclides detected above FVs were detected above residential SALs (LANL 2015, 600929).

2.4.2 Surface Water Sampling

Figure 2.4-3 shows the storm water sampling location where grab samples were collected by NMED-DOE Oversight Bureau (NMED-DOE-OB) on September 13, 2013. The samples were analyzed for dioxins and furans, PCB congeners, americium-241, strontium-90, plutonium isotopes, uranium isotopes, and gross-alpha and gross-beta radioactivity. Surface water sampling results are presented in Table 2.4-12. All results were compared with the applicable water-quality standards for the receiving stream, Los Alamos Canyon. Los Alamos Canyon waters are classified in New Mexico Administrative Code (NMAC) 20.6.4.128 as ephemeral or intermittent. The comparison showed that gross-alpha activity was detected at 2.5 times the applicable water-quality standard for livestock watering, and PCBs were detected at 3.6 times the water-quality standard for the human health-organism only. Gross-alpha activity and PCBs concentrations detected in the samples are within the range of activities and concentrations in undeveloped background watersheds (LANL 2013, 239557; LANL 2012, 219767).

2.5 RUSLE2 Modeling

NMED’s December 1, 2015, disapproval of Revision 1 of the 2013 excavation report (LANL 2015, 600513; NMED 2015, 601032) required the Laboratory to submit “stormwater modeling results” demonstrating the adequacy of the erosional controls established at the borrow pit. Additional details related to the modeling were discussed in a June 21, 2016, meeting among representatives of NMED, DOE, and LANS. During the meeting, NMED stated that erosional controls for similar sites covered under the National Pollutant Discharge Elimination System Construction General Permit were typically evaluated using the U.S. Department of Agriculture RUSLE2 software. Therefore, it was agreed that the requirements in the disapproval letter for storm water modeling would be met through modeling using RUSLE2.

Appendix E provides the details and results of modeling using the RUSLE2 software used to determine estimated annual soil loss from rill and interrill erosion at the former borrow pit where excavated sediments have been placed.

Two scenarios were modeled: Scenario 1 represents current conditions reflecting existing site stabilization activities (i.e., revegetation and sediment retention berm), and Scenario 2 represents nonstabilized conditions (i.e., without revegetation and sediment retention berm). Results of the RUSLE2 calculations indicate the site discharges under Scenario 1, current conditions, are estimated as 0.0087 tons/acre/yr of sediment past the berm or a total of 0.8 ft^3 of sediment in 10 yr. By comparison, Scenario 2, nonstabilized conditions, showed a discharge of 0.3 tons/acre/yr of sediment or a total of 29 ft^3 of sediment in 10 yr.

The RUSLE2 modeling results for the current conditions indicate relatively minor erosional loss from the sediment disposal area and very low delivery of sediment past the sediment basin. These results are consistent with field observations that indicate controls, including revegetation, have been very effective in stabilizing the site (Appendix E, Attachment E-1). The RUSLE2 modeling results for the nonstabilized scenario, Scenario 2, indicate substantially higher erosion losses would have been expected in the absence of erosion controls. These results also confirm the effectiveness of the controls established at the site. The results of the RUSLE2 modeling do not indicate the need for additional controls at the site.

3.0 PROPOSED INVESTIGATION ACTIVITIES

3.1 Sampling and Analysis

3.1.1 Sampling Locations and Depth Intervals

Sampling and analysis of the sediments in the borrow pit will be performed to identify hazardous and radionuclide constituents currently present in the sediments and to evaluate whether they would pose a potential unacceptable human health risk or dose. Per the June 21, 2016, meeting with NMED-HWB, the Laboratory proposes to collect samples at eight borehole locations within the footprint of the fill area in the borrow pit at approximate locations and sampling depths shown in Figure 3.1-1. Borehole locations were biased towards areas of the borrow pit that were a minimum of 3 ft thick. As-built technical specifications presented in Appendix C will be used to estimate the thickness of the fill in the borrow pit. The actual thickness at each location will be verified by hand-augering until the installed demarcation liner is encountered.

At each borehole sampling location, samples will be collected from three depth intervals as shown in Figure 3.1-1. The first interval will be the top 1 ft of the sediment fill. This interval represents the most recently applied fill and the material most available for exposure to receptors. The second interval will be in the middle 1 ft of the profile. The third interval will be the bottom 0 to 1 ft of sediment fill profile. This deepest interval is likely to be representative of sediment disposed of in 2011 and 2012 that has not been characterized previously. All sampling locations are sited within the footprint of the 2011 placement of sediments. Actual borehole locations and sampling depths may be adjusted based on field conditions.

3.1.2 Sample Analyses

Sediment samples will be analyzed for the same suite of analytes used during the 2013 and 2014 sampling of the Los Alamos low-head weir sediments. Inorganic analyses will include TAL metals and total cyanide. Organic analyses will include dioxins/furans, herbicides, PCBs, and pesticides. Radionuclide analyses will include americium-241, gamma-emitting radionuclides, isotopic plutonium, strontium-90, and tritium. Table 3.1-1 summarizes the samples to be collected and the analyses to be performed, including analytical method numbers.

3.1.3 Investigation Methods

The standard operating procedures (SOPs) cited below are available at http://www.lanl.gov/environment/plans-procedures.php.

3.1.3.1 Surface Samples

Surface sediment samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. Samples collected for analyses will be placed in the appropriate sample containers depending on the analytical method requirement.

3.1.3.2 Subsurface Samples

Subsurface samples will be collected using hand augers or power-assisted augers. The hand auger is advanced by turning the auger into the sediment until the barrel is filled. The auger is removed and the sample is placed in a stainless-steel bowl. Hand-auger samples will be collected in accordance with ER-SOP-20069, Soil, Tuff, and Sediment Sampling.

3.1.3.3 Geodetic Surveys

Geodetic surveys of sampling locations will be conducted in accordance with the current version of EP-ERSS-SOP-5028, Coordinating and Evaluating Geodetic Surveys. The surveyors will use a Trimble GeoXT hand-held global positioning system (GPS), or equivalent, for the surveys. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (transverse mercator), Central Zone, North American Datum 1983. Elevations will be reported as per the National Geodetic Vertical Datum of 1929. All GPS equipment used will meet the accuracy requirements specified in the SOP.

3.1.3.4 Chain of Custody for Samples

The collection, screening, and transport of samples will be documented on standard forms generated by the Laboratory's Sample Management Office. These forms include sample collection logs, chain-of-custody forms, and sample container labels. Sample collection logs will be completed at the time of sample collection and signed by the sampler and a reviewer who will verify the logs for completeness and accuracy. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. Chain-of-custody forms will be completed and signed to verify that the samples are not left unattended.

3.1.3.5 Quality Assurance/Quality Control Samples

Quality assurance and quality control samples will include field duplicate and equipment rinsate samples. These samples will be collected following the current version of SOP-5059, Field Quality Control Samples. Field duplicate samples will be collected at an overall frequency of at least 1 for every 10 regular samples.

3.1.3.6 Equipment Decontamination

Equipment for sampling will be decontaminated before and after sampling activities to minimize the potential for cross-contamination. Dry decontamination methods will be used to avoid the generation of liquid waste and to minimize the investigation-derived waste (IDW). Dry decontamination uses disposable paper towels and over-the-counter cleaner, such as Fantastik or equivalent. All sampling and measuring equipment will be decontaminated in accordance with SOP-5061, Field Decontamination of Equipment.

3.1.3.7 Investigation-Derived Waste

IDW generated by the proposed investigation activities may include, but is not limited to, excavated sediment, contact waste such as personal protective equipment, decontamination fluids, and all other waste that has potentially come into contact with contaminants.

All IDW generated during field investigation activities will be managed in accordance with applicable U.S. Environmental Protection Agency (EPA) and NMED regulations, DOE orders, and Laboratory requirements.

3.2 Data Evaluation

The analytical data will be evaluated to identify chemicals of potential concern (COPCs) and to identify potential unacceptable human-health risks associated with COPCs.

3.2.1 Identification of COPCs

COPCs are chemicals and radionuclides that may be present as a result of releases from SWMUs or AOCs. Sediments that deposited in the Los Alamos weir basins contain a complex mix of sources of contaminants. These contaminates may be sourced from SWMUs or AOCs, natural background sediments derived from Bandelier Tuff, global fallout of radionuclides, urban development in the Los Alamos townsite, and ash from wildfires (LANL 2016, 601433). Some of these non-SWMU or non-AOC sources are discussed below.

Inorganic chemicals and some radionuclides occur naturally, and inorganic chemicals and radionuclides detected because of natural background are not considered COPCs. Similarly, some radionuclides may be present as a result of fallout from historical nuclear weapons testing, and these radionuclides are also not considered COPCs. The Laboratory has collected data on background concentrations of many inorganic chemicals, naturally occurring radionuclides, and fallout radionuclides. These data have been used to develop media-specific BVs and FVs (LANL 1998, 059730). For inorganic chemicals and radionuclides for which BVs or FVs exist, identification of COPCs includes background comparisons, which are described below. If no BVs or FVs are available, COPCs are identified based on detection status (i.e., if the inorganic chemical or radionuclide is detected, it is identified as a COPC unless available information indicates it is not present as a result of a release from the SWMU or AOC).

Organic chemicals may also be present as a result of anthropogenic activities unrelated to the SWMU or AOC or, to a lesser extent, from natural sources. Because no background data are available for organic chemicals, background comparisons cannot be performed in the same manner as for inorganic chemicals or radionuclides. Therefore, organic COPCs are identified on the basis of detection status (i.e., the organic chemical is detected). Organic chemicals that are clearly present from sources other than releases from a SWMU or AOC, and for which there are no known releases from a SWMU or AOC, may be eliminated as COPCs and not evaluated further.

3.2.1.1 Inorganic Chemical and Radionuclide Background Comparisons

COPCs are identified for inorganic chemicals and radionuclides according to Laboratory procedures EP-SOP-10071, Background Comparisons for Inorganic Chemicals, and EP-SOP-10073, Background Comparisons for Radionuclides (available at http://www.lanl.gov/environment/plans-procedures.php). Inorganic COPCs are identified by comparing site data with BVs and maximum concentrations in a background data set and using statistical comparisons, as applicable (LANL 1998, 059730). Radionuclides are identified as COPCs based on background comparisons and statistical methods if BVs or FVs are available or based on detection status if BVs or FVs have not been established.

Background data are generally available for inorganic chemicals in soil, sediment, and tuff (LANL 1998, 059730). A BV may be either a calculated value from the background data set (upper tolerance limit or the 95% upper confidence bound on the 95th quantile) or a detection limit (DL). When a BV is based on a DL, there is no corresponding background data set for that analyte/media combination.

For inorganic chemicals, data are evaluated by sample media to facilitate comparison with media-specific background data. To identify inorganic COPCs, the first step is to compare the sampling result with BVs. If all results are below BV, the inorganic chemical is not a COPC. If sampling results are above the BV and sufficient data are available (eight or more sampling results and five or more detections), statistical tests are used to compare the site sample data with the background data set for the appropriate media. If statistical tests cannot be performed because of insufficient data or a high percentage of nondetections, the sampling results are compared with the BV. If at least one sampling result is above the BV, the inorganic chemical is identified as a COPC unless lines of evidence can be presented to establish the inorganic chemical is not a COPC. Such lines of evidence include, but are not limited to, comparison with the background data set concentrations, number of detections above the BV, number of nondetections in the data set, and site history. When an inorganic chemical is not detected but has a DL above the BV, the same evaluation is performed using DLs instead of BVs. If no BV is available, detected inorganic chemicals are identified as COPCs.

Radionuclides are identified as COPCs based on comparisons with BVs for naturally occurring radionuclides or with FVs for fallout radionuclides. Thorium-228, thorium-230, thorium-232, uranium-234, uranium-235/236, and uranium-238 are naturally occurring radionuclides. Americium-241, cesium-137, plutonium-238, plutonium-239/240, strontium-90, and tritium are fallout radionuclides having FVs.

Naturally occurring radionuclides detected at activities above their respective BVs are identified as COPCs in the same manner as inorganic chemicals. If there is no associated BV or FV and the radionuclide is detected, it is retained as a COPC.

The FVs for the fallout radionuclides apply to sediment regardless of sample depth. The radionuclide is eliminated as a COPC if activities are similar to fallout activities or lines of evidence can be presented to establish the radionuclide is not a COPC.

3.2.1.2 Statistical Methods

If inorganic chemicals or radionuclides are detected above BVs or FVs, statistical methods may be used to determine whether the constituents are COPCs. The statistical tests will be used to evaluate potential differences between the distributions in the site data and the background data. These tests are used for testing hypotheses about data from two potentially different distributions (e.g., a test of the hypothesis that site concentrations are elevated above background levels). Nonparametric tests most commonly performed include the Gehan test (modification of the Wilcoxon Rank Sum test) and the quantile test (Gehan 1965, 055611; Gilbert and Simpson 1990, 055612).

The Gehan test is recommended when between 10% and 50% of the data sets are nondetections. It handles data sets with nondetections reported at multiple DLs in a statistically robust manner (Gehan 1965, 055611; Millard and Deverel 1988, 054953). The Gehan test is not recommended if either of the two data sets has more than 50% nondetections. If there are no nondetected concentrations in the data, the Gehan test is equivalent to the Wilcoxon Rank Sum test. The Gehan test is the preferred test because of its applicability to a majority of environmental data sets and its recognition and recommendation in EPA-sponsored workshops and publications.

The quantile test is better suited to assessing shifts in a subset of the data. The quantile test determines whether more of the observations in the top chosen quantile of the combined data set come from the site data set than would be expected by chance, given the relative sizes of the site and background data sets. If the relative proportion of the two populations being tested is different in the top chosen quantile of the data from that of the remainder of the data, the distributions may be partially shifted because of a subset of site data. This test is capable of detecting a statistical difference when only a small number of concentrations are elevated (Gilbert and Simpson 1992, 054952). The quantile test is the most useful distribution shift test where samples from a release represent a small fraction of the overall data collected. The quantile test is applied at a prespecified quantile or threshold, usually the 80th percentile. The test cannot be performed if more than 80% (or, in general, more than the chosen percentile) of the combined data are nondetected values. It can be used when the frequency of nondetections is approximately the same as the quantile being tested. For example, in a case with 75% nondetections in the combined background and site data set, application of a quantile test comparing 80th percentiles is appropriate. However, the test cannot be performed if nondetections occur in the top chosen quantile. The threshold percentage can be adjusted to accommodate the detection rate of an analyte or to look for differences further into the distribution tails. The quantile test is more powerful than the Gehan test for detecting differences when only a small percentage of the site concentrations are elevated.

If the differences between two distributions appear to occur far into the tails, the slippage test may be performed. This test evaluates the potential for some of the site data to be greater than the maximum concentration in the background data set if, in fact, the site data and background data came from the same distribution. This test is based on the maximum concentration in the background data set and the number ("n") of site concentrations that exceed the maximum concentration in the background set (Gilbert and Simpson 1990, 055612, pp. 5–8). The result (p-value) of the slippage test is the probability that "n" site samples (or more) exceed the maximum background concentration by chance alone. The test accounts for the number of samples in each data set (number of samples from the site and number of samples from background) and determines the probability of "n" (or more) exceedances if the two data sets came from identical distributions. This test is similar to the BV comparison in that it evaluates the largest site measurements but is more useful than the BV comparison because it is based on a statistical hypothesis test, not simply on a statistic calculated from the background distribution.

For all statistical tests, a p-value less than 0.05 will be the criterion for accepting the null hypothesis that site sampling results are different from background.

3.2.2 Human-Health Risk Screening Evaluation

After COPCs have been identified, a human-health risk screening evaluation will be performed to assess whether the sediments in the borrow pit pose potential unacceptable human health risk. For each COPC, an exposure point concentration (EPC) will be calculated. For evaluation of the borrow pit, the entire data set (i.e., all locations and depths) will be used to determine EPCs. If there are sufficient data (i.e., eight samples and five detections) to calculate an upper confidence limit (UCL), the UCL will be used as the EPC. UCLs will be calculated using the EPA ProUCL statistical software package. If there are not sufficient data to calculate a UCL, the maximum detected concentration will be used as the EPC. Risk will be evaluated using NMED's SSLs for the residential scenario (NMED 2015, 600915). If there are no NMED SSLs for a COPC, the EPA residential screening levels (http://www.epa.gov/risk/risk-based-screening-table-generic-tables) will be used, adjusted to 10^{-5} risk for carcinogens.

Carcinogenic risk will be evaluated for all inorganic and organic COPCs having a carcinogenic endpoint for the residential scenario. The carcinogenic risk associated with each COPC will be calculated by dividing the EPC by the residential SSL and multiplying by 10^{-5}. The carcinogenic risks for each COPC will then be summed to determine the cumulative risk, which will be compared to NMED's target of 1×10^{-5}.

Noncarcinogenic risk will be evaluated for all inorganic and organic COPCs having a noncarcinogenic endpoint for the residential scenario. The noncarcinogenic hazard quotient (HQ) for each COPC will be calculated by dividing the EPC by the residential SSL. The HQs for each COPC will then be summed to determine the hazard index (HI), which will be compared to NMED's target of 1.

In addition to carcinogenic and noncarcinogenic risk, the potential radiological dose for the residential scenario will also be evaluated for all radionuclide COPCs. Dose will be evaluated using the Laboratory's SALs for the residential scenario (LANL 2015, 600929). The dose for each radionuclide COPC will be evaluated by dividing the EPC by the residential SAL and multiplying by 25 mrem/yr. The doses for each COPC will then be summed to determine the total dose, which will be compared with the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

4.0 SCHEDULE

Preparation for investigation activities is anticipated to take approximately 2 mo. Fieldwork is expected to take 2 wk, and preparation of the SAR is anticipated to take approximately 4 mo after fieldwork activities are completed, which includes time for sample analysis and reporting. The total duration to implement the investigation and submit the SAR is anticipated to be approximately 7 mo. The Laboratory intends to initiate investigation activities following the approval of the SAR work plan by the NMED-HWB.

5.0 REFERENCES

The following list includes all documents cited in this plan. Parenthetical information following each reference provides the author(s), publication date, and ER ID or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED-HWB and the ESH Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

Gehan, E.A., June 1965. "A Generalized Wilcoxon Test for Comparing Arbitrarily Singly-Censored Samples," *Biometrika,* Vol. 52, No. 1 and 2, pp. 203–223. (Gehan 1965, 055611)

Gilbert, R.O., and J.C. Simpson, November 1990. "Statistical Sampling and Analysis Issues and Needs for Testing Attainment of Background-Based Cleanup Standards at Superfund Sites," Proceedings of The Workshop on Superfund Hazardous Waste: Statistical Issues in Characterizing a Site: Protocols, Tools, and Research Needs, U.S. Environmental Protection Agency, Arlington, Virginia. (Gilbert and Simpson 1990, 055612)

Gilbert, R.O., and J.C. Simpson, December 1992. "Statistical Methods for Evaluating the Attainment of Cleanup Standards, Volume 3: Reference-Based Standards for Soils and Solid Media," document prepared for the U.S. Environmental Protection Agency, Pacific Northwest Laboratory, Richland, Washington. (Gilbert and Simpson 1992, 054952)

LANL (Los Alamos National Laboratory), September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 059730)

LANL (Los Alamos National Laboratory), September 2011. "Las Conchas Wildfire Effects and Mitigation Actions in Affected Canyons," Los Alamos National Laboratory document LA-UR-11-4793, Los Alamos, New Mexico. (LANL 2011, 206488)

LANL (Los Alamos National Laboratory), December 2013. "2013 Excavation of the Los Alamos Canyon Low-Head Weir," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2013, 251741)

LANL (Los Alamos National Laboratory), June 2015. “2013 Excavation of the Los Alamos Canyon Low-Head Weir, Revision 1,” Los Alamos National Laboratory document LA-UR-15-24404, Los Alamos, New Mexico. (LANL 2015, 600513)

LANL (Los Alamos National Laboratory), September 2015. “Derivation and Use of Radionuclide Screening Action Levels, Revision 4,” Los Alamos National Laboratory document LA-UR-15-24859, Los Alamos, New Mexico. (LANL 2015, 600929)

LANL (Los Alamos National Laboratory), April 2016. “2015 Monitoring Report for Los Alamos/ Pueblo Watershed Sediment Transport Mitigation Project,” Los Alamos National Laboratory document LA-UR-16-22705, Los Alamos, New Mexico. (LANL 2016, 601433)

Millard, W.P., and S.J. Deverel, December 1988. “Nonparametric Statistical Methods for Comparing Two Sites Based on Data with Multiple Nondetect Limits,” *Water Resources Research,* Vol. 24, No. 12, pp. 2087–2098. (Millard and Deverel 1988, 054953)

NMED (New Mexico Environment Department), March 3, 2015. “Disapproval, 2013 Excavation of the Los Alamos Canyon Low-Head Weir,” New Mexico Environment Department letter to P. Maggiore (DOE-NA-LA) and M. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 600271)

NMED (New Mexico Environment Department), July 2015. “Risk Assessment Guidance for Site Investigations and Remediation,” Hazardous Waste Bureau and Ground Water Quality Bureau, Santa Fe, New Mexico. (NMED 2015, 600915)

NMED (New Mexico Environment Department), December 1, 2015. “Disapproval, 2013 Excavation of the Los Alamos Canyon Low-Head Weir, Revision 1 and Response to the Disapproval for the 2013 Excavation of the Los Alamos Canyon Low-Head Weir,” New Mexico Environment Department letter to D. Hintze (DOE-EM-LA) and M. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 601032)

Figure 1.0-1 2015 orthophoto showing locations of the Los Alamos Canyon weir and borrow pit near the intersection of NM 502 and NM 4

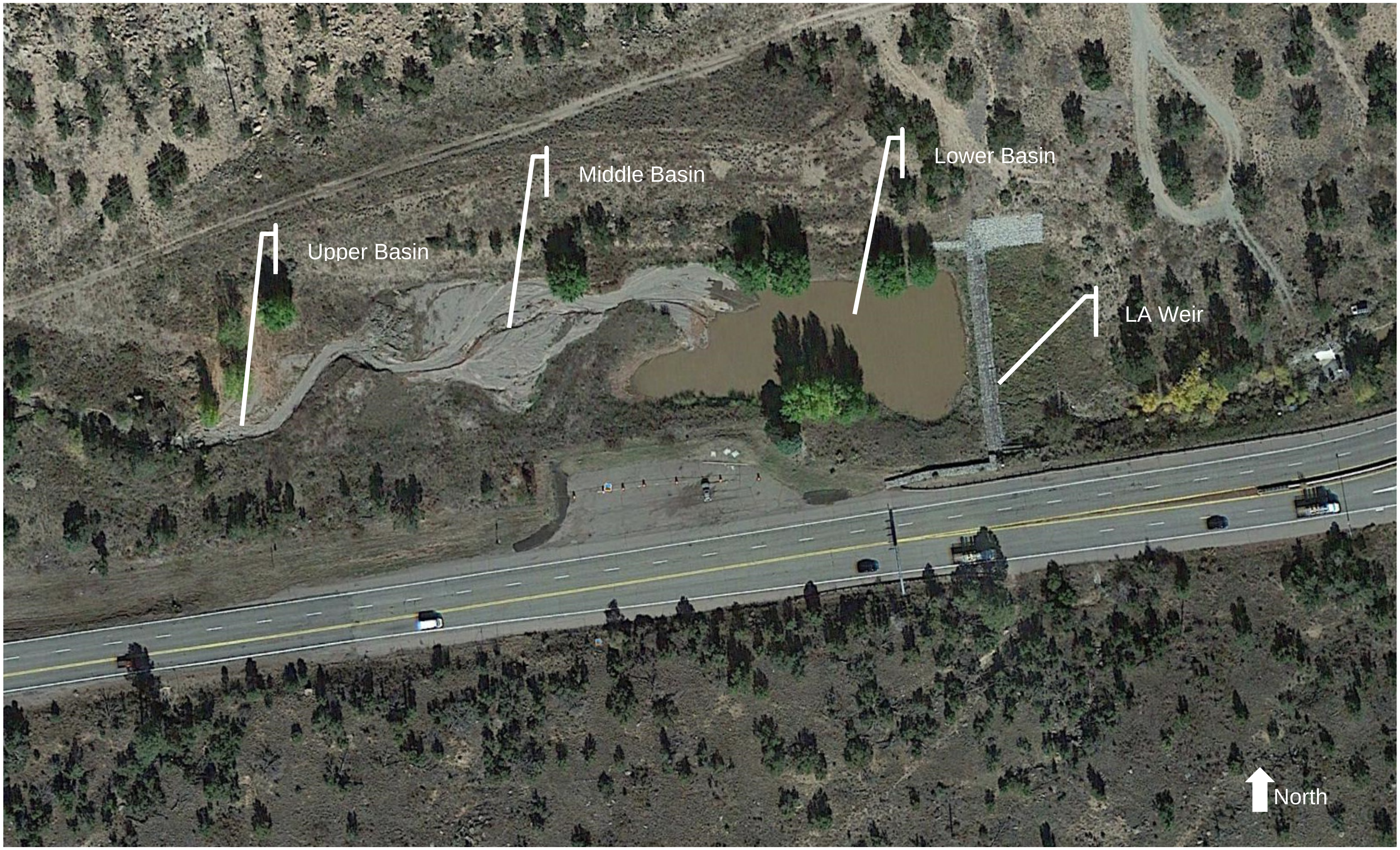


Figure 2.1-1 2015 orthophotograph showing the Los Alamos weir and sediment basins

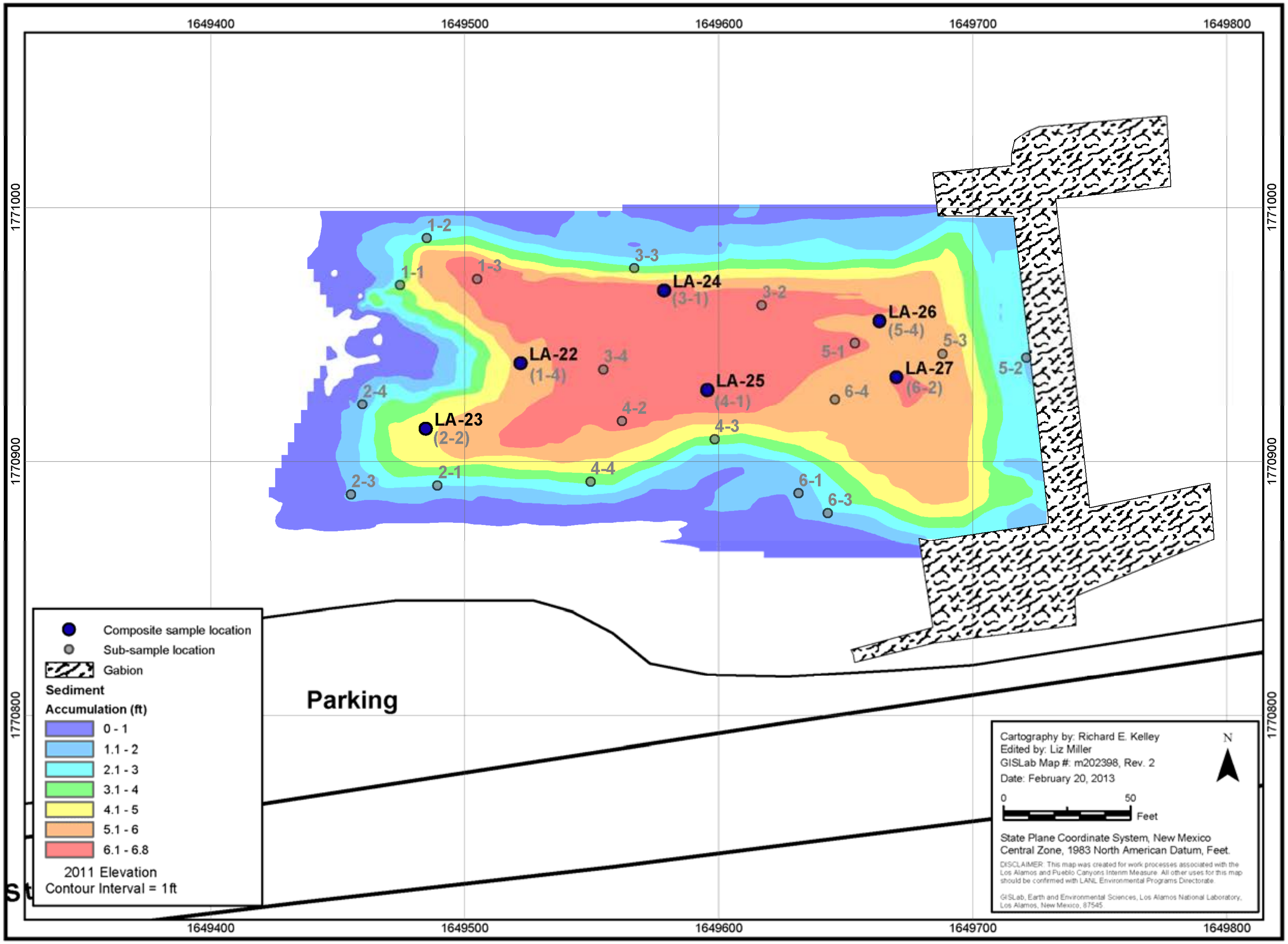


Figure 2.4-1 Los Alamos weir sediment sampling locations (collected in 2013 before excavation)

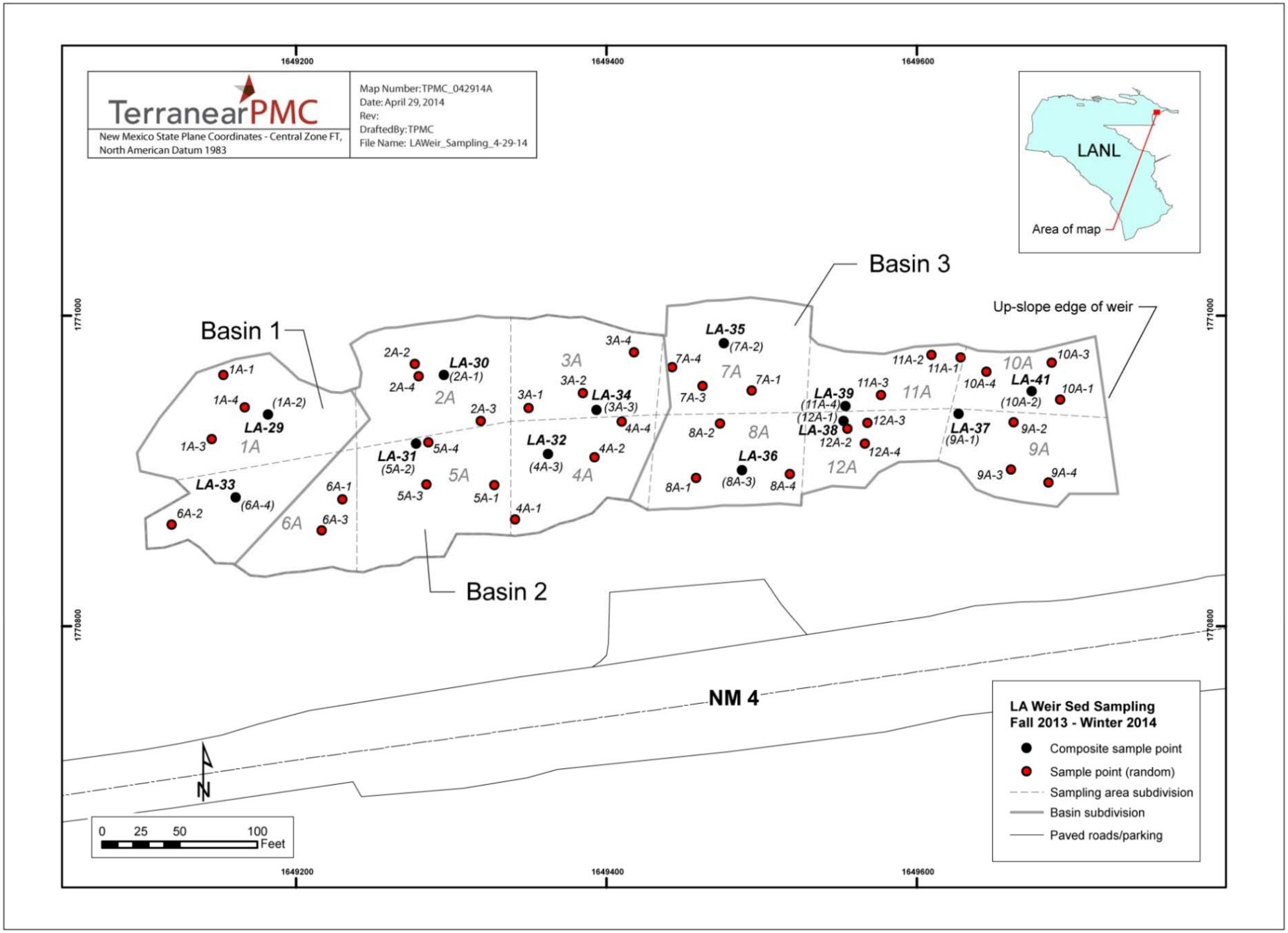


Figure 2.4-2 Los Alamos weir sediment sampling locations (collected in 2014 before excavation)

Figure 2.4-3 **2015 orthophotograph showing the location of the sediments placed in the borrow pit and 2013 NMED Oversight Bureau storm water sampling location**

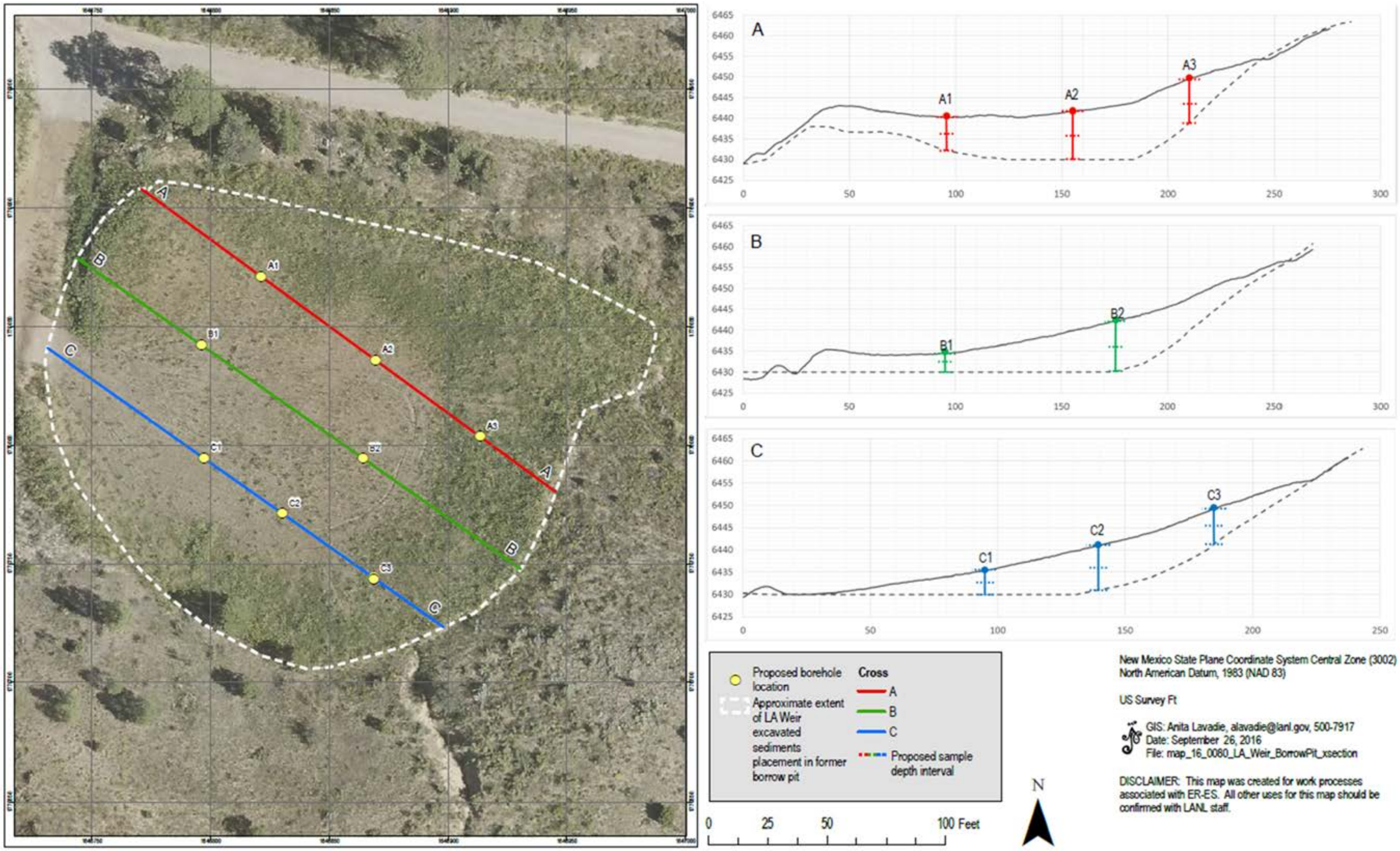


Figure 3.1-1 Proposed borehole locations and sampling depths

Table 2.2-1
Summary of Los Alamos Weir Sediment Deposition Activities in the Borrow Pit

Year	Los Alamos Weir Sediments Placed in the Borrow Pit	Number of Sediment Samples Analyzed	Volume (yd^3)	Los Alamos Weir Basins Excavated	Related Activities
2011	Yes	0	1200	Upper, middle, lower	Demarcation liner placed on existing ground. Tackifier, seeding, and berm construction occurred following placement of sediment.
2012	Yes	0	2000	Upper, middle	Seeding and berm maintenance occurred following placement of sediment.
2013	Yes	6	6000	Lower	Seeding and berm maintenance occurred following placement of sediment.
2014	Yes	12	7200	Upper, middle	Seeding, hydromulching, and berm maintenance occurred following placement of sediment.
2015	No	0	0	Not applicable	Runoff retention berm elevation raised and berm erosion-control matting installed.

Table 2.4-1
2013 Samples Collected at Los Alamos Weir Basins 1, 2, and 3

Location ID	Sample ID	Subsample Point ID	Depth (ft)	Easting	Northing
LA-22	CALA-13-28425	1-1	4.75	1649474.763	1770969.321
		1-2	3.2	1649485.224	1770987.861
		1-3	4.8	1649504.253	1770971.094
		1-4	5.6	1649522.11	1770938.49
LA-23	CALA-13-28426	2-1	2	1649489.714	1770890.905
		2-2	4.85	1649484.816	1770912.634
		2-3	2.4	1649455.134	1770887.06
		2-4	2.7	1649459.902	1770922.411
LA-24	CALA-13-28427	3-1	6.5	1649578.63	1770967.101
		3-2	6.2	1649616.938	1770961.431
		3-3	3.7	1649566.892	1770976.009
		3-4	6.5	1649554.62	1770936.3
LA-25	CALA-13-28428	4-1	6.7	1649595.23	1770928.171
		4-2	6.1	1649561.97	1770915.742
		4-3	3.9	1649598.627	1770908.945
		4-4	4.1	1649549.602	1770891.979

Table 2.4-1 (continued)

Location ID	Sample ID	Subsample Point ID	Depth (ft)	Easting	Northing
LA-26	CALA-13-28429	5-1	6	1649653.692	1770946.489
		5-2	2.2	1649721.104	1770940.921
		5-3	5.6	1649688.196	1770942.47
		5-4	6.25	1649663.455	1770955.044
LA-27	CALA-13-28430	6-1	2	1649631.513	1770887.331
		6-2	6.1	1649670.233	1770933
		6-3	2.55	1649643.036	1770879.554
		6-4	5.9	1649645.849	1770924.351

Note: Coordinates expressed in New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983.

Table 2.4-2
2014 Samples Collected at Los Alamos Weir Basins 1, 2, and 3

Location ID	Sample ID	Subsample Point ID	Depth (ft)	Easting	Northing
Western Basin #1					
LA-29	CALA-14-54424	1A-1	0.5	1649153.295	1770961.964
		1A-2	4.5	1649181.932	1770936.405
		1A-3	3.65	1649145.631	1770920.757
		1A-4	3.6	1649166.951	1770941.166
LA-33	CALA-14-54428	6A-1	1	1649229.992	1770881.936
		6A-2	1	1649119.842	1770865.527
		6A-3	0.8	1649216.53	1770861.699
		6A-4	1.3	1649161.2	1770883.006
Central Basin #2					
LA-30	CALA-14-54425	2A-1	6.25	1649295.481	1770961.809
		2A-2	3.2	1649276.338	1770968.979
		2A-3	2.85	1649319.225	1770932.252
		2A-4	3.45	1649278.865	1770961.013
LA-34	CALA-14-54429	3A-1	2.35	1649349.679	1770940.516
		3A-2	3.9	1649384.718	1770949.944
		3A-3	4.5	1649393.529	1770939.387
		3A-4	1.5	1649417.651	1770976.515
LA-32	CALA-14-54427	4A-1	1	1649341.134	1770869.078
		4A-2	1.7	1649392.425	1770908.822
		4A-3	3.4	1649362.553	1770910.928
		4A-4	1	1649409.884	1770931.984

Table 2.4-2 (continued)

Location ID	Sample ID	Subsample Point ID	Depth (ft)	Easting	Northing
LA-31	CALA-14-54426	5A-1	1	1649327.76	1770890.856
		5A-2	2.65	1649277.194	1770917.564
		5A-3	2.2	1649284.068	1770891.492
		5A-4	2.4	1649285.18	1770918.477
Eastern Basin #3					
LA-35	CALA-14-54439	7A-1	3.6	1649493.784	1770951.956
		7A-2	4.8	1649475.563	1770982.142
		7A-3	0.65	1649462.01	1770954.518
		7A-4	1.3	1649442.446	1770966.723
LA-36	CALA-14-54440	8A-1	1.1	1649457.899	1770895.622
		8A-2	3.35	1649472.994	1770930.754
		8A-3	3.7	1649487.453	1770900.606
		8A-4	2.3	1649518.178	1770897.962
LA-37	CALA-14-54986	9A-1	3.5	1649627.101	1770936.69
		9A-2	3.5	1649662.441	1770931.454
		9A-3	2.8	1649660.621	1770900.798
		9A-4	3.1	1649685.053	1770892.572
LA-41	CALA-14-54991	10A-1	1.8	1649692.463	1770945.848
		10A-2	3.5	1649674.154	1770951.373
		10A-3	3.1	1649687.119	1770969.702
		10A-4	2	1649644.842	1770963.694
LA-39	CALA-14-54988	11A-1	2.6	1649628.191	1770973.147
		11A-2	2.5	1649609.614	1770974.764
		11A-3	3.5	1649577.09	1770948.926
		11A-4	4.2	1649554.198	1770941.823
LA-38	CALA-14-54987	12A-1	4	1649552.779	1770932.241
		12A-2	3.9	1649555.32	1770927.134
		12A-3	2.9	1649568.246	1770930.931
		12A-4	3.3	1649566.713	1770917.722

Notes: Coordinates expressed in New Mexico State Plane Coordinate System, Central Zone, North American Datum 1983.

Table 2.4-3
Samples Collected and Analyses Requested in 2013

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Cyanide (Total)	Dioxins/Furans	Herbicides	Pesticides	PCBs	Americium-241	Gamma-Emitting Radionuclides	Strontium-90	Tritium	Isotopic Plutonium
CALA-13-28425	LA-22	0.0–5.6	Sediment	X*	X	X	X	X	X	X	X	X	X	X
CALA-13-28426	LA-23	0.0–4.8	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-13-28427	LA-24	0.0–6.5	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-13-28428	LA-25	0.0–6.7	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-13-28429	LA-26	0.0–6.2	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-13-28430	LA-27	0.0–6.1	Sediment	X	X	X	X	X	X	X	X	X	X	X

* X = Sample analyzed.

Table 2.4-4
Inorganic Chemicals above BVs in 2013 Samples

Sample ID	Location ID	Depth (ft)	Media	Barium	Beryllium	Calcium	Cobalt	Copper	Cyanide (Total)	Iron	Lead	Manganese	Nickel	Zinc
Sediment BV[a]				**127**	**1.31**	**4420**	**4.73**	**11.2**	**0.82**	**13,800**	**19.7**	**543**	**9.38**	**60.2**
Residential SSL[b]				**15,600**	**156**	**13,000,000**	**23**[c]	**3130**	**11.2**	**54,800**	**400**	**10,500**	**1560**	**23,500**
CALA-13-28425	LA-22	0.0–5.6	Sediment	209 (J-)	1.32	7640	—[d]	13	—	—	24.4	1030	—	62.3
CALA-13-28426	LA-23	0.0–4.8	Sediment	196	1.43	6290	4.29	12.1	1.05	—	26	996	9.42	62
CALA-13-28427	LA-24	0.0–6.5	Sediment	221	1.31	8040	4.76	13.7	1.1	—	25.8	1080	—	66.4
CALA-13-28428	LA-25	0.0–6.7	Sediment	226	—	7620	5.03	14.4	1.23	—	28.6	1110	—	73.6
CALA-13-28429	LA-26	0.0–6.2	Sediment	218	—	8600	4.76	13.1	1.35		24.3	1200	—	64.6
CALA-13-28430	LA-27	0.0–6.1	Sediment	275	1.82	8680	6.06	17.3	1.08	14,700	35.2	1270	12.3	84.8

Notes: All concentrations are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs from LANL (1998, 059730).

[b] SSLs from NMED (2015, 600915) unless otherwise noted.

[c] EPA regional screening level (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).

[d] — = Not detected or not detected above BV.

Table 2.4-5
Organic Chemicals Detected in 2013 Samples

Sample ID	Location ID	Depth (ft)	Media	DB[2,4-]	DDE[4,4-]	DDT[4,4-]	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Hexachlorodibenzofuran[1,2,3,4,7,8-]	MCPP	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	Tetrachlorodibenzofuran[2,3,7,8-]
Residential SSL[a]				**na**[b]	**15.7**	**18.7**	**na**	**na**	**na**	**63**[c]	**na**	**na**	**0.00049**
CALA-13-28425	LA-22	0.0–5.6	Sediment	—[d]	0.00244	—	0.0000124	0.00000313 (J)	—	—	0.00012	0.00000658 (J)	0.000000818 (J)
CALA-13-28426	LA-23	0.0–4.8	Sediment	—	0.00138 (J)	0.000823 (J)	0.00000608 (J)	0.00000192 (J)	—	—	0.0000607	0.00000367 (J)	0.000000896 (J)
CALA-13-28427	LA-24	0.0–6.5	Sediment	—	0.00299	0.000794 (J)	0.00000972	0.000003 (J)	—	—	0.000107	0.00000532 (J)	0.000000823 (J)
CALA-13-28428	LA-25	0.0–6.7	Sediment	—	0.00255	—	0.00000899	0.00000287 (J)	—	—	0.0000902	0.00000581 (J)	0.00000111 (J)
CALA-13-28429	LA-26	0.0–6.2	Sediment	0.0217	0.00121 (J)	—	0.00000615 (J)	0.00000193 (J)	—	—	0.0000558	0.00000443 (J)	0.000000877 (J)
CALA-13-28430	LA-27	0.0–6.1	Sediment	0.0234	0.00297	—	0.00000482 (J)	0.00000256 (J)	0.000000841 (J)	1.32 (J)	0.0000455	0.00000323 (J)	0.000000952 (J)

Notes: All concentrations are in mg/kg. Data qualifiers are defined in Appendix A.
[a] SSLs from NMED (2015, 600915) unless otherwise noted.
[b] na = Not available.
[c] EPA regional screening level (http://www.epa.gov/risk/risk-based-screening-table-generic-tables).
[d] — = Not detected.

Table 2.4-6
Dioxin and Furan Toxic Equivalencies for 2013 Samples

Congener	TEF[a]	CALA-13-28425		CALA-13-28426		CALA-13-28427		CALA-13-28428		CALA-13-28429		CALA-13-28430	
		Concentration	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	0.01	1.24E-05	1.24E-07	6.08E-06 (J)	6.08E-08	9.72E-06	9.72E-08	8.99E-06	8.99E-08	6.15E-06 (J)	6.15E-08	4.82E-06 (J)	4.82E-08
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	0.01	3.13E-06 (J)	3.13E-08	1.92E-06 (J)	1.92E-08	3.00E-06 (J)	3.00E-08	2.87E-06 (J)	2.87E-08	1.93E-06 (J)	1.93E-08	2.56E-06 (J)	2.56E-08
Hexachlorodibenzofuran[1,2,3,4,7,8-]	0.1	—[b]	n/a[c]	—	n/a	—	n/a	—	n/a	—	n/a	8.41E-07 (J)	8.41E-08
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	0.0003	1.20E-04	3.60E-08	6.07E-05	1.82E-08	1.07E-04	3.21E-08	9.02E-05	2.71E-08	5.58E-05	1.67E-08	4.55E-05	1.37E-08
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	0.0003	6.58E-06 (J)	1.97E-09	3.67E-06 (J)	1.10E-09	5.32E-06 (J)	1.60E-09	5.81E-06 (J)	1.74E-09	4.43E-06 (J)	1.33E-09	3.23E-06 (J)	9.69E-10
Tetrachlorodibenzofuran[2,3,7,8-]	0.1	8.18E-07 (J)	8.18E-08	8.96E-07 (J)	8.96E-08	8.23E-07 (J)	8.23E-08	1.11E-06 (J)	1.11E-07	8.77E-07 (J)	8.77E-08	9.52E-07 (J)	9.52E-08
Total TEQ[d]			2.75E-07		1.89E-07		2.43E-07		2.58E-07		1.87E-07		2.68E-07
Residential SSL[e]			4.90E-05		4.90E-05		4.90E-05		4.90E-05		4.90E-05		4.90E-05

Notes: All concentrations are in mg/kg. Data qualifiers are defined in Appendix A.
[a] TEFs (toxicity equivalency factors) from NMED (2015, 600915).
[b] — = Not detected.
[c] n/a = Not applicable.
[d] TEQ = Toxic equivalency.
[e] SSL from NMED (2015, 600915).

Table 2.4-7
Radionuclides Detected or Detected above FVs in 2013 Samples

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Cesium-137	Plutonium-239/240
Sediment FV[a]				**0.04**	**0.9**	**0.068**
Residential SAL[b]				**83**	**12**	**79**
CALA-13-28425	LA-22	0.0–5.6	Sediment	0.0993 (J)	1.15	0.0913 (J)
CALA-13-28426	LA-23	0.0–4.8	Sediment	0.045	1.33	0.0557
CALA-13-28427	LA-24	0.0–6.5	Sediment	—[c]	1.17	0.1
CALA-13-28428	LA-25	0.0–6.7	Sediment	—	1.32	0.119
CALA-13-28429	LA-26	0.0–6.2	Sediment	0.0768	1.31	0.177
CALA-13-28430	LA-27	0.0–6.1	Sediment	—	1.48	0.108

Note: All activities are in pCi/g. Data qualifiers are defined in Appendix A.

[a] FVs from LANL (1998, 059730).

[b] SALs from LANL (2015, 600929).

[c] — = Not detected or not detected above FV.

Table 2.4-8
Samples Collected and Analyses Requested in 2014

Sample ID	Location ID	Depth (ft)	Media	TAL Metals	Cyanide (Total)	Dioxins/Furans	Herbicides	Pesticides	PCBs	Americium-241	Gamma-Emitting Radionuclides	Strontium-90	Tritium	Isotopic Plutonium
CALA-14-54424	LA-29	0.0–4.5	Sediment	X*	X	X	X	X	X	X	X	X	X	X
CALA-14-54425	LA-30	0.0–6.2	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54426	LA-31	0.0–2.6	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54427	LA-32	0.0–3.4	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54428	LA-33	0.0–1.3	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54429	LA-34	0.0–4.5	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54439	LA-35	0.0–4.8	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54440	LA-36	0.0–3.7	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54986	LA-37	0.0-3.5	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54987	LA-38	0.0-4.0	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54988	LA-39	0.0-4.2	Sediment	X	X	X	X	X	X	X	X	X	X	X
CALA-14-54991	LA-41	0.0-3.5	Sediment	X	X	X	X	X	X	X	X	X	X	X

* X = Sample analyzed.

Table 2.4-9
Organic Chemicals Detected in 2014 Samples

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1260	DDE[4,4-]	DDT[4,4-]	Dieldrin	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	Hexachlorodibenzofuran[1,2,3,4,7,8-]
Residential SSL[a]				2.43	15.7	18.7	0.333	na[b]	na	na	na	na	na	na
CALA-14-54424	LA-29	0.0–4.5	Sediment	0.0094 (J)	—[c]	—	0.000554 (J)	0.0000163	0.00000309 (J)	—	—	0.000000615 (J)	—	—
CALA-14-54425	LA-30	0.0–6.2	Sediment	0.00728 (J)	—	—	—	0.0000102	0.00000223 (J)	—	—	—	—	—
CALA-14-54426	LA-31	0.0–2.6	Sediment	—	—	—	—	0.0000261	0.00000478 (J)	—	—	0.0000012 (J)	0.000000589 (J)	—
CALA-14-54427	LA-32	0.0–3.4	Sediment	0.00584	—	—	—	0.0000118	0.000003 (J)	—	—	0.000000571 (J)	—	—
CALA-14-54428	LA-33	0.0–1.3	Sediment	0.00305 (J)	—	—	—	0.00000328 (J)	0.000000764 (J)	—	—	—	—	—
CALA-14-54429	LA-34	0.0–4.5	Sediment	0.0145 (J)	0.000418 (J)	—	0.000729 (J)	0.0000408	0.00000719	—	—	0.00000154 (J)	—	—
CALA-14-54439	LA-35	0.0–4.8	Sediment	0.0121 (J)	—	—	0.000608 (J)	0.0000462	0.00000748	0.000000826 (J)	—	0.00000187 (J)	0.000000906 (J)	—
CALA-14-54440	LA-36	0.0–3.7	Sediment	—	—	0.00118 (J)	—	0.0000119	0.00000263 (J)	—	—	—	—	—
CALA-14-54986	LA-37	0.0-3.5	Sediment	0.0299	—	—	—	0.00007650	0.0000139	0.00000133 (J)	—	0.00000279 (J)	0.00000153 (J)	0.00000205 (J)
CALA-14-54987	LA-38	0.0-4.0	Sediment	0.0139	—	—	—	0.000056	0.00000905	—	—	0.0000023 (J)	0.00000143 (J)	0.00000124 (J)
CALA-14-54988	LA-39	0.0-4.2	Sediment	0.0142	—	—	—	0.0000638	0.0000118	0.00000112 (J)	—	0.00000247 (J)	0.00000128 (J)	0.00000187 (J)
CALA-14-54991	LA-41	0.0-3.5	Sediment	0.0102 (J)	—	—	—	0.000102	0.000018	0.00000124 (J)	0.00000083 (J)	0.00000315 (J)	0.00000158 (J)	0.00000193 (J)

Table 2.4-9 (continued)

Sample ID	Location ID	Depth (ft)	Media	Hexachlorodibenzofuran[1,2,3,6,7,8-]	Hexachlorodibenzofuran[2,3,4,6,7,8-]	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	Pentachlorodibenzofuran[2,3,4,7,8-]	Tetrachlorodibenzofuran[2,3,7,8-]
Residential SSL[a]				na	na	na	na	na	0.00049
CALA-14-54424	LA-29	0.0–4.5	Sediment	—	—	0.000163	0.00000656 (J)	—	0.000000142 (J)
CALA-14-54425	LA-30	0.0–6.2	Sediment	—	—	0.000104	0.00000402 (J)	—	0.000000192 (J)
CALA-14-54426	LA-31	0.0–2.6	Sediment	—	—	0.000262	0.0000111	—	0.000000199 (J)
CALA-14-54427	LA-32	0.0–3.4	Sediment	—	—	0.000119	0.00000387 (J)	—	—
CALA-14-54428	LA-33	0.0–1.3	Sediment	—	—	0.0000286	0.00000175 (J)	—	—
CALA-14-54429	LA-34	0.0–4.5	Sediment	—	0.000000638 (J)	0.000456	0.0000182	—	0.000000375 (J)
CALA-14-54439	LA-35	0.0–4.8	Sediment	—	—	0.000487	0.0000177	—	0.000000186 (J)
CALA-14-54440	LA-36	0.0–3.7	Sediment	—	—	0.000133	0.0000048 (J)	—	—
CALA-14-54986	LA-37	0.0-3.5	Sediment	—	0.000001 (J)	0.000859	0.0000405	—	0.0000019
CALA-14-54987	LA-38	0.0-4.0	Sediment	—	0.00000089 (J)	0.000605	0.0000208	—	0.00000122 (J)
CALA-14-54988	LA-39	0.0-4.2	Sediment	0.0000008 (J)	0.00000098 (J)	0.000725	0.0000330	0.00000107 (J)	0.00000153 (J)
CALA-14-54991	LA-41	0.0-3.5	Sediment	—	0.00000121 (J)	0.00138	0.0000722	0.00000104 (J)	0.00000154 (J)

Notes: All concentrations are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs from NMED (2015, 600915) unless otherwise noted.

[b] na = Not available.

[c] — = Not detected.

Table 2.4-10
Dioxin and Furan Toxic Equivalencies for 2014 Samples

Congener	TEF[a]	CALA-14-54424		CALA-14-54425		CALA-14-54426		CALA-14-54427		CALA-14-54428		CALA-14-54429		CALA-14-54439		CALA-14-54440	
		Concentration	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	Concentration	TEQ	Concentration	TEQ
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	0.01	1.63E-05	1.63E-07	1.02E-05	1.02E-07	2.61E-05	2.61E-07	1.18E-05	1.18E-07	3.28E-06 (J)	3.28E-08	4.08E-05	4.08E-07	4.62E-05	4.62E-07	1.19E-05	1.19E-07
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	0.01	3.09E-06 (J)	3.09E-08	2.23E-06 (J)	2.23E-08	4.78E-06 (J)	4.78E-08	3.00E-06 (J)	3.00E-08	7.64E-07 (J)	7.64E-09	7.19E-06	7.19E-08	7.48E-06	7.48E-08	2.63E-06 (J)	2.63E-08
Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	0.01	—[b]	n/a[c]	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	8.26E-07 (J)	8.26E-09	—	n/a
Hexachlorodibenzodioxin[1,2,3,4,7,8-]	0.1	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a
Hexachlorodibenzodioxin[1,2,3,6,7,8-]	0.1	6.15E-07 (J)	6.15E-08	—	n/a	1.20E-06 (J)	1.20E-07	5.71E-07 (J)	5.71E-08	—	n/a	1.54E-06 (J)	1.54E-07	1.87E-06 (J)	1.87E-07	—	n/a
Hexachlorodibenzodioxin[1,2,3,7,8,9-]	0.1	—	n/a	—	n/a	5.89E-07 (J)	5.89E-08	—	n/a	—	n/a	—	n/a	9.06E-07 (J)	9.06E-08	—	n/a
Hexachlorodibenzofuran[1,2,3,4,7,8-]	0.1	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a
Hexachlorodibenzofuran[1,2,3,6,7,8-]	0.1	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a
Hexachlorodibenzofuran[2,3,4,6,7,8-]	0.1	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	6.38E-07 (J)	6.38E-08	—	n/a	—	n/a
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	0.0003	1.63E-04	4.89E-08	1.04E-04	3.12E-08	2.62E-04	7.86E-08	1.19E-04	3.57E-08	2.86E-05	8.58E-09	4.56E-04	1.37E-07	4.87E-04	1.46E-07	1.33E-04	3.99E-08
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	0.0003	6.56E-06	1.97E-09	4.02E-06	1.21E-09	1.11E-05	3.33E-09	3.87E-06	1.16E-09	1.75E-06	5.25E-10	1.82E-05	5.46E-09	1.77E-05	5.31E-09	4.80E-06 (J)	1.44E-09
Pentachlorodibenzofuran[2,3,4,7,8-]	0.3	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a	—	n/a
Tetrachlorodibenzofuran[2,3,7,8-]	0.1	1.42E-07	1.42E-08	1.92E-07	1.92E-08	1.99E-07	1.99E-08	—	n/a	3.75E-07	3.75E-08	—	n/a	1.86E-07 (J)	1.86E-08	—	n/a
Total TEQ[d]			3.20E-07		1.76E-07		5.90E-07		2.42E-07		8.70E-08		8.40E-07		9.93E-07		1.87E-07
Residential SSL[e]			4.90E-05		4.90E-05		4.90E-05		4.90E-05		4.90E-05		4.90E-05		4.90E-05		4.90E-05

Table 2.4-10 (continued)

Congener	TEF[a]	CALA-14-54986		CALA-14-54987		CALA-14-54988		CALA-14-54991	
		Concentration	TEQ	**Concentration**	TEQ	**Concentration**	TEQ	**Concentration**	TEQ
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	0.01	7.65E-05	7.65E-07	5.60E-05	5.60E-07	6.38E-05	6.38E-07	1.02E-04	1.02E-06
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	0.01	1.39E-05	1.39E-07	9.05E-06	9.05E-07	1.18E-05	1.18E-07	1.80E-05	1.80E-07
Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	0.01	1.33E-06 (J)	1.33E-08	—	—	1.12E-06 (J)	1.12E-08	1.24E-06 (J)	1.24E-08
Hexachlorodibenzodioxin[1,2,3,4,7,8-]	0.1	—	—	—	—	—	—	8.30E-07 (J)	8.30E-08
Hexachlorodibenzodioxin[1,2,3,6,7,8-]	0.1	2.79E-06 (J)	2.79E-07	2.30E-06	2.30E-07	2.47E-06 (J)	2.47E-07	3.15E-06 (J)	3.15E-07
Hexachlorodibenzodioxin[1,2,3,7,8,9-]	0.1	1.53E-06 (J)	1.53E-07	1.43E-06	1.43E-07	1.28E-06 (J)	1.28E-07	1.58E-06 (J)	1.58E-07
Hexachlorodibenzofuran[1,2,3,4,7,8-]	0.1	2.05E-06 (J)	2.05E-07	1.24E-06	1.24E-07	1.87E-06 (J)	1.87E-07	1.93E-06 (J)	1.93E-07
Hexachlorodibenzofuran[1,2,3,6,7,8-]	0.1	—	—	—	—	8.00E-07 (J)	8.00E-08	—	—
Hexachlorodibenzofuran[2,3,4,6,7,8-]	0.1	1.00E-06 (J)	1.00E-07	8.90E-07	8.90E-08	9.80E-07 (J)	9.80E-08	1.21E-06 (J)	1.21E-07
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	0.0003	8.59E-04	2.58E-07	6.05E-04	1.82E-07	7.25E-04	2.18E-07	1.38E-03	4.14E-07
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	0.0003	4.05E-05	1.22E-08	2.08E-05	6.24E-09	3.30E-05	9.90E-09	7.22E-05	2.17E-08
Pentachlorodibenzofuran[2,3,4,7,8-]	0.3	—	—	—	—	1.07E-06 (J)	3.21E-07	1.04E-06 (J)	3.12E-07
Tetrachlorodibenzofuran[2,3,7,8-]	0.1	1.90E-06	1.90E-07	1.22E-06	1.22E-07	1.53E-06 (J)	1.53E-07	1.54E-06 (J)	1.54E-07
Total TEQ			1.36E-06		1.65E-06		2.21E-06		2.98E-06
Residential SSL			4.90E-05		4.90E-05		4.90E-05		4.90E-05

Notes: All concentrations are in mg/kg. Data qualifiers are defined in Appendix A.

[a] TEFs (toxicity equivalency factors) from NMED (2015, 600915).

[b] — = Not detected.

[c] n/a = Not applicable.

[d] TEQ = Toxic equivalency.

[e] SSL from NMED (2015, 600915).

Table 2.4-11
Radionuclides Detected or Detected above FVs in 2014 Samples

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Plutonium-238	Plutonium-239/240
Sediment FV[a]				**0.04**	**0.006**	**0.068**
Residential SAL[b]				**83**	**12**	**79**
CALA-14-54424	LA-29	0.0–4.5	Sediment	0.4	0.0402	0.452
CALA-14-54425	LA-30	0.0–6.2	Sediment	0.274	—[c]	0.268
CALA-14-54426	LA-31	0.0–2.6	Sediment	0.177	—	0.317
CALA-14-54427	LA-32	0.0–3.4	Sediment	0.0904	—	0.179
CALA-14-54428	LA-33	0.0–1.3	Sediment	0.0868	—	0.103
CALA-14-54429	LA-34	0.0–4.5	Sediment	0.149	—	0.273
CALA-14-54439	LA-35	0.0–4.8	Sediment	0.146	0.0294	0.322
CALA-14-54440	LA-36	0.0–3.7	Sediment	0.0953	—	0.17
CALA-14-54986	LA-37	0.0-3.5	Sediment	0.162	—	0.547
CALA-14-54987	LA-38	0.0-4.0	Sediment	0.14	—	0.423
CALA-14-54988	LA-39	0.0-4.2	Sediment	0.147	—	0.564
CALA-14-54991	LA-41	0.0-3.5	Sediment	0.183	—	0.642

Note: All activities are in pCi/g.

[a] FVs from LANL (1998, 059730).

[b] SALs from LANL (2015, 600929).

[c] — = Not detected or not detected above FV.

Table 2.4-12
Constituents Detected in NMED-DOE-OB Runoff Samples Collected at Borrow Pit on September 13, 2013

Sample ID	Location ID	Field Preparation	Date Collected	Gross Alpha Radioactivity	Gross Beta Radioactivity	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Strontium-90	Total PCBs	Toxicity Equivalent (TEQ) for Dioxins and Furans	Uranium-234	Uranium-235	Uranium-238
Water-Quality Standard[a]				**15[b]**	**na[c]**	**na**	**na**	**na**	**8[b]**	**0.00064[d]**	**0.00003[b]**	**na**	**na**	**na**
LASP091313A	LA Weir spoils pile NW corner	UF[e]	9/13/2013	—[f]	—	—	—	—	—	0.00233	—	—	—	—
LASP091313B	LA Weir spoils pile NW corner	UF	9/13/2013	—	—	0.00000511 (J)	0.00000127 (J)	0.0000478 (J)	—	—	0.0000000781[g]	—	—	—
LASP091313C-W	LA Weir spoils pile NW corner	UF	9/13/2013	37	45				0.73	—	—	2.1	0.11	2.0
LASP091313D-W	LA Weir spoils pile NW corner	F[h]	9/13/2013	—	—	—	—	—	1.1	—	—	—	—	—

Notes: All concentrations are in µg/L for chemicals and activities are in pCi/L for radionuclides. Data qualifiers are defined in Appendix A.

[a] Water-quality standards from NMAC 20.6.4.900 J.

[b] Water-quality standard for domestic water supply.

[c] na = Not available.

[d] Water standard for human health-organism only.

[e] UF = Unfiltered.

[f] — = Not analyzed.

[g] TEQ calculated using concentrations of detected dioxin/furan congeners and toxicity equivalency factors from NMED (2015, 600915).

[h] F = Filtered.

Table 3.1-1
Summary of Proposed Samples and Analyses

Location Number	Location	Sample Interval	TAL Metals (EPA SW-846:6010B/6020)	Total Cyanide (EPA-SW846:9012A)	Dioxins/Furans (EPA SW-846:8290)	Herbicides (EPA SW-846:8151A)	PCBs (EPA SW-846:8082)	Pesticides (EPA SW-846:8081A)	Americium-241 (HASL 300)	Gamma-Emitting Radionuclides (EPA 901.1)	Isotopic Plutonium (HASL-300)	Strontium-90 (EPA 905.0)	Tritium (EPA 906.0)
1 through 8	Grid locations within borrow pit	Top 1 ft of sediment fill (top one-third of profile if thickness less than 3 ft)	X*	X	X	X	X	X	X	X	X	X	X
		Middle 1 ft of sediment fill (middle one-third of profile if thickness less than 3 ft)	X	X	X	X	X	X	X	X	X	X	X
		Bottom 2 ft of sediment fill (bottom one-third of profile if thickness less than 3 ft)	X	X	X	X	X	X	X	X	X	X	X

* X = Analysis will be performed.

Appendix A

Acronyms and Abbreviations,
Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

AOC	area of concern
BV	background value
COPC	chemical of potential concern
DB[2,4-]	4-(2,4-dichlorophenoxy)butyric acid
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DL	detection limit
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
ESH	Environment, Safety, and Health
FV	fallout value
GPS	global positioning system
HI	hazard index
HQ	hazard quotient
IDW	investigation-derived waste
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
MCPP	methylchlorophenoxypropionic acid
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMED-HWB	NMED Hazardous Waste Bureau
NMED-DOE-OB	NMED-DOE Oversight Bureau
NOD	notice of disapproval
NRCS	Natural Resources Conservation Service
PCB	polychlorinated biphenyls
RUSLE2	Revised Universal Soil Loss Equation 2
SAL	screening action level
SAR	solid waste management unit assessment report
SOP	standard operating procedure
SSL	soil screening level
SWMU	solid waste management unit

TAL	target analyte list
TCDD	tetrachlorodibenzodioxin
TEF	toxicity equivalency factor
TEQ	toxic equivalency
UCL	upper confidence limit
USDA	Department of Agriculture (U.S.)

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control parameters.

Appendix B

Site Photographs

Figure B-1 Excavation activities within the Los Alamos low-head weir lower sediment basin in 2011

Figure B-2 Excavation of the Los Alamos weir middle basin in 2012

Figure B-3 Los Alamos weir lower basin showing ponding conditions during excavation activities in 2012

Figure B-4 Emplacement of excavated Los Alamos weir sediments in the borrow pit in 2012. The liner is visible around the sediments.

Figure B-5 Excavation of Los Alamos weir sediments in the lower basin in 2013

Figure B-6 Los Alamos weir lower basin after completion of 2013 excavation activities

Figure B-7 Emplacement of excavated Los Alamos weir sediments in the borrow pit in 2013

Figure B-8 Excavation of Los Alamos weir sediments in the lower basin in 2014

Figure B-9 Emplacement of excavated Los Alamos weir sediments in the borrow pit in 2014

Figure B-10 Emplacement of excavated Los Alamos weir sediments in the borrow pit and contouring of the pit in 2014

Figure B-11 Runoff retention berm following 2015 maintenance activities

Figure B-12 July 2016 photograph showing current conditions of the borrow pit

Figure B-13 July 2016 photograph showing current conditions of the sediments placed in the borrow pit

Figure B-14 July 2016 photograph showing current conditions of revegetation (foreground) of the sediment in the borrow pit

Appendix C

As-Built Drawings

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS

BLDG N/A TA-72

LIST OF FIGURES

LOCATION PLAN
PARTIAL TA-72

200' 100' 0 100' 200'

GENERAL NOTES:

1. IF THIS SHEET IS NOT 24"X36" USE GRAPHIC SCALE ACCORDINGLY.
2. THIS PACKAGE CONSISTS OF AS-BUILT INFORMATION BASED ON EXISTING FIELD CONDITIONS, DESIGN ANALYSIS USING ADEM SPECIFICATIONS, AND ADDITIONAL DATA BASED ON WORK ORDER #CAP-51083.
3. REFER TO SPECIFICATIONS FOR ADDITIONAL DESIGN INFORMATION NOT SHOWN ON DRAWINGS.
4. ALL ELEVATIONS ARE FINISHED GRADE, UNLESS OTHERWISE NOTED.

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
0				INITIAL ISSUE					

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS
TITLE SHEET

DRAWN: G. VOGEL
DESIGN: W. FOLEY
CHECKED: S. LIME
DATE: 06-29-2016

TA-72 BLDG N/A

SUBMITTED: T. KOSTRUBALA
APPROVED FOR RELEASE: G. VEENIS

Los Alamos NATIONAL LABORATORY
PO Box 1663
Los Alamos, New Mexico 87545

SHEET G-0001
1 OF 7

D.C.: UNCLASSIFIED
REVIEWER: WILLIAM TURNEY
DATE: 7-22-16

PROJECT ID 102891
DRAWING NO
REV 0

LEGEND

	NORTH ORIENTATION SYMBOL
20' 10' 0 10' 20'	GRAPHIC SCALE
	REFERENCE ELEVATION
	SAMPLER LOCATION
A C-3000	SECTION TAG
	SECTION END LINE
1 C-5000	DETAIL TAG
	AOC/SWMU BOUNDARY
	NON-WOVEN GEOTEXTILE FABRIC
	EXTENTS OF EXCAVATED SEDIMENT PLACEMENTS
	EXTENT OF EXISTING GRADE MARKER
	EROSION CONTROL BLANKET
	SURFACE DRAINAGE FLOW ARROW
7300	2015 EXISTING GRADE CONTOURS
	2002 EXISTING GRADE
	2015 EXISTING GRADE
	ANGULAR RIPRAP
	PONDING AREA
	MISC EXISTING STRUCTURE
	EXISTING GROUND OR TUFF
	MULCH AND SEEDING
	COMPACTED BERM FILL
	LA WEIR SEDIMENTS
	SERVICE ROAD
	FLOODPLAIN

ABBREVIATIONS

ALT	- ALTERNATING
AOC	- AREA OF CONCERN
ASTM	- AMERICAN SOCIETY FOR TESTING AND MATERIALS
BLDG	- BUILDING
BMP	- BEST MANAGEMENT PRACTICE
C OF G	- CENTER OF GRAVITY
CFR	- CODE OF FEDERAL REGULATIONS
CFT	- CUBIC FEET
DIA	- DIAMETER
EA	- EACH
ELEV	- ELEVATION
EXID	- EXCAVATION / FILL / SOIL DISTURBANCE
ESM	- ENGINEERING STANDARDS MANUAL
FL	- FLOWLINE
FT	- FOOT OR FEET
HDPE	- HIGH DENSITY POLYETHYLENE
INV	- INVERT
LANL	- LOS ALAMOS NATIONAL LAB
LBS	- POUNDS
LF	- LINEAR FEET
LLDPE	- LINEAR LOW-DENSITY POLYETHYLENE
MAX	- MAXIMUM
MIN	- MINIMUM
ML	- MANAGEMENT LEVEL
NAD	- NORTH AMERICAN DATUM
NGVD	- NATIONAL GEODETIC VERTICAL DATUM
NMDOT	- NEW MEXICO DEPARTMENT OF TRANSPORTATION
N/A	- NOT APPLICABLE
OSHA	- OCCUPATIONAL SAFETY AND HAZARD ADMINISTRATION
PIC	- PERSON IN CHARGE
PVC	- POLYVINYL CHLORIDE
RECP	- ROLLED EROSION CONTROL PRODUCT
SEC	- SECOND
SMA	- STORM WATER MANAGEMENT AREA
STA	- STATION
SWMU	- SOLID WASTE MANAGEMENT UNIT
TA	- TECHNICAL AREA
TOC	- TOP OF CONCRETE/TOP OF CURB
TYP	- TYPICAL
YR	- YEAR

GENERAL NOTES

1. ALL SYMBOLS, ABBREVIATIONS, HATCH, AND LINE TYPES LISTED ON THIS SHEET MAY NOT NECESSARILY BE USED.

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
1	09-21-2016	U		ADDED 'SEED AND MULCH' TO LEGEND	GV	WF	DR	TK	SV
0				INITIAL ISSUE					

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDMINETS AS-BUILT CONDITIONS

ABBREVIATIONS AND SYMBOLS LEGEND

TA-72 BLDG N/A

DRAWN	G. VOGEL
DESIGN	W. FOLEY
CHECKED	S. LIME
DATE	07-21-2016

SUBMITTED T. KOSTRUBALA

APPROVED FOR RELEASE S. VEENIS

Los Alamos NATIONAL LABORATORY

PO Box 1663 Los Alamos, New Mexico 87545

SHEET C-0001

2 OF 7

D.C.: UNCLASSIFIED

REVIEWER: WILLIAM TURNEY

DATE: 10-3-16

PROJECT ID 102891

DRAWING NO

REV 0

Earth Moving Specification

DEFINITIONS

A. Mechanical Excavation: Use of backhoes, jackhammers, trenchers, and similar powered digging machines; excludes vacuum excavators that are equivalent to hand digging.

B. Utility and Pipe: Any active or inactive buried pipe, duct, conduit, or cable in a primary or secondary utility system. A utility excludes drainage culverts and storm water conveyances.

C. Compaction: The densification of soil, with percent compaction being the ratio (in percent) of the soil measured in-place dry density to the same soil's maximum dry density.

D. Excavation Slope: An inclined surface formed by removing material from below existing grade.

E. Embankment Slope: An inclined surface formed by placement of material above surrounding grade.

F. Compacted Berm Fill: Material primarily used to construct storm water berms and comprised of imported clean fill.

G. Subgrade: The undisturbed earth or the compacted soil layer immediately below areas where some type of excavation, fill material, bottom of road pavement sections, foundations or slabs are to be constructed, as shown on the Project Drawings.

H. Site Grading Fill and Backfill: Soils used primarily in site areas other than under structures or roadways to achieve finish grade.

I. Base Course: Material primarily used under roadways as part of the pavement structural section.

J. Unsuitable Material: Materials which do not meet the requirements and/or cannot meet compaction requirements.

QUALITY ASSURANCE

A. Any groundbreaking, excavation, fill, or soil disturbance and transfer did not begin until known utilities were marked, and an excavation/soil disturbance permit was issued.

B. Excavation and trenching operation in compliance with OSHA 29 CFR 1926, Subpart P.

C. Excavation/Fill/Soil Disturbance (EX-ID) Permit package on site at all times during construction.

D. Daily pre-job briefing including EX-ID Permit and associated safety and hazard documentation with workers proir to performing the work.

E. Engineering controls and required Personnel Protective Equipment (PPE) were used during construction.

F. Work remained within the established boundaries of the EX-ID permit issued.

SITE CONDITIONS

A. Backfilled areas were kept free of debris, snow, ice, and water, and frozen surfaces. Backfill material was in a thawed state before being placed, mixed, or compacted.

MATERIALS

A. Compacted berm fill was produced from mixing base course aggregate with clay to obtain the required gradation for granular berm fill.

B. Granular berm fill had the following gradation:

Sieve Size	Percent Passing
2.0 inch	100
1.0 inch	98 - 100
3/4 inch	65 - 80
No. 10	45 - 65
No. 200	24 - 35

The fraction passing the No. 200 sieve was not be greater than 0.667 of the fraction passing the No. 40 sieve.

C. Professional Plastic 12 MiL Polyethylene Nylon Reinforced plastic was placed on existing grade prior to excavated sediment placement.

PREPARATION

A. Subgrade surfaces compacted to the same density requirements used for the overlying material placed as fill or backfill. Unsuitable and unstable subgrade material was removed.

GRADING

A. Vegetation, debris, unsatisfactory soil materials, and obstructions were removed from ground surface during grading.

B. Areas uniformly graded within limits of grading, including adjacent transition areas.

C. Changes in grade gradual. Slopes blended into level areas. Finish grade prepared to accept seeding.

D. Finished surfaces smooth, compacted, and free from irregularities.

CONTROL OF WATER

A. Excavations were kept free from water during construction.

SOIL COMPACTION AND TESTING

A. Soil material was moisture-conditioned before compacting, by uniformly applying water to the surface.

B. Soil material too wet to permit compaction to the specified density was scarified and air dried.

C. The allowable percent variation from optimum moisture was plus or minus 2 percent.

D. The upper surface of the previous lift on which fill is to be placed in discrete lifts, was scarified prior to placing the next lift of soil in order to preclude zones of weakness.

E. Sediment fill was spread across the area in thin lifts, not exceeding 8 inches in loose thickness and compacted with a minimum of 2 passes using compaction equipment.

Site Stabilization Specification

SEED

A. Native grass seed mix applied was Curtis & Curtis Inc, "Homesteaders Choice Mix" or "Santa Fe Trail Mix"

WOOD MULCH

A. Wood mulch or green-waste mulch free from noxious weeds, mold, or other objectionable material was used, with size distribution ranging in length from 1-inch to 2-inches with <25% exceeding 2-inches in size and <30% being less than 0.25-inches in size.

HYDROMULCH

A. Material used consisted of 100 percent virgin wood fibers manufactured expressly from whole wood chips, such as Eco-Fibre, Conwed, etc. Chips were processed in such a manner as to contain no growth or germination inhibiting factors. Fiber were not produced from recycled material such as sawdust, paper, cardboard, or reidue from pulp and paper plants. Materials provided were free from contaminants such as lead paint, varnish, or other metal contaminants. Hydraulic mulch used contained non-toxic dye to assist in visual determination of even distribution.

B. Mulch material was required to have a pH at 3% consistency of 4.5 +/- 0.5, ash content of 0.8 % 4+/- 0.2%, moisture holding capacity equal to 1250 (grams water / 100 grams oven dry fiber), and moisture content of 12% +/- 3% (wet weight basis).

C. Mulch was combined with an organic plantago based tackifier, such as M-binder, etc. that had no growth or germination inhibiting factors and was required to be non-toxic.

D. Mulch was applied uniformly to the seeded area.

ROLLED EROSION CONTROL PRODUCTS

A. Coconut fiber blankets - A machine produced coconut fiber erosion control blanket using 100% coconut fibers sewn into a biodegradable netting. Minimum weight of of coconut fiber of 0.5 lbs/square yard with a minimum weight of netting of 6.5 lb/1000 square feet, such as North American Green C125BN, etc.

PREPARATION PRIOR TO SEEDING

A. Seedbed was prepared to a maximum depth of 4 inches by ripping except on earthen berms. On earthen berms the seedbed was prepared via hand raking or similar approach to loosen the top ¼ to ½ inch of soils. All competitive vegetation was uprooted during seedbed preparation and soil worked uniformly, leaving the surface rough to reduce surface erosion and to retain water runoff. Large clods and stones or other foreign material that would interfere with seeding equipment and erosion control blankets were removed.

B. Ripping across slope and along the contour was performed to adequately break up soil. Ripping was not performed up and down slopes, to avoid creation of excessive surface erosion problems.

C. To minimize dust problems for adjoining areas, when wind speeds are over 10 mph, dust control measures were implemented.

D. The extent of seedbed preparation did not exceed the area on which the entire seeding operation could be accomplished within a one week period.

APPLICATION OF SEED GENERAL REQUIREMENTS

1. Seed boxes used for drill and broadcast seeding were equipped with an agitator.
2. To prevent stratification of seed mix, seed box agitators did not run while seeding was not being performed.
3. If seed mix was transported to site in a seed box or other equipment that subjected mix to shaking or similar movement with potential to cause stratification, the seed was remixed prior to application.
4. Seeding equipment was calibrated as appropriate to distribute seed at the specified rates.
5. Areas disturbed by or denuded by construction operations or erosion were seeded.
6. Markers used to ensure that no gaps will exist between passes of seeding equipment.
7. Where cover crop was established, the crop was mowed and seed perennial seed mix was drilled into the crop stubble.

BROADCAST SEEDING APPLICATION

1. Broadcast seeding, plant seed mix was applied at a rate of 32 - 37 lbs/acre.
2. Seed was mechanically broadcast by use of a hydraulic mulch slurry blower, rotary spreader, or a seeder box with a gear feed mechanism using the highest pressure and smallest nozzle opening possible.
3. Immediately following seeding operation, the surface soil was thoroughly hand raked, drag harrowed or disturbed by other means to a depth of ¼ inch to cover seed.
4. A 2-step process was used. Seed was applied with a tracer. Once seed was applied, full complement of mulch was applied, to allow seed to be in good contact with soil surface and not suspended in mulch matrix.
5. Vehicles were prohibited from traveling over the seeded areas following seeding and mulching operations.

HYDRAULIC MULCHING/TACKFIER APPLICATION

A. Slurry was mixed in a tank with an agitation system and sprayed, under pressure, uniformly over seeded area.

B. Materials in slurry were kept in uniform suspension throughout the missing and suspension cycle during hydraulic mulching equipment use.

C. Materials were applied at a rate of 150 lbs/acre.

D. Foot/vehicle traffic was prohibited from hydraulically mulched areas following seeding and mulching operations.

Site Stabilization Specification (CONTINUED)

APPLICATION OF MULCH

A. Weed-free wood or green-waste mulch was used in disturbed areas. Mulch was spread uniformly over area to achieve no less than 80 percent ground cover.

APPLICATION OF EROSION CONTROL BLANKET:

A. Blankets placed over native grass seeding immediately following the raking/chaining operation.

B. Single netted products on 2:1 or flatter slopes were placed with netting on top and the wood/ straw fibers in contact with soil over entire seeded area.

C. On slope installations, the following guidelines were used:

Upslope Anchor - utilize one of the methods detailed below for initial anchoring of Rolled Erosion Control Products (RECP):

1. Staples: Install the RECP 3 ft. beyond the shoulder of the slope onto flat final grade. Secure roll end with a single row of stakes/staples on 1 ft. centers.
2. Anchor trench: Unless otherwise specified in the design documents, excavate a 6 in. by 6 in. anchor trench. Extend the upslope terminal end of the RECP 3 ft. past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. centers. Backfill the trench and compact the soil into the anchor trench.
3. Unroll blanket downslope in direction of water flow unless otherwise specified in the design documents.
4. Overlap edges of adjacent parallel rolls 6 inches and staple every 1 foot.
5. When blankets are spliced, place blankets end over end (shingle style) with 6-inch overlap. Staple through overlapped area, approximately 12 inches apart.
6. Lay blankets loosely and maintain direct contact with soil. Do not place over protruding objects; rocks, grass, etc.
7. Wire staple blankets sufficiently to anchor blanket and maintain blanket contact with soil per manufacturer's instructions.

Seams - utilize one of the methods detailed below for seaming of RECP:

1. Adjacent seams: Overlap edges of adjacent RECP by 2 to 4 in. or by abutting products as defined by manufacturer. Use a sufficient number of stakes or staples to prevent seam or abutted rolls from separating.
2. Consecutive rolls: Shingle and overlap consecutive rolls 2 to 6 in. in the direction of flow. Secure staples through seam at 1 ft. intervals.
3. Check seam. Construct a stake/staple check seam along the top edge of RECP for slope application and at specified intervals in a channel by installing two staggered rows of stakes/staples 4 in. apart on 4 in. centers.
4. Slope interruption check slot: Excavate a trench measuring 6 in. wide by 6 in. deep. Secure product to the bottom of the trench. Fold product over upslope material and fill and compact the trench on the downslope side of check slot and seed fill. Continue rolling material downslope over trench.

Terminal Ends - utilize one of the methods detailed below for all terminal ends of RECPs:

1. Staples: Install the RECP 3 ft. beyond the end of the channel and secure end with a single row of stakes/staples on 1 ft. centers. Stakes/staples for securing RECP to the soil is typically 6 in. long.
2. Anchor trench: Excavate a 6 in. by 6 in. anchor trench unless otherwise specified in the design documents.
Extend the terminal end of the RECP 3 ft. past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. terminal end of the RECP. Secure terminal end of RECP with a single row of stakes or staples on 1 ft. centers.

D. Check slot: Stake/staple check slot constructed along the terminal end of the RECP by installing two rows of staggered stakes/staples 4 in. apart on 4 in. centers.

E. Blankets not used on undisturbed, natural tuff slopes. Hydraulic mulching used on tuff slopes.

CLEANUP AND PROTECTION

A. After completion of work, site cleared of excess soil, waste material, debris and objects believed to hinder maintenance and detract from neat appearance of site.

B. Seeded areas, work and materials was left protected from damage due to vehicles, pedestrians, and operations by other subcontractors. Protection maintained during installation and maintenance periods.

C. Upon completion of all seeding operations, the portion of the project site used for storing materials and equipment of all debris was cleaned. All superfluous materials and equipment was removed from the project site.

ACCEPTANCE

A. Seeded areas reviewed for acceptance by LANL PIC at final stabilization. Final stabilization is defined as "All soil disturbing activities at the site have been completed and a minimum effective uniform (e.g., evenly distributed, without large bare areas) cover of 70 percent of the area has been established on all unpaved areas and areas not covered by permanent structures. Effective uniform cover includes native perennial vegetation, equivalent permanent stabilization measures (such as the use of green waste/wood/gravel mulch, compacted basecoarse, riprap, gabions, or geotextiles), or combination of the two." Stabilization in conformance with the Storm Water Pollution Prevention Plan (SWPPP), as applicable.

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
0				INITIAL ISSUE					

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS

SPECIFICATIONS

DRAWN	G. VOGEL
DESIGN	W. FOLEY
CHECKED	S. LIME
DATE	06-29-2016

TA-72 BLDG N/A

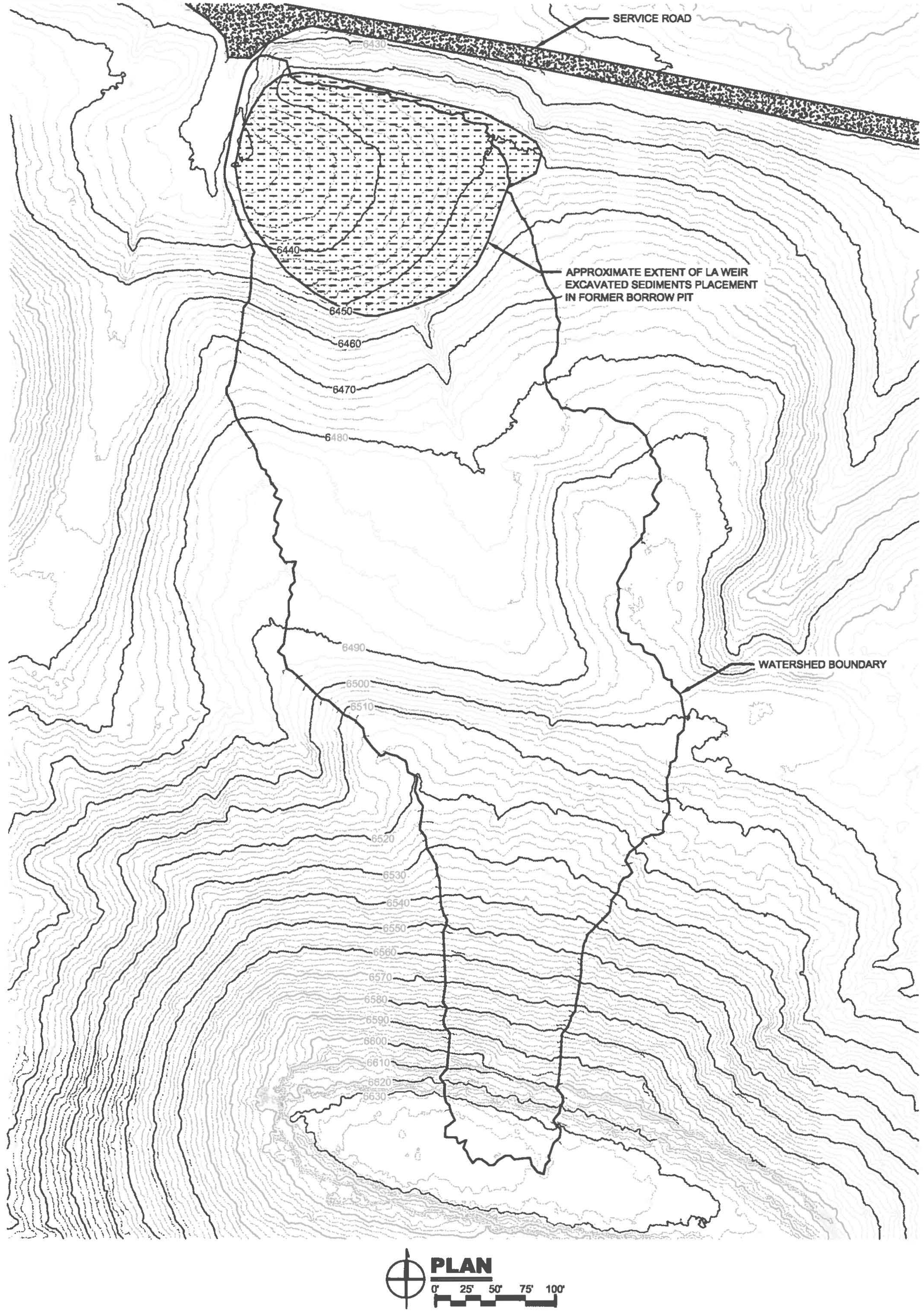
SUBMITTED T. KOSTRUBALA — APPROVED FOR RELEASE S. VEENIS

Los Alamos NATIONAL LABORATORY — PO Box 1663 Los Alamos, New Mexico 87545

SHEET C-0002 — 3 OF 7

D.C.: UNCLASSIFIED — REVIEWER: WILLIAM TURNEY — DATE 7-22-16

PROJECT ID 102891 — DRAWING NO — REV 0



GENERAL NOTES:

1. EXISTING CONTOURS BASED ON 2015 LIDAR SURVEY DATA.

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
1	09-21-2016	U		CORRECT CONTOUR LABELS	GV	WF	DR	TK	SV
0				INITIAL ISSUE	GV				SV

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS

SUB-WATERSHED PLAN

TA-72 BLDG N/A

DRAWN: G. VOGEL
DESIGN: W. FOLEY
CHECKED: S. LIME
DATE: 07-21-2016

SUBMITTED: T. KOSTRUBALA
APPROVED FOR RELEASE: S. VEENIS

Los Alamos National Laboratory
PO Box 1663
Los Alamos, New Mexico 87545

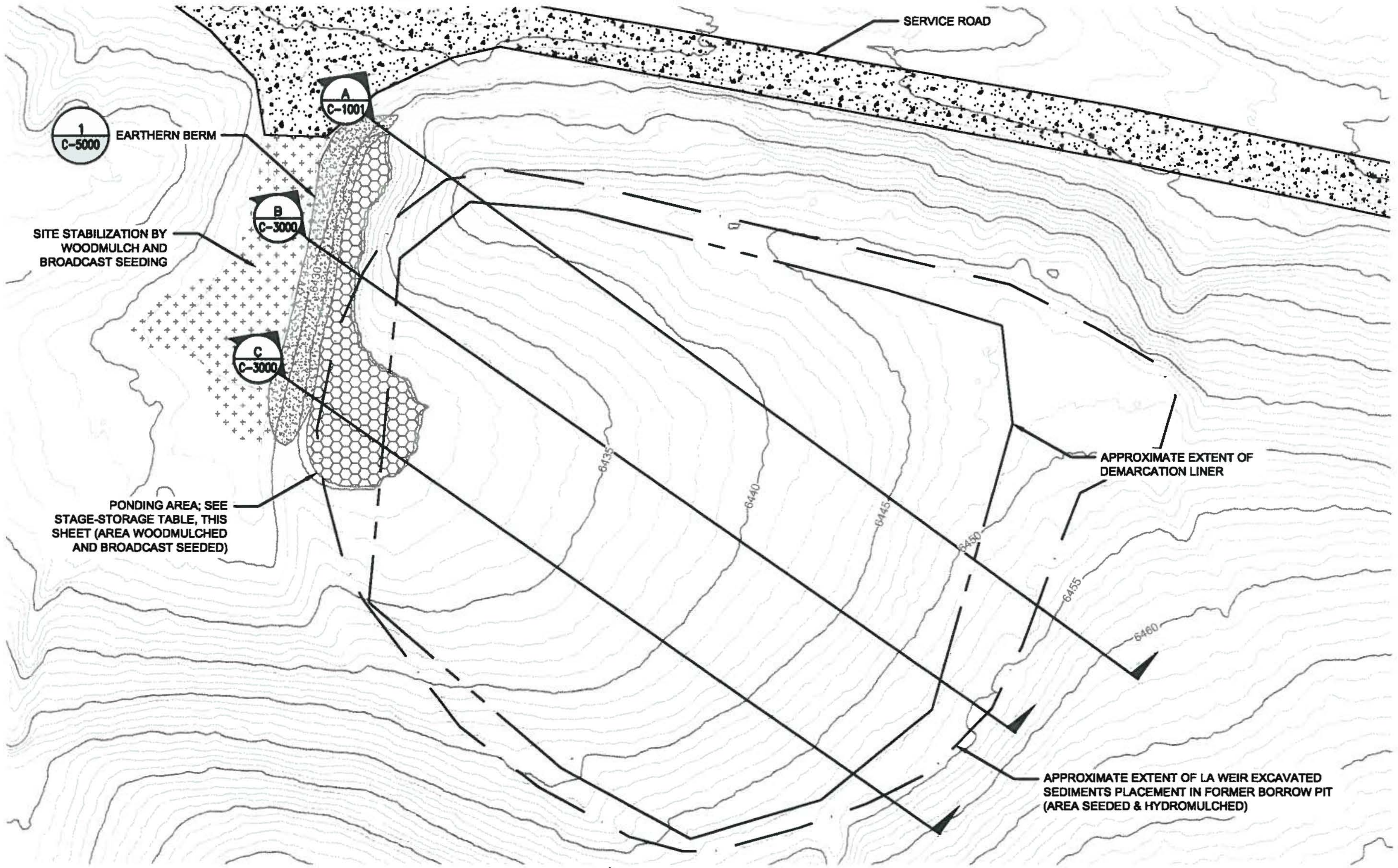
SHEET C-1000
4 OF 7

D.C.: UNCLASSIFIED
REVIEWER: WILLIAM TURNEY
DATE: 10-3-16

PROJECT ID 102891
DRAWING NO
REV 0

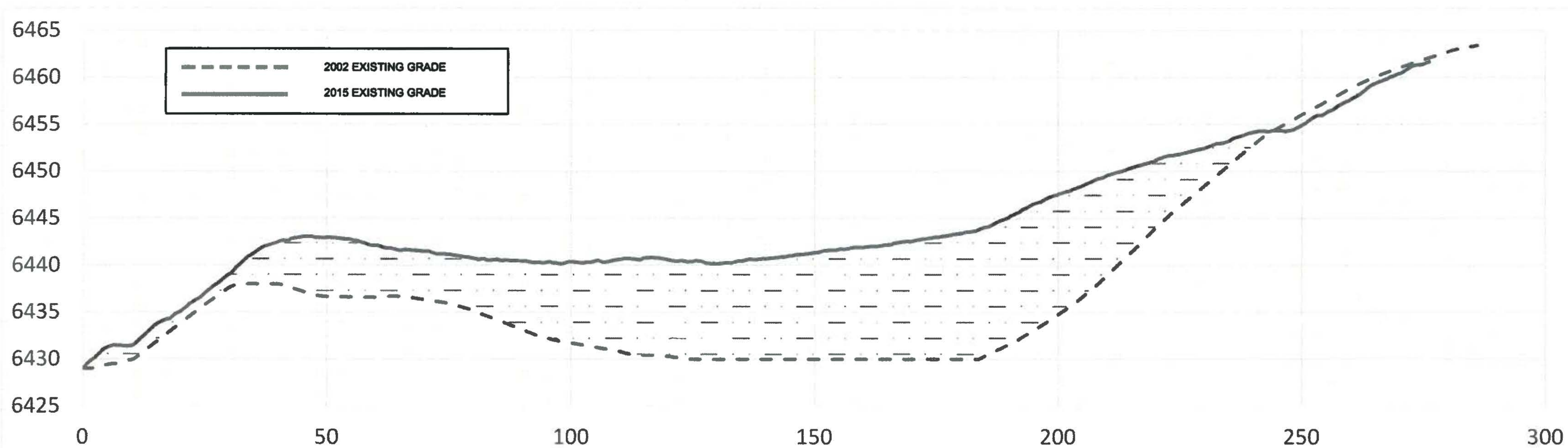
1 2 3 4 5 6

D C B A



PLAN

0' 25' 50' 75' 100'



A / C-1001 **BORROW PIT CROSS SECTION**

SCALE: NONE

GENERAL NOTES:

1. EXISTING CONTOURS BASED ON 2015 LIDAR SURVEY DATA.

PONDING AREA STAGE-STORAGE TABLE:

ELEVATION (FEET NGVD)	AS-BUILT RETENTION VOLUME (CUBIC-FEET)
6429.50*	0.56
6429.70	11.08
6429.90	44.29
6430.10	128.68
6430.30	262.91
6430.50	439.97
6430.70	655.18
6430.90	909.56
6431.10	1208.89
6431.30**	1554.47

* 6429.0 IS BOTTOM OF PONDING ELEVATION
** 6431.3 IS SPILLWAY ELEVATION

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
1	09-21-2016	U		NEW CROSS SECTIONS & EDIT DEMARCATION LINER	GV	WF	DR	TK	SV
0				INITIAL ISSUE					

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS

FORMER BORROW PIT PLAN

DRAWN G. VOGEL
DESIGN W. FOLEY
CHECKED S. LIME
DATE 07-21-2016

TA-72 BLDG N/A

SUBMITTED T. KOSTRUBALA

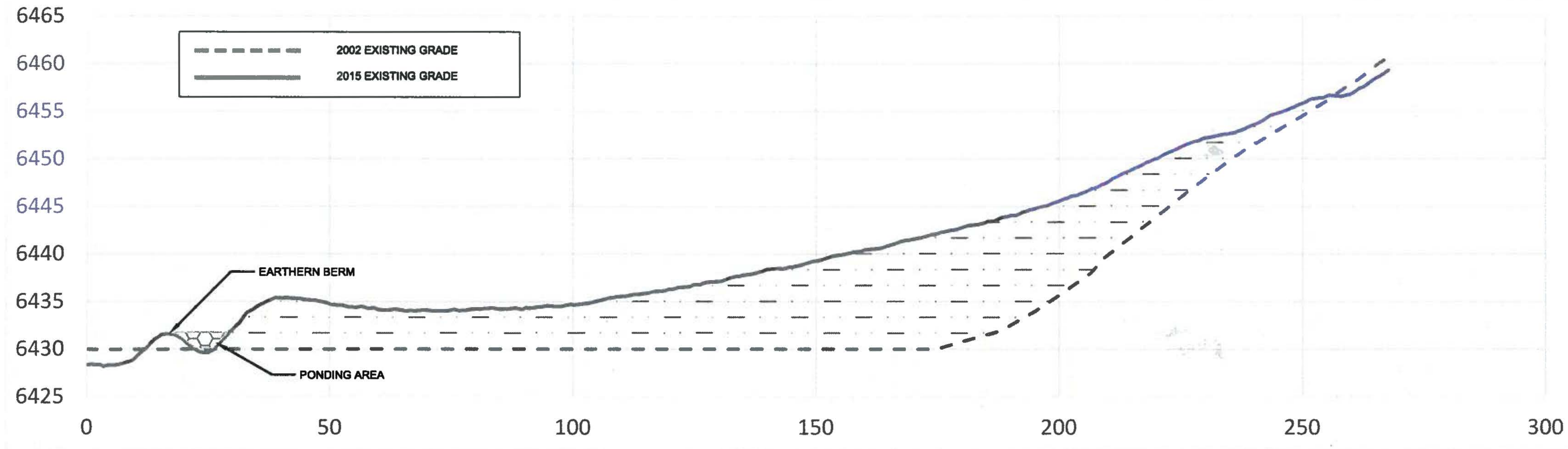
APPROVED FOR RELEASE S. VEENIS

Los Alamos NATIONAL LABORATORY PO Box 1663 Los Alamos, New Mexico 87545

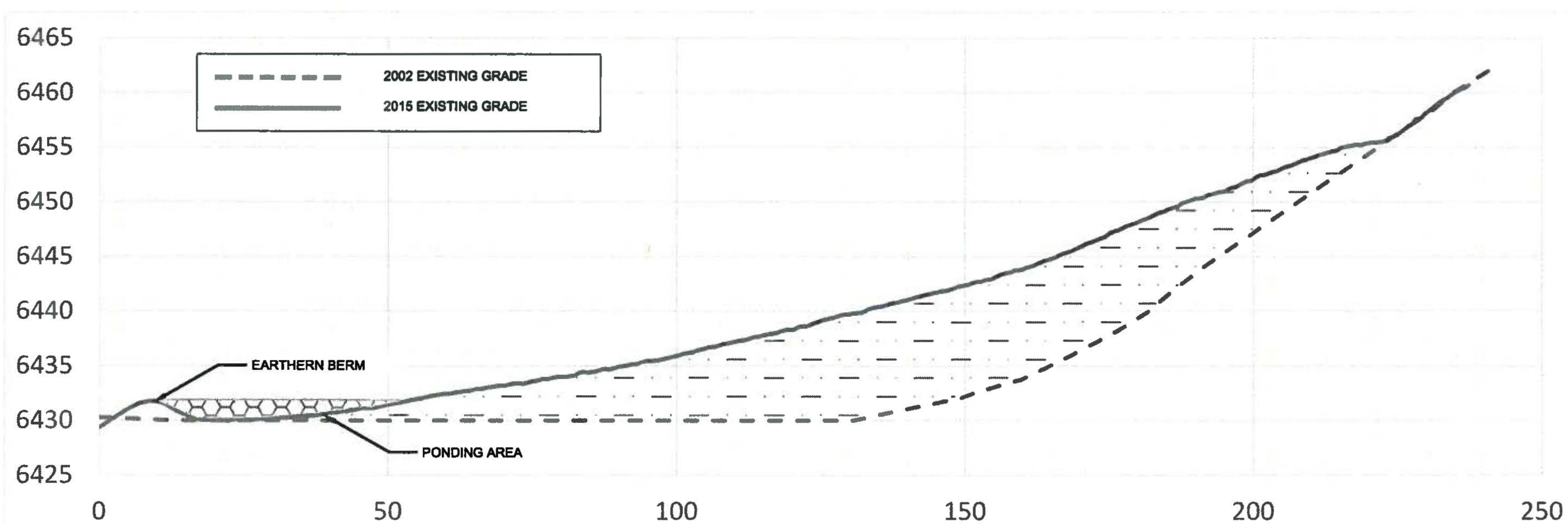
SHEET C-1001 5 OF 7

D.C.: UNCLASSIFIED REVIEWER: WILLIAM TURNEY DATE

PROJECT ID 102891 DRAWING NO REV 0



BORROW PIT CROSS SECTION (B / C-1001)
SCALE: NONE



BORROW PIT CROSS SECTION (C / C-1001)
SCALE: NONE

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
1	09-21-2016	U		NEW CROSS SECTIONS	GV	WF	DR	TK	SV
0				INITIAL ISSUE	GV				SV

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS

BORROW PIT CROSS SECTIONS

TA-72 BLDG N/A

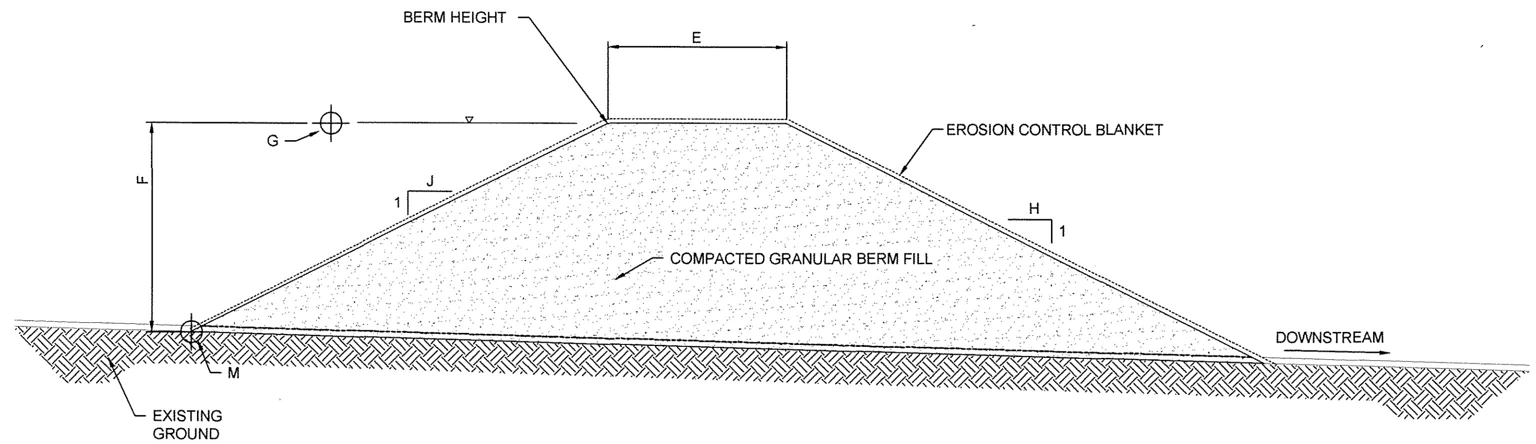
DRAWN	G. VOGEL
DESIGN	W. FOLEY
CHECKED	S. LIME
DATE	07-21-2016

SUBMITTED T. KOSTRUBALA
APPROVED FOR RELEASE S. VEENIS

Los Alamos NATIONAL LABORATORY
PO Box 1663
Los Alamos, New Mexico 87545

SHEET C-3000
6 OF 7

D.C.: UNCLASSIFIED
REVIEWER: WILLIAM TURNEY
DATE: 10-3-16
PROJECT ID 102891
DRAWING NO
REV 0



1
C-1001

BERM DETAIL

SCALE: NONE

GENERAL NOTES:

1. BERMS SHALL INSTALLED IN ACCORDANCE WITH SPECIFICATIONS ON SHEET 3.
2. EROSION CONTROL BLANKET INSTALLED IN ACCORDANCE WITH SPECIFICATIONS ON SHEET 3.

KEYED NOTES:

(1) EROSION CONTROL BLANKET CONSISTS OF COCONUT FIBER BLANKET NAG C125BN OR EQUIVALENT

DIMENSION ID	NAME	BERM
E	BERM CREST WIDTH	2.0 FT
F	BERM HEIGHT	1.8 - 2.5 FT
G	BERM CREST ELEVATION	6431.3 FT NGVD
H	BERM SLOPE (DOWNSTREAM)	3:1
J	BERM SLOPE (UPSTREAM)	2:1
M	UPSTREAM BERM TOE ELEVATION	6429.5 FT NGVD

NO	DATE	CLASS REV	DC	DESCRIPTION	DWN	DSGN	CHKD	SUB	APP
0				INITIAL ISSUE					

ENVIRONMENTAL MANAGEMENT

FORMER BORROW PIT CONTAINING LA WEIR EXCAVATED SEDIMENTS AS-BUILT CONDITIONS

BERM DETAIL

DRAWN G. VOGEL
DESIGN W. FOLEY
CHECKED S. LIME
DATE 07-21-2016

TA-72 BLDG N/A

SUBMITTED T. KOSTRUBALA

APPROVED FOR RELEASE S. VEENIS

Los Alamos NATIONAL LABORATORY

PO Box 1663 Los Alamos, New Mexico 87545

SHEET C-5000 7 OF 7

D.C.: UNCLASSIFIED

REVIEWER: WILLIAM TURNEY

DATE: 7.27.16

PROJECT ID 102891

DRAWING NO

REV 0

Appendix D

Analytical Data
(on CD included with this document)

Appendix E

Revised Universal Soil Loss Equation 2 Modeling

E-1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) has used a borrow pit located in Los Alamos Canyon to dispose of sediments removed from above the Los Alamos Canyon low-head weir between 2011 and 2014. A report of sediment excavation and disposal activities conducted in 2013 was submitted by the Laboratory to the New Mexico Environment Department (NMED) (LANL 2013, 251741). NMED's December 1, 2015, disapproval of Revision 1 of the 2013 excavation report (LANL 2015, 600513; NMED 2015, 601032) required the Laboratory to submit "stormwater modeling results" demonstrating the adequacy of the erosional controls established at the borrow pit. Additional details related to the modeling were discussed in a June 21, 2016, meeting between representatives of NMED, the U.S. Department of Energy, and Los Alamos National Security, LLC. During the meeting, NMED stated that erosional controls for similar sites covered under the National Pollutant Discharge Elimination System Construction General Permit were typically evaluated using the U.S. Department of Agriculture (USDA) Revised Universal Soil Loss Equation 2 (RUSLE2) software. Therefore, it was agreed that the requirements in the disapproval letter for storm water modelling would be met through RUSLE2 modeling.

This appendix to the solid waste management unit (SWMU) assessment report work plan describes the RUSLE2 modeling and the results of the modeling. RUSLE2 would typically be used to evaluate the expected performance of proposed erosion controls. Because erosion controls have already been established at the borrow pit site, RUSLE2 was used to evaluate current site conditions to verify that modeling results are consistent with field observations. In addition, RUSLE2 was used to evaluate soil erosion loss assuming disposal of sediments without erosion controls. These results define baseline conditions and allow quantification of the effectiveness of the controls installed in terms of the amount of sediment loss prevented.

Section E-2.0 describes the general RUSLE2 methodology. Section E-3.0 describes what the key model inputs are and how they were established for the borrow pit site. Section E-4.0 identifies the limitations of the modeling and the key assumptions inherent in the modeling. Section E-5.0 presents a summary of the modeling results, and Section E-6.0 provides conclusions. A list of references is provided in section E-7.0. Attachment E-1 contains documentation of the most recent site inspection, including photographs. Attachments E-2 and E-3 contain RUSLE2 inputs and outputs for the two scenarios modeled.

E-2.0 METHODOLOGY

The RUSLE2 software was used to determine estimated annual soil loss at the former borrow pit where excavated sediments from Los Alamos weir have been placed (0.82-acre area). RUSLE2 technology uses several factors, including climate, soil properties, base management, slope length, shape, and gradient, to determine erosional extent. The base RUSLE2 computation unit is a single overland flow path along a hillslope profile, outputting one soil loss calculation on one slope section of one field.

The RUSLE2 soil loss equation used in the model is

$$a = (r)\ (k)\ (l)\ (S)\ (c)\ (p) \qquad \textbf{Equation E-2.0-1}$$

where a = Annual computed soil loss in tons/acre/yr

r = Monthly rainfall-runoff erosivity factor

k = Soil erodibility factor

l = Slope length factor

S = Slope steepness factor

c = Monthly crop management factor or vegetative cover and maintenance practice factor

p = Monthly supporting practice factor or ratio of soil loss under erosion-control practice such as contouring or strip-cropping for straight-row farming

To obtain average annual soil loss, site-specific parameters are entered in a soil loss model for the area of concern.

E-3.0 MODEL INPUTS

Regional climate, soil, crop management, and supporting practice factors used in RUSLE2 modeling are developed and maintained by Natural Resources Conservation Service (NRCS) in its RUSLE2 database (available at http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm). Two modeling scenarios were developed: Scenario 1, current conditions, and Scenario 2, nonstabilized conditions (e.g., assumes sediments placed without site-stabilization activities). The two model scenarios were developed to aid in quantifying the reduction of soil loss that the existing erosion control measures at the borrow pit provide. The RUSLE2 model inputs used are described below.

E-3.1 Climate Factors

Monthly erosivity density and precipitation values are based on the NRCS RUSLE2 climate location database for Los Alamos County, New Mexico (University of Tennessee 2008, 601649), which provides the following climate factors:

- Average annual erosivity of 37.
- The 10-yr 24-h precipitation, defined as the storm amount that occurs in a 24-h period with the probability of occurring every 10 yr, equal to 2.6 in.

The 10-yr 24-h precipitation is used to compute an erosivity value, EI_{10y24h}, using the following equation:

$$EI_{10y24h} = 2\ (largest\ monthly\ erosivity\ density\ value) * P_{10y24h} \qquad \textbf{Equation E-3.1-1}$$

Where $EI_{10y24h} = erosivity\ value\ for\ the\ 10\ yr, 24yr\ \ precipitation\ (US\ erosivity)$

$P_{20y24h} = 10\ yr, 24\ hr\ precipitation\ (in.)$

EI_{10y24h} is used to compute runoff, which, along with storm erosivity, is used to compute transport capacity and deposition for concave slopes, vegetative strips, and channels; reduction of erosion by ponding; effectiveness of contouring; and critical slope length for contouring (University of Tennessee 2008, 601649).

E-3.2 Monthly Rainfall Runoff Erosivity (r)

RUSLE2 varies soil erosivity as a function of monthly precipitation and temperature (University of Tennessee 2008, 601649). Monthly rainfall-runoff erosivity values, r, distribution is determined using the following equation:

$$r = monthly\ erosivity\ density\ \ x\ \ monthly\ precipitation$$ **Equation E-3.2-1**

Monthly erosivity density and precipitation values, along with calculated monthly rainfall-runoff erosivity values, are summarized in the Table E-3.2-1 and used for both modeling scenarios.

E-3.3 Soil Erodibility Factor (k)

Soil erodibility factor, k, is equal to 0.020 for both modeling scenarios based on the "52 Totavi Loamy Sand" soil type in the NRCS-RUSLE2 Sandoval Area, parts of Los Alamos, Sandoval, and Rio Arriba, New Mexico, database (available at http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm).

Totavi loamy sand was selected as the appropriate soil type based on USDA NRCS Web Soil Survey for the area of investigation. Totavi loamy sand is also the predominant soil type in the lower Los Alamos Canyon watershed (available at http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx?marker=(-106.22830 35.86640), indicating it is the likely predominant soil type comprising the sediments collected in the Los Alamos weir basins.

E.3-4 Slope Length Factor (l) and Slope Steepness Factor (s)

For both modeling scenarios, the surface area of the Los Alamos weir excavated sediment placed in the borrow pit was divided into three areas based on average surface slope, shown as Segments 1, 2, and 3 in Figure E-3.4-1.

Slope steepness (s) and length factor (l) are based on Laboratory topographic data developed using aerial light detection and ranging survey data gathered in late 2015 and summarized in Table E-3.4-1:

E-3.5 Crop Management Factor (c)

Crop management factor (c) for the area under the current condition scenario is based on past revegetation practices and current vegetation conditions obtained from the NRCS RUSLE2 database for Crop Management Zone 29 (http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm), assuming the following management operations as model inputs:

- Seeding and Hydro Mulch Operation (2014)
- Native Grass Growth (from 2014 to 2016)

Based on these operations, RUSLE2 computes the crop management factor.

For Scenario 2, the nonstabilized scenario, the above management operations were removed as model inputs.

E-3.6 Erosion Control Practice Factor (p)

Erosion control practice factor (p) for the area under current conditions is based on the existing sediment basin at the base of the Los Alamos weir excavated sediments. The erosion control practice factor model input was selected from the NRCS RUSLE2 database (http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm) model options as follows:

- Water and Sediment Control Basin at the bottom of RUSLE2 slope.

Based on selection of this option, RUSLE2 computes the erosion control practice factor for Scenario 1.

For the nonstabilized scenario, the input was removed during modeling.

E-4.0 LIMITATIONS AND ASSUMPTIONS

RUSLE2 modeling computations performed have the following limitations:

- Does not include soil loss (i.e., erosion) from concentrated flow areas (e.g., channels, gullies, rilling)
- Does not estimate erosion by mass wasting or by piping (e.g., slope sloughing, water flowing through “pipes” in the soil)
- Does not estimate erosion caused by snowmelt

As shown in Figure E-3.4-1, a 3.7-acre area of clean fill and native earth runs on to the area where the Los Alamos weir–excavated sediments were placed in the borrow pit. The most recent biannual inspections (included as Attachment E-1) observed that this run-on area does not result in additional soil loss of the excavated sediments. In fact, sediment deposition from the run-on area was observed on top of the weir-excavated sediments. Based on these observations, the run-on area was not considered in the RUSLE2 modeling.

E-5.0 SUMMARY OF MODELING RESULTS

E-5.1 Summary of Modeling Results for Scenario 1, Current Conditions

The RUSLE2 model computation results for Scenario 1, current conditions (Attachment E-2), at the former borrow pit indicate detachment (i.e., average soil loss from the eroding portion of the slope) equal to 0.37 tons/acre/yr. Considering the deposition effects of the sediment basin at the bottom of the slope, RUSLE2 computation results in an annual sediment yield or annual sediment delivery rate of 0.0087 tons/acre/yr past the sediment basin. RUSLE2 input/output for the scenario is summarized in Attachment E-2, Scenario 1: RUSLE 2 Inputs and Outputs for Current Conditions. Over a 10-yr period, this volume of sediment delivered is 143 lb of sediment. Assuming a density of sediments at 168 lb/ft^3, this volume of sediment is equivalent to 0.8 ft^3 of sediment.

E-5.2 Summary of Modeling Results for Scenario 2, Nonstabilized Conditions

For comparison purposes, the RUSLE2 computation was prepared for the following scenario:

- Sediments placed without sediment basin construction and
- Sediments placed without site stabilization (i.e., revegetation)

If sediments were placed without a sediment basin and without providing site stabilization, RUSLE2 results indicate detachment, or an average soil loss from the eroding portion of the slope equal to 5.9 tons/acre/yr and an annual sediment yield or annual sediment delivery rate of 0.3 tons/acre/yr at the outlet. RUSLE2 input/output for the scenario is summarized in Attachment E-3, Scenario 2: RUSLE 2 Inputs and Outputs for Nonstabilized Conditions. Over a 10-yr period, this volume of sediment delivered is 2.5 tons of sediment. Assuming a density of sediments at 168 lb/ft^3, this volume of sediment is equivalent to 29 ft^3 of sediment.

E-5.3 Comparison of Modeling Result Scenarios

A comparison of the RUSLE2 modeling results for two scenarios described indicate that without the addition of the sediment basin, site stabilization activities (e.g., native grass seeding and hydromulching applications) and 2 yr of vegetation establishment, estimated annual sediment delivery rate would increase by a factor of approximately 36.

E-6.0 CONCLUSIONS

The RUSLE2 modeling results for the current conditions indicate relatively minor erosional loss from the sediment disposal area and very low delivery of sediment past the sediment basin. These results are consistent with field observations that indicate controls, including revegetation, have been very effective in stabilizing the site (Attachment E-1). The RUSLE2 modeling results for the nonstabilized scenario indicate substantially higher erosion losses would have been expected in the absence of erosion controls. These results also provide confirmation of the effectiveness of the controls established at the site. The results of the RUSLE2 modeling do not indicate the need for additional controls at the site.

E-7.0 REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID or ESH ID. This information is also included in text citations. ER IDs were assigned by the Environmental Programs Directorate's Records Processing Facility (IDs through 599999), and ESH IDs are assigned by the Environment, Safety, and Health (ESH) Directorate (IDs 600000 and above). IDs are used to locate documents in the Laboratory's Electronic Document Management System and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the ESH Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

LANL (Los Alamos National Laboratory), December 2013. "2013 Excavation of the Los Alamos Canyon Low-Head Weir," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2013, 251741)

LANL (Los Alamos National Laboratory), June 2015. "2013 Excavation of the Los Alamos Canyon Low-Head Weir, Revision 1," Los Alamos National Laboratory document LA-UR-15-24404, Los Alamos, New Mexico. (LANL 2015, 600513)

NMED (New Mexico Environment Department), December 1, 2015. "Disapproval, 2013 Excavation of the Los Alamos Canyon Low-Head Weir, Revision 1 and Response to the Disapproval for the 2013 Excavation of the Los Alamos Canyon Low-Head Weir," New Mexico Environment Department letter to D. Hintze (DOE-EM-LA) and M. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 601032)

University of Tennessee, May 15, 2008. "User's Reference Guide, Revised Universal Soil Loss Equation, Version 2 (RUSLE2)," draft, prepared for the U.S. Department of Agriculture–Agricultural Research Service, Washington, D.C. (University of Tennessee 2008, 601649)

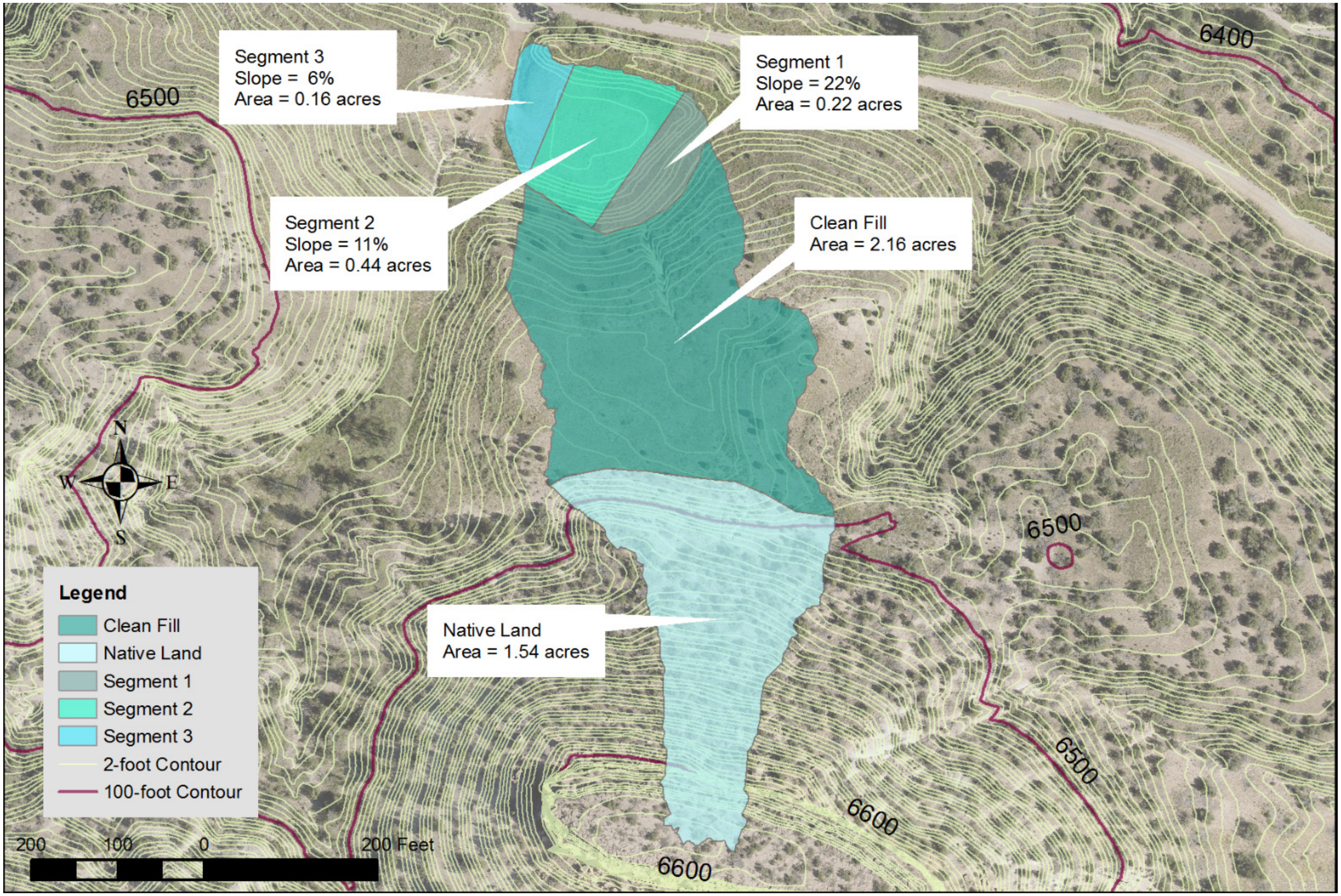


Figure E-3.4-1 Orthophoto showing the RUSLE2 modeling computation areas (Segment 1, 2, and 3) as well as clean fill and native land run-on areas

Table E-3.2-1
Monthly Erosivity Density and Precipitation Values Used in Models

Month	Average Temperature (ºF)	Monthly Precipitation (in.)	Monthly Erosivity Density (U.S. erosivity/in.)	Monthly Rainfall-Runoff Erosivity Value (r)
January	28	0.84	0.21	0.18
February	33	0.77	0.22	0.17
March	38	1.1	0.46	0.50
April	46	0.89	0.97	0.86
May	55	1.1	1.9	2.1
June	64	1.3	2.9	3.6
July	67	3.0	4.0	12
August	65	3.2	3.3	11
September	59	1.9	2.1	4.2
October	49	1.3	1.2	1.6
November	38	0.94	0.54	0.50
December	29	0.97	0.43	0.42

Table E-3.4-1
Slope Model Inputs

Segment	Slope Length	Slope Steepness %
1	50	22 (ft)
2	110	11 (ft)
3	50	6 (ft)

Attachment E-1

Los Alamos Canyon Weir and Borrow Pit Biannual Inspection

Los Alamos National Lab

Work Order CAP-44555

Corrective Action Projects
Printed 7/14/2016 - 9:03 AM (Duplicate Copy)

Maintenance Details

Requested By: Smith, Shannon on 6/7/2016 2:17:00 PM
Taken By: Administrator
Procedure: Inspection for EP Watershed, Retention, and No Exposure Controls (EP-DIV-GUIDE-20211)
Last PM: N/A
Project: Watershed Control Inspections (P-CAP-4808)

Target: 7/8/2016
Priority/Type: / Routine

Corrective Action Projects
Watershed Monitoring
Los Alamos Canyon Weir

Contact: Smith, Shannon
Phone:

Reason: Quarterly (Q2)

Tasks

#	Description	Rating	Meas.	Initials	Failed	N/A	Complete
	EMBANKMENTS						
20	Embankment [LA Weir Embankment] Inspect u/s slope for vegetation/erosion **Comments: No action recommended.**			SL	☐	☐	☑
30	Embankment [LA Weir Embankment] inspect u/s slope for breaching/slides/cracks (or damaged gabion mattresses) **Comments: No action recommended.**			SL	☐	☐	☑
40	Embankment [LA Weir Embankment] Inspect u/s slope for undermining/erosion **Comments: Monitor low point adjacent to gabion near parking area for preferential flow path development.**		Monitor	SL	☐	☐	☑
50	Embankment [LA Weir Embankment] Inspect abutment for vegetation/erosion **Comments: No action recommended.**			SL	☐	☐	☑
60	Embankment [LA Weir Embankment] Inspect abutment for sloughs/slides/cracks (or damaged gabion mattresses) **Comments: No action recommended.**			SL	☐	☐	☑
70	Embankment [LA Weir Embankment] Inspect abutment for seepage/wetness **Comments: No action recommended.**			SL	☐	☐	☑
80	Embankment [LA Weir Embankment] Inspect abutment for presence of trash/debris **Comments: No action recommended.**			SL	☐	☐	☑
90	Embankment [LA Weir Embankment] Inspect d/s slope for vegetation/erosion/riprap. **Comments: Monitor south side where TRM matting present for future erosion**	see photo 7.	Monitor	SL	☐	☐	☑
100	Embankment [LA Weir Embankment] Inspect d/s slope for rodent burrows **Comments: No action recommended.**			SL	☐	☐	☑
110	Embankment [LA Weir Embankment] Inspect d/s slope for sloughs/slides/cracks (or damaged gabion mattresses) **Comments: No action recommended.**			SL	☐	☐	☑
120				SL	☐	☐	☑

	Embankment [LA Weir Embankment] Inspect d/s slope for seepage/wetness **Comments: No action recommended.**						
PONDS							
140	Pond [LA Pond 1 (Upper)] Inspect sediment level **Comments: No action recommended. Sediment present approximately 3 feet below top of spillway.**			SL	☐	☐	☑
150	Pond [LA Pond 2 (Middle)] Inspect sediment level **Comments: No action recommended. Sediment present at unknown depth.**	see photo 3.		SL	☐	☐	☑
160	Pond [LA Pond 3 (Lower)] Inspect sediment level **Comments: No action recommended. Sediment present at 5-6 feet below top of spillway. Gage reading of 5.7 feet with minimal trash present.**	see photo 2, 4, & 5.		SL	☐	☐	☑
OVERFLOW WEIR STRUCTURE							
180	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect u/s face of weir structure for deteriorated joints or bulging gabion baskets **Comments: No action recommended.**			SL	☐	☐	☑
190	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect u/s face of weir structure for cracking/spalling or gabion basket separation/displacement **Comments: Monitor erosion potential piping on upstream side of the weir. Condition similar to previous inspection.**	see photo 8.	Monitor	SL	☐	☐	☑
200	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect u/s face of weir structure for presence of trash/debris **Comments: No action recommended.**			SL	☐	☐	☑
210	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect crest of weir structure for deteriorated joints or bulging gabion baskets **Comments: No action recommended.**			SL	☐	☐	☑
220	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect crest of weir structure for cracking/spalling or gabion basket separation/displacement **Comments: No action recommended.**			SL	☐	☐	☑
230	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect crest of weir structure for poor alignment **Comments: No action recommended.**			SL	☐	☐	☑
240	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect crest of weir structure for presence of trash/debris **Comments: No action recommended.**			SL	☐	☐	☑
250	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect d/s face of weir structure for deteriorated joints or bulging gabion baskets **Comments: No action recommended.**			SL	☐	☐	☑
260	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect d/s face of weir structure for cracking/spalling or gabion separation/displacement **Comments: No action recommended.**			SL	☐	☐	☑
270	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect d/s face of weir structure for seepage/piping **Comments: Monitor downstream bottom of weir. Gabion basket appears to have undercutting with erosion immediately downstream.**	see photo 6.	Monitor	SL	☐	☐	☑
280				SL	☐	☐	☑

	Overflow Weir Structure [LA Weir Overflow Weir Structure] Inspect d/s face of weir structure for presence of trash/debris **Comments: No action recommended.**						
STANDPIPE							
300	**Standpipe [LA Weir Standpipe]** Inspect standpipe for corrosion **Comments: No action recommended.**			SL	☐	☐	☑
310	**Standpipe [LA Weir Standpipe]** Inspect for amount of sediment present **Comments: No action recommended.**			SL	☐	☐	☑
320	**Standpipe [LA Weir Standpipe]** Inspect for presence of trash/debris **Comments: No action recommended.**			SL	☐	☐	☑
330	**Standpipe [LA Weir Standpipe]** Inspect standpipe for height of inlet **Comments: No action recommended. Standpipe unobstructed for 4 top holes. Staff gage reads 5.7 feet.**	see photo 4.		SL	☐	☐	☑
OUTLET							
360	**Outlet [LA Weir Outlet]** Inspect outlet for seepage/piping **Comments: See comments under Task 270.**	see photo 6.		SL	☐	☐	☑
370	**Outlet [LA Weir Outlet]** Inspect outlet for undercutting **Comments: No action recommended.**			SL	☐	☐	☑
380	**Outlet [LA Weir Outlet]** Inspect outlet for erosion **Comments: Monitor downstream side of outlet pipe where evidence of erosion exists.**		Monitor	SL	☐	☐	☑
390	**Outlet [LA Weir Outlet]** Inspect for presence of trash/debris **Comments: No action recommended.**			SL	☐	☐	☑
400	**Outlet [LA Weir Outlet]** Inspect for amount of sediment present **Comments: Sediment with mature vegetation on gabion apron.**			SL	☐	☐	☑
BORROW PIT							
430	**Borrow Pit [LA Weir Borrow Pit]** Inspect sediment for vegetation **Comments: No action recommended.**	see photo 1.		SL	☐	☐	☑
440	**Borrow Pit [LA Weir Borrow Pit]** Inspect presence for rilling/erosion **Comments: No action recommended.**			SL	☐	☐	☑
450	**Borrow Pit [LA Weir Borrow Pit]** Inspect berm for vegetation/matting **Comments: No action recommended.**			SL	☐	☐	☑
460	**Borrow Pit [LA Weir Borrow Pit]** Inspect for presence of trash/debris **Comments: No action recommended.**			SL	☐	☐	☑
470	**Borrow Pit [LA Weir Borrow Pit]** Inspect for rodent burrows **Comments: No action recommended.**			SL	☐	☐	☑

Labor Report

Completed: 6/13/2016 3:30:00 PM **Failure:** ____________

Report: ____________

WO ID: CAP - 44555 Page 4 of 13

Responded Date: 6/13/16 Time: 2:30pm Completed Date: 6/13/16 Time: 3:30pm

Inspector Signature: [signature] Z#: 119874

Certified By: [signature] Z#: 083933

Work Order #CAP-44555 Completed: 6/13/2016
Los Alamos Canyon Weir

page 5 of 13

1

/mc_imageserver/entlanl/WO/44555/Borrow Pit-image-2016-07-01T19-35-31.0210000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

2

/mc_imageserver/entlanl/WO/44555/Upstream of LA Weir-image-2016-07-01T19-35-17.1380000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

3

/mc_imageserver/entlanl/WO/44555/Lower Sediment Basin.-image-2016-07-01T19-34-49.3180000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

4

/mc_imageserver/entlanl/WO/44555/Standpipe Inlet.-image-2016-07-01T19-33-57.2550000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

5

/mc_imageserver/entlanl/WO/44555/Upstream of LA Weir.-image-2016-07-01T19-33-38.8320000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

6

/mc_imageserver/entlanl/WO/44555/Gabion at bottom of weir appearing to have undercu-image-2016-07-01T19-32-59.3000000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

7

/mc_imageserver/entlanl/WO/44555/TRM present on south side of embankment -image-2016-07-01T19-31-39.9900000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

8

/mc_imageserver/entlanl/WO/44555/Downstream side of outlet pipe where erosion is oc-image-2016-07-01T19-30-45.2790000Z.jpg

Date: 7/1/2016 Order: 0
☐ Active
☐ Follow-up ✔Save

Photo 1 Borrow pit berm matting

Photo 2 **Lower sediment basin of Los Alamos weir**

Photo 3 **Lower sediment basin of Los Alamos weir**

Photo 4 **Los Alamos weir standpipe inlet**

Photo 5 Lower sediment basin of Los Alamos weir

Photo 6 Los Alamos weir gabion structure at bottom of weir appearing to have undercutting

Photo 7 **Turf-reinforcing matte present on south side of Los Alamos weir embankment**

Photo 8 **Downstream side of Los Alamos weir outlet pipe where erosion is occurring**

Attachment E-2

Scenario 1: RUSLE 2 Inputs and Outputs for Current Conditions

RUSLE2 Profile Erosion Calculation Record – Current Conditions

Inputs:

Location: USA\New Mexico\Los Alamos County\NM_Los_Alamos_16-18

Soil: Sandoval Area, parts of Los Alamos, Sandoval, and Rio Arriba, NM\52 TOTAVI LOAMY SAND, 0 TO 5 PERCENT SLOPES\TOTAVI loamy sand 85%

Slope length (along slope): 210 ft.

Average slope steepness: 12 %

Management	Vegetation	Yield units	# yield units, #/ac
managements\E. Local Construction Site Managements\ADEP Seeding	vegetations\Grama, Yr 1	pounds (lbs)	100
managements\E. Local Construction Site Managements\ADEP Seeding	vegetations\Grama, yr 2	lbs	150
managements\E. Local Construction Site Managements\ADEP Seeding	vegetations\Grama, yr 3	lbs	150

Contouring: area not contoured

Strips/barriers: (none)

Diversion/terrace, sediment basin: 1 Water and Sediment Control Basin at bottom of RUSLE slope

Subsurface drainage: (none)

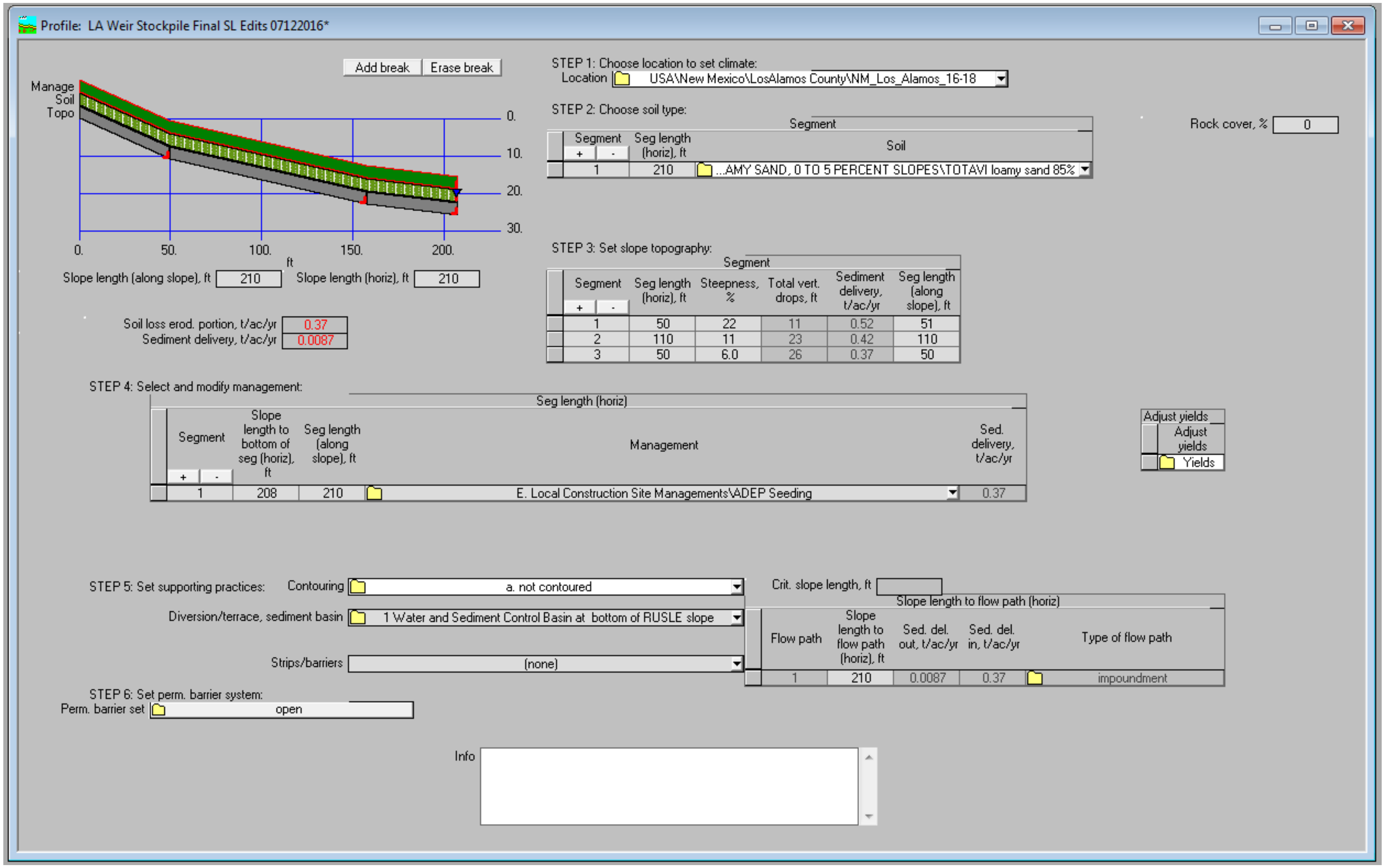
Adjust residue burial level: Normal residue burial

Outputs:

Detachment on slope: 0.37 t/ac/yr

Sediment delivery: 0.0087 t/ac/yr

Date	Operation	Vegetation	Surface residue cover after operation, %
4/1/14	Construction Site Operations\Bulldozer track walking	N/A	0
4/3/14	Planting, broadcast seeder	Grama, year 1	70
4/3/14	Construction Site Operations\Apply Hydro-mulch	N/A	70
4/3/15	Native Seed Growth	Grama, year 2	66
4/3/16	Native Seed Growth	Grama, year 3+	62



Profile: LA Weir Stockpile Final SL Edits 07122016*
Add break
Erase break
Manage
Soil
Topo
0.
10.
20.
30.
0.
50.
100.
150.
200.
ft
Slope length (along slope), ft 210
Slope length (horiz), ft 210
Soil loss erod. portion, t/ac/yr 0.37
Sediment delivery, t/ac/yr 0.0087
STEP 1: Choose location to set climate:
Location USA\New Mexico\LosAlamos County\NM_Los_Alamos_16-18
STEP 2: Choose soil type:
Segment
Segment
Seg length (horiz), ft
Soil
1
210
...AMY SAND, 0 TO 5 PERCENT SLOPES\TOTAVI loamy sand 85%
Rock cover, % 0
STEP 3: Set slope topography:
Segment
Segment
Seg length (horiz), ft
Steepness, %
Total vert. drops, ft
Sediment delivery, t/ac/yr
Seg length (along slope), ft
1 50 22 11 0.52 51
2 110 11 23 0.42 110
3 50 6.0 26 0.37 50
STEP 4: Select and modify management:
Seg length (horiz)
Segment
Slope length to bottom of seg (horiz), ft
Seg length (along slope), ft
Management
Sed. delivery, t/ac/yr
1 208 210 E. Local Construction Site Managements\ADEP Seeding 0.37
Adjust yields
Adjust yields
Yields
STEP 5: Set supporting practices:
Contouring a. not contoured
Diversion/terrace, sediment basin 1 Water and Sediment Control Basin at bottom of RUSLE slope
Strips/barriers (none)
Crit. slope length, ft
Slope length to flow path (horiz)
Flow path
Slope length to flow path (horiz), ft
Sed. del. out, t/ac/yr
Sed. del. in, t/ac/yr
Type of flow path
1 210 0.0087 0.37 impoundment
STEP 6: Set perm. barrier system:
Perm. barrier set open
Info

Attachment E-3

Scenario 2: RUSLE 2 Inputs and Outputs for Nonstabilized Conditions

RUSLE2 Profile Erosion Calculation Record – Non-stabilized Scenario: No Sediment Basin No Site Stabilization

Inputs:

Location: USA\New Mexico\LosAlamos County\NM_Los_Alamos_16-18

Soil: Sandoval Area, parts of Los Alamos, Sandoval, and Rio Arriba, NM\52 TOTAVI LOAMY SAND, 0 TO 5 PERCENT SLOPES\TOTAVI loamy sand 85%

Slope length (along slope): 210 ft.

Average slope steepness: 12 %

Management	Vegetation	Yield units	# yield units, #/ac
managements\E. Local Construction Site Managements\D&D Soil Disturbance	None	None	None

Contouring: area not contoured

Strips/barriers: (none)

Diversion/terrace, sediment basin: 3 gradient terraces 0.4% grade 2 in middle 1at bottom of RUSLE slope

Subsurface drainage: (none)

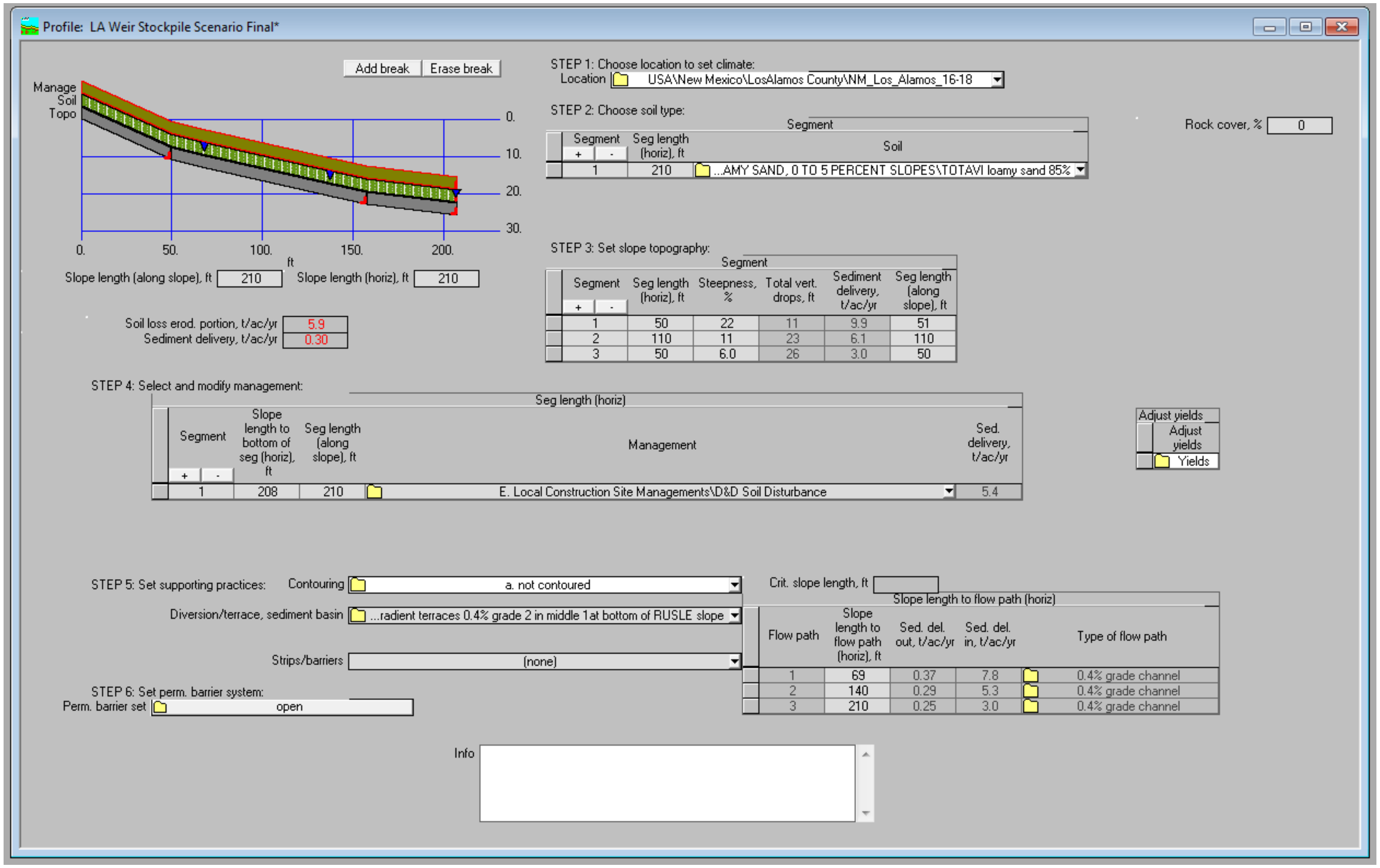
Adjust residue burial level: Normal residue burial

Outputs:

Detachment on slope: 5.9 t/ac/yr

Sediment delivery: 0.30 t/ac/yr

Date	Operation	Vegetation	Surface residue cover after operation, %
4/1/14	Construction Site Operations\Bulldozer cleaning/cutting	N/A	0
4/3/14	Construction Site Operations/Disk, offset, heavy	N/A	0


Profile: LA Weir Stockpile Scenario Final*
Add break
Erase break
Manage
Soil
Topo
Slope length (along slope), ft 210
Slope length (horiz), ft 210
Soil loss erod. portion, t/ac/yr 5.9
Sediment delivery, t/ac/yr 0.30
STEP 1: Choose location to set climate:
Location USA\New Mexico\LosAlamos County\NM_Los_Alamos_16-18
STEP 2: Choose soil type:
Rock cover, % 0
Segment
Seg length (horiz), ft
Soil
1 210 ...AMY SAND, 0 TO 5 PERCENT SLOPES\TOTAVI loamy sand 85%
STEP 3: Set slope topography:
Segment / Seg length (horiz), ft / Steepness, % / Total vert. drops, ft / Sediment delivery, t/ac/yr / Seg length (along slope), ft
1 50 22 11 9.9 51
2 110 11 23 6.1 110
3 50 6.0 26 3.0 50
STEP 4: Select and modify management:
Seg length (horiz)
Segment / Slope length to bottom of seg (horiz), ft / Seg length (along slope), ft / Management / Sed. delivery, t/ac/yr
1 208 210 E. Local Construction Site Managements\D&D Soil Disturbance 5.4
Adjust yields
Yields
STEP 5: Set supporting practices:
Contouring a. not contoured
Diversion/terrace, sediment basin ...radient terraces 0.4% grade 2 in middle 1at bottom of RUSLE slope
Strips/barriers (none)
Crit. slope length, ft
Slope length to flow path (horiz)
Flow path / Slope length to flow path (horiz), ft / Sed. del. out, t/ac/yr / Sed. del. in, t/ac/yr / Type of flow path
1 69 0.37 7.8 0.4% grade channel
2 140 0.29 5.3 0.4% grade channel
3 210 0.25 3.0 0.4% grade channel
STEP 6: Set perm. barrier system:
Perm. barrier set open
Info