2011 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project

Introduction and Objective	This monitoring plan is submitted pursuant to the New Mexico Environment Department's (NMED's) approval with modification letter, dated February 20, 2009 (2009, 105014), and NMED's approval of a request for extension, dated May 5, 2009 (2009, 106081). The objective of this monitoring plan is to evaluate the effect of mitigation measures that were installed in the Los Alamos and Pueblo canyons (LA/Pueblo) watershed under the NMED-approved "Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons" (LANL 2008, 101714) and the "Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons" (LANL 2008, 105716). In accordance with these work plans, several physical features have been built or modified to minimize flood energy and associated sediment transport. These features include cross-vane structures (CVSs), willow planting, a wing ditch, grade-control structures (GCSs), and sediment retention basins. The conceptual model that forms the basis for the mitigation measures in the LA/Pueblo watershed follows: Contaminants migrate with sediment entrained in runoff, and reduced sediment transport will thereby reduce contaminant transport. Two types of monitoring that began during 2010 will be continued to meet the objective: (1) monitoring of geomorphic changes in the valley floor that are measures of performance of various mitigations and (2) collection and analysis of stormwater runoff samples at gage and monitoring stations located throughout the watershed. Monitoring conducted during 2010 in the LA/Pueblo watershed was performed per the 2009 "Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project," (LANL 107457) and the "Approval with Modifications, Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan," (NMED 2010, 108444). This monitoring plan remains consistent with these initial guidance documents. Documentation of initial conditions in the valley floor was presented in the "Baseline Geomorphic Conditions at Sediment Transport Mitigation Sites in Los Alamos and Pueblo Canyon Watersheds, Revision 1" (LANL 2011, 200901). Documentation of stormwater monitoring conducted during 2010 was presented in the "Stormwater Performance Monitoring in the Los Alamos/Pueblo Watershed During 2010" (LANL 2011, 111808). Since the initial monitoring plan was approved, gages identified as E110, E060, and E050 have been decommissioned and replaced by E109.9, E060.1, and E050.1. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy. Water quality results from stormwater events are systematically uploaded to the publically accessible environmental monitoring database, RACER.
Monitoring Geomorphic Changes	Monitoring of geomorphic changes (e.g., aggradation or incision) associated with the mitigation measures will be conducted using three methods: repeat cross-section surveys, channel thalweg surveys, and general area surveys. These surveys will be conducted at the locations described below. Surveys will be conducted annually in late fall, winter, or early spring to document geomorphic changes that may have occurred during the previous summer season. The optimal time will be selected dependent on weather and the ability to work in the wetland after dense vegetation has senesced. If deemed necessary, additional surveys may be conducted locally at other times of the year to document geomorphic changes associated with unique runoff events. Figure 1 shows the areas where surveys will be conducted as described below.

Monitoring Geomorphic Changes (continued)	**Pueblo Canyon:** • Reaches P-3FE and P-4W in Pueblo Canyon—A total of 23 cross-sections were originally surveyed in September and October 2009 at 100-ft intervals, for a total of 1100 ft above and below a transition area separating a broad upcanyon wetland (P-3FE) from a narrower downcanyon wetland within incised geomorphic surfaces (P-4W), as shown in Figure 1. A longitudinal survey of the thalweg elevation through this area was also conducted. This encompasses the area where willows were planted in spring 2009 and where repeat cross-sections will be surveyed annually. Annual resurveys in these Pueblo Canyon reaches are intended to document geomorphic changes in this portion of the canyon, particularly those related to potential changes in the transition area. • Upper willow-planting area—A total of 18 cross-sections were originally surveyed in October 2009 in the area where willows were planted in spring 2008 and 2009 between the new Los Alamos County wastewater treatment plant (WWTP) outfall and the area just upcanyon of the installed wing ditch (Figure 1). These cross-sections were divided between the upper, middle, and lower thirds of this area. A total of six cross-sections were surveyed in each of these three areas at 100-ft intervals. A longitudinal channel thalweg profile was also surveyed in each of these areas. Annual resurveys at the upper willow-planting area are intended to document anticipated aggradation of floodplain surfaces where willows will slow flood water and trap sediment as well as to document any changes to thalweg elevation in this area. • Pueblo Canyon GCS—A total of 15 cross-sections were originally surveyed in April 2010 at 100-ft intervals for a distance of 1500 ft above the Pueblo GCS (Figure 1). Three cross-sections were also surveyed below the Pueblo GCS at 100-ft intervals to document any changes to the channel downcanyon of the structure. A longitudinal channel thalweg profile was also surveyed in this area. These cross-sections and profile will be resurveyed annually. • Pueblo Canyon CVSs—Two cross-sections were originally surveyed in April and May 2010 in the vicinity of each of the three Pueblo Canyon CVSs (Figure 1): one 50-ft upcanyon and one 50-ft downcanyon of the apex rock of each structure. A longitudinal thalweg profile was also surveyed over these 100-ft distances. Annual resurveys at the Pueblo Canyon CVSs are intended to document geomorphic changes in the channel associated with the CVSs. • Pueblo Canyon wing ditch—Five cross-sections were originally surveyed in November 2009 downcanyon from the wing ditch (Figure 1) at 100-ft spacings, and a longitudinal channel thalweg profile was also surveyed over this distance. Annual resurveys at the Pueblo Canyon wing ditch are intended to document geomorphic changes in the channel and floodplain associated with the wing ditch.

Monitoring Geomorphic Changes (continued)	**Los Alamos Canyon:** • Reach DP-2 GCS (DP Canyon GCS)—A total of 11 cross-sections were originally surveyed in April and May 2010 above the DP Canyon GCS (Figure 1) at 100-ft intervals upcanyon of the structure. Two cross-sections were also surveyed below the DP GCS at 100-ft intervals to document any changes to the channel downcanyon of the structure. A longitudinal channel thalweg profile was also surveyed over this area. These cross-sections and profile will be resurveyed annually. • Los Alamos Canyon low-head weir—A general area survey was originally conducted in July 2009 within the basin upcanyon of the gabion structure that composes the weir (Figure 1). Irregular topography associated with basalt mounds and constructed modifications within the basin warrants a more detailed survey than can be conducted with repeat cross-sections. Annual resurveys of this area will enable annual estimates of sediment accumulation within the basin. • Retention basins below solid waste management unit (SWMU) 01-001(f)—A general topographic survey was originally conducted in March 2010 of the sediment retention basins below SWMU 01-001(f). Annual resurveys of this area will enable annual estimates of sediment accumulation within the basins.
Monitoring Stormwater Runoff	Stormwater monitoring will be conducted at locations shown in Figure 1 and listed in Table 1. These locations are collectively situated to compartmentalize monitoring data for performance evaluation of each of the mitigation features within the watershed. Data will also be available to document baseline conditions upcanyon of the structures. The goals of the sampling strategy are (1) to collect data that represent variations in contaminant concentrations and suspended sediment concentrations within runoff events across a typical hydrograph for each location and (2) to document short-term and long-term trends in stormwater contaminant concentrations associated with the mitigation features. The monitoring strategy described below is developed to achieve these goals. After implementation of this plan, data collected during 2010 and 2011 will be reviewed and recommendations will be made regarding analytical suites and/or approach to sampling. Additionally, grab samples will be collected at the retention basins below SWMU 01-001(f) at the locations shown in Figure 2 and listed in Table 1. These grab samples will allow the performance of the sediment retention basins and wetland below the basins to be evaluated. **Discharge Gaging** Each of the gage-monitoring locations listed in Table 1 will be monitored continuously for stage. Each gage location will have an established rating curve and be reviewed annually or after large channel-altering floods to enable conversion of stage to discharge. **Sampling** Stormwater runoff sampling at each of the monitoring locations except E050.1, E060.1, E109.9, and at the retention basins below SWMU 01-001(f), will be triggered by discharges of approximately 10 cubic feet per second (cfs). Samples at E050.1, E060.1, and E109.9 will be triggered by 5-cfs discharges to ensure sampling at lower discharges that may extend to the Rio Grande. Analytical requirements for stormwater samples are listed in Table 2. Samples at gages will be collected using automated stormwater samplers that contain a carousel of twenty-four 1-L bottles and/or twelve 1-L bottles as specified in Tables 3, 4, and 5. The sampling approach is intended to represent four portions of a typical hydrograph characterized by a rapidly rising limb, a short-duration peak, a rapidly receding limb following the peak, and a longer-duration recessional limb. The longer-duration recessional limb is sampled repeatedly to capture constituent concentrations and enable mass-transport estimates for the entire flow event.

Monitoring Stormwater Runoff (continued)	In order to characterize the performance of the retention basins below SWMU 01-001(f), grab sampling from three locations will be conducted up to four times annually when inspectors note stormwater discharge has occurred, both retention basins are full, and stormwater is passing through the culvert below CO101038 (Figure 2). In general, sediment concentrations in the rising limb of the hydrograph are poorly correlated to discharge while sediment concentrations in the recessional limb are more highly correlated to discharge. As a result, sampling throughout the entire hydrograph optimizes representation of concentrations at each of the four portions of a typical hydrograph and enables estimates of sediment and contaminant transport for an event, and ultimately for a monitoring year. Sample suites vary according to monitoring groups and are based on key indicator contaminants for a given portion of the watershed. Table 1 shows the monitoring groups and the analytical suite for each. Suspended sediment analysis, which is common to all groups, will allow determination of correlations between contaminant concentrations and suspended sediment. The suspended sediment analysis will also allow calculations of estimated total mass transported during stormwater runoff events. Events exceeding 5 cfs at E050.1, E060.1, and E109.9 will be analyzed for the suite described in Table 1. For the rest of the monitoring locations, the first four events of each stormwater runoff year (beginning on June 1) will be analyzed for the suites described in Table 1. For the latter monitoring locations, if subsequent events are larger than events already sampled in the stormwater runoff year, samples from these events will be also be submitted for contaminant analysis. Additionally, samples will be submitted for contaminant analyses at gage stations E059 and E042.1 if samples were collected during the event at their paired downstream gages (E060.1 and E050.1, respectively). The list of contaminants for each monitoring group is prioritized to guide which analyses will be conducted if the collected water volume for a sample composite is insufficient to fulfill all planned suites. The priority is consistent with the order of the constituents listed in Table 1. The analytical method, expected method detection limit (MDL), and minimal detectable activity (MDA) (for radionuclides) are described in Table 2. The sampling sequence for upper watershed gages E026, E030, E040, E055, E055.5, and E056 is given in Table 3. Table 4 provides the sampling sequence at E038 and E039.1. Table 5 provides the sampling sequence at E042.1, E050.1, E059, and E060.1. Table 6 provides the sampling sequence at E109.9. During 2010, suspended sediment was measured throughout each storm event only at lower watershed gages. Sediment transport is determined more accurately when the entire storm discharge is sampled for suspended sediment. Sampling of the entire storm discharge will be achieved by installing a second automated sampler containing a carousel of twenty-four 1-L bottles above and below the DP Canyon GCS at E038 and E039.1. The second sampler will be dedicated to collecting stormwater for suspended sediment analyses with the goal of representing most or all of the duration of runoff. If four storm events have been monitored, subsequent storms with discharge less than the largest discharge will be analyzed for suspended sediment only. At upper watershed gages where a single sampler containing a carousel of twelve 1-L bottles is installed, the first and last sample collected from these subsequent storms will be analyzed for suspended sediment. At locations where a sampler containing a carousel of twenty-four 1-L bottles is installed and dedicated to collection of samples throughout the entire hydrograph (i.e., upstream and downstream of watershed mitigations), all samples collected from this 24-bottle carousel from these subsequent storms will be analyzed for suspended sediment. In this way, suspended sediment is collected at many different times during the hydrograph, and sediment transport for the entire storm can be characterized.

Reporting	The repeat cross-section, channel thalweg, and general area surveys will be conducted in late fall to early spring, as described above. The survey data, plotted cross-section and channel thalweg profiles, and discussion will be provided in an annual report on May 30 of each year. Analytical and discharge data for each water year (October through September) will be reported annually on February 28. The report will include discharge data from each gage, analytical results, and discussion. The report delivery schedule will allow time for combining analytical data from off-site laboratories with finalized discharge data from the gage stations, the latter of which typically requires 3 mo for data processing (e.g., December 31 for discharge data obtained in the third quarter of the calendar year). The objective of both reports is to review the data in the context of each of the mitigation measures implemented under the work plans as described in the Introduction and Objective section. The data will be reviewed to evaluate overall watershed performance and to watch for impacts to ongoing activities within the watershed. Additionally, evaluations of geomorphic change will include considerations of the need for adaptive management of any of the mitigative structures or activities implemented in the watershed.

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 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 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), 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)

LANL (Los Alamos National Laboratory), October 2008. "Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," Los Alamos National Laboratory document LA-UR-08-6588, Los Alamos, New Mexico. (LANL 2008, 105716)

LANL (Los Alamos National Laboratory), October 2009. "Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project," Los Alamos National Laboratory document LA-UR-09-6563, Los Alamos, New Mexico. (LANL 2009, 107457)

LANL (Los Alamos National Laboratory), February 2011. "Stormwater Performance Monitoring in the Los Alamos/Pueblo Watershed During 2010," Los Alamos National Laboratory document LA-UR-11-0941, Los Alamos, New Mexico. (LANL 2011, 111808)

LANL (Los Alamos National Laboratory), March 2011. "Baseline Geomorphic Conditions at Sediment Transport Mitigation Sites in Los Alamos and Pueblo Canyon Watersheds, Revision 1," EP2011-0077, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2011, 200901)

NMED (New Mexico Environment Department), February 20, 2009. “Approval with Modifications, Supplemental Interim Measure Work Plan (SIWP) 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 2009, 105014)

NMED (New Mexico Environment Department), May 5, 2009. “Approval of Exten[s]ion Request for Submittal of the Los Alamos and Pueblo Canyons Sediment Transport Monitoring Plan,” New Mexico Environment Department letter to D. Gregory (DOE-LASO) and M. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 106081)

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. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 108444)

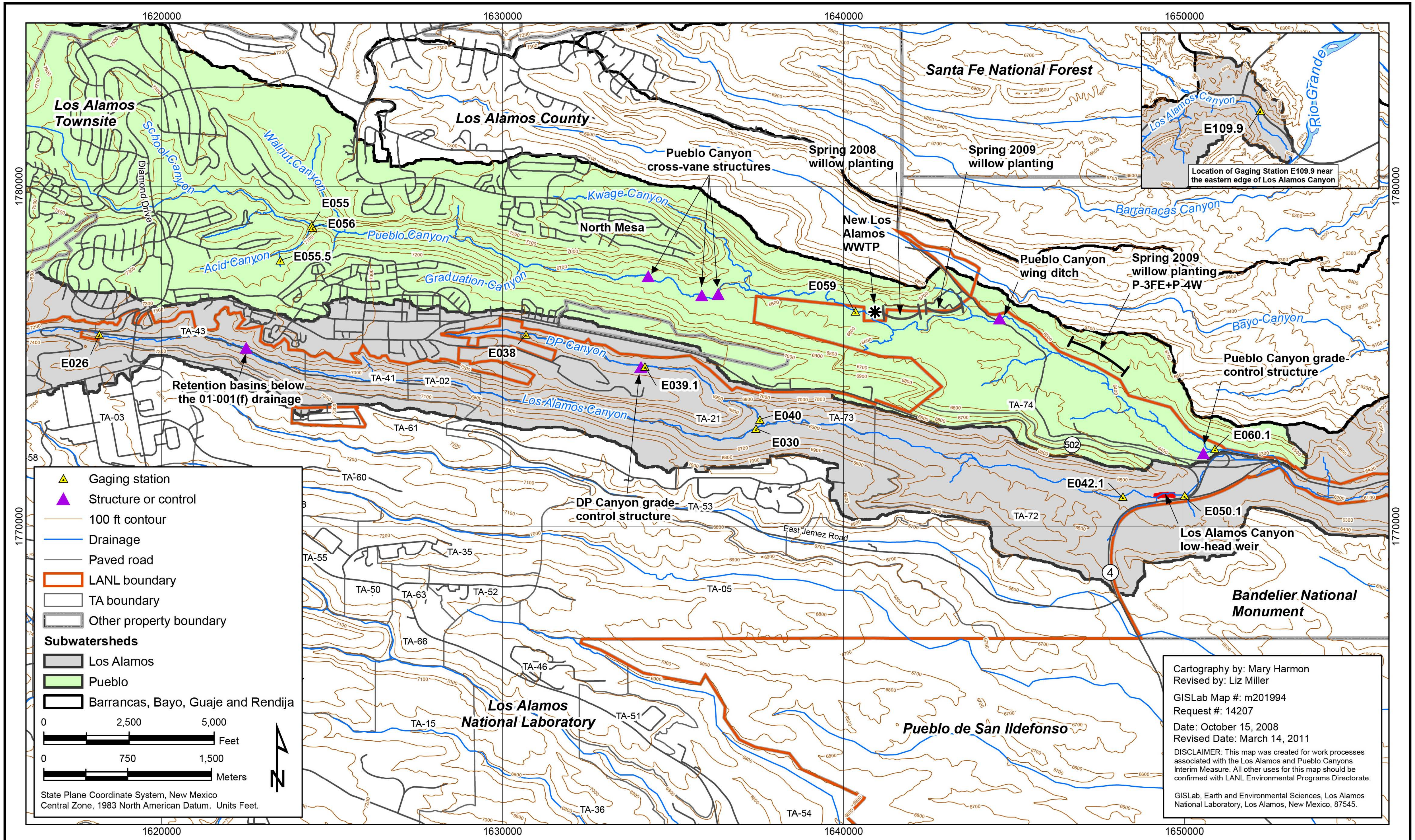

Figure 1 Los Alamos and Pueblo Canyon watershed showing monitoring locations and stormwater mitigation features

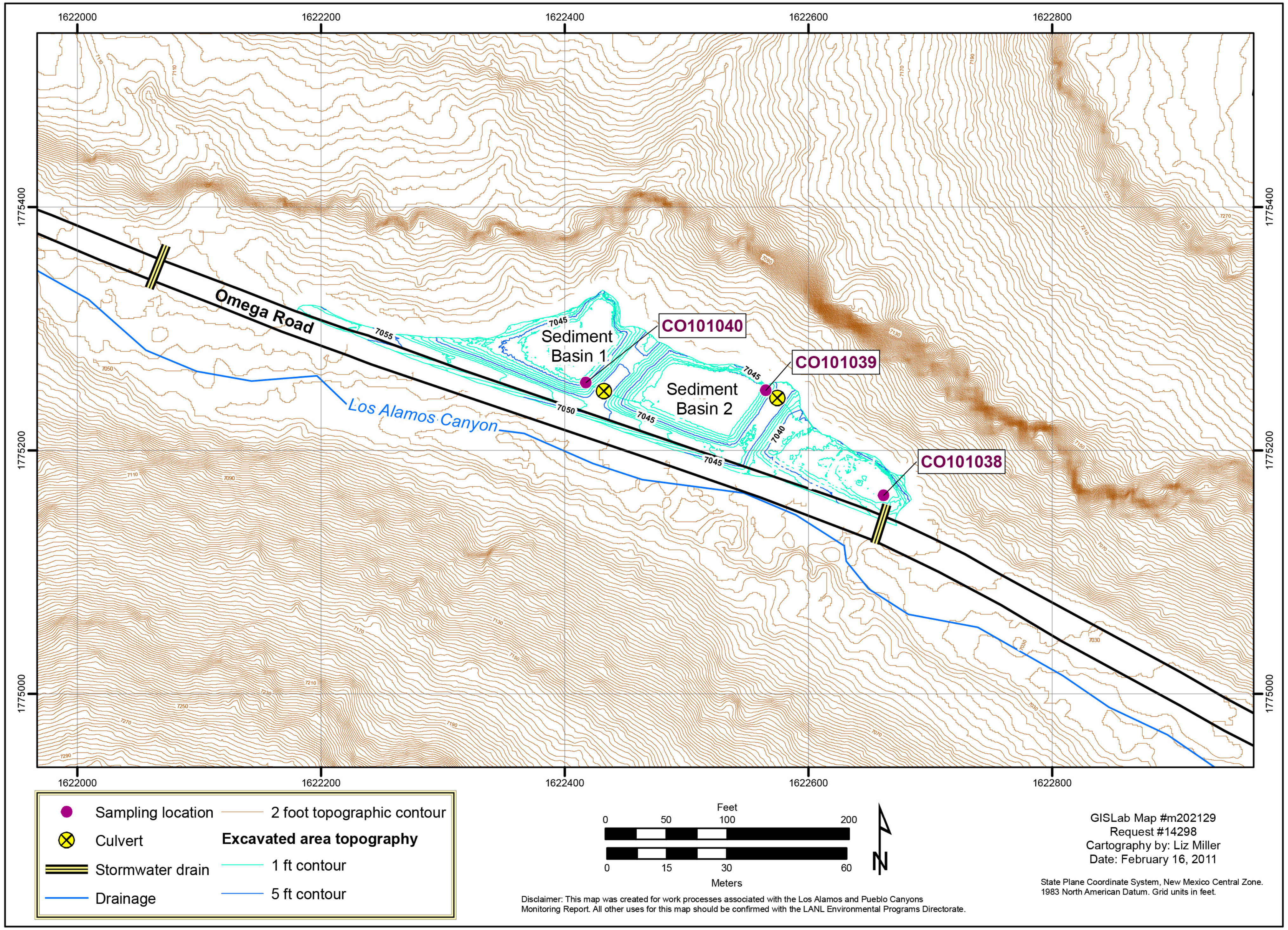

Figure 2 Orthophotograph of a portion of Pueblo Canyon showing surveyed cross-section locations around reach P-4W

Table 1
Locations and Analytical Suites for Stormwater Samples

Monitoring Group	Locations	Analytical Suite [a, b]
Upper Los Alamos Canyon gages	E038, E039.1, E040, E026, E030	Suspended sediment, PCBs[c] (by method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, strontium-90, dioxins and furans, TAL[d] metals, hardness, gross alpha
Upper Pueblo Canyon gages	E055, E055.5, E056	Suspended sediment, PCBs (by method 1668A), isotopic plutonium, dioxins and furans, TAL metals, hardness, gross alpha
Lower watershed gages	E042.1, E050.1, E059, E060.1, E109.9	PCBs (by method 1668A), isotopic plutonium, gamma spectroscopy radionuclides, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, dioxins and furans, TAL metals, hardness, gross alpha, gross beta, radium-226/radium-228, suspended sediment
Retention basins and wetland below the SWMU 01-001(f) drainage	CO101038, CO101039, CO101040	TAL metals, hardness, PCBs (by method 1668A), isotopic uranium, total organic carbon, gross alpha, gross beta, suspended sediment

[a] Suites are listed in order of priority to guide analysis of limited water volume. Suspended sediment is independent of prioritization because it is derived from separate sample bottles.

[b] Radionuclides will be analyzed in filtered and unfiltered samples at E109.9.

[c] PCBs = polychlorinated biphenyls

[d] TAL = target analyte list.

Table 2
Analytical Requirements for Stormwater Samples

Analytical Suite	Method	Detection Limit[a]	Upper Los Alamos Canyon	Upper Pueblo Canyon	Lower Watershed	Retention Basins and Wetland below the SWMU 01-001(f) Drainage
PCBs[b]	EPA:1668A	25 pg/L	√[c]	√	√	√
Isotopic plutonium	HASL-300	0.5 pCi/L	√	√	√	—[d]
Gamma spectroscopy radionuclides	EPA:901.1	10 pCi/L (cesium-137)	√	—	√	—
Isotopic uranium	HASL-300	0.5 pCi/L	√	—	√	√
Americium-241	HASL-300	0.5 pCi/L	—	—	√	—
Strontium-90	EPA:905.0	0.5 pCi/L	√	—	√	—
TAL[e] metals	EPA:200.7/200.8/245.2	Variable	√	√	√	√
Dioxins and furans	EPA:1613B	50 pg/L	√	√	√	—

Table 2 (continued)

Analytical Suite	Method	Detection Limit[a]	Upper Los Alamos Canyon	Upper Pueblo Canyon	Lower Watershed	Retention Basins and Wetland below the SWMU 01-001(f) Drainage
Gross alpha	EPA:900	10 pCi/L	√	√	√	√
Gross beta	EPA:900	10 pCi/L	—	—	√	√
Radium-226/radium-228	EPA:903.1/EPA:904	0.5/0.5 pCi/L	—	—	√	—
Suspended sediment	EPA:160.2	10 mg/L	√	√	√	—
Total organic carbon	SW-846:9060	0.5 mg/L	—	—	—	√

[a] MDL, or MDA for radionuclides.

[b] PCBs = polychlorinated biphenyls.

[c] Monitoring required.

[d] Monitoring not requested.

[e] TAL = target analyte list.

Table 3
Sampling Sequence for Collection of Stormwater Samples at Upper Watershed Gages

Sample Bottle	E026, E030, and E040		E055, E055.5, and E056	
	Start Time (min) 12-Bottle Sampler	Analytical Suite	Start Time (min) 12-Bottle Sampler	Analytical Suite
1	10	Suspended sediment	10	Suspended sediment
2	11	PCB congener (UF[a])	11	PCB congener (UF)
3	12	PCB congener (UF)	12	PCB congener (UF)
4	13	Gamma spectroscopy; isotopic plutonium, and isotopic uranium (UF)	13	Isotopic plutonium (UF)
5	14	Strontium-90 (UF)	14	Dioxins and furans (UF)
6	15	Dioxins and furans (UF)	15	Dioxins and furans (UF)
7	16	Dioxins and furans (UF)	16	TAL metals (F[b] and UF)
8	17	TAL metals (F and UF)	17	Gross-alpha (UF)
9	18	Gross-alpha (UF)	18	Suspended sediment
10	19	Suspended sediment	19	Extra bottle
11	20	Extra bottle	20	Extra bottle
12	21	Extra bottle	21	Extra bottle

[a] UF = Unfiltered.

[b] F = Filtered.

Table 4
Sampling Sequence for Collection of Stormwater Samples at E038 and E039.1

Sample Bottle	E038 and E039.1			
	Start Time (min) 12-Bottle Sampler	Analytical Suite 12-Bottle Sampler	Start Time (min) 24-Bottle Sampler	Analytical Suite 24-Bottle Sampler
1	10	PCB congener (UF[a])	0	Suspended sediment
2	11	PCB congener (UF)	3	Suspended sediment
3	12	Gamma spectroscopy; isotopic plutonium, and isotopic uranium (UF)	6	Suspended sediment
4	13	Strontium-90 (UF)	9	Suspended sediment
5	14	Dioxins and furans (UF)	12	Suspended sediment
6	15	Dioxins and furans (UF)	15	Suspended sediment
7	16	TAL metals (F[b] and UF)	18	Suspended sediment
8	17	Gross-alpha (UF)	21	Suspended sediment
9	18	extra bottle	24	Suspended sediment
10	19	extra bottle	27	Suspended sediment
11	20	extra bottle	30	Suspended sediment
12	21	extra bottle	50	Suspended sediment
13	n/a[c]	n/a	70	Suspended sediment
14	n/a	n/a	90	Suspended sediment
15	n/a	n/a	110	Suspended sediment
16	n/a	n/a	130	Suspended sediment
17	n/a	n/a	150	Suspended sediment
18	n/a	n/a	170	Suspended sediment
19	n/a	n/a	190	Suspended sediment
20	n/a	n/a	210	Suspended sediment
21	n/a	n/a	230	Suspended sediment
22	n/a	n/a	250	Suspended sediment
23	n/a	n/a	270	Suspended sediment
24	n/a	n/a	290	Suspended sediment

[a] UF = Unfiltered.

[b] F = Filtered.

[c] n/a = Not applicable.

Table 5
Sampling Sequence for Collection of Stormwater Samples at Lower Watershed Gages

Sample Bottle	E042.1, E050.1, E059, and E060.1			
	Start Time (min) 12-Bottle Sampler	Analytical Suite 12-Bottle Sampler	Start Time (min) 24-Bottle Sampler	Analytical Suite 24-Bottle Sampler
1	10	PCB congener (UF[a])	0	Suspended sediment
2	11	Gamma spectroscopy; isotopic plutonium, americium-241, and isotopic uranium (UF)	3	Suspended sediment
3	12	Strontium-90 (UF)	6	Suspended sediment
4	13	Dioxins and furans (UF)	9	Suspended sediment
5	14	TAL metals (F[b] and UF)	12	Radium-226 (UF)
6	15	Gross-alpha and gross-beta (UF)	15	Suspended sediment
7	60	PCB congener (UF)	18	Radium-228 (UF)
8	61	Gamma spectroscopy; isotopic plutonium (UF)	21	Suspended sediment
9	105	PCB congener (UF)	24	Suspended sediment
10	106	Gamma spectroscopy; isotopic plutonium (UF)	27	Suspended sediment
11	150	PCB congener (UF)	30	Suspended sediment
12	151	Gamma spectroscopy and isotopic plutonium (UF)	50	Suspended sediment
13	n/a[c]	n/a	70	Suspended sediment
14	n/a	n/a	90	Suspended sediment
15	n/a	n/a	110	Suspended sediment
16	n/a	n/a	130	Suspended sediment
17	n/a	n/a	150	Suspended sediment
18	n/a	n/a	170	Suspended sediment
19	n/a	n/a	190	Suspended sediment
20	n/a	n/a	210	Suspended sediment
21	n/a	n/a	230	Suspended sediment
22	n/a	n/a	250	Suspended sediment
23	n/a	n/a	270	Suspended sediment
24	n/a	n/a	290	Suspended sediment

[a] UF = Unfiltered.

[b] F = Filtered.

[c] n/a = Not applicable.

Table 6
Sampling Sequence for Collection of Stormwater Samples at E109.9

Sample Bottle	E109.9			
	Start Time (min) 12-Bottle Sampler	Analytical Suite 12-Bottle Sampler	Start Time (min) 24-Bottle Sampler	Analytical Suite 24-Bottle Sampler
1	10	PCB congener (UF[a])	0	Suspended sediment
2	11	Gamma spectroscopy; isotopic plutonium, americium-241, and isotopic uranium (UF)	2	Suspended sediment
3	12	Strontium-90 (UF)	4	Suspended sediment
4	13	Dioxins and furans (UF)	6	Suspended sediment
5	14	TAL metals (F[b] and UF)	8	Suspended sediment
6	15	Gross-alpha and gross-beta (F and UF)	10	Gamma spectroscopy; isotopic plutonium, americium-241, and isotopic uranium (F)
7	60	PCB congener (UF)	12	Suspended sediment
8	61	Gamma spectroscopy and isotopic plutonium (UF)	14	Strontium-90 (F)
9	105	PCB congener (UF)	16	Suspended sediment
10	106	Gamma spectroscopy and isotopic plutonium (UF)	18	Radium-226 (UF)
11	150	PCB congener (UF)	20	Suspended sediment
12	151	Gamma spectroscopy and isotopic plutonium (UF)	22	Radium-228 (UF)
13	n/a[c]	n/a	24	Suspended sediment
14	n/a	n/a	26	Radium-226 (F)
15	n/a	n/a	28	Suspended sediment
16	n/a	n/a	30	Radium-228 (F)
17	n/a	n/a	50	Suspended sediment
18	n/a	n/a	70	Suspended sediment
19	n/a	n/a	90	Suspended sediment
20	n/a	n/a	110	Suspended sediment
21	n/a	n/a	130	Suspended sediment
22	n/a	n/a	150	Suspended sediment
23	n/a	n/a	170	Suspended sediment
24	n/a	n/a	190	Suspended sediment

[a] UF = Unfiltered.

[b] F = Filtered.

[c] n/a = Not applicable.