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OCT 2008
NMED Hazardous Waste Bureau

National Nuclear Security Administration
Los Alamos Site Office, MS A316
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Date: October 17, 2008
Refer To: EP2008-0519

James P. Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons, as required by the July 18, 2008, letter of approval with modifications of the Interim Measure Work Plan to Mitigate Sediment Transport in Los Alamos and Pueblo Canyon. This submittal fulfills the requirement to provide supplemental work plan to the New Mexico Environment Department by October 17, 2008.

If you have any questions, please contact Danny Katzman at (505) 667-6633 (katzman@lanl.gov) or Nancy Werdel at (505) 665-3619 (nwerdel@doeal.gov).

Sincerely,

Susan G. Stiger, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

SS/DG/DK/RR:sm

Enclosures: 1) Two hard copies with electronic files - Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons (LA-UR-08-6588)

Cy: (w/enc.)
Neil Weber, San Ildefonso Pueblo
Ron Rager, EP-TA-21, MS C349
Danny Katzman, EP-LWSP, MS M992
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Nancy Werdel, DOE-LASO, MS A316
Steve Reneau, EES-16, MS D452
Steve Veenis, ENV-RCRA, MS K490
Kristine Smeltz, WES-DO, MS M992
EP-TA-21 File, MS C349

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Alison Bennett, DOE-LASO (date-stamped letter emailed)
Susan G. Stiger, ADEP, MS M991
Alison M. Dorries, WES-DO, MS M992
IRM-RMMSO, MS A150 (date-stamped letter emailed)

LA-UR-08-6588
October 2008
EP2008-0519

Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

LA-UR-08-6588
EP2008-0519

Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons

October 2008

Responsible project leader:

Printed Name	Signature	Title	Organization	Date
Ron E. Rager		Project Leader	Environmental Programs	10/17/08

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Susan G. Stiger		Associate Director	Environmental Programs	10/15/08

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
David R. Gregory		Project Director	DOE-LASO	10/17/08

CONTENTS

Figures

Tables

Appendixes

1.0 INTRODUCTION

This “Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons” (supplemental plan) is prepared pursuant to the New Mexico Environment Department’s (NMED’s) “Approval with Modifications to the Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons” (approval with modifications) (NMED 2008, 103007). The supplemental plan complements the February 2008 “Interim Measure Work Plan (IMWP) to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons” (LANL 2008, 101714). The IWMP and approval with modifications provide the background and context for this supplemental plan.

The supplemental plan provides details of additional mitigation actions that will be implemented in the Los Alamos and Pueblo Canyon (LA/P) watershed to reduce the transport of contaminated sediment. Section 2.0 of this report presents the results of characterization of sediment deposits accumulated upstream of the existing low-head weir in Los Alamos Canyon in support of the Los Alamos National Laboratory (the Laboratory) recommendation to spread excavated material on the ground near the weir (as described in the IMWP). Section 3.0 of this report provides the functional objectives and potential preliminary conceptual design for various structures and mitigation actions throughout the watershed. The functional objectives and conceptual designs are presented in sufficient detail such that a design/build contractor will be able to produce the final design and to implement construction.

The actions proposed in the IMWP and the supplemental plan are aimed at reducing transport of contaminated sediment within the LA/P watershed. These mitigation measures are not intended to completely eliminate contaminated sediment transport. They should, however, substantially reduce off-site transport of contaminated sediment and complement other actions implemented by the Laboratory (e.g., best management practices [BMPs] at solid waste management units [SWMUs] and areas of concern [AOCs]) and by Los Alamos County (LAC) (stabilization of the channel in upper Pueblo Canyon).

For the DP Canyon, located in the Los Alamos Canyon watershed, and the Pueblo Canyon grade-control structure located near the intersection of NM 502 and NM 4, the IMWP and the supplemental plan will satisfy portions of the U.S. Department of Energy (DOE) requirement for conduct of engineering under DOE-O-414.1C, Quality Assurance, Performance Criterion 6–Design. The other sediment-control structures, including the wing ditch and cross-vane structures, do not require formal design control processes, acting more as BMP installations than true structures.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the NMED in accordance with DOE policy.

2.0 CHARACTERIZATION OF SEDIMENT UPSTREAM OF LOS ALAMOS CANYON LOW-HEAD WEIR

This section presents the results of two phases of sediment characterization in the basin upstream of the low-head weir in Los Alamos Canyon. These characterization data provide insights into the contaminants transported in post-Cerro Grande floods and are also used to characterize the sediment to determine if it can be land-applied on-site, as discussed in NMED’s approval with modification (NMED 2008, 103007, Comment 6a). In the absence of specific criteria for comparison to contaminant concentrations within the sediment, the Laboratory proposes using the criteria of the November 2007 Notice of Intent Decision Tree for land application of drill cuttings and apply it to the sediment.

Figure 2.0-1 shows a plan view of the sampling locations and sediment thickness, and Figures 2.0-2 and 2.0-3 show the stratigraphy of deposits at the sampling locations and the specific strata sampled. Depth-integrated and discrete-horizon samples were collected. Depth-integrated samples were collected by sampling sediment over the entire stratigraphic column to represent the concentration of bulk excavated sediment. Discrete-horizon samples provide results from individual floods and serve to characterize variability between floods.

The analytical results are presented in Appendix B on the CD included with this supplemental plan. The analytical data are presented in Tables 2.0-1 to 2.0-3. Results for inorganic chemicals above background and detected organic chemicals were compared to the same screening levels approved by NMED for the land application of drill cuttings (October 2007 Notice of Intent Decision Tree), and none of the screening levels were exceeded (Tables 2.0-4 and 2.0-5). The comparisons indicate that the results are lower than the NMED soil screening levels (SSLs), the U.S. Environmental Protection Agency (EPA) SSLs (when no NMED SSLs are available), and the EPA Land Disposal Restrictions Treatment Standards. The excavated sediment also meets the radiological limits that DOE has established for land application of drill cuttings, which is applicable to evaluating the sediment.

Based on these comparisons, the Laboratory requests NMED's approval to land-apply the excavated sediment on-site. The sediment will be spread across the existing berm on the north side of the basin and upstream of the weir at an estimated thickness of approximately 2 ft. The area will be stabilized to allow vegetation to establish.

3.0 PROPOSED ACTIONS

This section presents the functional objectives and preliminary (conceptual) design of the sediment transport control structures and actions for the LA/P watershed. The structures are presented in the light of a systems approach to sediment-transport management and supplement those actions approved under the IMWP. Figure 3.0-1 shows each of the actions of the IMWP and the supplemental plan, and each of the actions included within the supplemental plan are presented below.

The desired objective of the proposed actions of the IMWP and the supplemental plan is to reduce flood (erosive) energy, stabilize and isolate existing contaminated sediment deposits, and enhance sediment-trapping efficiency behind structures and in existing floodplains and wetlands. These actions are consistent with the conceptual model presented in the IMWP.

The designs of the proposed interim measures are based on design objectives derived from the functional objectives. Quantitative performance objectives are not specifically defined at this time and will be evaluated as part of the engineering phase. During the engineering phase, each of the actions will also be considered in the context of potential impacts to groundwater.

Each of the actions discussed are presented in NMED's approval with modifications (NMED 2008, 103007). Additionally, implementation of any actions on property owned by LAC or actions requiring easements for access must be approved by LAC before any action is taken.

3.1 DP Canyon Grade-Control Structure

The approximate location of the proposed DP Canyon grade-control structure is shown in Figure 3.1-1. It is located downcanyon from the SWMU 21-011(k) outfall at Technical Area 21 and near the site of the current E039 gaging station at the east end of reach DP-2. The primary objectives of the structure in DP Canyon are to reduce erosive flood energy and to cause upstream aggradation that will fill the channel and bury existing floodplain deposits. This goal will be accomplished by establishing a fixed base level above the existing channel elevation. Aggradation within the channel should minimize or eliminate erosion of contaminated stream banks during frequent floods. A sediment-filled channel should also cause floods to spill overbank more frequently, which will reduce channelized conveyance of flood energy downstream. Overbank floods should also deposit sediment derived from reaches upstream of SWMU 21-011(k) and bury existing contaminated floodplain deposits.

Figure 3.1-2 shows a longitudinal profile of key features of reach DP-2 that will support the final design of the grade-control structure. According to the general guideline, a stream channel gradient upstream from a grade-control structure lowers the channel gradient by approximately one-half the existing channel gradient (Heede 1978, 103345). Figure 3.1-2 indicates that a 6-ft- (1.8-m-) high spillway will cause aggradation of the channel for approximately 1000 ft (300 m) upstream. A cross-sectional profile at the proposed grade-control structure is shown in Figure 3.1-3. Functional requirements for the grade-control structure are presented in a Functional and Operational Requirements (FOR) format (AP-341-601, Appendix B) in Appendix A and complete the detailed conceptual design for the structure. Detailed information on the geomorphology and the nature and distribution of contaminants within reach DP-2 (and downstream reaches) is presented in the Los Alamos and Pueblo Canyons investigation report (LANL 2004, 087390).

3.2 Cross-Vane Structures

The three cross-vane structures to be located in Pueblo Canyon between the confluences of Graduation and Kwage Canyons are shown in Figure 3.0-1. Figure 3.2-1 shows the location and configuration of this westernmost one in reach P-2W. The two remaining structures shown in Figure 3.0-1 will be similar to that of the westernmost one. The segment of Pueblo Canyon was selected for these structures based on channel morphology and bank height. Cross-vane structures are considered most effective within open, relatively wide channel and floodplain settings (Rosgen 2006, 103025). The proposed cross-vane structures do not lend themselves to formal engineering design processes. Each structure will consist of a single row of approximately 5- to 10-ft-diameter boulders, buried approximately one-third belowgrade and placed in a configuration of the cross-vane weir (Rosgen 2006, 103025). Individual boulders will be spaced approximately one-half the boulder diameter apart.

The primary objective of the structures is to decrease flood peaks before floods enter the downstream wetland. The structures will be constructed from large boulders set within the channel in a “V” configuration (Figure 3.2-1) with appropriate boulder spacing that will allow relatively unimpeded passage of low flows but that will reduce the peak (erosive) discharge associated with the rising limb of the hydrograph. The structures may also locally enhance deposition of contaminated sediment.

NMED also required an additional cross-vane structure in Pueblo Canyon downstream of the confluence with Acid Canyon in the vicinity of the location where the LAC sewer line is exposed above the stream channel. Based on recent conversations with LAC officials, the Laboratory proposes deferring channel stabilization in that portion of Pueblo Canyon to accommodate LAC’s planned construction activities to protect the sewer line. The Laboratory proposes that erosion in that portion of the canyon is largely caused by urban runoff, for which LAC accepts the responsibility for mitigation.

3.3 Wing Ditch

NMED’s approval with modifications (NMED 2008, 103007) required a wing ditch additional to the one approved in the IMWP (LANL 2008, 101714). This wing ditch, located at the west end of reach P-4W, would divert water onto the adjacent floodplain to decrease surface-water flow velocities. As an alternative, NMED proposed that the Laboratory may construct two or more check dams in this area.

The Laboratory proposes that the impacted area below the proposed wing ditch is not appropriate and will not achieve the desired objectives. Specifically, a significant chance exists that diversion of water in this area would cause incision of a new channel through the current floodplain and remobilize currently stable contaminated sediment deposits.

Similarly, the topography and bank characteristics in this portion of Pueblo Canyon are not suitable for effective check dams because of the difficulty in keying them to adjacent banks while maintaining channel capacity to ensure their stability in large flood events. Instead, the Laboratory proposes extensive planting of willows in this area to aid in surface stabilization, flow reduction, and sediment accumulation, building on the successful planting of willows upstream in spring 2008. In addition, following the advice of the stream-restoration expert, the Laboratory proposes monitoring the geomorphic response to the restoration activities upstream from the planned grade-control structure in lower Pueblo Canyon. The monitoring will be detailed in a monitoring plan to be submitted to NMED by May 1, 2009.

3.4 Pueblo Canyon Grade-Control Structure

To supplement the preliminary conceptual design of the proposed Pueblo Canyon grade-control structure presented in the IMWP, longitudinal and cross-section profiles of the area are provided in Figures 3.4-1 and 3.4-2, respectively. The longitudinal profile shows the current stream channel and knickpoints along the channel where the channel has incised into old (pre-1943) alluvium. This figure also shows the heights of older alluvial surfaces, the proposed structure, and the expected future channel grade once the structure has been backfilled with sediment. Using the guideline discussed in section 3.1, Figure 3.4-1 shows that channel aggradation is expected approximately 540 ft (165 m) upstream from a 7-ft- (2.1-m-) high structure, burying the knickpoints along the channel and preventing further incision in this area. Appendix A presents this structure’s FOR.

3.5 Pueblo Canyon Pilot Wing Ditch Willow Planting

With the success of the 2008 willow planting along portions of Pueblo Canyon, downstream from the new LAC wastewater treatment plant, the Laboratory will plant additional willows in the next downstream reach extending from Hamilton Bend to near the pilot wing ditch proposed in the IMWP (Figure 3.0-1). The willows will be planted in spring 2009.

4.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the Environmental Programs Directorate’s Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau; the DOE–Los Alamos Site Office; EPA, Region 6; and the 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.

EPA (U.S. Environmental Protection Agency), November 2005. “EPA Region 6 Human Health Medium-Specific Screening Levels,” U.S. EPA Region 6, Dallas, Texas. (EPA 2005, 091002)

Heede, B.H., 1978. "Designing Gully Control Systems for Eroding Watersheds," *Environmental Management,* Vol. 2, No. 6, pp. 509–522. (Heede 1978, 103345)

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), April 2004. "Los Alamos and Pueblo Canyons Investigation Report," Los Alamos National Laboratory document LA-UR-04-2714, Los Alamos, New Mexico. (LANL 2004, 087390)

LANL (Los Alamos National Laboratory), February 2008. "Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," Los Alamos National Laboratory document LA-UR-08-1071, Los Alamos, New Mexico. (LANL 2008, 101714)

NMED (New Mexico Environment Department), June 2006. "Technical Background Document for Development of Soil Screening Levels, Revision 4.0, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document," New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2006, 092513)

NMED (New Mexico Environment Department), October 2006. "New Mexico Environment Department TPH Screening Guidelines," Santa Fe, New Mexico. (NMED 2006, 094614)

NMED (New Mexico Environment Department), July 18, 2008. "Approval with Modifications, Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 103007)

Rosgen, D.L., 2006. "Cross-Vane, W-Weir, and J-Hook Vane Structures (Updated 2006), Description, Design and Application for Stream Stabilization and River Restoration," Wildland Hydrology, Inc., Ft. Collins, Colorado. (Rosgen 2006, 103025)

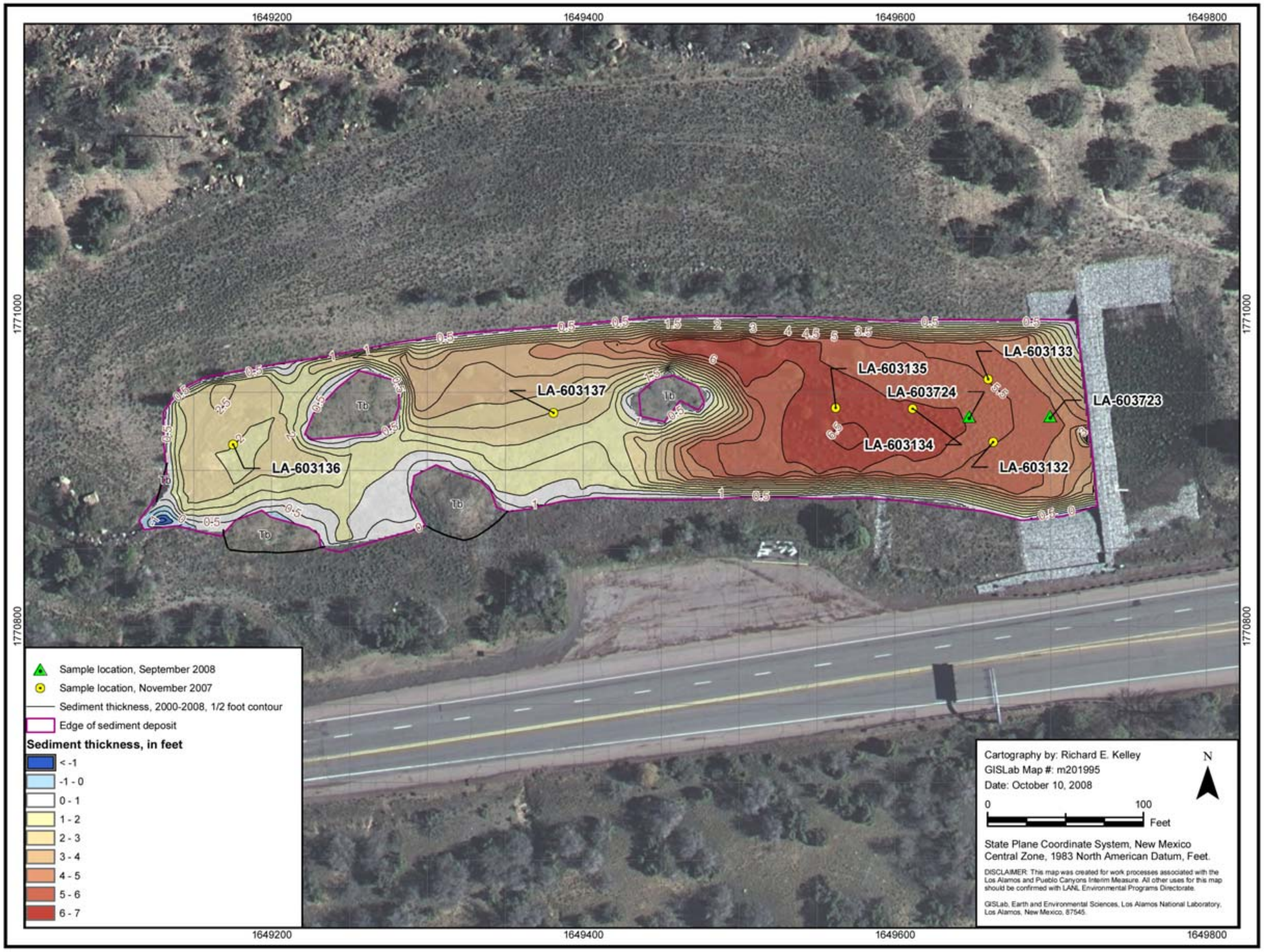

Figure 2.0-1 Sampling locations at the Los Alamos Canyon low-head weir

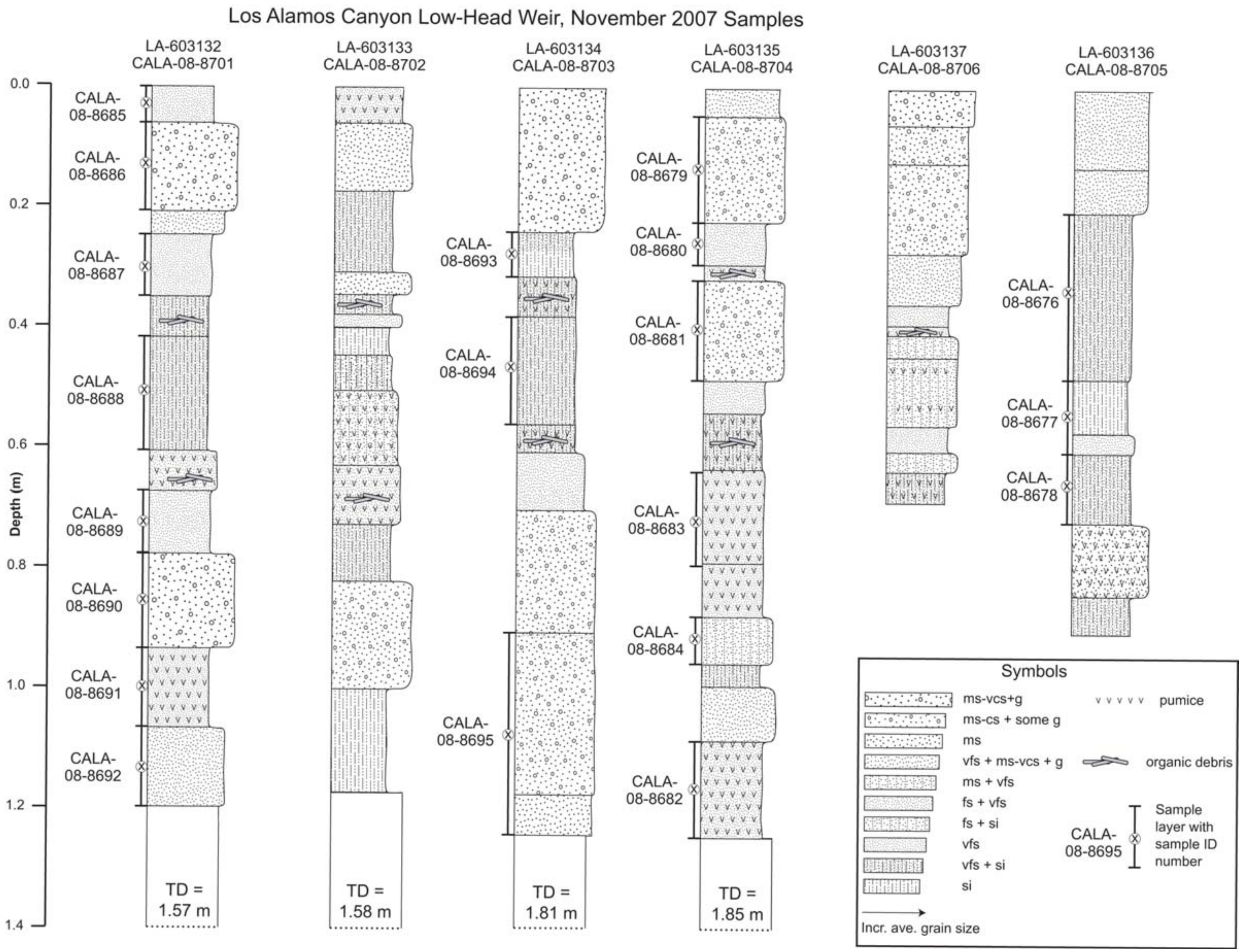

Figure 2.0-2 2007 sampling locations and stratigraphic columns

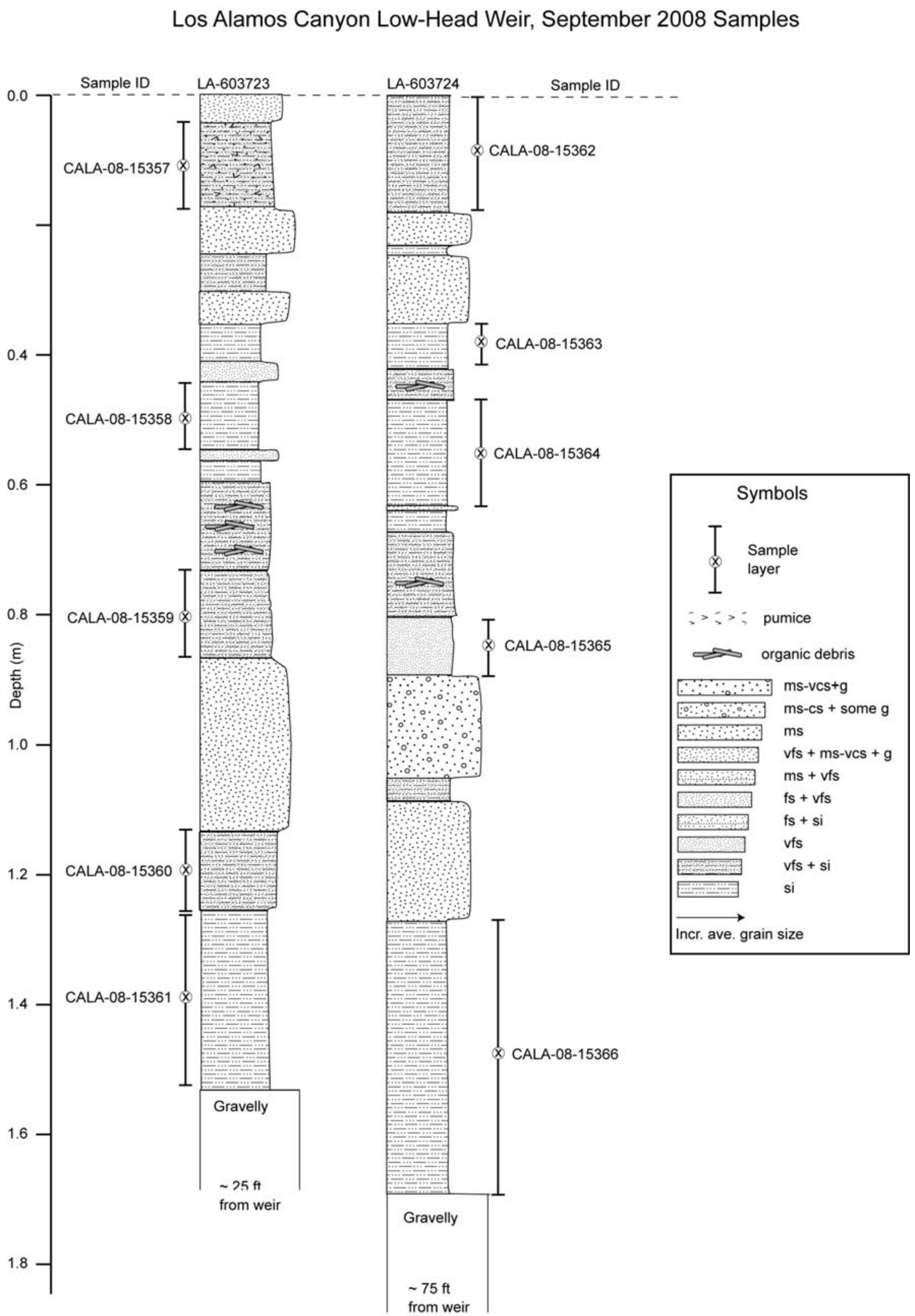

Figure 2.0-3 2008 sampling locations and stratigraphic columns

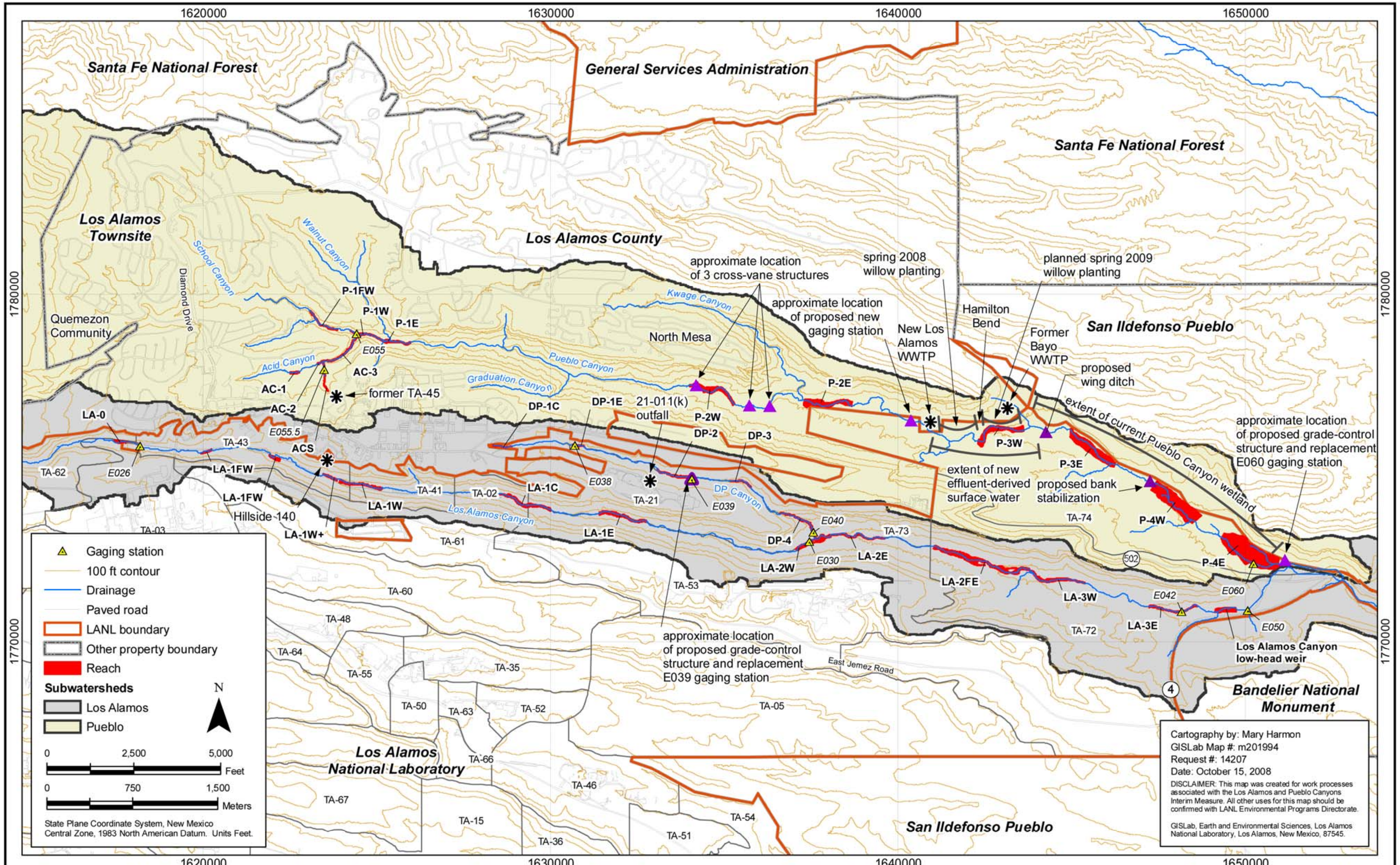

Figure 3.0-1 Proposed actions for the Los Alamos and Pueblo Canyon watershed

Figure 3.1-1 Proposed DP Canyon grade-control structure

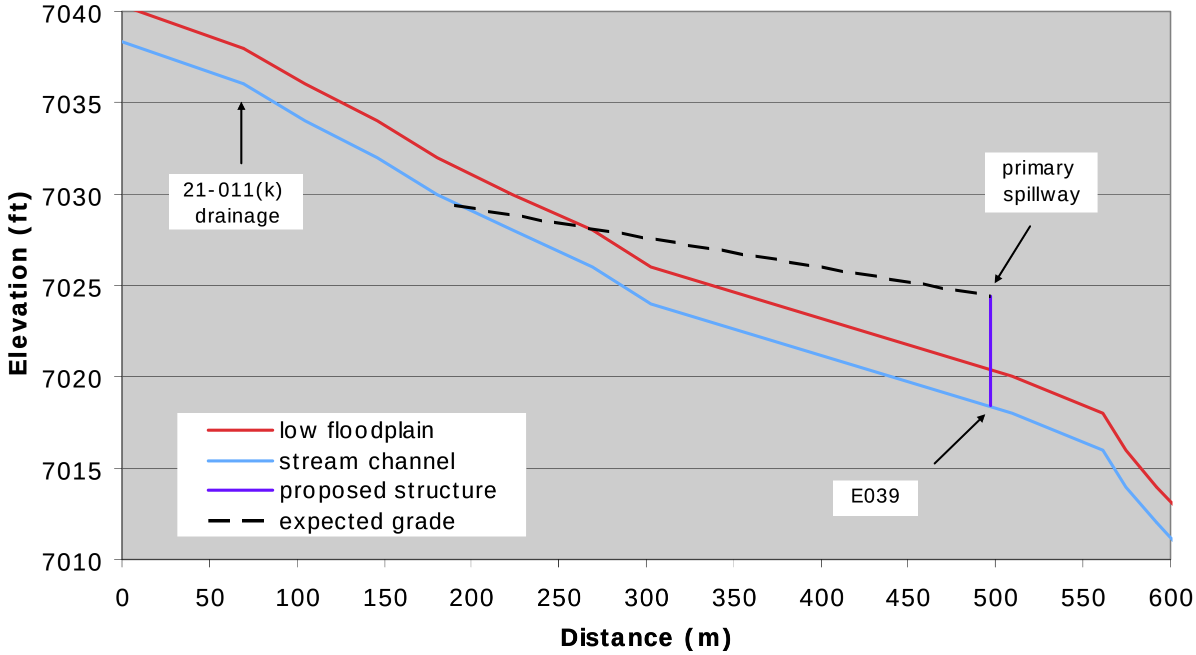

Figure 3.1-2 Longitudinal profile of DP Canyon in the vicinity of proposed grade-control structure

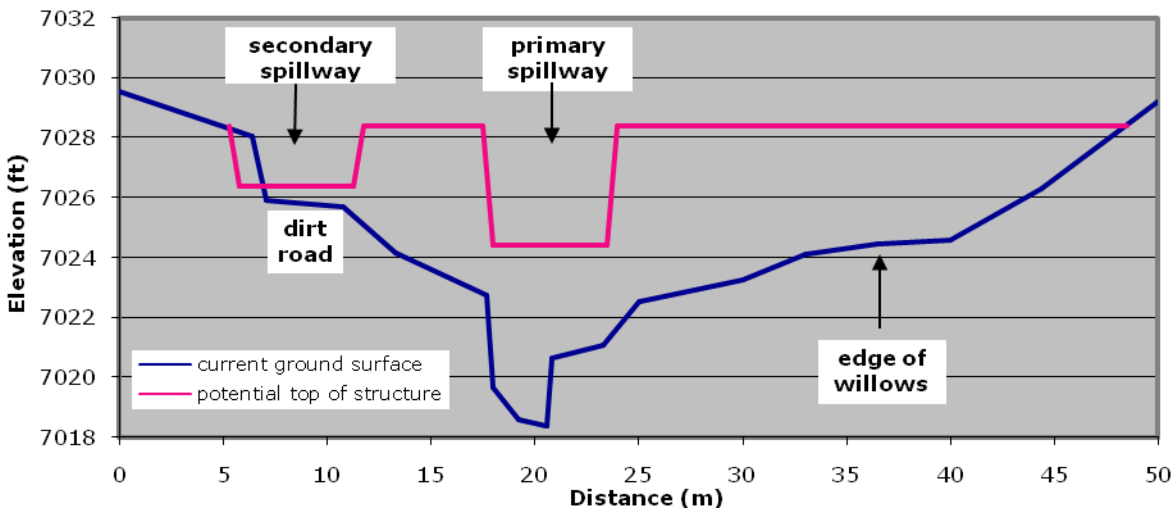

Figure 3.1-3 Cross-section profile of proposed DP Canyon grade-control structure

Figure 3.2-1 One of three cross vane structures proposed for Pueblo Canyon

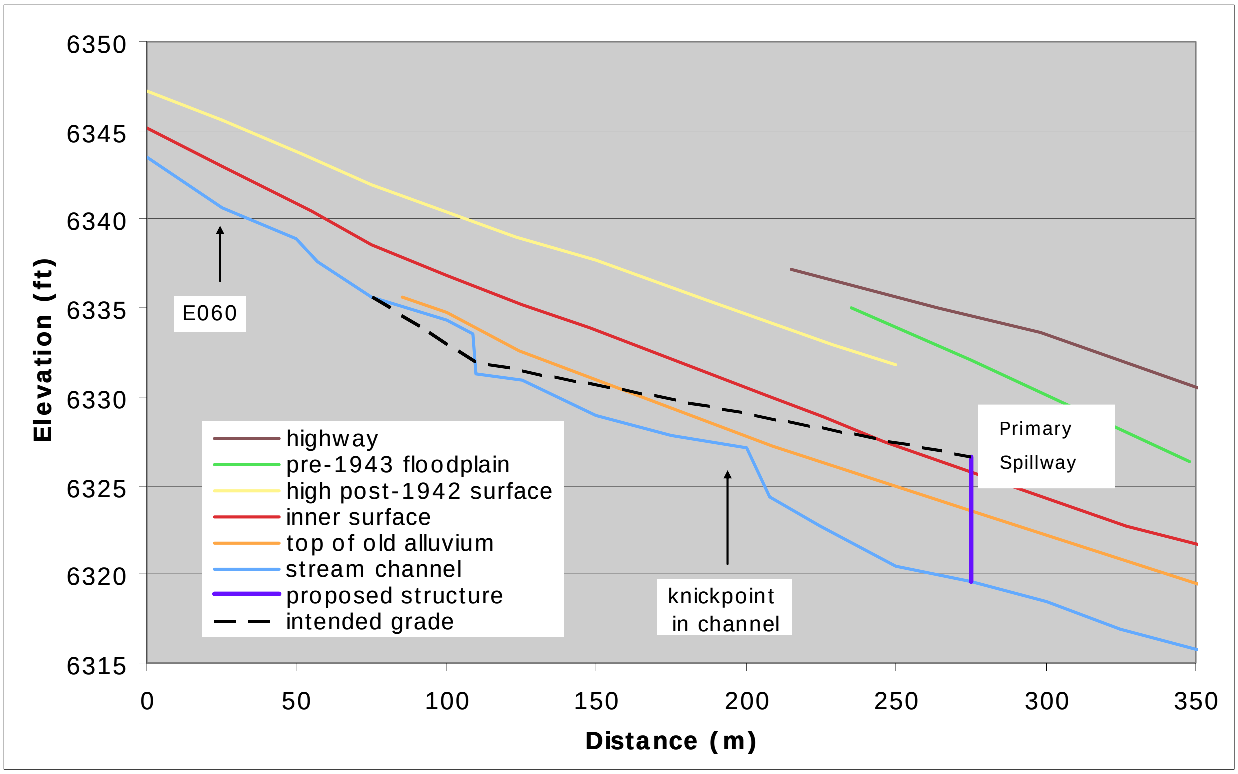

Figure 3.4-1 Longitudinal profile of Pueblo Canyon in the vicinity of proposed grade-control structure

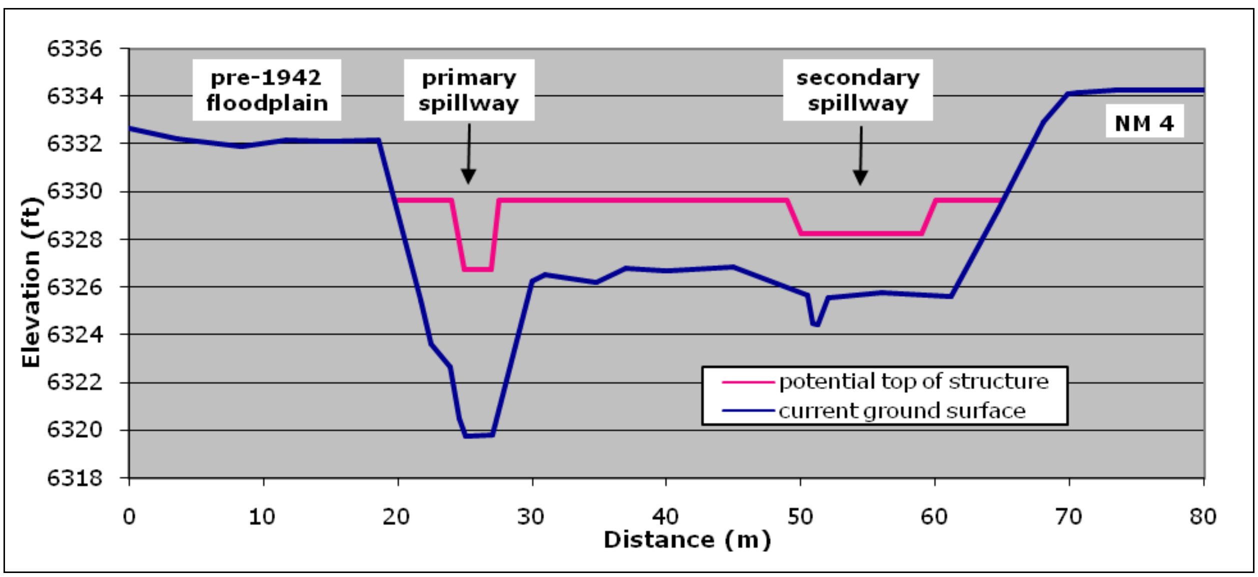

Figure 3.4-2 Cross-section profile of the proposed Pueblo Canyon grade-control structure

Table 2.0-1
Summary of Radionuclide Results in
Sediment Collected from Basin above Los Alamos Canyon Low-Head Weir

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Background Value	Frequency of Detects above Background Value	Min Detected Result	Max Detected Result
November 2007 Sampling Event – Depth-Integrated Samples[a]									
Americium-241	SED	6	6	0.238 to 0.635	pCi/g	0.04	6/6	0.238	0.635
Cesium-134	SED	1	0	[0.0387][b]	pCi/g	na[c]	0/1	0	0
Cesium-137	SED	6	6	0.855 to 1.53	pCi/g	0.9	5/6	0.855	1.53
Cobalt-60	SED	6	0	[-0.0275 to 0.0418]	pCi/g	na	0/6	0	0
Europium-152	SED	6	0	[-0.0487 to 0.0319]	pCi/g	na	0/6	0	0
Plutonium-238	SED	6	5	[0.0155] to 0.0584	pCi/g	0.006	5/6	0.0239	0.0584
Plutonium-239/240	SED	6	6	0.177 to 0.569	pCi/g	0.068	6/6	0.177	0.569
Ruthenium-106	SED	6	0	[-0.367 to 0.213]	pCi/g	na	na	0	0
Sodium-22	SED	6	0	[-0.0294 to 0.0616]	pCi/g	na	na	0	0
Strontium-90	SED	6	5	[0.0626] to 0.401	pCi/g	1.04	0/6	0.24	0.401
Thorium-228	SED	6	6	1.61 to 1.84	pCi/g	2.28	0/6	1.61	1.84
Thorium-230	SED	6	6	1.05 to 1.48	pCi/g	2.29	0/6	1.05	1.48
Thorium-232	SED	6	6	1.53 to 1.69	pCi/g	2.33	0/6	1.53	1.69
Tritium	SED	6	0	[0.00417937 to 0.0332659]	pCi/g	0.093	0/6	0	0
Uranium-234	SED	6	6	1.18 to 1.6	pCi/g	2.59	0/6	1.18	1.6
Uranium-235	SED	6	6	0.0667 to 0.119	pCi/g	0.2	0/6	0.0667	0.119
Uranium-238	SED	6	6	1.18 to 1.57	pCi/g	2.29	0/6	1.18	1.57
November 2007 Sampling Event – All Samples[d]									
Americium-241	SED	20	11	[0.00395] to 0.966	pCi/g	0.04	11/20	0.238	0.966
Cesium-134	SED	12	0	[0.0272 to 0.112]	pCi/g	na	0/12	0	0
Cesium-137	SED	26	26	0.331 to 3.4	pCi/g	0.9	17/26	0.331	3.4
Cobalt-60	SED	26	0	[-0.0309 to 0.0498]	pCi/g	na	0/26	0	0

Table 2.0-1 (continued)

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Background Value	Frequency of Detects above Background Value	Min Detected Result	Max Detected Result
Europium-152	SED	26	0	[-0.186 to 0.175]	pCi/g	na	0/26	0	0
Plutonium-238	SED	26	12	[-0.0117] to 0.0749	pCi/g	0.006	12/26	0.0239	0.0749
Plutonium-239/240	SED	26	25	[0.0117] to 1.2	pCi/g	0.068	23/26	0.0376	1.2
Ruthenium-106	SED	26	0	[-0.367 to 0.315]	pCi/g	na	0/26	0	0
Sodium-22	SED	26	0	[-0.0565 to 0.0649]	pCi/g	na	0/26	0	0
Strontium-90	SED	26	15	[-0.0568] to 1.23	pCi/g	1.04	2/26	0.24	1.23
Thorium-228	SED	6	6	1.61 to 1.84	pCi/g	2.28	0/6	1.61	1.84
Thorium-230	SED	6	6	1.05 to 1.48	pCi/g	2.29	0/6	1.05	1.48
Thorium-232	SED	6	6	1.53 to 1.69	pCi/g	2.33	0/6	1.53	1.69
Tritium	SED	6	0	[0.00417937 to 0.0332659]	pCi/g	0.093	0/6	0	0
Uranium-234	SED	6	6	1.18 to 1.6	pCi/g	2.59	0/6	1.18	1.6
Uranium-235	SED	26	6	[-0.107] to [0.308]	pCi/g	0.2	0/26	0.0667	0.119
Uranium-238	SED	6	6	1.18 to 1.57	pCi/g	2.29	0/6	1.18	1.57
September 2008 Sampling Event[e]									
Americium-241	SED	10	10	0.0906 to 1.19	pCi/g	0.04	10/10	0.0906	1.19
Cesium-134	SED	7	0	[0.0567 to 0.102]	pCi/g	na	0/7	0	0
Cesium-137	SED	10	10	0.635 to 3.26	pCi/g	0.9	9/10	0.635	3.26
Cobalt-60	SED	10	0	[-0.0622 to 0.0722]	pCi/g	na	0/10	0	0
Europium-152	SED	10	0	[-0.0609 to 0.0533]	pCi/g	na	0/10	0	0
Plutonium-238	SED	10	9	[0.00832] to 0.0908	pCi/g	0.006	9/10	0.0246	0.0908
Plutonium-239/240	SED	10	10	0.0951 to 1.86	pCi/g	0.068	10/10	0.0951	1.86
Ruthenium-106	SED	10	0	[-0.411 to 0.223]	pCi/g	na	0/10	0	0
Sodium-22	SED	10	0	[-0.0293 to 0.0428]	pCi/g	na	0/10	0	0
Strontium-90	SED	10	8	[0.0112] to 0.81	pCi/g	1.04	0/10	0.177	0.81
Thorium-228	SED	10	10	1.72 to 2.55	pCi/g	2.28	3/10	1.72	2.55

Table 2.0-1 (continued)

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Background Value	Frequency of Detects above Background Value	Min Detected Result	Max Detected Result
Thorium-230	SED	10	10	1.14 to 2	pCi/g	2.29	0/10	1.14	2
Thorium-232	SED	10	10	1.62 to 2.36	pCi/g	2.33	1/10	1.62	2.36
Tritium	SED	10	7	[-0.00123739] to 0.288006	pCi/g	0.093	6/10	0.090529	0.288006
Uranium-234	SED	10	10	1.46 to 2.06	pCi/g	2.59	0/10	1.46	2.06
Uranium-235/236	SED	10	2	[0.00742] to 0.166	pCi/g	0.2	0/10	0.158	0.166
Uranium-238	SED	10	10	1.4 to 2.24	pCi/g	2.29	0/10	1.4	2.24

[a] 2007 integrated samples collected from full depth of six auger holes for waste characterization purposes.

[b] [ ] = Indicates the analyte was not detected.

[c] na = Not available.

[d] All 2007 samples, including both integrated samples and 20 discrete sampling layers, were used for understanding sample variability.

[e] 2008 samples collected from the five thickest fine-grained sediment layers in each of two holes, approximately 25 ft and 75 ft from weir.

Table 2.0-2
Summary of Inorganic Chemical Results in
Sediment Collected from Basin above Los Alamos Canyon Low-Head Weir

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Background Value	Frequency of Detects above Background Value	Frequency of Nondetects above Background Value	Min Detected Result	Max Detected Result
November 2007 Sampling Event – Depth-Integrated Samples Only[a]										
Aluminum	SED	6	6	1700 to 3140	mg/kg	15400	0/6	0/6	1700	3140
Antimony	SED	6	0	[0.437 to 0.532][b]	mg/kg	0.83	0/6	0/6	0	0
Arsenic	SED	6	6	1.42 to 3	mg/kg	3.98	0/6	0/6	1.42	3
Barium	SED	6	6	27.6 to 57.6	mg/kg	127	0/6	0/6	27.6	57.6
Beryllium	SED	6	6	0.385 to 0.752	mg/kg	1.31	0/6	0/6	0.385	0.752
Cadmium	SED	6	0	[0.543 to 0.658]	mg/kg	0.4	0/6	6/6	0	0
Calcium	SED	6	6	841 to 1880	mg/kg	4420	0/6	0/6	841	1880
Chromium	SED	6	6	2.84 to 4.86	mg/kg	10.5	0/6	0/6	2.84	4.86
Cobalt	SED	6	6	1.28 to 1.91	mg/kg	4.73	0/6	0/6	1.28	1.91
Copper	SED	6	6	2.59 to 32.6	mg/kg	11.2	1/6	0/6	2.59	32.6
Cyanide (Total)	SED	6	1	[0.268] to 2.21	mg/kg	0.82	1/6	0/6	2.21	2.21
Iron	SED	6	6	5040 to 6410	mg/kg	13800	0/6	0/6	5040	6410
Lead	SED	6	6	9.2 to 22	mg/kg	19.7	1/6	0/6	9.2	22
Magnesium	SED	6	6	433 to 689	mg/kg	2370	0/6	0/6	433	689
Manganese	SED	6	6	210 to 301	mg/kg	543	0/6	0/6	210	301
Mercury	SED	6	6	0.0056 to 0.0465	mg/kg	0.1	0/6	0/6	0.0056	0.0465
Nickel	SED	6	6	1.75 to 3.24	mg/kg	9.38	0/6	0/6	1.75	3.24
Potassium	SED	6	6	377 to 596	mg/kg	2690	0/6	0/6	377	596
Selenium	SED	6	6	3.53 to 5.03	mg/kg	0.3	6/6	0/6	3.53	5.03
Silver	SED	6	4	0.0498 to [0.228]	mg/kg	1	0/6	0/6	0.0498	0.0904
Sodium	SED	6	6	68 to 92.8	mg/kg	1470	0/6	0/6	68	92.8
Thallium	SED	6	6	0.0671 to 0.215	mg/kg	0.73	0/6	0/6	0.0671	0.215

Table 2.0-2 (continued)

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Background Value	Frequency of Detects above Background Value	Frequency of Nondetects above Background Value	Min Detected Result	Max Detected Result
Vanadium	SED	6	6	5.81 to 8.79	mg/kg	19.7	0/6	0/6	5.81	8.79
Zinc	SED	6	6	27.9 to 52.7	mg/kg	60.2	0/6	0/6	27.9	52.7
September 2008 Sampling Event[c]										
Aluminum	SED	10	10	4430 to 10600	mg/kg	15400	0/10	0/10	4430	10600
Antimony	SED	10	0	[0.178 to 0.649]	mg/kg	0.83	0/10	0/10	0	0
Arsenic	SED	10	1	0.716 to [2.42]	mg/kg	3.98	0/10	0/10	0.716	0.716
Barium	SED	10	10	56.3 to 232	mg/kg	127	3/10	0/10	56.3	232
Beryllium	SED	10	10	0.918 to 1.61	mg/kg	1.31	2/10	0/10	0.918	1.61
Cadmium	SED	10	9	0.214 to [0.744]	mg/kg	0.4	2/10	1/10	0.214	0.515
Calcium	SED	10	10	1990 to 5290	mg/kg	4420	2/10	0/10	1990	5290
Chromium	SED	10	10	3.56 to 10.3	mg/kg	10.5	0/10	0/10	3.56	10.3
Cobalt	SED	10	10	1.39 to 5.9	mg/kg	4.73	2/10	0/10	1.39	5.9
Copper	SED	10	10	5.69 to 18	mg/kg	11.2	5/10	0/10	5.69	18
Cyanide (Total)	SED	10	10	0.142 to 0.77	mg/kg	0.82	0/10	0/10	0.142	0.77
Iron	SED	10	10	5610 to 12600	mg/kg	13800	0/10	0/10	5610	12600
Lead	SED	10	10	18.3 to 36.5	mg/kg	19.7	9/10	0/10	18.3	36.5
Magnesium	SED	10	10	866 to 1980	mg/kg	2370	0/10	0/10	866	1980
Manganese	SED	10	10	224 to 1110	mg/kg	543	2/10	0/10	224	1110
Mercury	SED	10	10	0.0153 to 0.128	mg/kg	0.1	2/10	0/10	0.0153	0.128
Nickel	SED	10	10	3.91 to 13.8	mg/kg	9.38	2/10	0/10	3.91	13.8
Potassium	SED	10	10	755 to 1510	mg/kg	2690	0/10	0/10	755	1510
Selenium	SED	10	0	[1.97 to 2.42]	mg/kg	0.3	0/10	10/10	0	0
Silver	SED	10	10	0.0843 to 0.187	mg/kg	1	0/10	0/10	0.0843	0.187

Table 2.0-2 (continued)

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Background Value	Frequency of Detects above Background Value	Frequency of Nondetects above Background Value	Min Detected Result	Max Detected Result
Sodium	SED	10	10	113 to 180	mg/kg	1470	0/10	0/10	113	180
Thallium	SED	10	9	0.157 to 0.382	mg/kg	0.73	0/10	0/10	0.157	0.382
Vanadium	SED	10	10	8.01 to 21.5	mg/kg	19.7	2/10	0/10	8.01	21.5
Zinc	SED	10	10	41.8 to 99	mg/kg	60.2	9/10	0/10	41.8	99

[a] 2007 integrated samples collected from full depth of six auger holes for waste characterization purposes.

[b] [ ] = Indicates the analyte was not detected.

[c] 2008 samples collected from the five thickest fine-grained sediment layers in each of two holes, approximately 25 ft and 75 ft from weir.

Table 2.0-3
Summary of Detected Organic Chemical Results in Sediment Collected from Basin above Los Alamos Canyon Low-Head Weir

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Frequency of Detects	EQL	Min Detected Result	Max Detected Result
November 2007 Sampling Event – Depth-Integrated Samples Only[a]									
Acenaphthene	SED	6	1	0.0162 to [0.0427][b]	mg/kg	1/6	0.0427	0.0162	0.0162
Anthracene	SED	6	4	0.0091 to [0.0427]	mg/kg	4/6	0.0427	0.0091	0.029
Aroclor-1254	SED	6	6	0.0052 to 0.0155	mg/kg	6/6	0.00476	0.0052	0.0155
Aroclor-1260	SED	6	6	0.0078 to 0.023	mg/kg	6/6	0.0053	0.0078	0.023
Benzo(a)anthracene	SED	6	1	[0.0363] to 0.118	mg/kg	1/6	0.0438	0.118	0.118
Benzo(a)pyrene	SED	6	3	[0.0363] to 0.129	mg/kg	3/6	0.0427	0.0672	0.129
Benzo(b)fluoranthene	SED	6	6	0.0424 to 0.217	mg/kg	6/6	0.044	0.0424	0.217
Benzo(g,h,i)perylene	SED	6	4	[0.0363] to 0.101	mg/kg	4/6	0.0363	0.0518	0.101
Chloroform	SED	6	1	0.000286 to [0.00133]	mg/kg	1/6	0.00133	0.000286	0.000286
Chrysene	SED	6	6	0.0571 to 0.143	mg/kg	6/6	0.044	0.0571	0.143
Fluoranthene	SED	6	6	0.0537 to 0.229	mg/kg	6/6	0.044	0.0537	0.229
Fluorene	SED	6	1	0.0182 to [0.0427]	mg/kg	1/6	0.0427	0.0182	0.0182
Indeno(1,2,3-cd)pyrene	SED	6	3	0.0255 to 0.0651	mg/kg	3/6	0.0427	0.0255	0.0651
Naphthalene	SED	6	1	0.016 to [0.0427]	mg/kg	1/6	0.0427	0.016	0.016
Phenanthrene	SED	6	6	0.0253 to 0.146	mg/kg	6/6	0.044	0.0253	0.146
Pyrene	SED	6	6	0.0512 to 0.249	mg/kg	6/6	0.044	0.0512	0.249
Toluene	SED	6	2	0.000896 to [0.00119]	mg/kg	2/6	0.00119	0.000896	0.00102
Total Petroleum Hydrocarbons Diesel Range Organics	SED	6	6	10.8 to 38.3	mg/kg	6/6	4.4	10.8	38.3
Total Petroleum Hydrocarbons Gasoline Range Organics	SED	6	1	0.0512 to [0.0667]	mg/kg	1/6	0.0667	0.0512	0.0512

Table 2.0-3 (continued)

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Frequency of Detects	EQL	Min Detected Result	Max Detected Result
November 2007 Sampling Event – All Samples[c]									
Acenaphthene	SED	6	1	0.0162 to [0.0427]	mg/kg	1/6	0.0427	0.0162	0.0162
Aroclor-1254	SED	26	19	[0.00344] to 0.065	mg/kg	19/26	0.00476	0.0042	0.065
Aroclor-1260	SED	26	26	0.0022 to 0.0726	mg/kg	26/26	0.0053	0.0022	0.0726
Benzo(a)anthracene	SED	6	1	[0.0363] to 0.118	mg/kg	1/6	0.0438	0.118	0.118
Benzo(a)pyrene	SED	6	3	[0.0363] to 0.129	mg/kg	3/6	0.0427	0.0672	0.129
Benzo(b)fluoranthene	SED	6	6	0.0424 to 0.217	mg/kg	6/6	0.044	0.0424	0.217
Benzo(g,h,i)perylene	SED	6	4	[0.0363] to 0.101	mg/kg	4/6	0.0363	0.0518	0.101
Chloroform	SED	6	1	0.000286 to [0.00133]	mg/kg	1/6	0.00133	0.000286	0.000286
Chrysene	SED	6	6	0.0571 to 0.143	mg/kg	6/6	0.044	0.0571	0.143
Fluoranthene	SED	6	6	0.0537 to 0.229	mg/kg	6/6	0.044	0.0537	0.229
Fluorene	SED	6	1	0.0182 to [0.0427]	mg/kg	1/6	0.0427	0.0182	0.0182
Indeno(1,2,3-cd)pyrene	SED	6	3	0.0255 to 0.0651	mg/kg	3/6	0.0427	0.0255	0.0651
Naphthalene	SED	6	1	0.016 to [0.0427]	mg/kg	1/6	0.0427	0.016	0.016
Phenanthrene	SED	6	6	0.0253 to 0.146	mg/kg	6/6	0.044	0.0253	0.146
Pyrene	SED	6	6	0.0512 to 0.249	mg/kg	6/6	0.044	0.0512	0.249
Toluene	SED	6	2	0.000896 to [0.00119]	mg/kg	2/6	0.00119	0.000896	0.00102
Total Petroleum Hydrocarbons Diesel Range Organics	SED	6	6	10.8 to 38.3	mg/kg	6/6	4.4	10.8	38.3
Total Petroleum Hydrocarbons Gasoline Range Organics	SED	6	1	0.0512 to [0.0667]	mg/kg	1/6	0.0667	0.0512	0.0512
September 2008 Sampling Event[d]									
Acenaphthene	SED	10	2	0.017 to [0.0557]	mg/kg	2/10	0.0557	0.017	0.0204
Acetone	SED	10	3	[0.00747] to 0.0351	mg/kg	3/10	0.00953	0.0296	0.0351
Anthracene	SED	10	9	0.0132 to [0.0508]	mg/kg	9/10	0.0508	0.0132	0.0406
Aroclor-1248	SED	10	1	[0.00507] to 0.0739	mg/kg	1/10	0.0254	0.0739	0.0739

Table 2.0-3 (continued)

Analyte	Media	Number of Analyses	Number of Detects	Concentration Range	Std Result Unit of Measure	Frequency of Detects	EQL	Min Detected Result	Max Detected Result
Aroclor-1254	SED	10	10	0.0071 to 0.0836	mg/kg	10/10		0.0071	0.0836
Aroclor-1260	SED	10	10	0.008 to 0.112	mg/kg	10/10		0.008	0.112
Benzene	SED	10	1	0.000911 to [0.00191]	mg/kg	1/10	0.00191	0.000911	0.000911
Benzo(a)anthracene	SED	10	9	[0.0508] to 0.162	mg/kg	9/10	0.0508	0.0673	0.162
Benzo(a)pyrene	SED	10	10	0.0493 to 0.199	mg/kg	10/10		0.0493	0.199
Benzo(b)fluoranthene	SED	10	10	0.0979 to 0.438	mg/kg	10/10		0.0979	0.438
Benzo(g,h,i)perylene	SED	10	10	0.0315 to 0.125	mg/kg	10/10		0.0315	0.125
Butanone[2-]	SED	10	3	[0.00747] to 0.0101	mg/kg	3/10	0.00953	0.00934	0.0101
Butylbenzylphthalate	SED	10	1	0.248 to [0.557]	mg/kg	1/10	0.557	0.248	0.248
Chloroform	SED	10	1	0.000418 to [0.00191]	mg/kg	1/10	0.00191	0.000418	0.000418
Chrysene	SED	10	10	0.0494 to 0.2	mg/kg	10/10		0.0494	0.2
Ethylbenzene	SED	10	1	0.000707 to [0.00191]	mg/kg	1/10	0.00191	0.000707	0.000707
Fluoranthene	SED	10	10	0.0896 to 0.379	mg/kg	10/10		0.0896	0.379
Fluorene	SED	10	2	0.0158 to [0.0557]	mg/kg	2/10	0.0557	0.0158	0.0166
Indeno(1,2,3-cd)pyrene	SED	10	10	0.12 to 0.195	mg/kg	10/10		0.12	0.195
Isopropyltoluene[4-]	SED	10	1	0.000762 to [0.00191]	mg/kg	1/10	0.00182	0.000762	0.000762
Methylene Chloride	SED	10	1	0.00396 to [0.00953]	mg/kg	1/10	0.00953	0.00396	0.00396
Phenanthrene	SED	10	10	0.0477 to 0.174	mg/kg	10/10		0.0477	0.174
Pyrene	SED	10	10	0.0944 to 0.35	mg/kg	10/10		0.0944	0.35
Toluene	SED	10	3	[0.00149] to 0.00554	mg/kg	3/10	0.00191	0.00165	0.00554
Total Petroleum Hydrocarbons Gasoline Range Organics	SED	10	3	0.0322 to [0.0801]	mg/kg	3/10	0.0801	0.0322	0.0381
Xylene[1,3-]+Xylene[1,4-]	SED	10	1	0.000516 to [0.00381]	mg/kg	1/10	0.00381	0.000516	0.000516

[a] 2007 integrated samples collected from full depth of six auger holes for waste characterization purposes.

[b] [ ] = Indicates the analyte was not detected.

[c] All 2007 samples, including both integrated samples and 20 discrete sampling layers, were used for understanding sample variability.

[d] 2008 samples collected from the five thickest fine-grained sediment layers in each of two holes, approximately 25 ft and 75 ft from weir.

Table 2.0-4
Comparison of Maximum Contaminant Levels Detected to SSLs for the 2007 Sampling Event (Integrated Samples)

Analyte	Maximum Concentration (mg/kg)	Residential SSL (mg/kg)[a]	Unit of Measure	Sediment Background Value (mg/kg)[b]	suite
Copper	32.6	3130	mg/kg	11.2	INORGANIC
Cyanide (Total)	2.21	1220	mg/kg	0.82	INORGANIC
Lead	22	400	mg/kg	19.7	INORGANIC
Selenium	5.03	391	mg/kg	0.3	INORGANIC
Acenaphthene	0.0162	3730	mg/kg	n/a[c]	ORGANIC
Anthracene	0.029	22000	mg/kg	n/a	ORGANIC
Aroclor-1254	0.065	1.12	mg/kg	n/a	ORGANIC
Aroclor-1260	0.0726	1.12	mg/kg	n/a	ORGANIC
Benzo(a)anthracene	0.118	6.21	mg/kg	n/a	ORGANIC
Benzo(a)pyrene	0.129	0.621	mg/kg	n/a	ORGANIC
Benzo(b)fluoranthene	0.217	6.21	mg/kg	n/a	ORGANIC
Benzo(g,h,i)perylene	0.101	2290	mg/kg	n/a	ORGANIC
Chloroform	0.000286	4	mg/kg	n/a	ORGANIC
Chrysene	0.143	615	mg/kg	n/a	ORGANIC
Fluoranthene	0.229	2290	mg/kg	n/a	ORGANIC
Fluorene	0.0182	2660	mg/kg	n/a	ORGANIC
Indeno(1,2,3-cd)pyrene	0.0651	6.21[d]	mg/kg	n/a	ORGANIC
Naphthalene	0.016	79.5	mg/kg	n/a	ORGANIC
Phenanthrene	0.146	1830	mg/kg	n/a	ORGANIC
Pyrene	0.249	2290	mg/kg	n/a	ORGANIC
Toluene	0.00102	252	mg/kg	n/a	ORGANIC
Total Petroleum Hydrocarbons Diesel Range Organics	38.3	200[e]	mg/kg	n/a	ORGANIC
Total Petroleum Hydrocarbons Gasoline Range Organics	0.0512	n/a	n/a	n/a	ORGANIC

[a] SSLs from NMED (2006, 092513), unless otherwise noted.
[b] Background values from LANL (1998, 059730, Table 6.0-1, p. 44).
[c] n/a = not applicable.
[d] Value from EPA Region 6 (EPA 2005, 091002).
[e] Value for unknown oil from NMED TPH screening guideline (NMED 2006, 094614).

Table 2.0-5
Comparison of Maximum Contaminant Levels Detected to SSLs for the 2008 Sampling Event

Analyte	Maximum Concentration (mg/kg)	Residential SSL (mg/kg)[a]	Unit of Measure	Sediment Background Value (mg/kg)[b]	Suite
Barium	232	15600	mg/kg	127	INORGANIC
Beryllium	1.61	156	mg/kg	1.31	INORGANIC
Cadmium	0.515	39	mg/kg	0.4	INORGANIC
Calcium	5290	n/a[c]	mg/kg	4420	INORGANIC
Cobalt	5.9	1520	mg/kg	4.73	INORGANIC
Copper	18	3130	mg/kg	11.2	INORGANIC
Lead	36.5	400	mg/kg	19.7	INORGANIC
Manganese	1110	3590	mg/kg	543	INORGANIC
Mercury	0.128	23[d]	mg/kg	0.1	INORGANIC
Nickel	13.8	1560	mg/kg	9.38	INORGANIC
Selenium	2.03	391	mg/kg	0.3	INORGANIC
Vanadium	21.5	78.2	mg/kg	19.7	INORGANIC
Zinc	99	23500	mg/kg	60.2	INORGANIC
Acenaphthene	0.0204	3730	mg/kg	n/a	ORGANIC
Acetone	0.0351	28100	mg/kg	n/a	ORGANIC
Anthracene	0.0406	22000	mg/kg	n/a	ORGANIC
Aroclor-1248	0.0739	1.12	mg/kg	n/a	ORGANIC
Aroclor-1254	0.0836	1.12	mg/kg	n/a	ORGANIC
Aroclor-1260	0.112	1.12	mg/kg	n/a	ORGANIC
Benzene	0.000911	10.3	mg/kg	n/a	ORGANIC
Benzo(a)anthracene	0.162	6.21	mg/kg	n/a	ORGANIC
Benzo(a)pyrene	0.199	0.621	mg/kg	n/a	ORGANIC
Benzo(b)fluoranthene	0.438	6.21	mg/kg	n/a	ORGANIC
Benzo(g,h,i)perylene	0.125	2290	mg/kg	n/a	ORGANIC
Butanone[2-]	0.0101	31800	mg/kg	n/a	ORGANIC
Butylbenzylphthalate	0.248	240[d]	mg/kg	n/a	ORGANIC
Chloroform	0.000418	4	mg/kg	n/a	ORGANIC
Chrysene	0.2	615	mg/kg	n/a	ORGANIC
Ethylbenzene	0.000707	128	mg/kg	n/a	ORGANIC
Fluoranthene	0.379	2290	mg/kg	n/a	ORGANIC
Fluorene	0.0166	2660	mg/kg	n/a	ORGANIC
Indeno(1,2,3-cd)pyrene	0.195	6.21[d]	mg/kg	n/a	ORGANIC
Isopropyltoluene[4-]	0.000762	271	mg/kg	n/a	ORGANIC
Methylene Chloride	0.00396	182	mg/kg	n/a	ORGANIC
Phenanthrene	0.174	1830	mg/kg	n/a	ORGANIC

Table 2.0-5 (continued)

Analyte	Maximum Concentration (mg/kg)	Residential SSL (mg/kg)[a]	Unit of Measure	Sediment Background Value (mg/kg)[b]	Suite
Pyrene	0.35	2290	mg/kg	n/a	ORGANIC
Toluene	0.00554	252	mg/kg	n/a	ORGANIC
Total Petroleum Hydrocarbons Diesel Range Organics	71.1	200[e]	mg/kg	n/a	ORGANIC
Total Petroleum Hydrocarbons Gasoline Range Organics	0.0381	n/a	n/a	n/a	ORGANIC
Xylene[1,3-]+Xylene[1,4-]	0.000516	82	mg/kg	n/a	ORGANIC

[a] SSLs from NMED (2006, 092513), unless otherwise noted.

[b] Background values from LANL (1998, 059730, Table 6.0-1, p. 44).

[c] n/a = Not applicable.

[d] Value from EPA Region 6 (EPA 2005, 091002).

[e] Value for unknown oil from NMED TPH screening guideline (NMED 2006, 094614).

Appendix A

Functional and Operational Requirements

Functional and Operational Requirements:

Stabilization and Enhancement of Pueblo Canyon Drainage

HMT No.: **N/A**	HMT Title: **N/A**
TA No.: **Pueblo Canyon Watershed**	Facility Number/ Name: **Pueblo Canyon Watershed**
System ID: **N/A**	System Name: **Grade Control Structure**

Name	Organization	Date	Signature
Project Engineer:			
Val Rhodes	EWMO-RLW		
Design Authority Representative:			
Steve Clemmons	EWMO-DO		
Design Authority Representative:			
TBD			
Quality Assurance:			
Debbie			
Program Manager			
Ron Rager	WES-RS		
Engineering Manager			
Steve Clemmons	EWMO-DO		

Reviewed Classification / UCNI

(Reviewed By)	(Z#)	(Review Date)	(Classification)

Revisions

Revision	**Description of Change**	**Date**	**Pages Affected**	**Approval Initials**					
				PE	DAR	DAR	QA	Prg. Mgr.	EM
A	Issue for Review	10/17/08	All	VR	n/a	n/a	n/a	RR	n/a
0	Original issue		All						
1									
2									

Total number of pages: 5

Table of Contents

1.0 INTRODUCTION

This document presents the functional and operational requirements for the Grade Control Structure, which will form part of the interim measures to mitigate contaminated sediment transport in the LA/P watershed. The grade-control structure shall be located in accordance with the Supplemental Plan (LA-UR-08-6588).

2.0 CLASSIFICATIONS

The following information identifies the specific classifications associated with the project.

<table>
<tr><td rowspan="2">2.1 Facility Hazard Category</td><td colspan="2">Hazard Category 2 Nuclear: ☐</td><td colspan="2">Hazard Category 3 Nuclear: ☐</td></tr>
<tr><td colspan="2">High Hazard Nonuclear: ☐</td><td colspan="2">Medium Hazard Nonuclear: ☐</td></tr>
<tr><td>2.2 SSC Functional Classification</td><td>SC: ☐</td><td>SS: ☐</td><td>DID: ☐</td><td>NS: ☒</td></tr>
<tr><td>2.3 SSC Management Level</td><td>ML-1: ☐</td><td>ML-2: ☐</td><td>ML-3: ☒</td><td>ML-4: ☐</td></tr>
<tr><td>2.4 SSC NPH Performance Category</td><td>PC-0: ☒</td><td>PC-1: ☐</td><td>PC-2: ☐</td><td>PC-3: ☐</td></tr>
<tr><td colspan="5">2.5 Occupancy Classification: n/a</td></tr>
<tr><td colspan="5">2.6 List of Priority Documents: To be determined</td></tr>
</table>

3.0 FUNCTIONAL REQUIREMENTS

3.1 Programmatic Mission and Capability Requirements

Low levels of PCB contamination is widely distributed in the sediment deposits of the LA/P watershed. In order to reduce the potential for flood transport of contaminated sediments from within Pueblo Canyon, a grade-control structure will be installed near the Interchange for highways NM 502 and NM 4. The overall goal of the project is to reduce contaminated sediment transport within the watershed.

3.2 General

The grade control structure shall be constructed across the Pueblo Canyon channel near the Interchange for highways NM 502 and NM 4 to:

- Reduce flow velocities and peak discharge during flood events resulting from stormwater drainage by lowering the gradient in the reach upstream of the structure. Reduced flow velocity and peak discharge should also reduce erosion of contaminated deposits downstream of the structure.
- Cause sediment accumulation in the channel and flood plain of reach DP-2 through the reduced gradient behind the weir structure. Aggradation in the reach upstream of the structure should result in burial of contaminated sediments, making them unavailable for erosion during floods.

4.0 OPERATIONAL AND PERFORMANCE REQUIREMENTS

4.1 Operability Requirements

- The structure shall be a direct overflow structure with emergency spillway and capable of passing floods of a magnitude that are common in Pueblo Canyon.
- The structure shall absorb energy from overflowing water to prevent bedrock scour and downstream erosion.
- The total spill capacity of the structure before overtopping shall be 2000 cfs.
- The structure shall either incorporate a downgradient gaging station and stormwater quality monitoring station or be supplemented by such features just downstream of the structure.
- The construction of the structure shall minimize disturbance of the floodplain and surrounding vegetation.
- Concrete-faced slope protection of the highway interchange shall be incorporated.
- Initial spilling of stream flows shall be direct overflow at the existing channel centerline
- Jute matting (or equivalent) slope protection shall be limited for use on slopes less than or equal to 4.0 horizontal to 1.0 vertical (14 degrees).
- Rock slope protection shall be used on slopes steeper than 4.0 horizontal to 1.0 vertical where needed.
- Finished exposed bedrock slopes shall be limited to slopes no steeper than 1.0 horizontal to 6.0 vertical.
- Design shall follow national consensus codes and standards.

4.2 Aesthetics

- Incorporate biotechnical design principals to the maximum extent practicable.

4.3 Monitoring and Maintenance

A monitoring and maintenance plan shall be developed to observe performance and provide corrective maintenance including abutment and downstream scour.

5.0 REFERENCES

Document No.	Title
ERID-101714	Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons, February 2008
ERID-103007	Approval with Modifications Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons Los Alamos National Laboratory, July 2008

19.25.12 NMAC	Rules and Regulations Governing the Design, Construction and Dam Safety, March 2005

6.0 DEFINITIONS AND ACRONYMS

Acronym	Term
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ASCE	American Society of Civil Engineers
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CWA	Clean Water Act
DOE	Department of Energy
ESH	Environmental, Safety, and Health
FEMA	Federal Emergency Management Agency
NEPA	National Environmental Policy Act
NPH	Natural Phenomenon Hazard
OSHA	Occupational Safety and Health Administration
SSC	Structures, Systems, and Components

Functional and Operational Requirements:

Stabilization and Enhancement of Reach DP-2 in DP Canyon

HMT No.: **N/A**	HMT Title: **N/A**
TA No.: **Los Alamos Canyon Watershed**	Facility Number/ Name: **Los Alamos Watershed**
System ID: **N/A**	System Name: **Grade-Control Structure**

Name	Organization	Date	Signature
Project Engineer:			
Val Rhodes	EWMO-RLW		
Design Authority Representative:			
Steve Clemmons	EWMO-DO		
Design Authority Representative:			
TBD			
Quality Assurance:			
Debbie			
Program Manager			
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3.0 FUNCTIONAL REQUIREMENTS

3.1 Programmatic Mission and Capability Requirements

Low levels of PCB contamination are widely distributed in the sediment deposits of the LA/P watershed. In order to reduce the potential for flood transport of contaminated sediments from within DP Canyon, a grade-control structure will be installed in reach DP-2 in DP Canyon. The overall goal of the project is to reduce contaminated sediment transport within the watershed.

DP Canyon drains a considerable amount of urban stormwater runoff collected in the stormwater drainage system of Los Alamos townsite.

3.2 General

The grade-control structure shall be constructed across the DP Canyon channel at the east end of reach DP-2 to:

- Reduce flow velocities and peak discharge during flood events resulting from storm water drainage to DP Canyon by lowering the gradient in the reach upstream of the structure. Reduced flow velocity and peak discharge should also reduce erosion of contaminated deposits downstream of the structure.
- Cause sediment accumulation in the channel and flood plain of reach DP-2 through the reduced gradient behind the weir structure. Aggradation in the reach upstream of the structure should result in burial of contaminated sediments making them unavailable for erosion during floods.

4.0 OPERATIONAL AND PERFORMANCE REQUIREMENTS

4.1 Operability Requirements

- The structure shall be a direct overflow structure with emergency spillway and capable of passing floods of a magnitude that are common in DP Canyon.
- The structure shall absorb energy from overflowing water to prevent bedrock scour and downstream erosion.
- The structure shall either incorporate a downgradient gaging station and stormwater quality monitoring station or be supplemented by such features just downstream of the structure.
- The construction of the structure shall minimize disturbance of the floodplain and surrounding vegetation.
- Jute matting (or equivalent) slope protection shall be limited for use on slopes less than or equal to 4.0 horizontal to 1.0 vertical (14 degrees).
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NEPA	National Environmental Policy Act
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OSHA	Occupational Safety and Health Administration
SSC	Structures, Systems, and Components

Appendix B

Analytical Results
(on CD included with this document)