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Appendix B Sandia Canyon Wetland Hydraulics
Appendix C Sandia Canyon Wetland Grade-Control Structure As-Built Drawings
Appendix D Photo Documentation
Appendix E Sandia Canyon Wetland Run-On Control Design

Acronyms and Abbreviations

BMP	best management practice
DOE	Department of Energy (U.S.)
DRO	diesel-range organics
EPA	Environmental Protection Agency (U.S.)
ES&H	environment, safety, and health
ET	evapotranspiration
gpd	gallons per day
HEC-RAS	Hydrologic Engineering Center River Analysis System (U.S. Army Corps of Engineers surface model)
IWD	integrated work document
LANL	Los Alamos National Laboratory
NMED	New Mexico Environment Department
NWP	nationwide permit
PAH	polycyclic aromatic hydrocarbon
RPF	Records Processing Facility
TPH	total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers

2. During the week of September 10, 2013, the site was inundated with unprecedented rainfall. Rainfall totals in some areas of the Laboratory exceeded 7 in. in a 1-wk time period, and much of the rain fell during an extremely intense event that occurred between September 12 and 13, 2013. These storm events were accompanied by record run-on, flooding, and erosion at the site.

   On the morning of September 17, 2013, damage to the site was summarized as follows:

   - The cascade pool lost roughly 25% of its boulders downstream.
   - Roughly 75% of recently planted site-restoration plants were lost.
   - The diversion pond overflowed, and some plastic lining was lost.

Cobbles rolled downstream from the rock aprons. Roughly 600 cubic yards of material from the Los Alamos County landfill was deposited between the first and second steel-sheet piles. During the construction phase, the sediment was removed from that area by the contractor and stockpiled to construct a large run-on control north of the valley floor west of sheet piles one and two to retain additional materials that may erode from the landfill area. Los Alamos County has installed temporary controls above the project area and is working towards a final solution in the near future.

The remaining sediment was then placed in a small south-entering swale measuring approximately 50 ft by 120 ft southwest of the grade-control structure and erosion controls were put in place for stabilization of the area. The swale and fill area are above the 100-year floodplain and are not susceptible to significant upgradient run-on. The 100-year flood plain levels have been calculated and plotted for the Sandia Canyon drainage basin by LANL (LANL Engineering Standards Manual). The established vegetation will resist potential erosion caused by rainfall falling directly on the fill area. Erosion controls for this area included lining the ravine with a polypropylene liner, track-walking the sediment to match existing contours, and hydroseeding. Four rows of wattles were also placed perpendicular to the slope of the swale. An earthen berm measuring approximately 30 ft was also constructed below the swale and hydroseeded to prevent any potential run-on from entering the wetlands area (Appendix D). The sediments in the stockpile were not sampled because much of it either came from the County landfill cover or was imported clean fill material and not material from the wetlands.

The wetland area and fill area has since withstood four additional flow events during the summer of 2014 over 50 cubic feet per second (cfs), with the largest storm being a 25-yr, 30-min event that generated an estimated peak discharge of 110 cfs. No significant erosion occurred after these events. The south-entering ravine and fill area as well as the entire project area have been inspected under the current construction general permit Storm Water Pollution Prevention Plan (SWPPP). The grade-control structure will continue to be inspected following rain events with discharges greater than 50 cfs and quarterly. If erosion or any indications of instability are observed, appropriate actions will be taken to ensure continued stability and functionality and will be documented in the annual performance report.

The second event resulted in significant delays to completing construction. Extensive repairs were required, including the design and construction of best management practice (BMP) run-on control structures (see Appendix E), repair of the sump pond and diversion system, replacement of boulders and repair of the cascade pool liner, removal of deposited sediments and regrading, and replanting of the lost plants. One month of work was required to recover from this event.

The September 2013 rain event has a 1000-year return period based on information provided by NOAA. The grade-control structure was designed to withstand a 25-yr 2-h peak flow event of 500 cfs. NMED approved and accepted the design parameters in the “Approval with Modification, Work Plan and Final Design for Stabilization of the Sandia Canyon Wetland.” (NMED 2011, 208094) The overall project goals

and objectives were to arrest the headcut in the lower portion of the wetland and to maintain hydrologic and geochemical conditions to minimize contaminant migration. The September 2013 rain event occurred after sheet piles two and three had already been constructed. Estimates vary on the return-interval magnitude of the event, but it was significantly greater than a 25-yr return interval. With the exception of the loss of newly planted vegetation and the displacement of some boulders in the cascade pool, no unusual erosion was noted above or below the sheet piles. Since that time, significant additional vegetation has been established (Appendix D). The wetland area has since had four additional flow events during the summer of 2014 over 50 cfs with the largest storm being a 25 yr, 30-min event that generated an estimated peak discharge of 110 cfs. No significant erosion occurred after these events. The south-entering swale as well as the entire project area is currently being inspected under the construction general permit SWPPP. The grade-control structure will also be inspected after every runoff event greater than 50 cfs and quarterly. If erosion or any indications of instability are observed, appropriate actions will be taken to ensure continued stability and function and will be documented in the annual performance report.

3.5 As-Built Drawings

A set of as-built drawings after construction for the grade-control structure can be found in Appendix C.

3.6 Photo Documentation

Photos of the grade-control structure can be found in Appendix D as well as photos of the run-on BMPs.

3.7 Deviations

The following deviation from the work plan occurred. NMED's approval with modification of the interim measures work plan required that "In the final design, the Permittees must propose to remove all post-1942 alluvial sediments that are present within reach S-2 of Sandia Canyon below the grade-control structure, and to place these sediments as fill behind the grade-control structure" (NMED 2011, 203806).

As previously discussed, the Sandia Wetland grade-control structure project was permitted under the USACE Nationwide Permit (NWP) 38 for Cleanup of Hazardous and Toxic Waste (USACE 2013, 251704). The Laboratory pursued permission from the USACE to fulfill the NMED requirement (LANL 2013, 251705), but it was concluded that NWP 38 General Condition 6 would be violated by the placement of sediments that contain toxic pollutants in toxic amounts into jurisdictional waters (USACE 2013, 251706). Thus, the Laboratory did not remove post-1942 alluvial sediments within reach S-2 of Sandia Canyon and use them as fill behind the grade-control structure.

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. This information is also included in text citations. ER IDs 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 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.

LANL (Los Alamos National Laboratory), May 2011. "Interim Measures Work Plan for Stabilization of the Sandia Canyon Wetland," Los Alamos National Laboratory document LA-UR-11-2186, Los Alamos, New Mexico. (LANL 2011, 203454)

LANL (Los Alamos National Laboratory), September 2011. "Work Plan and Final Design for Stabilization of the Sandia Canyon Wetland," Los Alamos National Laboratory document LA-UR-11-5337, Los Alamos, New Mexico. (LANL 2011, 207053)

LANL (Los Alamos National Laboratory), September 4, 2013. "Action No. SPA-2012-00050-ABQ Potential Removal and Placement of Sediments at Sandia Canyon Wetland," Los Alamos National Laboratory letter (ENV-DO-13-0073) to W. Oberle (USACE) from A.R. Grieggs (LANL) and G.E. Turner (DOE-NA-00-LA), Los Alamos, New Mexico. (LANL 2013, 251705)

NMED (New Mexico Environment Department), January 4, 2011. "Approval with Modification, Phase II Investigation Work Plan for Sandia Canyon," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 111518)

NMED (New Mexico Environment Department), June 9, 2011. "Approval with Modification, Interim Measures Work Plan for Stabilization of the Sandia Canyon Wetland," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 203806)

NMED (New Mexico Environment Department), November 15, 2011. "Approval with Modification, Work Plan and Final Design for Stabilization of the Sandia Canyon Wetland," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2011, 208094)

USACE (U.S. Army Corps of Engineers), March 27, 2013. "Action No. SPA-2012-00050-ABQ, McCann, LANL, Sandia Canyon, Wetland, Los Alamos County, NM," USACE letter to J. McCann (LANL) from W. Oberle (USACE), Albuquerque, New Mexico. (USACE 2013, 251704)

USACE (U.S. Army Corps of Engineers), September 5, 2013. "Potential Violation - Action No. SPA-2012-00050-ABQ, McCann, LANL, Sandia Canyon, Wetland, Los Alamos County, NM," USACE letter to G. Turner (DOE-NA-00-LA) and A.R. Grieggs (LANL) from W. Oberle (USACE), Albuquerque, New Mexico. (USACE 2013, 251706)

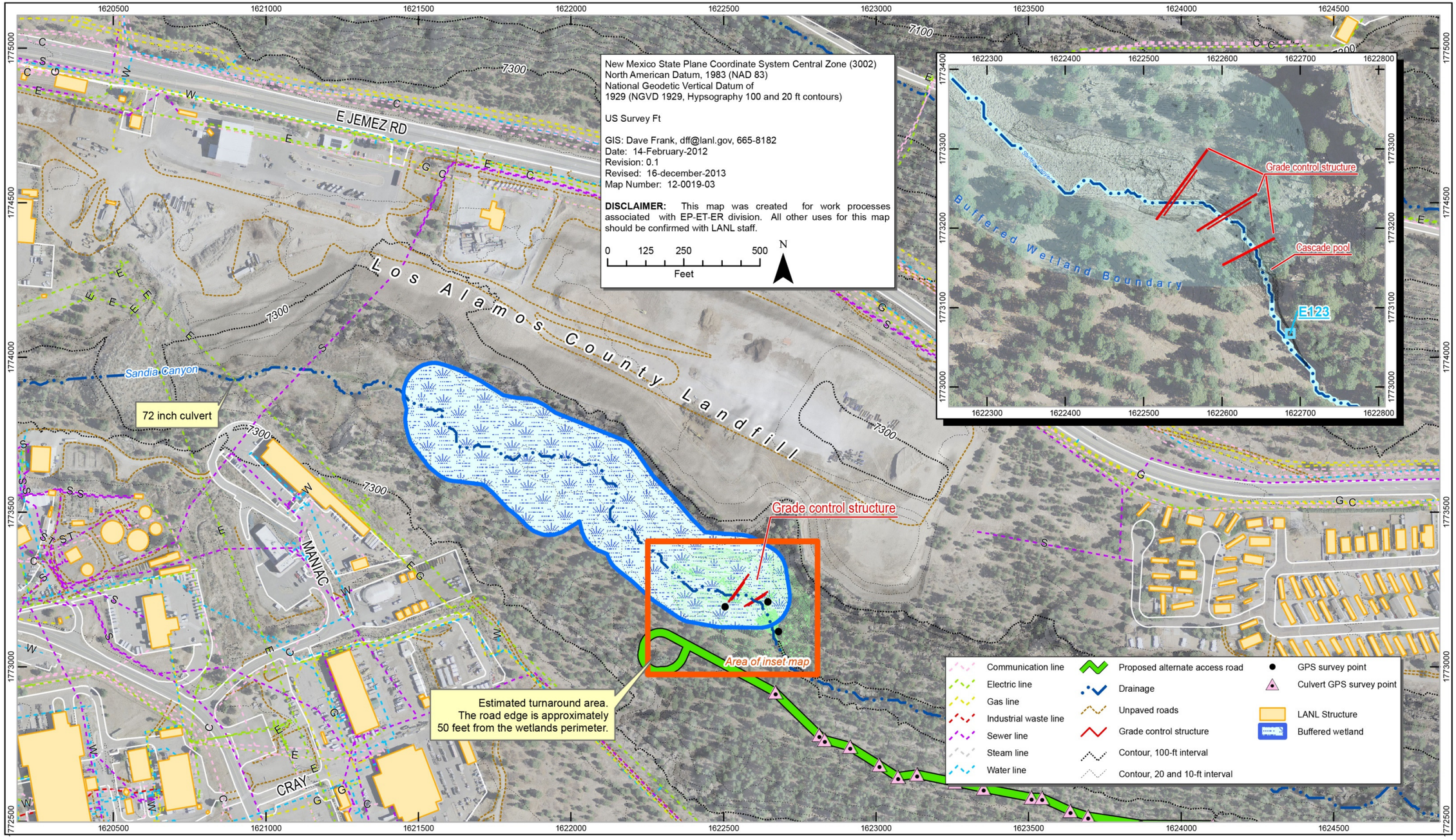


Figure 1 Location of Sandia Canyon grade-control structure

Table 1
Permits and Permissions Obtained

Permit	Agency
National Environmental Policy Act Assessment	U.S. Department of Energy
Section 7 Biological Assessment Consultation under the Endangered Species Act	U.S. Department of Interior Fish and Wildlife Service
National Pollutant Discharge Elimination System Construction General Permit	EPA
Section 404 NWP 38 for Cleanup of Hazardous and Toxic Waste under the Clean Water Act	USACE
Section 401 Water Quality Certification Permit under the Clean Water Act	NMED Surface Water Quality Bureau

Table 2
Analytical Results for Sample CASA-13-34678
Using SW-846 EPA Method 8270

Analyte Name	Result	Units
Anthracene	18,000	µg/kg
Carbazole	3400	µg/kg
Dibenzofuran	21,000	µg/kg
Fluorene	9200	µg/kg
2-Methylnaphthalene	38,000	µg/kg
Naphthalene	8800	µg/kg
Phenanthrene	8300	µg/kg
Pyrene	5500	µg/kg
TPH-DRO	11,000	mg/kg