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Refer To: ADESH-16-058
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Locates Action No.: n/a

John Kieling, Bureau Chief
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2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the 2016 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

Dear Mr. Kieling:

Enclosed please find two hard copies with electronic files of the 2016 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project. The objective of this monitoring plan is to evaluate the effects of mitigation measures undertaken in the Los Alamos and Pueblo Canyons watershed under the New Mexico Environment Department–approved Interim Work Plan to Mitigate Contaminated Sediment Transport in the Los Alamos and Pueblo Canyons.

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

Sincerely,

John P. McCann, Acting Division Leader
Environmental Protection & Compliance Division
Los Alamos National Laboratory

Sincerely,

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

JM/DR/BR/SV:sm

Enclosures: Two hard copies with electronic files – 2016 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project (EP2016-0037)

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LA-UR-16-22543
April 2016
EP2016-0037

2016 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Associate Directorate for Environmental Management

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EP2016-0037

2016 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project

April 2016

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1.0 INTRODUCTION

The objective of this monitoring plan is to describe methods and frequency of monitoring in the Los Alamos and Pueblo Canyons (LA/P) watershed. This monitoring plan has been developed to satisfy the requirements of the New Mexico Environment Department– (NMED-) approved Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons (hereafter, the IMWP) (LANL 2008, 101714), and NMED's Approval with Modification, Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons (NMED 2008, 103007). In accordance with these work plans and the approvals, Los Alamos National Laboratory (LANL or the Laboratory) has undertaken several activities to reduce flood energy and associated sediment transport. Because contaminants migrate with sediment entrained in runoff, reduced sediment transport will thus reduce contaminant transport, which is the primary objective of these activities.

Monitoring proposed within this plan is designed to satisfy four purposes:

1. Monitoring is described to support objectives of the IMWP to evaluate the performance of the controls installed to mitigate sediment transport. Two types of monitoring that began in 2010 are designed to meet the objectives of the IMWP:
    a. monitoring geomorphic changes in the canyon bottom facilitates continued evaluation of sediment control mitigation measures
    b. collecting and analyzing storm water runoff samples for sediment content supports assessment of the performance of sediment control measures.
2. Monitoring is described to support the analyses requested by NMED to assess attainment of designated uses. Monitoring concentrations of dissolved metals and total recoverable metals and other pollutants as requested by NMED in its approval of the 2010 monitoring plan (NMED 2010, 108444) supports the determination of whether or not surface waters of the state are attaining designated uses.
3. Monitoring of contaminants in affected environmental media at U.S. Department of Energy (DOE) sites is required under DOE Order 450.1A, "Environmental Protection Program."
4. Monitoring is described to satisfy requirements of the memorandum of understanding (MOU) between the U.S. Department of Energy (DOE) and the Buckman Direct Diversion Board (BDDB) regarding water-quality monitoring (hereafter, the MOU between BDDB and DOE) (DOE and BDD Board 2014, 600185). Analysis of gross beta, radium-226, and radium-228 at gaging stations E050.1 and E060.1 is being performed to fulfill requirements of the MOU between BDDB and DOE.

Storm water and geomorphic monitoring conducted under this 2016 monitoring plan will evaluate the potential impacts of the changes that occurred in the watershed and the efficacy of the mitigations over time. Table 1.0-1 provides a summary of annual monitoring plans and approvals under which monitoring has been conducted since 2010.

Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided in this plan to NMED in accordance with DOE policy. Water-quality results from storm water events are systematically uploaded to the publically accessible environmental monitoring database, Intellus New Mexico, at http://www.intellusnm.com/.

2.0 MONITORING GEOMORPHIC CHANGES

Monitoring of geomorphic changes (e.g., sediment deposition or erosion) associated with the mitigation measures was conducted in 2015 using three methods: (1) aerial light detection and ranging (LiDAR) surveys, (2) ground-based channel thalweg and bank surveys, and (3) additional supplemental ground-based surveys (e.g., check points for digital elevation model [DEM] evaluation). The surveys have been conducted annually to document geomorphic changes that may have occurred during the previous summer monsoon season. The optimal time for conducting surveys is selected based on the weather, typically after November 1st when storm water flows are unlikely to occur, the presence or absence of ponded water in sediment-retention basins, and the ability to work in the canyons after dense vegetation has senesced. Figure 2.0-1 shows the monitoring areas where surveys have been conducted in 2015 and where repeat surveys are planned.

LiDAR surveys are planned to measure points at least as densely as in the 2015 LiDAR data set (18–24 points per square meter). The LiDAR surveys will provide a detailed DEM of the entire active channel within each monitoring area so that a comparison with the previous year's DEM can show areas of geomorphic change. If noteworthy features are identified in the LiDAR comparison, the features will be field checked and additional ground-based survey methods may be implemented. Ground-based thalweg and bank surveys will be conducted and directly compared with 2015 data to show any geomorphic changes to these specific areas. These surveys help to verify geomorphic changes to the principal erosional processes in the canyon, including bank erosion and channel incision. Independent ground-based check-point survey points will be collected and used to estimate how well the DEM represents the bare earth in each of the survey areas.

2.1 Pueblo Canyon

Each Pueblo Canyon monitoring area will be surveyed using both ground-based and aerial LiDAR survey methods. At the reach scale, aerial LiDAR survey methods will be supplemented with ground-based surveying to improve resolution of channel incision or deposition and determine geomorphic changes. Listed below are the reach target areas and the proposed monitoring methods for each reach.

2.1.1 Pueblo Canyon Background Area above WWTF to Pueblo Canyon Wing Ditch

The Pueblo Canyon background area and the wing ditch no longer have functional erosion-control features but will be included and reported within the Pueblo canyon geomorphic change analysis to provide historical context.

Pueblo Canyon Background Area above WWTF—The upstream extent of this area is located at the westernmost edge of Reach P-2W; the downstream extent is located east of Reach P-2W. This section will be used as a background study area above the influence of the WWTF; however banks and thalweg will not be monitored because of the lack of functional erosion control structures.

Pueblo Canyon Upper Willow-Planting Area—The upstream extent of this area is located west of the westernmost edge of Reach P-3FW; the downstream extent is located within Reach P-3W. Between the Los Alamos County WWTF outfall and access road in Reach P-3E is the area where willows were planted in spring 2008 and 2009. Ground-based bank and thalweg surveys will be conducted to show geomorphic changes in this area. Vegetation monitoring of the willow viability will be conducted annually.

Pueblo Canyon Wing Ditch Area—The wing ditch is a short distance downstream from where the road to the Los Alamos County WWTF crosses the Pueblo Canyon stream channel. This section is located in contiguous reaches P-3C and P-3E. The wing ditch was abandoned when culverts were installed during road reconstruction completed by Los Alamos County in 2011. In 2015 major construction activities reworked this entire area, resulting in the removal of the wing ditch. These activities have been documented as a baseline for future survey comparisons in the 2015 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project. Ground-based bank and thalweg surveys will be conducted to show geomorphic changes in this area.

2.1.2 Pueblo Canyon Wing Ditch Area to Pueblo Canyon GCS Area

This area of Pueblo Canyon has undergone significant channel and bank stabilization efforts following the September 13th, 2013, floods. A drop structure was installed, willows were planted, reed canary grass was transplanted, and coir logs were installed. Stabilization efforts will be monitored using aerial LiDAR survey (DEM comparison analysis), and ground-based thalweg profile and bank surveys. Bank and thalweg surveys will be completed from the lower Pueblo Canyon willow-planting area to the Pueblo Canyon grade-control structure (GCS) area, which includes the following erosion-control features:

Lower Pueblo Canyon Willow-Planting Area—The upstream extent of this area is at the western end of Reach P-3FE, and the downstream extent is within Reach P-4W. In Pueblo Canyon, Reaches P-3FE and P-4W include a transition area separating a broad upcanyon wetland (Reach P-3FE) from a narrower downcanyon wetland within incised geomorphic surfaces (Reach P-4W) (LANL 2011, 203661). The Pueblo Canyon drop structure is located at the western end of Reach P-3FE and was completed in September 2015 to prevent further headcut erosion. Willow plantings were completed in the section from the nick point to reach P-4C) (LANL 2015, 600439). Vegetation monitoring of the willow viability will also be conducted annually.

Pueblo Canyon GCS—Annual resurveys in this area are intended to document expected sediment accumulation above the GCS and to monitor changes in the upcanyon wetland.

2.2 Los Alamos Canyon

Each Los Alamos Canyon monitoring area will be surveyed primarily with LiDAR survey methods. At the reach scale, LiDAR data may need to be supplemented with ground-based surveying to improve resolution of channel incision or deposition as well as to identify locations of bank erosion. The monitoring areas for Los Alamos Canyon are DP Canyon GCS (located within Reach DP-2), Los Alamos Canyon low-head weir, and detention basins below the Solid Waste Management Unit (SWMU) 01-001(f) drainage.

Upper Los Alamos Canyon Retention Basins—The Upper Los Alamos Canyon Retention Basins are constructed at the base of the drainage below (SWMU) 01-001(f) (LA-SMA-2 or Hillside 140). The basins and downstream vegetative buffer were constructed to capture polychlorinated biphenyl− (PCB-) laden sediments from SWMU 01-001(f). A ground-based survey of basin 1 is proposed to be conducted before the 2016 monsoon season to establish a baseline survey for future comparisons.

DP Canyon GCS Area—The upstream extent of this area is located at the westernmost edge of Reach DP-2; the downstream extent is located east of Reach DP-2. The DP Canyon GCS is located in this area. Annual resurveys here will help to document the performance of the GCS.

Los Alamos Canyon Low-Head Weir—Annual resurveys in this area are intended to document expected sediment accumulation in the ponds above the weir.

3.0 MONITORING STORM WATER RUNOFF

In 2016, storm water quality monitoring will be conducted at 13 gage stations and 2 ungaged stations (shown in Figure 2.0-1) within the Los Alamos and Pueblo watershed. Gage locations are sited to monitor sediment transport and performance of mitigations effectively throughout each watershed. Each gage station automatically collects storm water runoff using ISCO samplers. Storm water analytical suites and the associated reports where data will be presented for each gage location are presented in Table 3.0-1.

The goal of the sampling is to collect data that (1) represent spatial and temporal variations in potential contaminant concentrations and suspended sediment concentrations (SSC) in storm water; (2) allow evaluation of short-term and long-term trends in contaminant concentrations, SSC, and suspended sediment yield; (3) provide data to support the determination of whether or not surface waters of the state are attaining designated uses; and (4) meet requirements of the MOU between BDDB and DOE. The monitoring strategy described below was developed to achieve these goals.

3.1 2016 Monitoring Plan Changes

In the 2014 Los Alamos/Pueblo Monitoring Report (LANL 2015, 600439), LANL demonstrated in Figures 4.3-1 through 4.3-27 that concentrations of unfiltered target analyte list (TAL) metals in storm water are predicted by SSC concentrations. LANL proposed to discontinue monitoring for these constituents in the 2015 monitoring plan (LANL 2015, 600438). NMED responded to the request in their Approval with Modification letter (NMED 2015, 600507) to “continue to analyze unfiltered samples for TAL metals.” On January 14 and February 25, 2016, LANL met with NMED to discuss the analysis of unfiltered TAL metals. These meetings indicated that LANL could re-propose discontinuing analysis of unfiltered metals in the 2016 Monitoring Plan.

As a condition of discontinuing these analyses, LANL will analyze samples (time series) collected from/during at least one storm-flow event at gages E050.1 and E060.1 for dissolved metals, total metals (in water), SSC, and TAL metals in the sample-sediment fraction on a dry-weight basis. These special sampling event(s) will be selected per an average flow event during the mid-monsoonal season such as August. In the 2016 Monitoring Report, these data will be used to compare, statistically, the projected or estimated values from SSC concentrations with the measured concentrations from the metals analysis on the sediment fraction. LANL will adopt the sample collection and analysis methodology suggested by NMED as described in Section 3.7 of this monitoring plan. Results of these analyses will be presented in the 2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project.

3.2 2016 Storm Water Monitoring Locations Inspection, Maintenance, and Sample Retrieval Plan

Storm water monitoring at all locations proposed for 2016 will occur using ISCO-type automated pump samplers. Two sampling locations, CO111041 and CO101038 in Figure 3.2-1, are not gaged and are proposed for monitoring at the detention basins below SWMU 01-001(f). Monitoring requirements at these stations are listed in Table 3.0-1. These sampling locations will allow the Laboratory to evaluate how the sediment-detention basins and associated vegetative buffer below the basins are performing. These monitoring locations will be inspected following a rain event exceeding 0.25-in. rain intensity in a 30-min period as recorded at rage gage RG055.5.

All other storm water monitoring will occur at gaging locations. Flow-measurement devices and telemetry at gaging stations E050.1 and E060.1 will be inspected at least weekly and after each flow event throughout the year; automated samplers, flow-measurement devices and telemetry at other gages will be inspected weekly from June 1 to October 31 and monthly from November 1 to May 31. Equipment found to be damaged or malfunctioning will be repaired within 5 business days after the problem is identified. If the time to repair monitoring equipment at E050.1 and E060.1 is expected to exceed 48-h, DOE will notify BDDB per the MOU between BDDB and DOE. Samples will be retrieved from the field within 1 business day. If collection within 1 business day cannot be not achieved, sample collection will be performed using the following priority order:

- Lower watershed at E042.1, E050.1, E059.5, E059.8, and E060.1;
- Upper watershed at E026, E030, E055, E055.5, E056, CO101038, and CO111041; and
- DP Canyon at E038, E039.1, and E040.

Deviations from the planned inspection, maintenance, and sample retrieval objectives will be described in the 2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project.

3.3 Storm Water Sampling and Analysis Plan

Evaluation of the performance of sediment controls will be supported by repeat analyses of SSC through each monitored storm at gage stations above and below each GCS and weir. Storm water runoff sampling for SSC analyses at E050.1 and E060.1 will be triggered by discharges of approximately 5 cubic feet per second (cfs). Storm water runoff sampling for SSC at E038 will be triggered by discharges of approximately 40 cfs. Storm water runoff sampling for SSC at E039.1, E059.5, E059.8, and E042.1 will be triggered by discharges of approximately 10 cfs.

Storm water runoff sampling for chemical and radiochemical analyses at all gage stations will be triggered 10 min after the maximum discharge exceeding the triggering discharge. Sampling at the detention basins below SWMU 01-001(f) will be triggered by liquid-level actuators detecting the presence of water above each sampler's intake. The chemical and radiochemical analyses will be bounded by analysis of SSC to calculate an estimate of the sediment content of each chemical and radiochemical analysis.

Analytical requirements for storm water samples collected to satisfy the four monitoring purposes are consolidated in Table 3.4-1. Samples at gage stations will be collected using automated storm water samplers that contain a carousel of twenty-four 1-L bottles and/or twelve 1-L bottles, as specified in Tables 3.4-2 through 3.4-7. Sample collection inlets will be placed a minimum of 0.33 ft above the bottom of natural stream channels and at 0.17 ft above the bottom of supercritical flumes. The sampling approach summarized above is intended to allow characterization of suspended sediment flux and contaminant concentrations from each portion of the hydrograph, consisting of a

1. rapidly rising limb,
2. short-duration peak,
3. rapidly receding limb following the peak, and
4. longer-duration recessional limb following the peak.

To characterize water quality entering and leaving the sediment-detention basins and adjoining vegetative buffer below the SWMU 01-001(f) drainage, automated pump samplers will collect storm water from one location immediately upstream of sediment basin 1 and one location at the terminus of the vegetative buffer up to four times annually when storm water discharge is occurring (Figure 3.2-1).

Analytical suites vary according to monitoring groups and are based on key indicator contaminants, NMED requests, and the MOU between BDDB and DOE for given portions of each watershed.

Table 3.0-1 shows the monitoring groups, the analytical suite for each location, and the report associated with each monitoring suite. The results of SSC analyses will be used to calculate the total mass/activity transported during storm water runoff events at the gage stations. Particle-size analyses conducted in conjunction with selected SSC analyses will support characterization of organic chemicals and radionuclides.

The list of analytical suites for each monitoring group presented in Table 3.0-1 is prioritized to guide what analyses will be conducted if the water volume collected from a storm event is not sufficient for all the planned suites. The analytical method, expected method detection limit (MDL), and minimal detectable activity (MDA) (for radionuclides) are presented in Table 3.4-1. The sampling sequence for CO101038 and CO111041 is presented in Table 3.4-2. The sampling sequence for E026, E030, E055, E055.5, and E056 is presented in Table 3.4-3. Table 3.4-4 presents the sampling sequence at E038, E039.1, and E040. Table 3.4-5 presents the sampling sequence at E042.1. Table 3.4-6 presents the sampling sequence at E059.5 and E059.8. Table 3.4-7 presents the sampling sequence at E050.1 and E060.1. Samples will be submitted for chemical and radiochemical analyses at gage stations E038, E059.8, and E042.1 if samples were collected during an event at their paired downstream gages (E039.1, E060.1, and E050.1, respectively).

Total suspended sediment transport during a storm event is determined by sampling discharge periodically for SSC analysis throughout the hydrograph. Samples for SSC measurements will be collected at 2-min intervals for the first 30 min, then at 20-min intervals for the following 160 min if runoff is available. Repeat measurements will be taken above and below the DP Canyon GCS at E038 and E039.1, above and below the Los Alamos Canyon low-head weir at E042.1 and E050.1, and above and below the Pueblo Canyon GCS at E059.8 and E060.1 to better characterize the performance of the structures. At these stations, a second sampler is dedicated to collecting storm water for SSC analyses with the objective of representing most or all of the duration of runoff. Collecting SSC samples at 2-min intervals during the first 30 min allows characterization of the rapidly changing early part of the hydrograph.

Except at E050.1 and E060.1, where all events are monitored for all parameters, if four runoff events have been sampled at a gage station during the monitoring year, subsequent events with discharge less than the largest discharge of the sampled storm events will be analyzed for SSC only. At upper watershed gage stations where a single sampler containing a carousel of twelve 1-L bottles is installed, following collection of samples from four storm events, the first and last sample collected will be analyzed for SSC and other analyses will not be performed. At locations where a sampler containing a carousel of twenty-four 1-L bottles is installed and dedicated to collecting samples throughout the entire hydrograph (i.e., upstream and downstream of watershed mitigations), following collection of samples from four storm events, one sample from each of the four portions of the hydrograph from these subsequent storms will be analyzed for SSC and other analyses will not be performed. In this way, SSC analyses are obtained at different times during the hydrograph, and suspended sediment transport for the entire storm event can be characterized.

3.4 Discharge Gaging

Flow at each of the stream gages listed in Table 3.0-1 and gage E099 will be monitored continuously throughout the year. Rating curves are used to convert stage to discharge. Rating curves for the gage stations are updated following channel-forming flood events.

3.5 Inspections of Erosion and Sediment Control Structures

Erosion and sediment control structures and monitoring stations will be inspected after storm events exceeding 50 cfs, or other channel-forming flood events, within 3 business days. Repairs will be made as necessary to ensure such structures and other storm water mitigation features continue to function as intended.

3.6 Sediment Sampling and Analysis Plan

Sediment sampling is conducted annually within the Los Alamos/Pueblo watershed as part of voluntary monitoring conducted for the Annual Site Environmental Report (ASER). The results of this voluntary or NMED-directed sediment sampling occurring in 2016 will be presented in the 2016 ASER.

3.7 Comparison of Unfiltered Metals and Metals Suspended in Sediment

Storm water collected in two 1-L polyethylene sample bottles from each storm event at E050.1 and E060.1 will be quantitatively split using the Dekaport sample splitter into 2/10 (400-mL), 2/10 (400-mL), 3/10 (600-mL), and 3/10 (600-mL) portions. One of the 400-mL aliquots will be filtered using a 0.45-μm pore size membrane for dissolved TAL metals analysis. The other 400-mL aliquot will be submitted for total recoverable TAL metals analysis. One of the 600-mL aliquots will be submitted for SSC analysis. Solids from the remaining 600-mL aliquot will be separated from the liquid phase using filtration techniques, dried, and submitted for TAL metals analysis. Concentrations of metals analyzed from the solid sample will be reported on a dry weight basis. These data collected in 2016 will be used to evaluate the precision and accuracy of normalized concentrations of metals estimated from analysis of SSC and unfiltered storm water collected in prior years.

4.0 REPORTING

All data collected as part of this 2016 monitoring plan to support objectives of the IMWP to understand the performance of the controls installed to mitigate sediment transport will be presented in the 2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project, to be submitted to NMED by April 30, 2017. The 2017 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project will also be submitted to NMED by April 30, 2017. Monitoring conducted as part of this 2016 monitoring plan to determine whether or not waters of the state are attaining designated uses and to fulfill monitoring requirements in DOE Order 450.1A will be reported in the 2016 ASER, to be submitted on or by September 30, 2017. Monitoring conducted as part of this 2016 monitoring plan solely to fulfill requirements of the MOU between BDDB and DOE will be made publically available in Intellus NM. All analytical data, stream discharge measurements and DEM measurements collected as a result of this plan will be provided in the 2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project.

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 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.

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LANL (Los Alamos National Laboratory), May 2015. "2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-15-21412, Los Alamos, New Mexico. (LANL 2015, 600438)

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)

NMED (New Mexico Environment Department), January 11, 2010. "Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan," 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 2010, 108444)

NMED (New Mexico Environment Department), June 3, 2011. "Approval with Modifications, 2011 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project," 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, 203705)

NMED (New Mexico Environment Department), January 23, 2013. "Approval, 2012 Monitoring Plan for Los Alamos and Pueblo Canyons, Sediment Transport Mitigation Project, Revision 2," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2013, 521854)

NMED (New Mexico Environment Department), July 19, 2013. "Approval, 2013 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 1," New Mexico Environment Department letter to P. Maggiore (DOE-LASO) and J.D. Mousseau (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2013, 523106)

NMED (New Mexico Environment Department), June 12, 2015. "Approval with Modifications, 2015 Monitoring Plan for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project," New Mexico Environment Department letter to C. Gelles (DOE-NA-LA) and M.T. Brandt (LANL) from J.E. Kieling (NMED-HWB), Santa Fe, New Mexico. (NMED 2015, 600507)

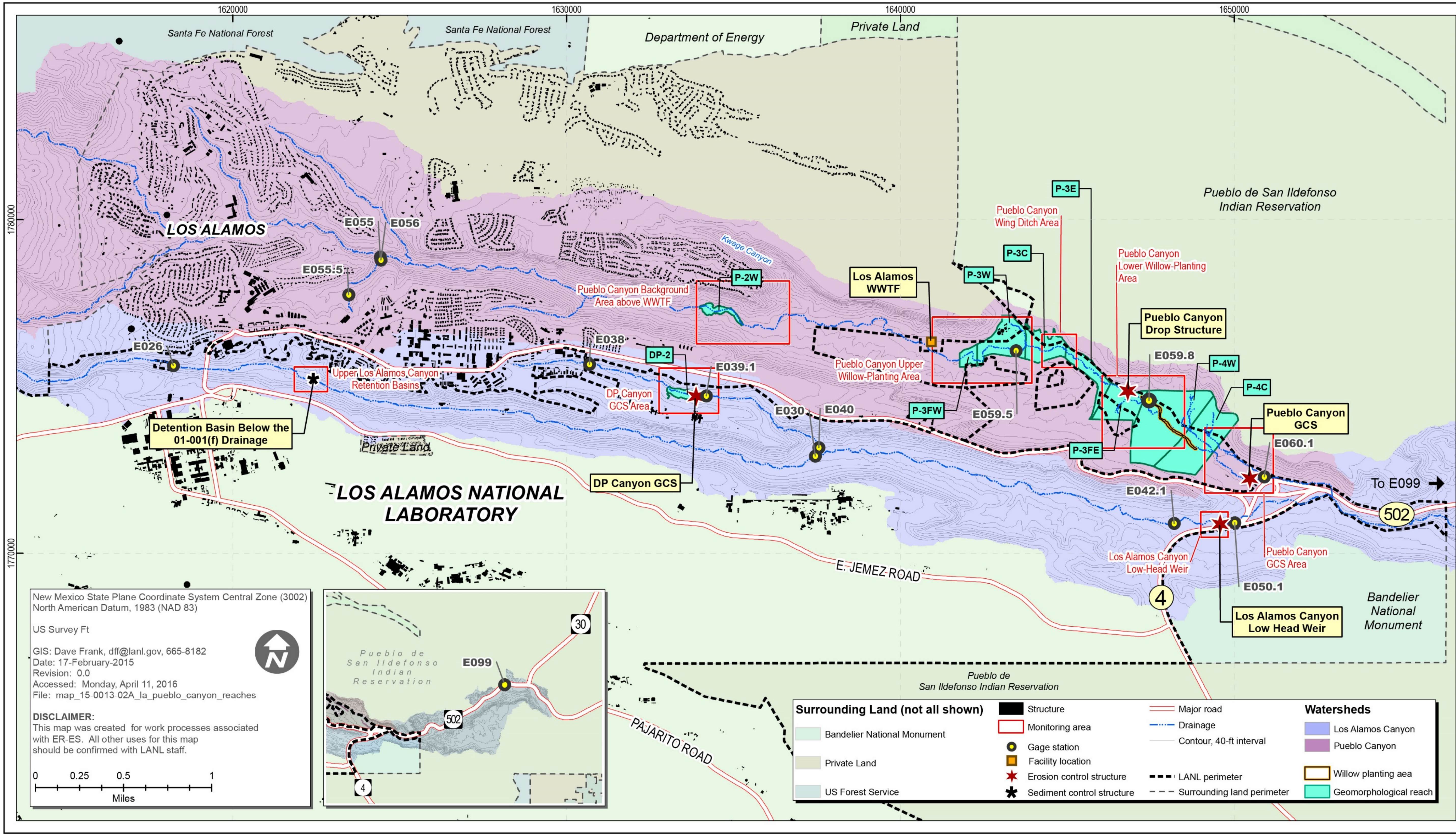

Figure 2.0-1 Monitoring locations and sediment trap mitigation sites in Los Alamos and Pueblo Canyons

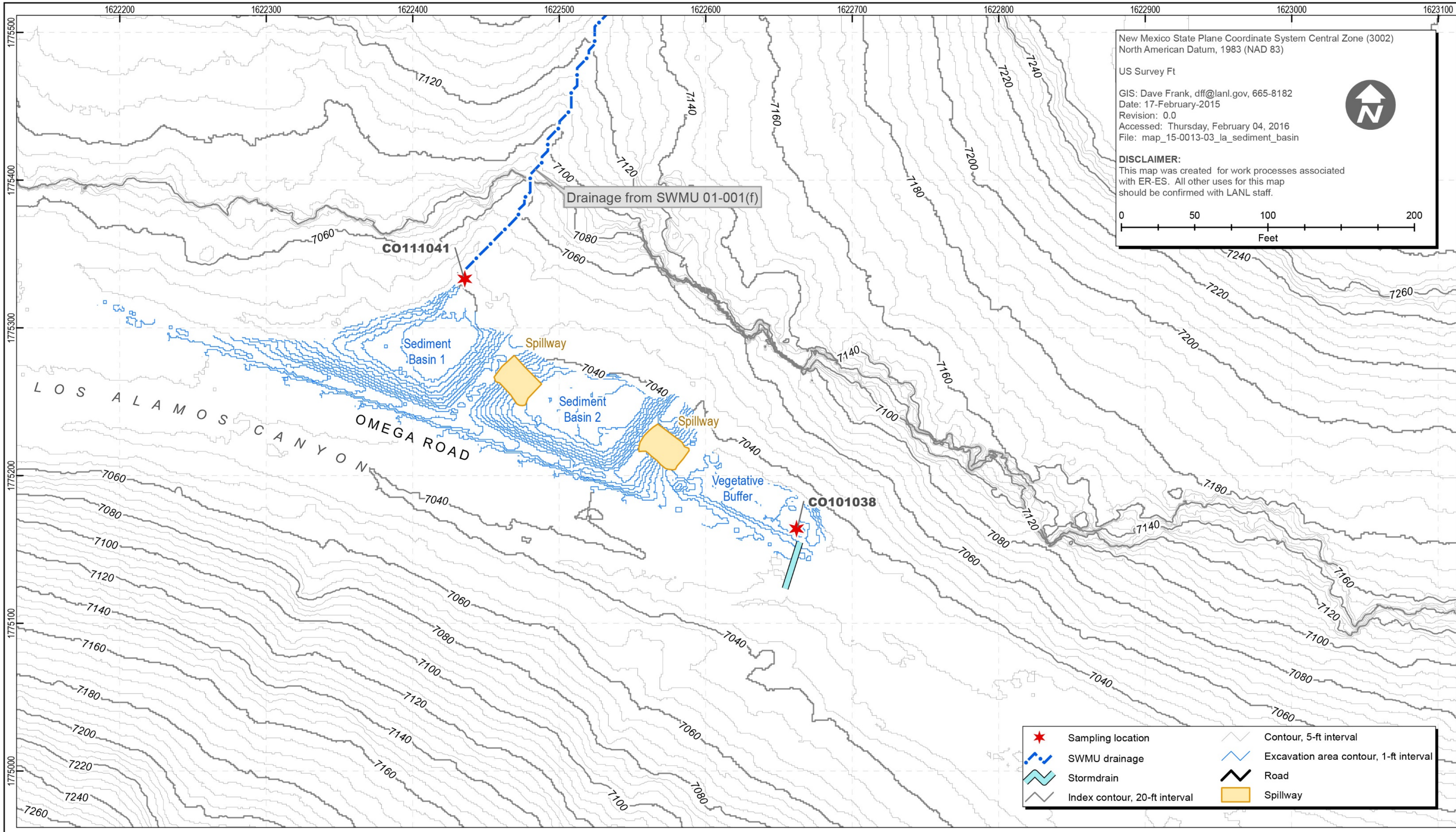

Figure 3.2-1 Detention basins and sampling locations below the SWMU 01-001(f) drainage

Table 1.0-1
Monitoring Plans Submitted since 2010

Monitoring Year	Monitoring Plan Name	ER ID/ESH ID – Date Submitted	Approval	Approval ER ID/ESH ID – Approval Date
2010	Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	107457 – 10/15/2009	Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan	108444 – 1/11/2010
2011	2011 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	201578 – 3/23/2011	Approval with Modifications [for the] 2011 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	203705 – 6/3/2011
2012	2012 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 2	222833 – 9/28/2012	Approval [for the] 2012 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 2	521854 – 1/23/2013
2013	2013 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 1	243432 – 6/21/2013	Approval [for the] 2013 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 1	523106 – 7/19/2013
2014	2014 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	256575 – 5/15/2014	Neither approved nor denied	n/a*
2015	2015 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	600438 – 5/15/2015	Approval with Modifications [for the] 2015 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project	600507 – 6/12/2015

*n/a = Not applicable.

Table 3.0-1
Locations and Analytical Suites for Storm Water Samples

Monitoring Group	Locations	Analytical Suites[a]		
		Associated Report: 2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project[b]	**Associated Report: 2016 Annual Site Environment Report**	**MOU between BDDB and DOE**
Upper Los Alamos Canyon gages	E026, E030	PCBs (by Method 1668A), gamma spectroscopy radionuclides, dioxin/furans, strontium-90, isotopic plutonium, SSC, particle size	Dissolved TAL[c] metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite[d]	n/a[e]
DP Canyon gages	E038, E039.1, E040	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, strontium-90, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Upper Pueblo Canyon, and Acid Canyon gages	E055, E055.5, E056	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), total recoverable silver, SSC, particle size, total recoverable silver	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Lower Los Alamos Canyon gage	E042.1	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), dioxins/furans, strontium-90, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Lower Los Alamos Canyon gage	E050.1	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy),dioxins/furans, strontium-90, solid phase TAL metals, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	PCBs (by Method 1668A), dioxins/furans, gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, gross alpha, gross beta, radium-226/radium-228, dissolved and total recoverable TAL metals, hardness, SSC, particle size

Table 3.0-1 (continued)

Monitoring Group	Locations	Analytical Suites[a]		
		Associated Report: 2016 Monitoring Report for Los Alamos/Pueblo Watershed Sediment Transport Mitigation Project[b]	Associated Report: 2016 Annual Site Environment Report	MOU between BDDB and DOE
Lower Pueblo Canyon gage	E059.5, E059.8	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), isotopic uranium, strontium-90, SSC, particle size, total recoverable silver	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	n/a
Lower Pueblo Canyon gage	E060.1	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, americium-241 (by alpha spectroscopy), strontium-90, solid phase TAL metals, SSC, particle size, total recoverable silver	Dissolved TAL metals+ B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, total uranium, gross alpha, BLM suite	PCBs (by Method 1668A), dioxins/furans, gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, gross alpha, gross beta, radium-226/radium-228, dissolved and total recoverable TAL metals, hardness, SSC, particle size
Detention basins and vegetative buffer below the SWMU 01-001(f) drainage	CO101038, CO111041	PCBs (by Method 1668A), total organic carbon, SSC, particle size	Dissolved TAL metals + B + U, hardness, total recoverable aluminum, total recoverable selenium, total mercury, gross alpha, BLM suite	n/a

[a] Suites are listed in order of priority to guide analysis of limited water volume. SSC and particle size are independent of prioritization because they are derived from separate sample bottles.

[b] Radionuclides are collected and reported per DOE order 450.1.

[c] TAL = Target analyte list; hardness is calculated from calcium and magnesium, components of the TAL list. TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn.

[d] BLM suite = Biotic Ligand Model (BLM) suite, which includes dissolved organic carbon, chloride, sulfate, alkalinity, and pH.

[e] n/a = Not applicable.

Table 3.4-1
Analytical Requirements for Storm Water Samples

Analytical Suite	Method	Contract-Required Reporting Limit	Typical Detection Limit in Storm Water[a]	Upper Los Alamos Canyon (E026, E030)	Upper Pueblo Canyon and Acid Canyon (E055, E056, E055.5)	DP Canyon (E038, E039.1, E040)	Lower Los Alamos Canyon (E042.1, E050.1)	Lower Pueblo Canyon (E059.5, E059.8, E060.1)	BDDB-Required Monitoring (E050.1, E060.1)	Detention Basins below the SWMU 01-001(f) Drainage
PCBs	EPA:1668A	na[b]	25 pg/L	X[c]	X	X	X	X	X	X
Isotopic plutonium	HASL-300	0.075 pCi/L	0.5 pCi/L	X	X	X	X	X	X	—
Gamma spectroscopy	EPA:901.1	8 pCi/L (Cs-137)	10 pCi/L (Cs-137)	X	X	X	X	X	X	—
Isotopic uranium	HASL-300	0.1 pCi/L	0.5 pCi/L	—[d]	—	—	—	—	X	—
Americium-241	HASL-300	0.075 pCi/L	0.5 pCi/L	—	X	—	X	X	X	—
Strontium-90	EPA:905.0	0.5 pCi/L	0.5 pCi/L	X	—	X	X	X	X	—
TAL[e] metals + B + U	EPA:200.7/200.8/245.2	Variable	Variable	X	X	X	X	X	X	X
TAL metals + B + U	SW846:6010C/6020/ 7471A; ASTM: D3977-97	Variable	Variable	—	—	—	—	—	X	—
Dioxins and furans	EPA:1613B	10–50 ng/L	50 pg/L	X	—	—	X	—	X	—
Gross alpha	EPA:900	3 pCi/L	10 pCi/L	X	X	X	X	X	X	X
Gross beta	EPA:900	3 pCi/L	10 pCi/L	—	—	—	—	—	X	—
Radium-226/radium-228	EPA:903.1/EPA:904	1 pCi/L	0.5/0.5 pCi/L	—	—	—	—	—	X	—
SSC	ASTM: D3977-97	3 mg/L	10 mg/L	X	X	X	X	X	X	X
Particle size	ASTM:C1070	na	0.01%	X	X	X	X	X	X	X
Alkalinity	EPA:310	na	na	X	X	X	X	X	X	X
pH	EPA:150.1	na	na	X	X	X	X	X	X	X
Chloride	EPA:300	na	0.1 mg/L	X	X	X	X	X	X	X
Sulfate	EPA:300	na	0.5 mg/L	X	X	X	X	X	X	X
Dissolved organic carbon	EPA:415.1	na	0.5 mg/L	X	X	X	X	X	X	X

[a] MDL or MDA for radionuclides.

[b] na = Not available.

[c] X = Monitoring planned.

[d] — = Monitoring not planned.

[e] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

Table 3.4-2
Sampling Sequence for Collection of Storm Water Samples at the Detention Basins and Vegetative Buffer below the SWMU 01-001(f) Drainage

Sample Bottle (1 L)	CO101038, CO111041		Target Report
	Start Time (min) 12-Bottle ISCO	Analytical Suite	
1	Trigger	SSC; particle size	LA/P
2	Trigger +1	PCBs (UF[a])	LA/P
3	Trigger +2		
4	Trigger +3	TAL[b] metals + B + U + hardness (F[c]); total recoverable aluminum (F10u[d])	ASER
5	Trigger +4	Gross alpha (UF)	ASER
6	Trigger +5	Total recoverable selenium (UF); total mercury (UF); total uranium (UF)	ASER
7	Trigger +6	SSC	LA/P
8	Trigger +7	DOC[e] (F); chloride (F); sulfate (F); alkalinity (UF); pH (UF)	ASER
9	Trigger +8	Extra bottle	n/a[f]
10	Trigger +9	Extra bottle	n/a
11	Trigger +10	Extra bottle	n/a
12	Trigger +11	Extra bottle	n/a

[a] UF = Unfiltered.

[b] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[c] F = Filtered using 0.45-µm filter membrane.

[d] F10u = Filtered using 10-µm filter membrane.

[e] DOC = Dissolved organic carbon.

[f] n/a = Not applicable.

Table 3.4-3
Sampling Sequence for Collection of
Storm Water Samples at E026, E030, E055, E055.5, and E056

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E026 and E030 Analytical Suites	E026 E030 Target Report	E055, E055.5, and E056 Analytical Suites	E055 E055.5 E056 Target Report
1	Max+10	SSC; particle size	LA/P	SSC; particle size	LA/P
2	Max+11	PCBs (UF[a])	LA/P	PCB (UF)	LA/P
3	Max+12				
4	Max+13	Gamma spectroscopy (UF); gross alpha (UF); isotopic plutonium (UF)	LA/P & ASER	Gamma spectroscopy (UF); gross alpha (UF)	ASER
5	Max+14			Isotopic plutonium (UF); americium-241 (UF)	LA/P
6	Max+15	Strontium-90 (UF)	LA/P		
7	Max+16	Dioxins and furans (UF)	LA/P	TAL[b] metals + B + U + hardness (F[c]); total recoverable aluminum (F10u[d])	ASER
8	Max+17			Total recoverable selenium (UF); total mercury (UF); total uranium (UF); total recoverable silver (UF)	ASER & LA/P
9	Max+18	TAL metals + B + U + hardness (F); total recoverable aluminum (F10u)	ASER	SSC	LA/P
10	Max+19	Total recoverable selenium (UF); total mercury (UF); total uranium (UF)	ASER	DOC[e] (F); chloride (F);sulfate (F); alkalinity (UF); pH (UF)	LA/P
11	Max+20	SSC	LA/P	Extra bottle	n/a[f]
12	Max+21	DOC (F); chloride (F);sulfate (F); alkalinity (UF); pH (UF)	ASER	Extra bottle	n/a

[a] UF = Unfiltered.

[b] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[c] F = Filtered using 0.45-µm filter membrane.

[d] F10u = Filtered using 10-µm filter membrane.

[e] DOC = Dissolved organic carbon.

[f] n/a = Not applicable.

Table 3.4-4
Sampling Sequence for Collection of Storm Water Samples at E038, E039.1, and E040

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E038 and E039.1		E040		E038 and E039.1 Target Report: LA/P	
		Analytical Suites	Target Report	Analytical Suites	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge
1	Max+10	PCBs (UF[a])	LA/P	SSC; particle size	LA/P	Trigger	SSC
2	Max+11			PCBs (UF)	LA/P	Trigger+2	SSC
3	Max+12	Gamma spectroscopy (UF); gross alpha (UF)	ASER			Trigger+4	SSC
4	Max+13	Isotopic plutonium (UF)	ASER	gross alpha (UF)	ASER	Trigger+6	SSC
5	Max+14			Isotopic plutonium (UF)	ASER	Trigger+8	SSC
6	Max+15	Strontium-90 (UF)	ASER			Trigger+10	SSC
7	Max+16	TAL[b] metals + B + U + hardness (F[c]); total recoverable aluminum (F10u[d])	ASER	Strontium-90 (UF)	ASER	Trigger+12	SSC
8	Max+17	Total recoverable selenium (UF); total mercury (UF); total uranium (UF)	ASER	TAL metals + B + U + hardness (F); total recoverable aluminum (F10u)	ASER	Trigger+14	SSC
9	Max+18	DOC[e] (F); chloride (F); sulfate (F); alkalinity (UF); pH (UF)	ASER	Total recoverable selenium (UF); total mercury (UF); total uranium (UF)	ASER	Trigger+16	SSC
10	Max+19	Extra bottle	n/a[f]	SSC	LA/P	Trigger+18	SSC; particle size
11	Max+20	Extra bottle	n/a	DOC (F); chloride (F); sulfate (F); alkalinity (UF); pH (UF)	ASER	Trigger+20	SSC
12	Max+21	Extra bottle	n/a	Extra bottle	n/a	Trigger+22	SSC
13	n/a	n/a	n/a	n/a	n/a	Trigger+24	SSC
14	n/a	n/a	n/a	n/a	n/a	Trigger+26	SSC
15	n/a	n/a	n/a	n/a	n/a	Trigger+28	SSC
16	n/a	n/a	n/a	n/a	n/a	Trigger+30	SSC
17	n/a	n/a	n/a	n/a	n/a	Trigger+50	SSC
18	n/a	n/a	n/a	n/a	n/a	Trigger+70	SSC

Table 3.4-4 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E038 and E039.1 Analytical Suites	Target Report	E040 Analytical Suites	Target Report	E038 and E039.1 Target Report: LA/P Start Time (min) 24-Bottle ISCO	E038 and E039.1 Target Report: LA/P Analytical Suites 24-Bottle ISCO 1-L Poly Wedge
19	n/a	n/a	n/a	n/a	n/a	Trigger+90	SSC
20	n/a	n/a	n/a	n/a	n/a	Trigger+110	SSC
21	n/a	n/a	n/a	n/a	n/a	Trigger+130	SSC
22	n/a	n/a	n/a	n/a	n/a	Trigger+150	SSC
23	n/a	n/a	n/a	n/a	n/a	Trigger+170	SSC
24	n/a	n/a	n/a	n/a	n/a	Trigger+190	SSC

[a] UF = Unfiltered.

[b] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[c] F = Filtered using 0.45-µm filter membrane.

[d] F10u = Filtered using 10-µm filter membrane.

[e] DOC = Dissolved organic carbon.

[f] n/a = Not applicable.

Table 3.4-5
Sampling Sequence for Collection of Storm Water Samples at E042.1

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
1	Max+10	PCBs (UF[a])	LA/P	Trigger	SSC	LA/P
2	Max+11		LA/P	Trigger+2	SSC	LA/P
3	Max+12	Gamma spectroscopy (UF); gross alpha (UF)	ASER	Trigger+4	SSC	LA/P
4	Max+13	Isotopic plutonium (UF); americium-241 (UF)	ASER	Trigger+6	SSC	LA/P
5	Max+14			Trigger+8	SSC	LA/P
6	Max+16	Dioxins/furans (UF)	LA/P	Trigger+10	SSC	LA/P
7	Max+17	TAL[b] metals + B + U + hardness (F[c]); total recoverable aluminum (F10u[d])	ASER	Trigger+12	SSC	LA/P
8	Max+18	Strontium-90 (UF)	ASER	Trigger+14	SSC	LA/P
9	Max+60	PCBs (UF)	LA/P	Trigger+16	SSC; particle size	LA/P
10	Max+61	Isotopic plutonium (UF)	LA/P	Trigger+18	Total recoverable selenium (UF); total mercury (UF); total uranium (UF)	ASER
11	Max+105	PCBs (UF)	LA/P	Trigger+20	SSC	LA/P
12	Max+106	Isotopic plutonium (UF)	LA/P	Trigger+22	DOC[e] (F); chloride (F); sulfate (F); alkalinity (UF); pH (UF)	ASER
13	n/a[f]	n/a	n/a	Trigger+24	SSC	LA/P
14	n/a	n/a	n/a	Trigger+26	SSC	LA/P
15	n/a	n/a	n/a	Trigger+28	SSC	LA/P
16	n/a	n/a	n/a	Trigger+30	SSC	LA/P
17	n/a	n/a	n/a	Trigger+50	SSC; particle size	LA/P
18	n/a	n/a	n/a	Trigger+70	SSC	LA/P
19	n/a	n/a	n/a	Trigger+90	SSC; particle size	LA/P
20	n/a	n/a	n/a	Trigger+110	SSC	LA/P
21	n/a	n/a	n/a	Trigger+130	SSC	LA/P

Table 3.4-5 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
22	n/a	n/a	n/a	Trigger+150	SSC	LA/P
23	n/a	n/a	n/a	Trigger+170	SSC	LA/P
24	n/a	n/a	n/a	Trigger+190	SSC	LA/P

[a] UF = Unfiltered.

[b] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[c] F = Filtered using 0.45-µm filter membrane.

[d] F10u = Filtered using 10-µm filter membrane.

[e] DOC = Dissolved organic carbon.

[f] n/a = Not applicable.

Table 3.4-6
Sampling Sequence for Collection of Storm Water Samples at E059.5 and E059.8

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
1	Max+10	PCBs (UF[a])	LA/P	Trigger	SSC	LA/P
2	Max+11		LA/P	Trigger+2	SSC	LA/P
3	Max+12	Gamma spectroscopy (UF); gross alpha (UF)	ASER	Trigger+4	SSC	LA/P
4	Max+13	Isotopic plutonium (UF); americium-241 (UF	ASER	Trigger+6	SSC	LA/P
5	Max+14			Trigger+8	SSC	LA/P
6	Max+16	TAL[b] metals + B + U + hardness (F[c]); total recoverable aluminum (F10u[d])	LA/P	Trigger+10	SSC	LA/P
7	Max+17	Total recoverable selenium (UF); total mercury (UF); total uranium (UF); total recoverable silver (UF)	ASER & LA/P	Trigger+12	SSC	LA/P
8	Max+18	Strontium-90 (UF)	ASER	Trigger+14	SSC	LA/P
9	Max+60	PCBs (UF)	LA/P	Trigger+16	SSC; particle size	LA/P
10	Max+61	Isotopic Plutonium (UF)	ASER	Trigger+18	DOC[e] (F); chloride (F); sulfate (F); alkalinity (UF); pH (UF)	ASER
11	Max+105	PCBs (UF)	LA/P	Trigger+20	SSC	LA/P
12	Max+106	Isotopic Plutonium (UF)	ASER	Trigger+22	SSC	LA/P
13	n/a	n/a	n/a[f]	Trigger+24	SSC	LA/P
14	n/a	n/a	n/a	Trigger+26	SSC	LA/P
15	n/a	n/a	n/a	Trigger+28	SSC	LA/P
16	n/a	n/a	n/a	Trigger+30	SSC	LA/P
17	n/a	n/a	n/a	Trigger+50	SSC; particle size	LA/P
18	n/a	n/a	n/a	Trigger+70	SSC	LA/P
19	n/a	n/a	n/a	Trigger+90	SSC; particle size	LA/P
20	n/a	n/a	n/a	Trigger+110	SSC	LA/P
21	n/a	n/a	n/a	Trigger+130	SSC	LA/P

Table 3.4-6 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	Analytical Suites 12-Bottle ISCO	Target Report	Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	Target Report
22	n/a	n/a	n/a	Trigger+150	SSC	LA/P
23	n/a	n/a	n/a	Trigger+170	SSC	LA/P
24	n/a	n/a	n/a	Trigger+190	SSC	LA/P

[a] UF = Unfiltered.

[b] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[c] F = Filtered using 0.45-µm filter membrane.

[d] F10u = Filtered using 10-µm filter membrane.

[e] DOC = Dissolved organic carbon.

[f] n/a = Not applicable.

Table 3.4-7
Sampling Sequence for Collection of Storm Water Samples at E050.1 and E060.1

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E050.1 and E060.1 Analytical Suites 12-Bottle ISCO	E050.1 E060.1 Target Report	E050.1 and E060.1 Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	E050.1 E060.1 Target Report
1	Max+10	PCBs (UF[a])	LA/P	Trigger	SSC	LA/P
2	Max+11			Trigger+2	SSC	LA/P
3	Max+12	Gamma spectroscopy (UF); gross alpha (UF)	BDDB & ASER	Trigger+4	SSC	LA/P
4	Max+13	Isotopic plutonium (UF); americium-241 (UF); isotopic uranium (UF)	BDDB	Trigger+6	SSC	LA/P
5	Max+14			Trigger+8	Radium-226/radium-228 (UF)	BDDB
6	Max+16	Strontium-90 (UF)	BDDB	Trigger+12		BDDB
7	Max+17	TAL[b] metals + B + U + hardness (F[c]); total recoverable aluminum (F10u[d])	ASER	Trigger+14	SSC	LA/P
8	Max+18	Dioxins/furans (UF)	LA/P	Trigger+16	Gross beta (UF)	BDDB
9	Max+60	PCB (UF)	LA/P	Trigger+18	SSC	LA/P
10	Max+61	Isotopic plutonium (UF)	ASER	Trigger+20	SSC; particle size	LA/P
11	Max+105	PCB (UF)	LA/P	Trigger+22	DOC[e] (F); chloride (F); sulfate (F); alkalinity (UF); pH (UF)	ASER
12	Max+106	Isotopic plutonium (UF)	ASER	Trigger+24	SSC	LA/P
13	n/a[f]	n/a	n/a	Trigger+26	Per Section 3.7: TAL metals + B + U + hardness (F/UF); solid phase TAL metals + B + U; SSC	LA/P
14	n/a	n/a	n/a	Trigger+28		
15	n/a	n/a	n/a	Trigger+30	SSC	LA/P
16	n/a	n/a	n/a	Trigger+50	SSC	LA/P
17	n/a	n/a	n/a	Trigger+70	SSC; particle size	LA/P
18	n/a	n/a	n/a	Trigger+90	SSC	LA/P
29	n/a	n/a	n/a	Trigger+110	SSC; particle size	LA/P
20	n/a	n/a	n/a	Trigger+130	SSC	LA/P

Table 3.4-7 (continued)

Sample Bottle (1 L)	Start Time (min) 12-Bottle ISCO	E050.1 and E060.1	E050.1 E060.1 Target Report	E050.1 and E060.1		E050.1 E060.1 Target Report
		Analytical Suites 12-Bottle ISCO		Start Time (min) 24-Bottle ISCO	Analytical Suites 24-Bottle ISCO 1-L Poly Wedge	
21	n/a	n/a	n/a	Trigger+150	SSC	LA/P
21	n/a	n/a	n/a	Trigger+170	SSC	LA/P
23	n/a	n/a	n/a	Trigger+190	SSC	LA/P
24	n/a	n/a	n/a	Trigger+210	SSC	LA/P

[a] UF = Unfiltered.

[b] TAL = TAL metals are Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, Pb, Sb, Se, Tl, V, and Zn; hardness is calculated from calcium and magnesium, components of the TAL list.

[c] F = Filtered using 0.45-µm filter membrane.

[d] F10u = Filtered using 10-µm filter membrane.

[e] DOC = Dissolved organic carbon.

[f] n/a = Not applicable.