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Storm Water Performance Monitoring in the Los Alamos/Pueblo Watershed during 2012

Prepared by the Environmental Programs Directorate

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Storm Water Performance Monitoring in the Los Alamos/Pueblo Watershed during 2012

March 2013

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EXECUTIVE SUMMARY

This third annual monitoring report provides a summary of analytical data, discharge measurements, geomorphic changes, and precipitation associated with storm water samples collected from the Los Alamos and Pueblo (LA/P) watershed from May 2012 to October 2012. Monitoring objectives include collecting data to evaluate the effect of watershed mitigations installed in the LA/P watershed on stream flow and sediment and contaminant transport. Watershed mitigations being evaluated include the DP Canyon grade-control structure (GCS) and associated floodplains; Pueblo Canyon wing ditch, willow planting, wetland, and GCS; the Los Alamos Canyon low-head weir; and the storm water detention basins and associated willow planting below the Solid Waste Management Unit (SWMU) 01-001(f) drainage in Los Alamos Canyon. These mitigations have been implemented with the overall goal of working together to minimize the potentially erosive nature of storm water runoff, to enhance deposition of sediment, and to reduce access of contaminated sediments to flood erosion.

Gage and sampling locations are situated within the LA/P watershed to monitor the hydrology and sediment transport along the length of the watershed, including stations that bound the mitigations. However, the topography, geology, geomorphology, and meteorology of the watershed are complex; thus, monitoring runoff and precipitation is also complex and challenging. Stage height, which is then converted to discharge using rating curves developed for each individual gage, is monitored at 5-min intervals at a series of gages using shaft-encoder float sensors, self-contained bubbler pressure sensors, and ultrasonic probe sensors. Precipitation data are collected across Los Alamos National Laboratory (the Laboratory) by means of five meteorological towers and an extended rain gage network. Sampling for analyte suites specific to each reach of the watershed is conducted using ISCO 3700 portable automated samplers configured to begin sampling routines when a preset stage height or after a discharge peak is recorded at the data logger. Sampling equipment and the extended rain-gage network are deactivated during the winter months (December to March) and reactivated in the spring. In addition, three samples were collected below the SWMU 01-001(f) drainage and above the retention basins on July 6, September 12, and October 12. On October 12, one sample was collected below the constructed detention basins. On October 12, one sample was collected in Graduation Canyon above the confluence with Pueblo Canyon.

Geomorphic changes were monitored at the nine sediment transport mitigation sites that have been established in the LA/P watershed. Cross-sections upgradient and downgradient and a thalweg profile of each site were surveyed following the summer 2012 monsoon season. Surveys were supplemented with sediment-thickness measurements obtained from hand-dug or hand-augered holes along the survey transect. The net changes in cross-sectional area from the previous year were calculated and used to estimate total deposition or erosion over the surveyed area.

The Los Alamos Canyon watershed experienced a moderate number of runoff events in 2012, including runoff from the Las Conchas burn area in the upper watersheds of Los Alamos and Guaje Canyons. Runoff from the burn area had high concentrations of suspended sediment, in part related to entrainment of ash. By contrast, Pueblo Canyon, not affected by the fire, had few runoff events in 2012 and no events from the upper watershed that extended through the length of wetland past the GCS and into lower Los Alamos Canyon. Attenuation of flow and associated sediment transport through this wetland is a primary goal of the sediment transport mitigation activities conducted in Pueblo Canyon, and this part of the watershed performed as designed in 2012.

The 2012 monitoring data in upper Los Alamos Canyon indicate a substantial reduction in suspended sediment concentration (SSC) as floods passed through the low-head weir and associated sediment retention basins. This structure is, therefore, performing as designed. By contrast, SSC was much higher

at gaging station E109.9 in lower Los Alamos Canyon as a result of floods in Guaje Canyon originating from the Las Conchas burn area.

In DP Canyon, which primarily receives runoff from the Los Alamos townsite, direct comparison of runoff and sediment yield above and below the GCS and upstream floodplains was possible in one event in 2012, on October 12. Sediment yield decreased downstream between bounding stations (E038 and E039.1), which is consistent with the intent of the GCS in this canyon. Peak discharge between these gages also decreased, indicating attenuation of flood energy.

Net sediment deposition occurred in most surveyed areas in the LA/P watershed that experienced monsoonal flood events in 2012, which is consistent with the goal of sediment transport mitigation control. All surveyed sites with the exception of the DP Canyon GCS recorded less than 1% net change compared with the 1942–1997 total sediment volume, indicating the monitored sites remain stable. The DP Canyon GCS recorded a 6% increase compared with the 1942–1997 total sediment volume. Sediment deposition at the Los Alamos Canyon low-head weir in 2012 is greater than that recorded in 2011 and is nearly an order of magnitude greater than the annual sediment deposition recorded in 2010, the year before the Las Conchas fire. The upper Los Alamos Canyon sediment detention basins appear to contain nearly all of the sediment transported by the small drainage below SWMU 01-001(f). The surveys document that the sediment transport mitigation sites are currently operating as desired and are not undergoing net erosion over the period of this monitoring program.

Off-site transport of polychlorinated biphenyls (PCBs) in 2012 occurred only in Los Alamos Canyon, and the weir and associated sediment retention basins were effective at substantially reducing this transport. Concentrations of PCBs measured at E109.9 in lower Los Alamos Canyon are similar to those measured in upper Los Alamos Canyon above Laboratory sites, at E026, and are consistent with the transport of PCBs from the Las Conchas burn area down Guaje Canyon. PCBs in the burn area have a source in atmospheric fallout and were released during the fire. The transport of radionuclides in storm water with a Laboratory source was also substantially reduced by the settling of sediment above the Los Alamos Canyon weir. Continued monitoring in 2013 is expected to further confirm the sediment transport mitigation structures and associated wetlands, and floodplains in the LA/P watershed are performing as intended.

CONTENTS

1.0	INTRODUCTION	1
1.1	Project Goals	1
2.0	DISCHARGE AND PRECIPITATION MEASUREMENTS AND SAMPLING IN THE LA/P	2
2.1	Discharge and Precipitation Measurements and Sampling in the LA/P Watershed	2
2.2	Sampling at the Detention Basins below the SWMU 01-001(f) Drainage and in Graduation Canyon.....	4
2.3	Sampling at the Gage Stations in the LA/P Watershed.....	4
2.4	Samples Collected in the LA/P Watershed	4
2.5	Operational Issues.....	5
2.6	Deviations from Work Plan	5
3.0	WATERSHED HYDROLOGY	6
3.1	Drainage Areas and Impermeable Surfaces	6
3.2	Water and Sediment Transmission	7
3.3	Geomorphic Changes.....	9
3.3.1	Pueblo Canyon.....	10
3.3.2	Los Alamos Canyon	10
3.4	Impact and Efficiency of Watershed Mitigations.....	10
4.0	ANALYTICAL RESULTS.....	12
4.1	Data Exceptions.....	12
4.2	Analytes Exceeding Comparison Values.....	12
4.3	Relationships between Discharge, SSC, and Contaminant Concentrations.....	13
4.4	Storm Water Sampling below SWMU 01-001(f) and in Graduation Canyon.....	14
5.0	CONCLUSIONS	15
6.0	REFERENCES AND MAP DATA SOURCES	16
6.1	References	16
6.2	Map Data Sources	19

Figures

Figure 1.1-1	Los Alamos and Pueblo Canyons showing monitoring locations and sediment transport mitigation sites	21
Figure 2.1-1	Los Alamos Canyon watershed showing drainage areas for each stream gage and associated rain gages, Thiessen polygons, and extent of the Las Conchas burn area ...	22
Figure 2.2-1	Sediment detention basins and sampling locations below the SWMU 01-001(f) drainage	23
Figure 3.2-1	Flow diagram of gage stations and sediment transport mitigation sites in the LA/P watershed.....	24
Figure 3.2-2	Box and whisker plots of TSS for all stations in DP Canyon and downstream over the past 3 yr of monitoring	25
Figure 3.2-3	Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches.....	28
Figure 3.2-4	Discharge, TSS, and SSC for sampled events at E026, E038, E042.1, E050.1, E099, and E109.9.....	43

Figure 3.2-5	Relationship between sediment yield and runoff volume over the past 3 yr of monitoring	47
Figure 3.2-6	Relationship between sediment yield and peak discharge over the past 3 yr of monitoring	48
Figure 3.4-1	Discharge and TSS at E038 and E039.1 in DP Canyon on days when sampling of the same runoff event occurred	49
Figure 3.4-2	Box and whisker plots of TSS (left) and peak discharge (right) upstream and downstream of the watershed mitigations in DP (top), Los Alamos (middle), and Pueblo (bottom) Canyons over the past 3 yr of monitoring	50
Figure 3.4-3	Box and whisker plots of selected metal concentrations from decommissioned station E039 and replacement station E039.1 in DP Canyon	51
Figure 3.4-4	Discharge and TSS at E042.1 and E050.1 in upper Los Alamos Canyon on days when sampling of the same runoff event occurred	52
Figure 4.3-1	TSS concentration vs. discharge for each station over the past 3 yr of monitoring (there is no legend if only 1 yr of data is available).....	54
Figure 4.3-2	Relationship of plutonium-239/240 and total PCBs to TSS in the LA/P watershed in 2012	58

Tables

Table 2.1-1	Station Configuration at LA/P Gages	59
Table 2.3-1	Maximum Daily Discharge and Storm Water Sampling in the LA/P Watershed during 2012	60
Table 2.4-1	Locations and Analytical Suites for Storm Water Samples	61
Table 2.4-2	Analytical Requirements for Storm Water Samples.....	62
Table 2.4-3	Factors Contributing to Analytical Suite Prioritization	63
Table 2.4-4	Planned and Actual Analyses	64
Table 2.6-1	Sample Collection and Sample Retrieval Working Day Intervals	103
Table 2.6-2	Gage Station Operational Issues during the 2012 Monitoring Year	105
Table 2.6-3	Gaging Station and Sampler Inspection Intervals.....	107
Table 3.1-1	Drainage Areas, Impermeable Surface Percentages, and Las Conchas Fire Burn Areas in the Los Alamos Canyon Watershed	115
Table 3.2-1	Travel Time of Flood Bore, Peak Discharge, Increase or Decrease in Peak Discharge, and Percent Change in Peak Discharge from Upstream to Downstream Stations for Sampled 2012 Runoff Events in Lower LA/P Watershed	116
Table 3.2-2	Summary of Peak Discharge Increases/Decreases in Lower LA/P Watershed	117
Table 3.2-3	Pearson's Correlation Coefficients between Post-Flood-Bore Discharge (Q) and TSS for Each Station Sampled during 2012	117
Table 3.2-4	Sediment Yield and Runoff Volume for Sampled 2012 Runoff Events.....	118
Table 3.4-1	Travel Time of Flood Bore, Peak Discharge, Increase or Decrease in Peak Discharge, and Percent Change in Peak Discharge from Upstream to Downstream Stations for 2012 Runoff Events Exceeding Sampling Triggers across the Watershed Mitigations	119
Table 4.2-1	NMWQCC Surface Water Standards.....	120

Table 4.2-2	Maximum Detected Results By Station and Event above Comparison Values in LA/P Storm Water Samples in 2012	121
Table 4.2-3	Dioxin and Furan TEFs for the Dibenzodioxins and Dibenzofurans.....	123
Table 4.2-4	Dioxin and Furan TEQs in 2012 Storm Water Samples	123
Table 4.3-1	Calculated SSC and Instantaneous Discharge Determined for Each Sample Collected during 2012 in the LA/P Watershed	124
Table 4.4-1	Analytical Results Obtained below the SWMU 01-001(f) Drainage.....	137
Table 4.4-2	Analytical Results from Graduation Canyon	142

Appendixes

Appendix A	2012 Geomorphic Changes at Sediment Transport Mitigation Sites in the Los Alamos and Pueblo Canyon Watershed
Appendix B	Hydrographs, Hyetographs, and Sedigraphs for Samples Collected
Appendix C	Analytical Results, Analytical Reports, and 5-Minute Discharge Results (on CD included with this document)

Acronyms and Abbreviations

cfs	cubic feet per second
Consent Order	Compliance Order on Consent
DOE	Department of Energy (U.S.)
EPA	Environmental Protection Agency (U.S.)
GCS	grade-control structure
GPS	global positioning system
CVS	cross-vane structure
IMWP	interim measures work plan
Laboratory	Los Alamos National Laboratory
LANL	Los Alamos National Laboratory
LA/P	Los Alamos and Pueblo (watershed)
LIDAR	light detecting and ranging
MSS	Maintenance and Site Services (Laboratory group)
NMED	New Mexico Environment Department
NMWQCC	New Mexico Water Quality Control Commission
PCB	polychlorinated biphenyl
RPD	relative percent difference
RPF	Records Processing Facility
SIMWP	supplemental interim measures work plan
SSC	suspended sediment concentration
SWMU	solid waste management unit
TAL	target analyte list (EPA)
TCDD	tetrachlorodibenzodioxin
TEF	toxicity equivalency factor
TEQ	toxic equivalency quotient
TSS	total suspended solids
UTL	upper tolerance limit
VE	vertical exaggeration
WWTP	wastewater treatment plant

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) that is managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site comprises an area of 36 mi², mostly on the Pajarito Plateau, which consists of a series of mesas separated by eastward-draining canyons. It also includes part of White Rock Canyon along the Rio Grande to the east.

This third annual monitoring report provides a summary of analytical data, discharge measurements, and precipitation associated with storm water collected from the Los Alamos and Pueblo (LA/P) watershed from May 2012 to October 2012. In addition, the geomorphic changes at the sediment transport mitigation sites in the LA/P watershed are also incorporated in this report, as Appendix A, as approved by NMED (LANL 2013, 235735; NMED 2013, 522065). This monitoring was performed to support the NMED-approved "Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons" (IMWP) (LANL 2008, 101714; NMED 2008, 103007) and the approved "Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons" (SIMWP) (LANL 2008, 105716; NMED 2009, 105014). Monitoring in 2012 was performed in accordance with the "2012 Monitoring Plan for Los Alamos and Pueblo Canyons Sediment Transport Mitigation Project, Revision 2" (LANL 2012, 222833; NMED 2013, 521854).

Monitoring objectives include collecting data to evaluate the effect of watershed mitigations installed in the LA/P watershed on stream flow and sediment and on contaminant transport. The discussion of flow and analytical results for suspended sediment and constituent concentrations focuses on an evaluation of the overall watershed performance, with specific emphasis on the effects of the mitigations implemented per the IMWP and SIMWP. The discussion of geomorphic stability in Appendix A focuses on sediment stability and mobility in the watershed as a measure of the overall stability of the watershed and the performance of the sediment-mitigation structures.

The NMED approval with modifications of the 2011 monitoring plan for sediment transport (LANL 2011, 201578; NMED 2011, 203705) also directed the Laboratory to monitor storm water above and below the detention basins below the Solid Waste Management Unit (SWMU) 01-001(f) drainage in upper Los Alamos and in Graduation Canyons above the confluence with Pueblo Canyon.

The watershed addressed in this monitoring report is potentially contaminated with both hazardous and radioactive components. Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). 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.

Watershed mitigations being evaluated include the DP Canyon grade-control structure (GCS) and associated floodplain; Pueblo Canyon wing ditch, willow planting, wetlands, and GCS; the Los Alamos Canyon low-head weir; and the storm water detention basins and associated willow planting below the SWMU 01-001(f) drainage in Los Alamos Canyon.

1.1 Project Goals

The mitigations specified in the IMWP and SIMWP have been implemented with the overall goal of minimizing the potentially erosive nature of storm water runoff to enhance deposition of sediment and to reduce or eliminate the susceptibility of contaminated sediments to flood erosion. Figure 1.1-1 shows the

locations of the mitigations and monitoring stations, including stream gages, in the LA/P watershed. In the Pueblo Canyon watershed, the central focus of the mitigations is to maintain a physically, hydrologically, and biologically functioning wetland that can reduce peak flows and trap suspended solids because of the presence of thick wetland vegetation. Stabilization and enhancement of the wetland were partially addressed with installation of a GCS designed to inhibit headcutting at the terminus of the wetland and to potentially promote establishment of additional riparian or wetland vegetation beyond the current terminus of the wetland. Mitigations in upper portions of Pueblo Canyon above the wetland are designed primarily to reduce the flood peaks and to enhance channel/floodplain interaction before floods reach the wetland. Gages are situated within the watershed to monitor the overall hydrology and sediment transport along the length of the watershed, including stations that bound the wetland.

In DP and Los Alamos Canyons, mitigations included stabilizing and potentially partially burying the channel and adjacent floodplains in reach DP-2 in DP Canyon, which is a source of contaminants entrained in frequent floods that originate from a portion of the Los Alamos County townsite. A GCS was installed in the lower part of reach DP-2 with a height that may encourage channel aggradation, thus reducing the potential for erosion of contaminated sediment deposits in adjacent banks during floods. Channel aggradation in reach DP-2 should also encourage spreading of floodwaters, thus reducing peak discharge because of transmission loss within the reach and enhancing sediment deposition. Lower flood peaks should also reduce the erosion of contaminated sediment deposits downcanyon of the GCS. Mitigations in Los Alamos Canyon several kilometers below the DP Canyon confluence involved removing accumulated sediment behind the low-head weir to increase the residence time of floodwaters and to enhance settling of suspended solids and associated contaminants.

Additional mitigations were implemented in Los Alamos Canyon under a separate administrative requirement (LANL 2008, 104020; NMED 2009, 105858) to address polychlorinated biphenyl (PCB) contamination associated with SWMU 01-001(f). The mitigation actions at that location involved removing contaminated sediment from the canyon wall and constructing detention basins at the bottom of the associated hillside drainage to promote the settling of contaminated sediments in runoff from the canyon wall.

This report presents data collected in 2012 in the context of performance of these mitigations and associated wetlands and floodplains by evaluating various metrics for performance, including flow (peak discharge and total discharge), sediment erosion and deposition, and analytical results for sediment and constituent concentrations. The nature of precipitation events that generate floods is also evaluated as an integral part of the analysis.

2.0 DISCHARGE AND PRECIPITATION MEASUREMENTS AND SAMPLING IN THE LA/P

2.1 Discharge and Precipitation Measurements and Sampling in the LA/P Watershed

Measurements of discharge and surface-water sampling were conducted at 13 gages in the LA/P watershed in 2012. Gages located at 5 concrete, trapezoidal, supercritical-flow flumes are designated Los Alamos above the Rio Grande (E109.9), Los Alamos below low-head weir (E050.1), Pueblo below grade-control structure (E060.1), DP below grade-control structure (E039.1), and Los Alamos above low-head weir (E042.1). Eight other gages that complete the monitoring network in the LA/P watershed are designated as Pueblo above Acid (E055), South Fork of Acid Canyon (E055.5), Acid above Pueblo (E056), Los Alamos below Ice Rink (E026), Los Alamos above DP Canyon (E030), DP above Technical Area 21 (E038), Pueblo above the wastewater treatment plant (E059), and DP above Los Alamos Canyon (E040). Although gage station E099 in lower Guaje watershed is not part of the formal Los Alamos/Pueblo monitoring network, post-fire floods emanating from burn scars in the Guaje watershed consistently impact E109.9 and thus E099 is discussed in this report. Figure 1.1-1 shows the

locations of stream gages and watershed mitigations within the Laboratory's property boundary and on adjacent land owned by the County of Los Alamos.

Stage height was monitored at each LA/P gage at 5-min intervals in the LA/P watershed. Sutron 9210 data loggers stored each recorded stage-height measurement as it was made. Discharge was computed for each 5-min stage measurement using rating curves for each individual gage. Shaft-encoder float sensors installed in stilling wells were used to measure water levels at E026, E030, E039.1, E042.1, E050.1, E059, E060.1, E099, and E109.9. Self-contained bubbler pressure sensors (Sutron Accubar) were used to measure water levels at E038, E055, E055.5, and E056 and to provide backup sensing at E109.9, E050.1, and E060.1. An ultrasonic probe sensor (Siemens Miltronics "The Probe") was used to measure water levels at E040 and provided additional backup sensing at E109.9. In 2012, approximately 1,000,000 individual stage measurements were recorded at the 13 gage stations monitored within the LA/P watershed.

A complete record of 5-min stage height measurements for the monitoring period from June 1, 2012, to October 31, 2012, exists at E026, E050.1, E059, E060.1, and E109.9. Five-minute stage height measurements are incomplete at E030 (July 25–26 when data were missing and September 28–30 when the equipment malfunctioned); E038 (May 30–31 when data were missing); E039.1 (May 9–22 when the equipment malfunctioned); E040 (July–16 and September 18–24 when the equipment malfunctioned); E042.1 (August 6 when the equipment malfunctioned); E055 (July 24 when data were missing); E055.5 (September 30 when the equipment malfunctioned); E056 (August 29–September 4 when the equipment malfunctioned); and E099 (July 16–30 when data were missing).

Storm water programs at the Laboratory use precipitation data collected at the Laboratory's meteorological towers. In addition, a seasonal, extended rain gage network is deployed during the months from April to November to coincide with storm water monitoring periods. Using a geographic information system, storm water monitoring stations are assigned to an individual rain gage using the method of Thiessen polygons. Rain gages, meteorological towers, Thiessen polygons, and the drainage area for each stream gage associated with the LA/P watershed are presented in Figure 2.1-1.

Sampling was conducted using ISCO 3700 portable automated samplers. At E026, E038, E039.1, E042.1, E050.1, E059, E060.1, and E109.9, two ISCO samplers were installed. At locations where two samplers were installed, one sampler was configured with a 24-bottle carousel to monitor primarily suspended sediment, and the second sampler was configured with a 12-bottle carousel to monitor inorganic and organic chemicals and radionuclides. At locations where a single sampler was installed, the sampler was configured with a 12-bottle carousel to monitor suspended sediment, inorganic and organic chemicals, and radionuclides. Sampler intake lines were set above the bottom of the channel or gage and were placed perpendicularly to the direction of flow. The placement of trip levels and sampler intake lines is presented in Table 2.1-1.

Sampling equipment at gages in LA/P watershed was shut down during the winter months and reactivated in the spring. During the 2012 monitoring period, requests for field personnel to inspect activated gages and sampling equipment were issued weekly. Gaging and sampling equipment at the 13 LA/P gauging stations was connected via telemetry to a base station, allowing real-time access to gage discharge measurements and battery state of charge. Inspectors inspected gaging stations and samplers when telemetry readings indicated discharge had occurred.

2.2 Sampling at the Detention Basins below the SWMU 01-001(f) Drainage and in Graduation Canyon

In 2012, storm water samples were collected with automated samplers above two constructed detention basins below the SWMU 01-001(f) drainage at location CO111041 on July 6, September 12, and October 12. Storm water discharge ponded in the detention basins, and sampling was not triggered at CO101038, at the culvert at the terminus of the wetland below the lower basin. Sampling locations and storm water control features at the detention basins below the SWMU 01-001(f) drainage are identified in Figure 2.2-1.

In 2012, an automated sampler was used to collect samples from station CO115002 in Graduation Canyon above the confluence with Pueblo Canyon on October 12. The sampling location is shown in Figure 1.1-1.

2.3 Sampling at the Gage Stations in the LA/P Watershed

During the monitoring period in 2012 (June 1 to October 31), 10 runoff events were sampled and analyzed for inorganic and organic chemicals, radionuclides, and suspended sediment from 1 or more of the 13 gage stations in the LA/P watershed. A total of 30 sampling events occurred, with a sampling event defined as the collection of one or more samples from a specific gaging station during a specific runoff event. Maximum daily discharge at all gages on days when flow reached or exceeded 5 cubic feet per second (cfs) at E050.1, E060.1, or E109.9; 40 cfs at E038; or 10 cfs at the other gages is presented in Table 2.3-1. Table 2.3-1 also summarizes the runoff events sampled at each station. In 2012, the threshold discharge at a station was reached 40 times, and sampling was conducted 30 of these times. This results in an overall sampling efficiency of 75%.

2.4 Samples Collected in the LA/P Watershed

Sample suites presented in the monitoring plan vary according to the monitoring location and are based on key indicator constituents for a given portion of the watershed. Following the Las Conchas fire, americium-241 was added to the analytical suite at E026 and E030, and cyanide was added at all stream gages downstream from the burn area in Los Alamos Canyon (E026, E030, E042.1, E050.1, and E109.9). Analyses were obtained from storm water collected at sampling locations as presented in Table 2.4-1. In cases where insufficient water was collected to perform all planned analyses, analyses were prioritized in the order presented in Table 2.4-1. Up to 24 samples were collected for suspended sediment analysis from a single ISCO sampler containing a 24-bottle carousel at the lower watershed gages (E042.1, E050.1, E059, E060.1, and E109.9), gages in upper DP Canyon (E038 and E039.1), and the upstream gage in Los Alamos Canyon, downstream from the Las Conchas burn area (E026) (Figures 1.0-1 and 2.1-1). Suspended sediment analyses at all other locations were obtained from the first and last sample in an ISCO sampler containing a 12-bottle carousel. Suspended sediment analyses when conducted using U.S. Environmental Protection Agency (EPA) Method 160.2, from an aliquot of sample, were reported using the designation "Total Suspended Solids" (TSS). Suspended sediment analyses when conducted using American Society for Testing and Materials method D3977-97, from an entire sample, were reported using the designation "Suspended Sediment Concentration" (SSC).

Target analyte list (TAL) metals were analyzed in filtered and unfiltered samples at all locations. Radionuclides were analyzed in filtered and unfiltered samples at E109.9. All other analyses were conducted from unfiltered samples. Sample collection times were recorded for each individual sample bottle filled, which allowed more precise estimation of discharge and SSCs at the time samples were collected.

Analyses were conducted using the analytical methods presented in Table 2.4-2. Detection limits are provided for comparison purposes but are affected by sample-specific factors that are not fully known until after the sample is analyzed. Such sample-specific factors can include available sample volume, matrix interferences, and sample dilution. Table 2.4-3 contains the prioritization matrix that was used to help guide submission of analyses during 2012. The complete sequence and timing of analyses planned, samples collected, and analyses requested at each gage station are presented in Table 2.4-4.

Analyses planned and analyses performed differ during the year for several reasons including:

1. Incomplete sample volumes were collected.
 - a. Minimum volumes are required to obtain specified detection limits.
 - b. Lowest priority analyses are omitted when incomplete volumes are collected.
2. Samples are collected in glass or polyethylene bottles.
 - a. Organic chemical analyses are conducted on samples collected in glass bottles.
 - b. Boron was analyzed as an addition to the TAL metal suite and samples were collected in polyethylene bottles.
3. The high sediment content of samples collected precluded the analysis of samples using analytical techniques designed for water matrixes; instead, samples with the highest sediment content were analyzed using analytical techniques applicable to solid matrixes.
4. Sampler and gage station configuration caused incomplete sample collection during several storm events.

2.5 Operational Issues

During 2012, field crews were authorized to perform inspections weekly at gages and samplers in the LA/P watershed. Inspections were also authorized to occur at sampling and stage measurement equipment following a rain event that resulted in discharge. Additionally, flumes at E039.1, E042.1, E050.1, E060.1, and E109.9 were inspected for sedimentation after each discharge event and cleaned on the first workday after sedimentation occurred. If inspectors were unable to repair damaged equipment at the time of inspection, additional resources were made available as quickly as possible to make any repairs. The flume and stilling well at E109.9 was cleared of sediment 17 times during the 2012 monitoring season.

2.6 Deviations from Work Plan

The approved 2012 monitoring plan required samples to be retrieved within 1 business day, damaged or malfunctioning equipment to be repaired within 1 business day, and gage stations and samplers to be inspected a minimum of 1 every 2 weeks during dry periods. Any deviations from this plan must be documented in this annual monitoring report.

The goal of sample retrieval is to collect samples within 1 business day. When samples cannot be retrieved on the day following collection, then samples must be retrieved in the following order of priority:

- BDD Boundary Station: Los Alamos above the Rio Grande at E109.9;
- Downgradient Laboratory boundary stations: E042.1, E050.1, E059, and E060.1;
- Upgradient Laboratory boundary stations: E026, E030, E040, E055, E055.5, E056, CO101038 and CO111041; and
- DP Canyon and Graduation Canyon E038, E039.1, and CO115002.

The duration between sample collection and sample retrieval is documented in Table 2.6-1. In 2012, samples were collected at gages 35 times including environmental surveillance gage station E099 in lower Guaje watershed. Samples were collected at gages 22 times within the first business day.

Damage occurring to samplers and gage monitoring equipment is documented in Table 2.6-2. In 2012, 10 stations were damaged or malfunctioned a total of 68 times. The stations monitoring and sampling equipment were repaired within 5 business days on 65 of these occasions. Samples could not be collected on 12 sampling events because of silting or damage to gages, as noted in Table 2.6-2.

Samplers and monitoring equipment at E109.9, E050.1, and E060.1 were inspected weekly. Samplers and monitoring equipment at other gage stations were inspected at least every 2 weeks, between March 1 and December 1, 2012. The dates of each inspection at each station are documented in Table 2.6-3. Each station was inspected at the frequency required with the exception of when access was denied because of Stage III fire restrictions on-site.

3.0 WATERSHED HYDROLOGY

The topography, geology, geomorphology, and meteorology of the LA/P watershed are quite complex and include mesas, canyons, and large elevation gradients; alluvium, volcanic tuff, pumice, and basalt; ephemeral streams, evolving stream networks (both laterally and vertically), and sediment-laden stream discharge; winter snowfall that can create spring snowmelt, intense summer monsoonal rainfall, and occasional late summer to fall tropical storm activity. Consequently, monitoring of the LA/P watershed runoff is also complex and challenging.

3.1 Drainage Areas and Impermeable Surfaces

Drainage areas unique to each gage station (Figure 2.1-1) were developed using the ArcHydro Data Model in ArcGIS. Model inputs were developed using an elevation grid created from 4-ft light detecting and ranging (LIDAR) images, a digital elevation model from 2000, surface-water drainage culverts from the Laboratory and the County of Los Alamos, and manual site-specific controls based on field assessments. Each drainage area defines the area that drains to the particular gage station from either the next upstream gage station or the headwaters of the watershed, as determined by the model inputs.

The impermeable surface area was derived from the urban-sparse-bare rock land cover type within the taxonomic-level classification system developed in the Land Cover Map for the Eastern Jemez Region (McKown et al. 2003, 087150). The specific grid data set selected to provide the land cover type was the quarter-hectare smoothed taxonomic level. Within each gage station drainage area, the urban-sparse-bare rock land cover type was spatially queried for total acreage based upon the number of 50-ft × 50-ft grid cells that fell within the drainage boundary. This total area was then divided by the total area of the entire drainage area to derive the percent impermeable surface area. The following assumptions were made in determining the percent impermeable surface area: (1) the only available land cover data were from 2002–2003, and therefore, newer impermeable surfaces may not be captured; and (2) urban-sparse-bare rock grid cells that may have overlapped two drainage areas were spatially queried based upon where the center of the cell resided rather than the exact amount of each cell that fell within each drainage area.

A significant factor in the frequency of discharge at each gage is the ratio of permeable to impermeable surface area discharging to the gage or within the canyon drainage (Table 3.1-1). The Las Conchas fire affected this relationship because of soil hydrophobicity (infiltration decreases), lack of vegetation (through fall increases and evapotranspiration decreases), and lack of litter (infiltration decreases)

following a medium- to high-intensity forest fire, leading to an increase in runoff, as occurred after the Cerro Grande fire (Gallaher and Koch 2004, 088747). The effect of the fire was particularly evident at E109.9, which measures discharge from a total drainage area of 37,800 acres, with 11% impermeable surface area before the fire and an additional 13% of the watershed experiencing high- or moderate-severity burn during the fire. Gage E109.9 recorded discharge greater than 5 cfs only 4 times during the 2010 monitoring period (pre-fire), 15 times during the 2011 monitoring period (1 yr post-fire), and 14 times during the 2012 monitoring period (2 yr post-fire).

3.2 Water and Sediment Transmission

Figure 3.2-1 is a flow diagram of the LA/P watershed displaying each gage station and the location of sediment transport mitigation sites. Figure 3.2-2 shows box and whisker plots of total suspended sediment for DP, Los Alamos, and Pueblo/Acid Canyons from up- to downstream over the past 3 yr of monitoring. As expected, Los Alamos Canyon had higher concentrations of suspended sediment as a result of the Las Conchas fire (compare the pre-fire year 2010 to post-fire years 2011 and 2012), particularly at the upper boundary station E026 and Guaje Canyon station E099. In fact, for 2011 and 2012, the TSS decreases from E026 to E030, increases slightly at E042.1 (possibly from the DP Canyon confluence between E030 and E042.1, although the TSS concentrations in DP Canyon are significantly lower than Los Alamos Canyon), decreases across the Los Alamos Canyon low-head weir to E050.1, increases greatly after the Guaje Canyon confluence (E099), and decreases slightly at E109.9. The TSS concentrations in Pueblo and Acid Canyons are also significantly less than in Los Alamos Canyon.

For runoff events exceeding sampling triggers in 2012, Figure 3.2-3 shows hydrographs for DP, Los Alamos, and Pueblo/Acid Canyons from up to downstream. Figure 3.2-3 also shows separate hydrographs for E099, which is a baseline station in Guaje Canyon not on Laboratory property but upstream of E109.9, along with E050.1, E060.1, and E109.9, which are lower boundary stations in the LA/P watershed. Table 3.2-1 summarizes the flood bore transmission downstream in the lower LA/P watershed, including travel time of flood bore from the upstream to the downstream station, peak discharges of the flood bore at the station, and the percent reduction in peak discharge between the stations for every sampled runoff event in 2012. The flood bore is defined as the leading edge of the storm hydrograph as it transmits downcanyon and peak discharge is the maximum 5-min instantaneous flow rate measured during a flood. The focus was on peak discharge because it is related to stream power, and in ephemeral streams in semiarid climates, the greater the stream power, the greater the erosive force, hence the greater the sediment transport (Bagnold 1977, 111753; Graf 1983, 111754; Lane et al. 1994, 111757).

As flood bores move from up- to downstream, peak discharge can either increase by means of alluvial groundwater and/or tributary contributions or decrease because of transmission losses (infiltration). In some events, downstream stations experienced discharge before upstream stations did because of inputs from intermediate tributary drainages or localized storms centered closer to the downstream station. This occurred three times at E050.1 in 2012, possibly because of the Guaje Canyon tributary and/or localized precipitation in the E109.9 area. A summary of the peak discharge increases and decreases (Tables 3.2-2) between stations provides insight into the stream network.

In the lower part of Los Alamos Canyon, between E050.1 and E109.9, the peak discharge increased for 13 of 14 runoff events (74% average increase) and decreased for 1 event (16% average decrease), indicating this section tends to gain rather than lose volume. Discharge was measured at E050.1 for 10 events, 5 of which may have contributed to discharge at E109.9 and 5 of which were less than 5 cfs and did not contribute to discharge at E109.9. Of the 5 events where E050.1 may have contributed, during 3 events E099 may also have contributed; during 1 event, E099 did not contribute; and during 1 event E099 was not operational. No runoff was measured at E060.1; therefore, in the stretch from

E060.1 to E109.9, peak discharge increased in all 14 runoff events (100% average increase), indicating this channel section tends to gain rather than lose volume. Gain in the channel comes from side drainages between the confluence of Pueblo and upper Los Alamos Canyons and E109.9 watershed in lower Los Alamos Canyon.

These relationships indicate runoff from Guaje Canyon and localized precipitation contributed to discharge measured at E109.9 in multiple events (also see Figure 3.2-3). When E099 was operational, the peak discharge increased for 13 of 16 runoff events (75% average increase) and decreased for 3 events (22% average decrease), indicating this section tends to gain rather than lose volume. The discharge values for E099 are considered estimates because of the wide open channel and the validity of a rating curve for this site; nonetheless, the short distance and number of increasing runoff events between E099 and E109.9 and the lack of E050.1 contributions to E109.9 indicate a fair number of localized precipitation events occur. Discharge was measured at E099 for 16 events, 14 of which may have contributed to discharge at E109.9, and 2 of which did not contribute to discharge at E109.9.

Figure 3.2-4 shows the hydrograph and sedigraph for each station sampled through all or most of the duration of a runoff event plotted as time since the peak. Table 3.2-3 shows the Pearson's correlation coefficients between discharge and TSS for these stations and runoff events. Concurrent times as well as various time lags are displayed. Pearson's correlation coefficients are computed as follows:

$$corr_{Q_t, TSS_t} = \frac{\sum_{t=0}^n (Q_t - \bar{Q})(TSS_t - \overline{TSS})}{\sqrt{\sum_{t=0}^n (Q_t - \bar{Q})^2 \sum_{t=0}^n (TSS_t - \overline{TSS})^2}} \quad \text{Equation 3.2-1}$$

where Q_t is the discharge at time t , TSS_t is the TSS at time t , n is the number of measurements to be correlated ($t = 1, 2, \dots, n$), and

$$\bar{Q} = \frac{\sum_{t=0}^n Q_t}{n} \quad \text{Equation 3.2-2}$$

$$\overline{TSS} = \frac{\sum_{t=0}^n TSS_t}{n} \quad \text{Equation 3.2-3}$$

The peak TSS can occur after the peak discharge; thus, lags between 0 and 30 min are presented with the discharge lagging behind the TSS to align the peaks (after 30 min, the correlations were reduced for all stations and all runoff events). For example, when the Pearson's correlation coefficient between Q_t and TSS_{t+5} is computed, the TSS time series begins 5 min after the discharge time series.

For stations E026, E038, E042.1, E050.1, E099, and E109.9, discharge is reasonably positively correlated to TSS with no lag. The exceptions are E026 on July 11, 2012, when the sampler intake clogged, and E050.1 on September 28, when the discharge was low (peak of 7 cfs) and the sampler intake might have clogged and unclogged itself during the storm event (refer to Figure 3.2-4). Figure 3.2-5 shows the linear relationship between sediment yield and runoff volume for the stations where TSS was measured throughout the runoff event over the past 3 yr of monitoring; Table 3.2-4 presents the 2012 values shown in Figure 3.2-5. (The 2011 monitoring report [LANL 2011, 207072] and the 2012 report [LANL 2012, 222836] contain the 2010 and 2011 data, respectively.) Although TSS and instantaneous discharge are not always highly correlated as a result of localized precipitation, sediment availability, or antecedent conditions, the linear relationship between sediment yield and runoff volume is well established (Onodera et al. 1993, 111759; Nichols 2006, 111758; Mingguo et al. 2007, 111756). The July 2011 Las Conchas fire undoubtedly affected this relationship, as can be seen from 2010 to 2011 where the robustness of the relationship decreases. However, between 2011 and 2012 the relationship seems to be rebounding, perhaps indicating the LA/P watershed is beginning its post-fire recovery.

The runoff volume for each event was computed as follows:

$$V = \sum_{i=0}^n Q(t_i)(t_{i+1} - t_i) \quad , \quad \text{Equation 3.2-4}$$

Where n = the number of instantaneous discharge measurements taken throughout the runoff event,

t = the time, i , at which an instantaneous discharge measurement is taken, and

$Q(t_i)$ = the discharge (ft³/s) at time t_i (multiplied by 60 to convert from ft³/s to ft³/min).

The mass of sediment for each runoff event was computed by

$$M = \sum_{j=0}^n Q(t_j)(t_{j+1} - t_j) TSS(t_j) \quad , \quad \text{Equation 3.2-5}$$

Where n = the number of TSS samples taken throughout the storm event,

t_j = the time, j , at which an TSS sample is taken,

$Q(t_j)$ = the discharge (ft³/s) at time t_j interpolated from the instantaneous discharge measurements taken at time t_i (multiplied by 60 to convert from ft³/s to ft³/min), and

$TSS(t_j)$ = TSS (mg/L) at time t_j (multiplied by 28.3×10^{-6} to convert from mg/L to kg/ft³).

Figure 3.2-6, like Figure 3.2-5, shows the linear relationship between sediment yield and peak discharge, which is more robust than the relationship between sediment yield and runoff volume in 2010 and 2012. The effects of the Las Conchas fire can also be seen in the peak discharge relationship.

Appendix B presents plots of discharge (hydrographs), precipitation (hyetographs), TSS, and SSC (sedigraphs) versus time for each date and station when samples were collected. The precipitation shown is associated with the precipitation-station-based Thiessen polygons that overlay the individual gage's watershed area, thus potentially contributing to the discharge measured at the station. As expected, discharge lags precipitation, and when several pulses occur in the hyetograph, consequential peaks occur in the hydrograph. TSS is less predictable and SSC is more accurate and predictable.

3.3 Geomorphic Changes

Topographic surveys to measure sediment deposition and erosion were conducted at the following sediment transport mitigation sites: Pueblo Canyon cross-vane structures, upper Pueblo Canyon willow-planting area, Pueblo Canyon wing ditch, lower Pueblo Canyon willow-planting area, upper Los Alamos Canyon sediment detention basins, DP Canyon GCS, and Los Alamos Canyon low-head weir. A complete summary of the methods and detailed results is provided in Appendix A.

Net sediment deposition occurred in most surveyed areas in the LA/P watershed that experienced monsoonal flood events in 2012, which is consistent with the goal of the sediment transport mitigation work plans (LANL 2008, 101714; LANL 2008, 105716). Tables A-3.3-1 and A-3.3-2 in Appendix A list the average depositional and erosional changes for each mitigation site for 2010 to 2012. All surveyed sites with the exception of the DP Canyon GCS recorded less than 1% net change in total sediment volume compared to the 1942–1997 total sediment volume indicating the monitored sites remain stable. The DP Canyon GCS recorded a 6% increase compared with the 1942–1999 total sediment volume, which was approximately 3 times greater than the 2011 deposition. Overall, the surveys document that the structures in the LA/P watershed are currently operating as desired and have not undergone net erosion during the 2010–2012 monitoring period.

3.3.1 Pueblo Canyon

With the exception of the cross-vane structures, none of the areas in Pueblo Canyon that contained sediment transport mitigation structures or willow plantings experienced summer monsoon floods in 2012. The Pueblo Canyon cross-vane structures experienced a small amount of erosion during the 2012 monsoon season that removed approximately half of the sediment deposited in this area in 2011. The willow-planting areas and the wing ditch areas experienced relatively minimal erosion or sediment deposition in 2012, which can be attributed to erosion and sediment transport caused by the effluent stream from the wastewater treatment plant. The primary erosional process in areas that only experienced flows related to effluent discharge was bank erosion, and the primary depositional processes were channel aggradation and local sloughing of banks. The Pueblo Canyon wing ditch area also experienced a small amount of erosion attributed to the effluent stream from the wastewater treatment plant. During the 2012 monsoon season, approximately one-third of the sediment deposited in 2010 and 2011 was eroded from the Pueblo Canyon wing ditch area. The 2012 erosion may represent remobilization of sediment deposited during the August 2010 runoff event and remobilization of sediment deposition associated with construction activities conducted next to the wing ditch.

3.3.2 Los Alamos Canyon

Sediment deposition at the upper Los Alamos Canyon sediment detention basins in 2012 was similar to that recorded in 2011. Based on the deposition of sediment observed in upper basin 1 and the absence of any appreciable sediment deposition in lower basin 2, nearly all of the sediment transported by the small drainage below SWMU 01-001(f) is being contained in the upper Los Alamos Canyon sediment detention basins. Net sediment deposition for 2012 in the DP Canyon GCS area is greater than that recorded in 2011. This sediment deposition includes both channel aggradation and overbank deposition. Sediment deposition at the Los Alamos Canyon low-head weir in 2012 is greater than that recorded in 2011 and is nearly an order of magnitude greater than the annual sediment deposition recorded in 2010, the year before the Las Conchas fire. The total sediment accumulation rate in the Los Alamos weir during the 2011 and 2012 monsoon seasons was higher than that measured in previous years (2000–2010). The higher sedimentation rate can be attributed to post-Las Conchas fire runoff that allowed flows to bypass the Los Alamos Reservoir in the upper part of the watershed after the Las Conchas fire.

3.4 Impact and Efficiency of Watershed Mitigations

The DP and Pueblo Canyon GCSs were constructed to help reduce erosive flood energy and to cause upstream aggradation to bury existing stream channels, potentially to bury existing floodplain deposits, and in Pueblo Canyon, to stabilize an eroding wetland. As a result, the GCSs should help reduce sediment transported during flood events. The Pueblo Canyon wing ditch was designed to divert floodwater from the main channel into an adjacent abandoned channel, spreading water more broadly over a wetland and decreasing surface water flow velocities. Willows were planted in Pueblo Canyon to aid in surface stabilization, flow reduction, and sediment accumulation.

DP Canyon: In 2012 sampling conducted in DP Canyon on October 10 was performed above (E038) and below (E039.1) the GCS and associated floodplains. Analyses performed from samples collected during this runoff event allow direct evaluation of changes in discharge and sediment transport through this part of DP Canyon. This particular event had two peak discharges at both stations, the first of which was 40 min apart and the second of which was 25 min apart (Figure 3.4-1). Samples collected for TSS analyses initiated and concluded sample collection at both stations. Sample collection began within 5 min of initial discharge (triggered above 40 cfs for E038 and 10 cfs for E039.1). For E038 and E039.1, the

calculated sediment yield is 2.6 and 2.1 yd^3 , respectively (Table 3.2-4). Between these two stations for this event, there is a 21% relative percent difference (RPD) decrease in sediment yield.

Decreasing storm water velocity allows for infiltration to be increased. Increasing infiltration reduces the distance that a storm surge travels in the stream channel and decreases the distance that sediment and associated contaminants entrained in the water column travel. Increasing infiltration reduces peak discharge but can also decrease the total volume of storm water passing through a gage station. In 2012, the peak discharge decreased in seven of eight runoff events between E038 and E039.1, with an average decrease of 80% (Table 3.4-1). For the October 12 event, the runoff volume was 3.8 and 6.9 acre-feet for E038 and E039.1, respectively (Table 3.2-4). Between these two stations for this event, a 58% RPD increase in runoff volume occurred, most likely caused by additional contributions from local runoff from the widespread nature of the October 12 storm.

In addition to examining coinciding sampling events, watershed mitigation performance can be assessed by examining overall statistics over time. Figure 3.4-2 shows box and whisker plots for E038 and E039.1 for both TSS and peak discharge over the past 3 yr of monitoring. These plots indicate overall reductions in TSS over the 3 yr and reductions in peak discharge (i.e., erosive force) over 2010 and 2011 through this part of DP Canyon, consistent with the goals of the sediment transport mitigation activities.

Figure 3.4-3 shows box and whisker plots for copper, lead, and zinc sampled at the pre-GCS station E039 and post-GCS station E039.1. Because of the strong adsorption tendency of metals onto sediment, the reduction in concentrations after the GCS was installed indicates a reduction in suspended sediments and thus a reduction in floodplain erosion, which is consistent with the goals of the sediment transport mitigation activities.

Pueblo Canyon: In 2012, no sampling was performed in Pueblo Canyon above (E059) or below (E060.1) the GCS and upstream wetland for the same runoff event because no discharge was measured at either station (Table 3.4-1). Therefore, overall statistics over the past 3 yr of monitoring must be used to assess performance. Figure 3.4-2 shows box and whisker plots for E059 and E060.1 for both TSS and peak discharge. As these plots indicate, peak discharge was effectively attenuated through the Pueblo Canyon wetland in 2010 and 2011, resulting in little to no transport from the upper Pueblo watershed into lower Los Alamos Canyon. This is consistent with the goals of the sediment transport mitigation activities. It should also be noted that, although no flow was measured in 2012 at either of the bounding stations, a tributary from the Los Alamos Airport regularly discharges storm water runoff into the wetland; however, the discharge magnitude is still being reduced through this area, which is a primary goal of the mitigation actions. In addition, TSS magnitude was reduced through the mitigation structures in 2010 (no samples were collected at E060.1 during 2011).

Los Alamos Canyon: Sampling was performed in Los Alamos Canyon on July 11 and 24, August 3, and October 12 above (E042.1) and below (E050.1) the low-head weir. Analyses performed from samples collected during these runoff events allow direct evaluation of the effect of the weir and associated basins on flow and sediment transport. Each event had downstream decreases in peak discharge, total runoff volume, and TSS (Figure 3.4-4). More specifically, between E042.1 and E050.1 for the four events sampled at the same time, there is a 60%, 124%, 49%, and 108% RPD decrease in sediment yield, respectively, and a 45%, 56%, 31%, and 103% RPD decrease in runoff volume, respectively. In addition, in 2012, the peak discharge decreased in all nine runoff events between E042.1 and E050.1, with an average decrease of 60% (Table 3.4-1). Sediment trapping efficiency is expected to be higher in smaller events and events early in the season before the retention basins have filled with water. Flow is reduced through the weir and the upstream sediment retention basins, allowing sediment to settle out of suspension; thus, this mitigation feature is performing as designed.

In addition to examining coinciding sampling events, performance of the weir and upstream sediment retention basins can be assessed by examining overall statistics over the past 3 yr of monitoring. Figure 3-4.2 shows box and whisker plots for E042.1 and E050.1 for both TSS and peak discharge. These plots show major reductions in TSS, particularly in response to the post-fire years (2011 and 2012) and smaller reductions in peak discharge; thus, the weir is performing well.

4.0 ANALYTICAL RESULTS

Appendix C contains all analytical results obtained from storm water runoff samples collected in the LA/P watershed during 2012. Data packages for these analyses are included on a CD included with this report.

4.1 Data Exceptions

Storm water samples collected at E099 on July 11 and E109.9 on July 5 could not be analyzed as liquid samples. The sediment concentrations were great enough that samples were analyzed as having solid matrix using solid-sample preparation methods and solid-sample analytical techniques. These solid-matrix analytical results are presented separately from other storm water analytical results in Appendix C.

The sample preparation method used for inductively coupled plasma optical emission spectroscopy and mass spectroscopy, EPA Method 200.2, for TAL metals (excluding mercury) applies only to samples containing less than 1% suspended solid material, or 10,000 mg/L SSC. Fourteen samples analyzed for unfiltered metals were reported to contain SSCs above 10,000 mg/L. Six storm water samples collected at E030 on August 3; at E042.1 on July 24 and August 3; at E050.1 on August 3; and at E109.9 on July 24, August 3, and August 7 were separated into solid and liquid fractions, analyzed separately, and the fractional results proportionally recombined. The remaining eight samples containing greater than 10,000 mg/L suspended sediment were analyzed following the EPA Method 200.2 sample digestion. Regression plots of analyte concentration versus SSC indicate that analyte concentrations are underreported in these samples prepared using EPA Method 200.2 containing greater than 10,000 mg/L suspended sediment. Analytical concentrations were not underreported when solid and liquid fractions were separated and recombined.

In 2012, the Laboratory provided separate 1-L sample volumes for analysis by gamma spectroscopy and of isotopic plutonium, uranium, and americium. This extra sample volume allowed the analytical laboratory to optimize sample dissolution for the radionuclide analyses and prevented the low bias in high solid samples observed during analyses conducted during 2011.

4.2 Analytes Exceeding Comparison Values

As explained in the IMWP, several actions were taken as part of an interim measure under Section VII.B of the Consent Order to mitigate transport of contaminated sediments in the LA/P watershed (LANL 2008, 101714). The analytical results from monitoring are presented and evaluated within this context. The mitigation actions were not undertaken with the objective of reducing concentrations of water-borne contaminants to specific levels, and the analytical results are therefore not compared with water-quality standards or other criteria for that purpose or for the purpose of evaluating compliance with regulatory requirements. For this report, monitoring results are compared with water-quality standards to narrow the list of specific constituents for conceptual model discussions in this report and to provide a basis for potential future revisions to the analytical suites. The New Mexico Water Quality Control Commission (NMWQCC) Standards for Interstate and Intrastate Surface Waters (New Mexico Administrative Code 20.6.4) establish surface water standards for New Mexico. The NMWQCC classifies all surface

water within the Laboratory boundary with segment-specific designated uses. The LA/P stream segments are classified as ephemeral or intermittent, with designated uses of limited aquatic life, livestock watering, wildlife habitat, and secondary contact. Some of the standards are for total concentrations, which are compared with data from unfiltered surface water samples. Other standards are for dissolved concentrations, which are compared with data from filtered samples. Table 4.2-1 presents the NMWQCC standards used as numeric values for comparison with monitoring results for the purposes stated above. When chemicals have comparison values for multiple designated uses, the smallest value was selected to compare with analytical results. Table 4.2-2 presents the comparison of detected analytical results from 2012 with the standards in Table 4.2-1. Analytical constituents most frequently detected above these comparison values are total PCBs and dioxins and furans.

Dioxin and furan congeners were detected in 8 of 12 samples analyzed in 2012, and these results were converted to concentrations equivalent in toxicity (toxic equivalency quotients [TEQs]) to 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD) for comparison with the NMWQCC standard. The TEQs were calculated using the toxicity equivalency factors (TEFs) presented in Table 4.2-3 (Van den Berg et al. 2006, 106990). The detected concentration of each congener was multiplied by its TEF, and these products were summed for each detected congener to obtain the TEQ for a sample. The TEQs for each sample analyzed for dioxins and furans are presented in Table 4.2-4, and range over 2 orders of magnitude (9.18×10^{-8} to 1.6×10^{-6} µg/L).

4.3 Relationships between Discharge, SSC, and Contaminant Concentrations

Discharge was calculated from stage height using a rating curve, which is the relationship between discharge in cubic feet per second and height of the water in feet, developed for each individual gage. Stage height was measured at 5-min intervals, logged continuously during each sampled storm event. During the first 190 min of each storm, TSS was measured: up to 23 times at E026, E038, and E039.1; up to 21 times at E042.1 and E059; up to 19 times at E050.1 and E060.1; and up to 15 times at E109.9. During the first 190 minutes of each storm, SSC and particle size were measured: up to 1 time at E026, E038, and E039.1; and up to 3 times at E042.1, E059, E050.1, E060.1, and E109.9. At other gages, SSC and particle size were measured immediately before sampling for inorganic and organic chemicals and radionuclides, and TSS was measured immediately following this sampling.

TSS, SSC, and instantaneous discharge estimates were calculated for each sample using a linear relationship between the two corresponding analytically-determined TSSs and SSCs or the two corresponding physically-measured discharge, as follows:

$$y = mx + b, \quad \text{Equation 4.4-1}$$

where y = the calculated TSS, SSC, or discharge at the time of sample collection,

m = the slope of the line,

x = the time differential in minutes between TSS or SSC sample collection or discharge measurements, and

b = the concentration of analytically-determined TSS or SSC before sample analyses or corresponding physically-determined discharge.

The slope m is determined by dividing the difference in TSS, SSC, or discharge by the difference in time, in minutes, between TSS or SSC sample collection or discharge measurements before and after analytical sample collection. Using this equation, TSS, SSC, and instantaneous discharge were calculated for each sample collected. Where analytical results are not bounded by sediment results, the concentration of the

nearest sediment result is used as an estimate of the sediment concentration at the time the sample was collected. The calculated TSSs, SSCs, and instantaneous discharges are presented in Table 4.3-1.

Relationships between calculated TSS, SSC, instantaneous discharge, and analytical results can be used to evaluate sediment transport in the LA/P watershed. This evaluation in turn provides insight into performance of watershed mitigations conducted in the watershed and the usefulness of future monitoring strategies.

Analyte concentrations generally show a poor correlation to instantaneous discharge in storm water on the Pajarito Plateau (Malmon 2002, 076038; LANL 2011, 207072). The relationship of calculated, instantaneous discharge to TSS for each station where storm water samples were collected during 2012 is shown in Figure 4.3-1 (along with the past 3 yr of monitoring data). Some stations have more robust relationships than others, including E042.1, E050.1, E099, and E109.9 (for 2012 only).

TSS is commonly positively correlated with concentrations of inorganic chemicals and radionuclides in unfiltered samples (LANL 2011, 207072). Storm water performance monitoring in the LA/P watershed during 2010 and 2011 showed relationships between TSS and the concentrations of 15 frequently detected inorganic chemicals in the LA/P storm water samples from 2010 and 2011, respectively (LANL 2011, 207072; LANL 2012, 222836). Strong positive correlations between SSC and analyte concentrations for samples collected throughout the watershed, such as aluminum, beryllium, uranium-234, and uranium-238, are consistent with naturally occurring constituents. Weak positive correlations can result from the presence of contaminants at one or more locations. For example, copper and zinc are common contaminants found in urban runoff (Breault and Granato 2000, 082310). Weak positive correlations can also occur when there is local background variability associated with geologic units. For example, geologic units in Guaje Canyon are different from those found in upper Los Alamos and Pueblo Canyons (Griggs and Hem 1964, 092516; Smith et al. 1970, 009752), and storm water samples collected at E109.9 in lower Los Alamos Canyon can be expected to show some differences from samples collected at the other LA/P gages. In addition, many of the 2011 storm water samples contain variable percentages of ash from the Las Conchas burn area, and concentrations of analytes such as barium and manganese that are elevated in ash (Katzman et al. 2001, 072660; Kraig et al. 2002, 085536; LANL 2004, 087390) can be expected to show additional variability.

Analytes present as contaminants at significant levels above background will have strong spatial variability and no expected systematic correlations between analyte concentration and SSC in a watershed-scale data set. Two examples from the LA/P watershed, plutonium-239/240 and total PCBs, are shown in Figure 4.3-2 for the 2012 storm water samples. Correlations may be better at specific gaging stations because the source areas for runoff and associated sediment may be similar between runoff events, although considerable variability still exists in the LA/P data set. The relatively poor correlations may be partly associated with different percentages of the flow in each event being derived from the Las Conchas burn area, townsite runoff into DP Canyon, and runoff from other parts of the upper Los Alamos Canyon watershed. In addition, much of the contaminant load is probably derived from erosion of stream bank sediments containing variable concentrations of plutonium-239/240, PCBs, and other analytes, and some variability in contaminant concentrations within events and between events is to be expected.

4.4 Storm Water Sampling below SWMU 01-001(f) and in Graduation Canyon

PCB results for the storm water samples collected at the inlet to the upper detention basin below the SWMU 01-001(f) drainage on July 6, September 12, and October 12, 2012, range from 4.09 µg/L to 21.8 µg/L; the upper range in 2012 is greater than the result of 9.07 µg/L in 2011. The higher result suggests the hill slope continues to equilibrate after removal of sediment and rock during corrective action

at SWMU 01-001(f) during 2010. No storm water was collected below the retention ponds in 2012. Analytical results from samples collected at the inlet to the upper detention basin, at location CO111041 are presented in Table 4.4-1.

Storm water samples were collected in Graduation Canyon on October 12 at location CO115002. Total PCBs were detected in these samples at 0.0886 µg/L, less than the baseline urban storm water upper tolerance limit (UTL) of 0.098 µg/L (LANL 2012, 219767). PCB results from 2011 (0.00363 µg/L and 0.00673 µg/L) were below the urban storm water UTL as well, suggesting this drainage is dominated by PCBs from a developed urban source. Analytical results for samples collected from this location are presented in Table 4.4-2.

5.0 CONCLUSIONS

The Los Alamos Canyon watershed experienced a moderate number of runoff events in 2012, including runoff from the Las Conchas burn area in the upper watersheds of Los Alamos Canyon and Guaje Canyon. Runoff from the burn area had high concentrations of suspended sediment, in part related to entrainment of ash. In contrast, the Pueblo Canyon watershed was not affected by the fire and had only three runoff events in the upper canyon and no events from the upper watershed that extended through the length of wetland past the GCS and into lower Los Alamos Canyon. Attenuation of flow and associated sediment transport through this wetland is a primary goal of the sediment transport mitigation activities conducted in Pueblo watershed, and this part of the watershed performed successfully and as intended in 2012.

The 2012 monitoring data in upper Los Alamos watershed indicate a substantial reduction in SSC and peak discharge as floods passed through the low-head weir and associated sediment retention basins. This structure is therefore performing as designed. In contrast, SSC was much higher at gaging station E109.9 in lower Los Alamos Canyon as a result of floods in Guaje Canyon from the Las Conchas burn area.

In DP Canyon, which primarily receives runoff from the Los Alamos County townsite, direct comparison of runoff and sediment yield above and below the GCS and upstream floodplains was possible in one event in 2012 (October 12, 2012). A reduction in sediment yield was observed between bounding stations (E038 and E039.1), which is consistent with the intent of activities in this canyon.

Net sediment deposition occurred in most surveyed areas in the LAMP watershed that experienced monsoonal flood events in 2012, which is consistent with the goal of the sediment transport mitigation work plans. The surveys document that the sediment transport mitigation sites are currently operating as desired and are not undergoing net erosion over the period of this monitoring program.

Analytical data collected from storm water samples in 2012 indicate that for the 9 analytes exceeding NMWQCC water-quality standards (used as comparison values), only 1, total PCBs, has a recognized source at Laboratory sites and off-site transport. Off-site transport of PCBs in 2012 occurred only in Los Alamos Canyon, and the weir and associated sediment retention basins were effective at substantially reducing this transport. Concentrations of PCBs measured at E109.9 in lower Los Alamos Canyon are similar to those measured in upper Los Alamos Canyon above Laboratory sites, at E026, and are consistent with the transport of PCBs from the Las Conchas burn area down Guaje Canyon. PCBs in the burn area have a global source in atmospheric fallout and have accumulated in the watershed over time. The transport of radionuclides in storm water that have a Laboratory source was also substantially reduced by the settling of sediment above the weir. Continued monitoring in 2013 is expected to further confirm the sediment transport mitigation structures and associated wetlands and floodplains in the LAMP watershed are performing as intended.

6.0 REFERENCES AND MAP DATA SOURCES

6.1 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.

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6.2 Map Data Sources

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 29 November 2010.

Summer/Winter rain gage locations and networks; Los Alamos National Laboratory, Environmental Programs; Unpublished 2010 project data, Project 10-0027.

Gage stations; Los Alamos National Laboratory, Environmental Programs; Unpublished 2011 project data, Project 11-0002; locations based on WQDB data pull from January 5, 2011.

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Structures; County of Los Alamos, Information Services; as published 29 October 2007.

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Outlet; Los Alamos National Laboratory, Environmental Programs; Unpublished 2013 project data, Projects 13-0015.

Excavated topology; Los Alamos National Laboratory, Environmental Programs; Unpublished 2013 project data, Projects 13-0015.

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Gage station; Los Alamos National Laboratory, Environmental Programs; Unpublished 2013 project data, Projects 11-002.

Rain/Summer gage; Los Alamos National Laboratory, Environmental Programs; Unpublished 2013 project data, Projects 10-0027/2010_Raingage_network.shp.

Watershed; Los Alamos National Laboratory, Environmental Programs; Unpublished 2013 project data, Projects 11-0002/ merge_watersheds_02_13_2012.shp.

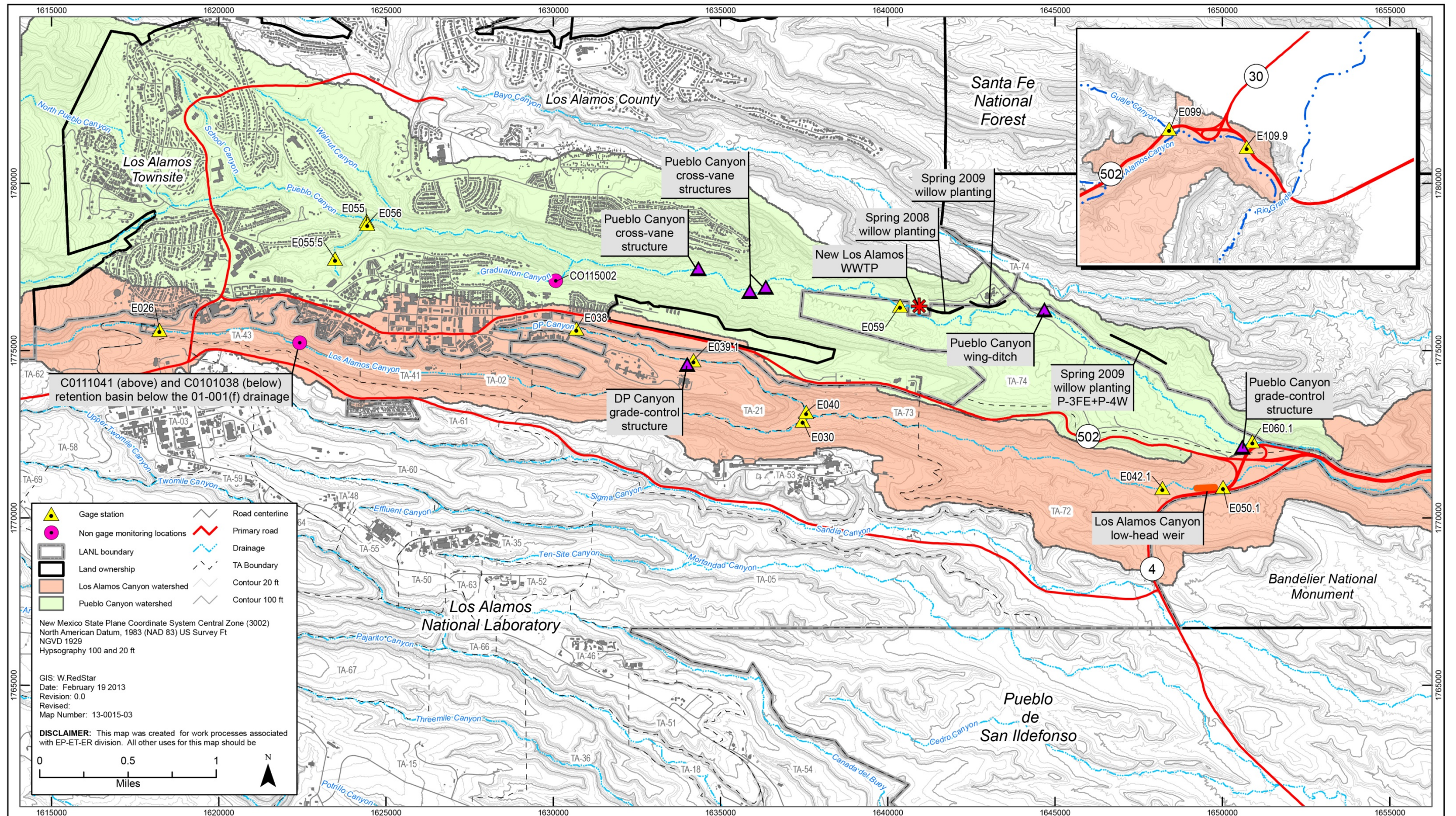


Figure 1.1-1 Los Alamos and Pueblo Canyons showing monitoring locations and sediment transport mitigation sites

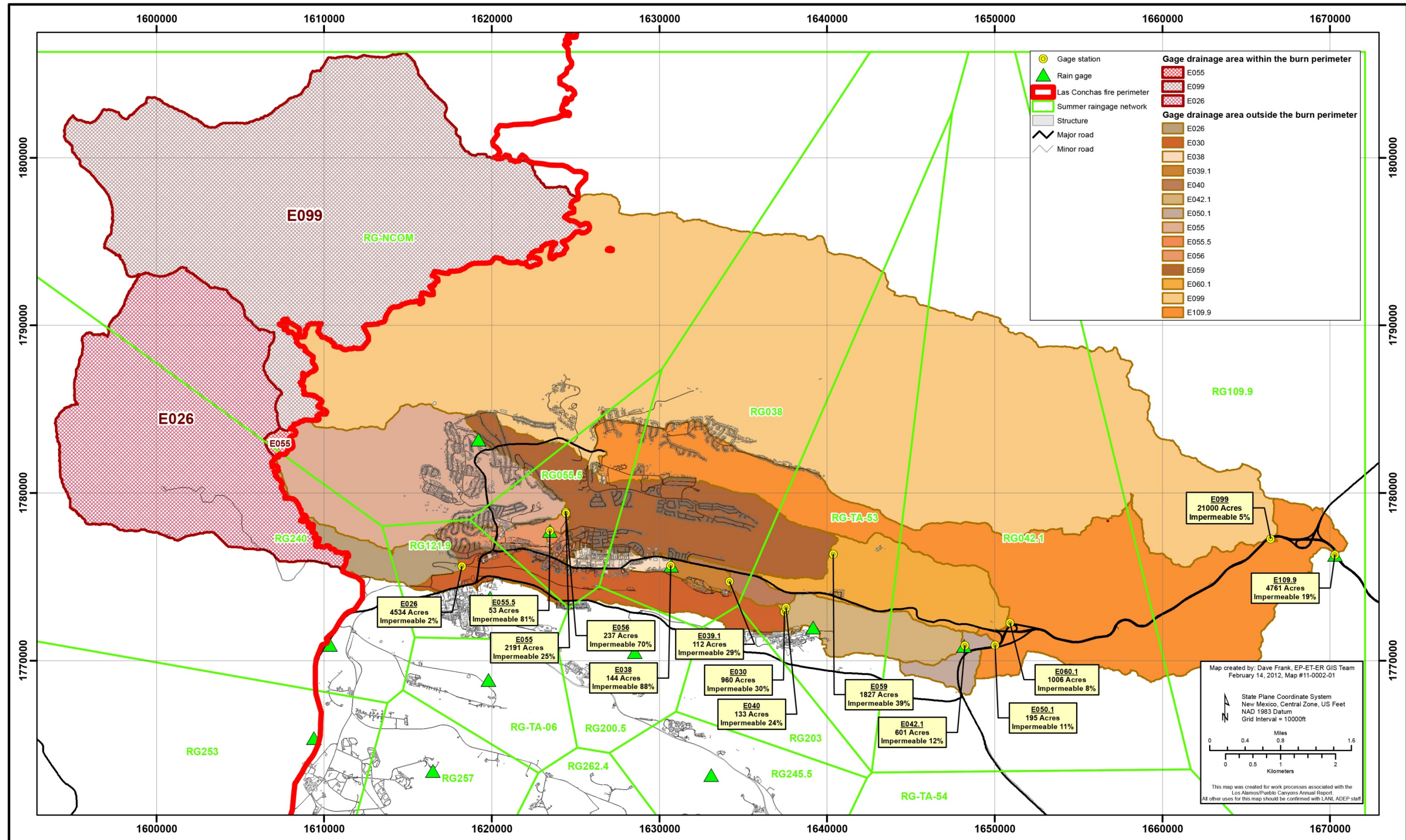


Figure 2.1-1 Los Alamos Canyon watershed showing drainage areas for each stream gage and associated rain gages, Thiessen polygons, and extent of the Las Conchas burn area

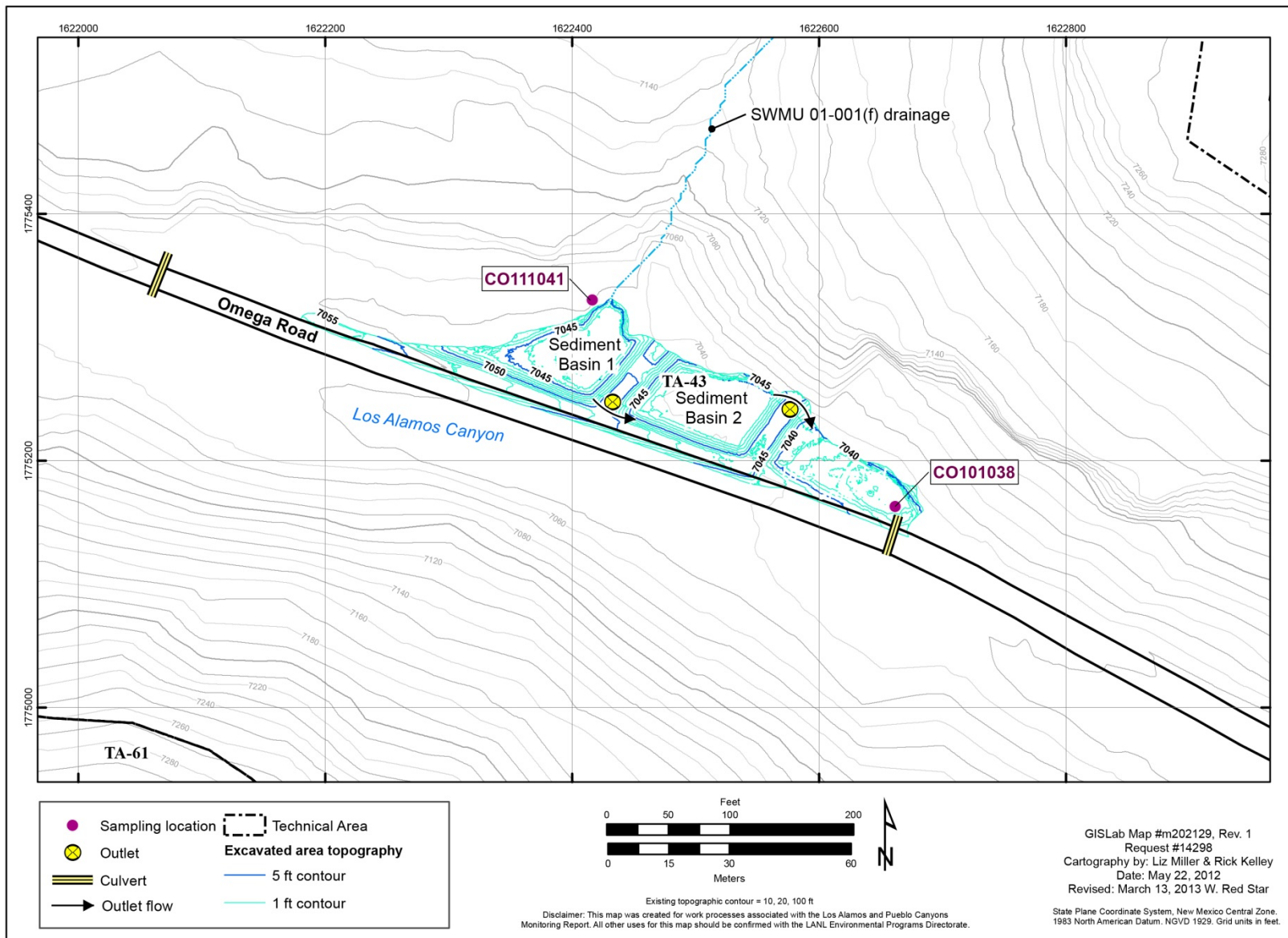


Figure 2.2-1 Sediment detention basins and sampling locations below the SWMU 01-001(f) drainage

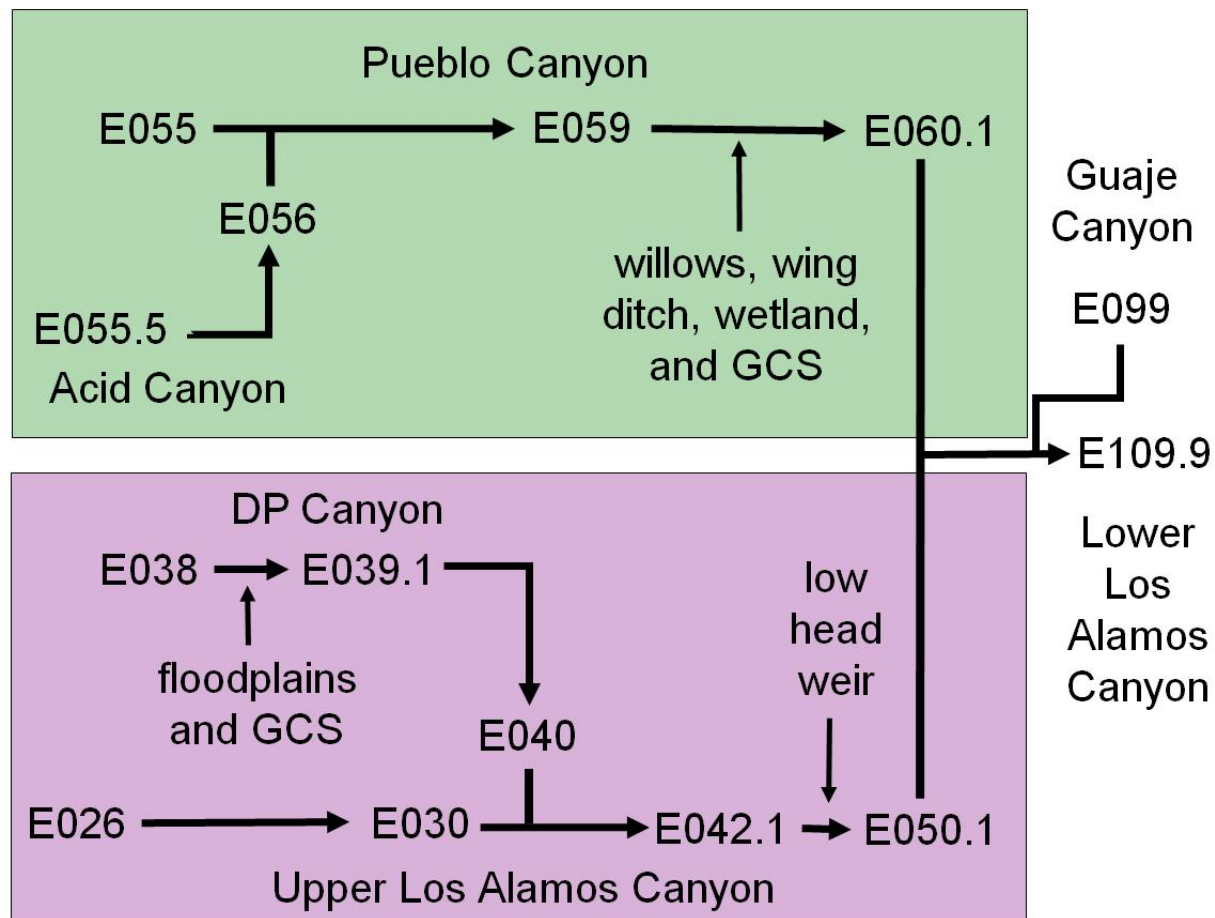


Figure 3.2-1 Flow diagram of gage stations and sediment transport mitigation sites in the LA/P watershed

DP Canyon

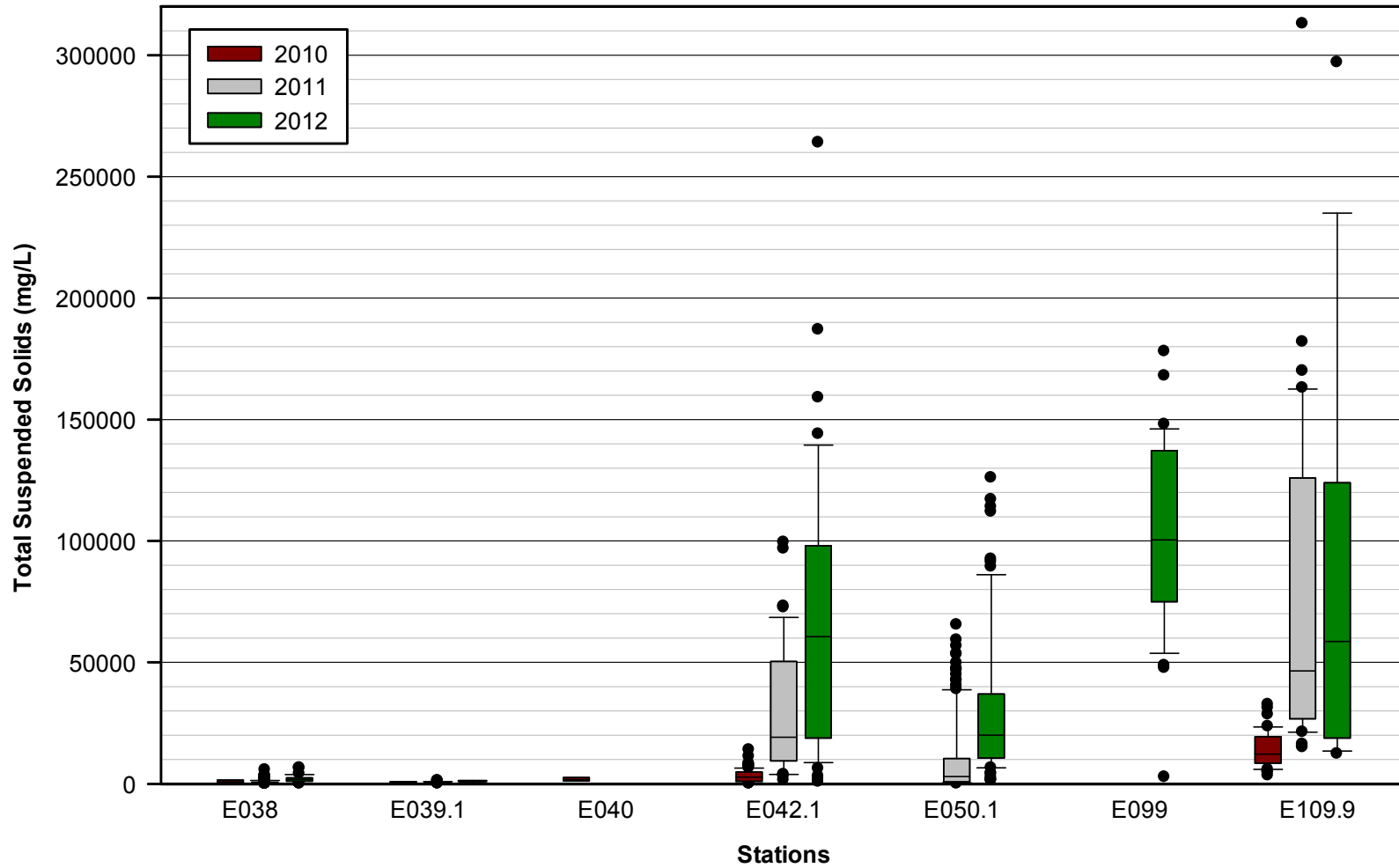


Figure 3.2-2 Box and whisker plots of TSS for all stations in DP Canyon and downstream over the past 3 yr of monitoring

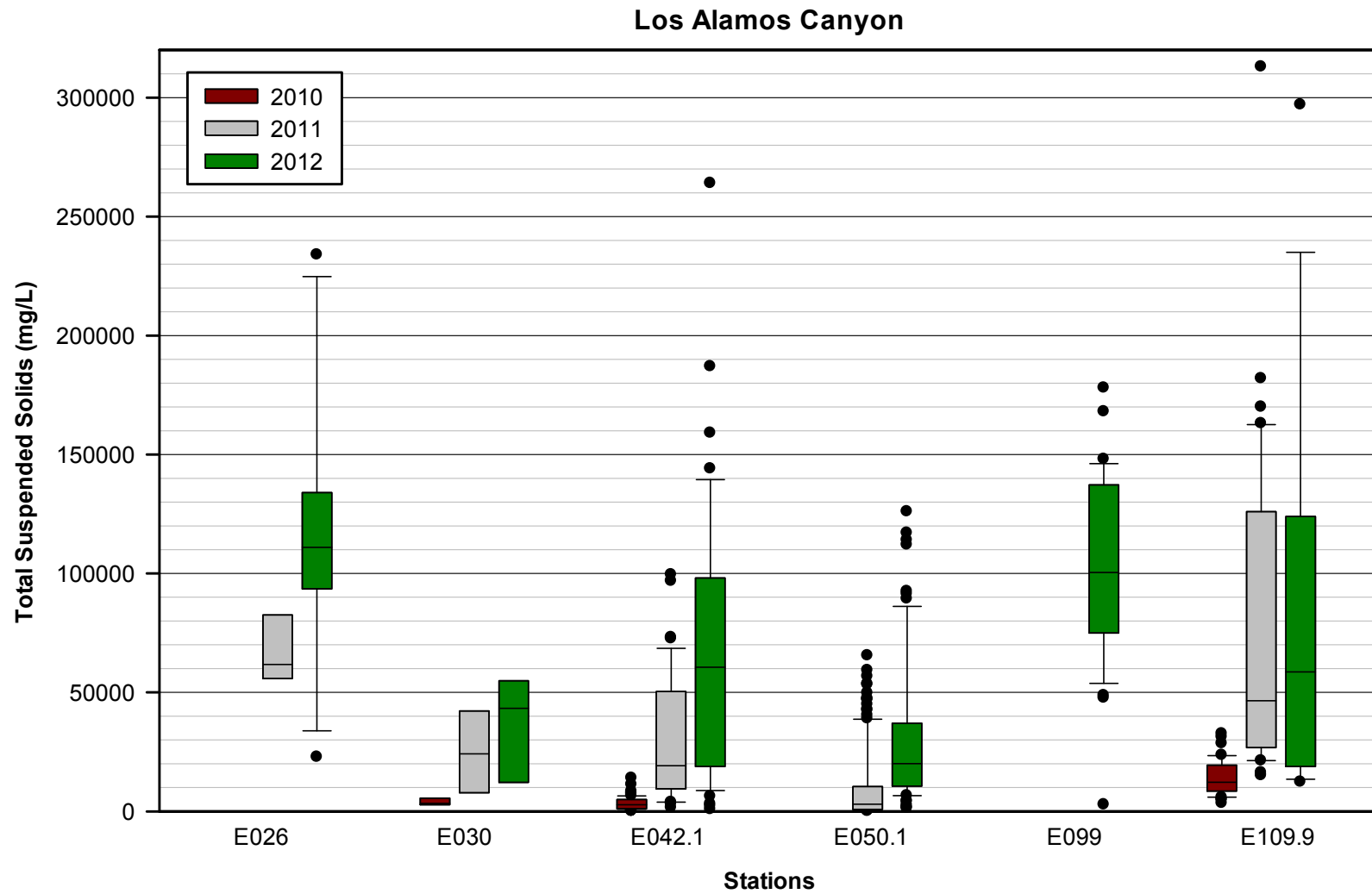


Figure 3.2-2 (continued) Box and whisker plots of TSS for all stations in Los Alamos Canyon and downstream over the past 3 yr of monitoring

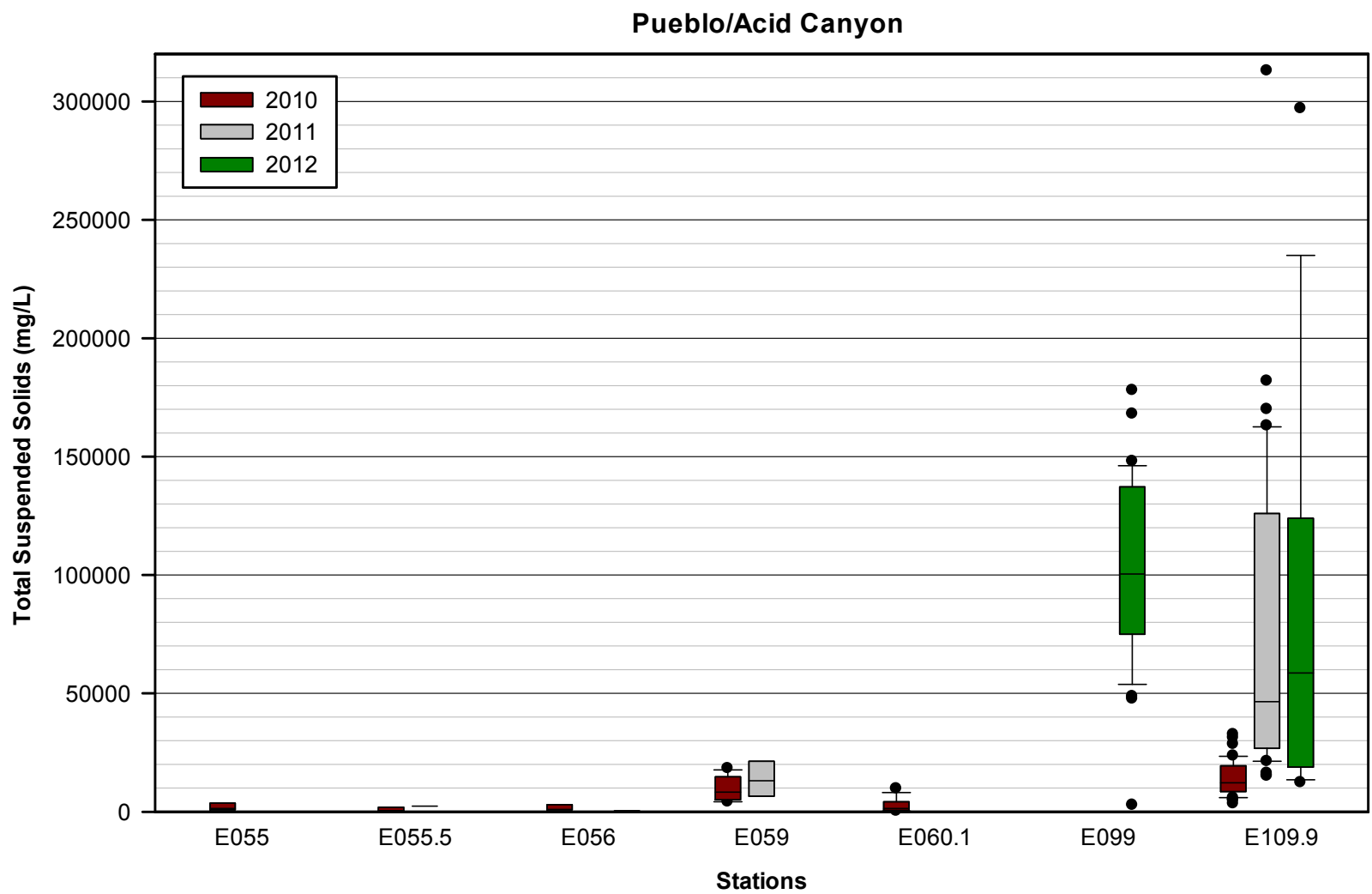


Figure 3.2-2 (continued) Box and whisker plots of TSS for all stations in Pueblo/Acid Canyons and downstream over the past 3 yr of monitoring

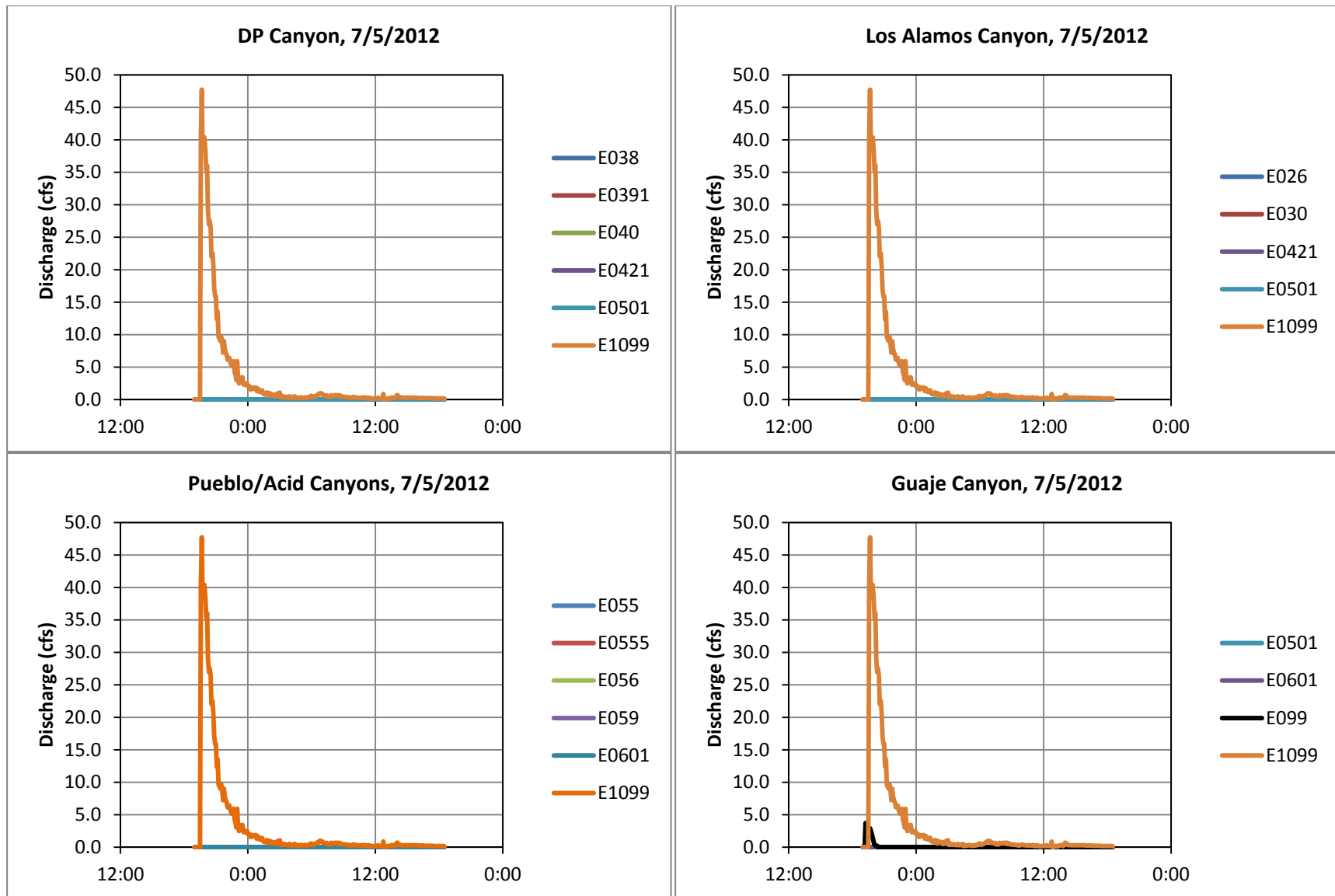


Figure 3.2-3 Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

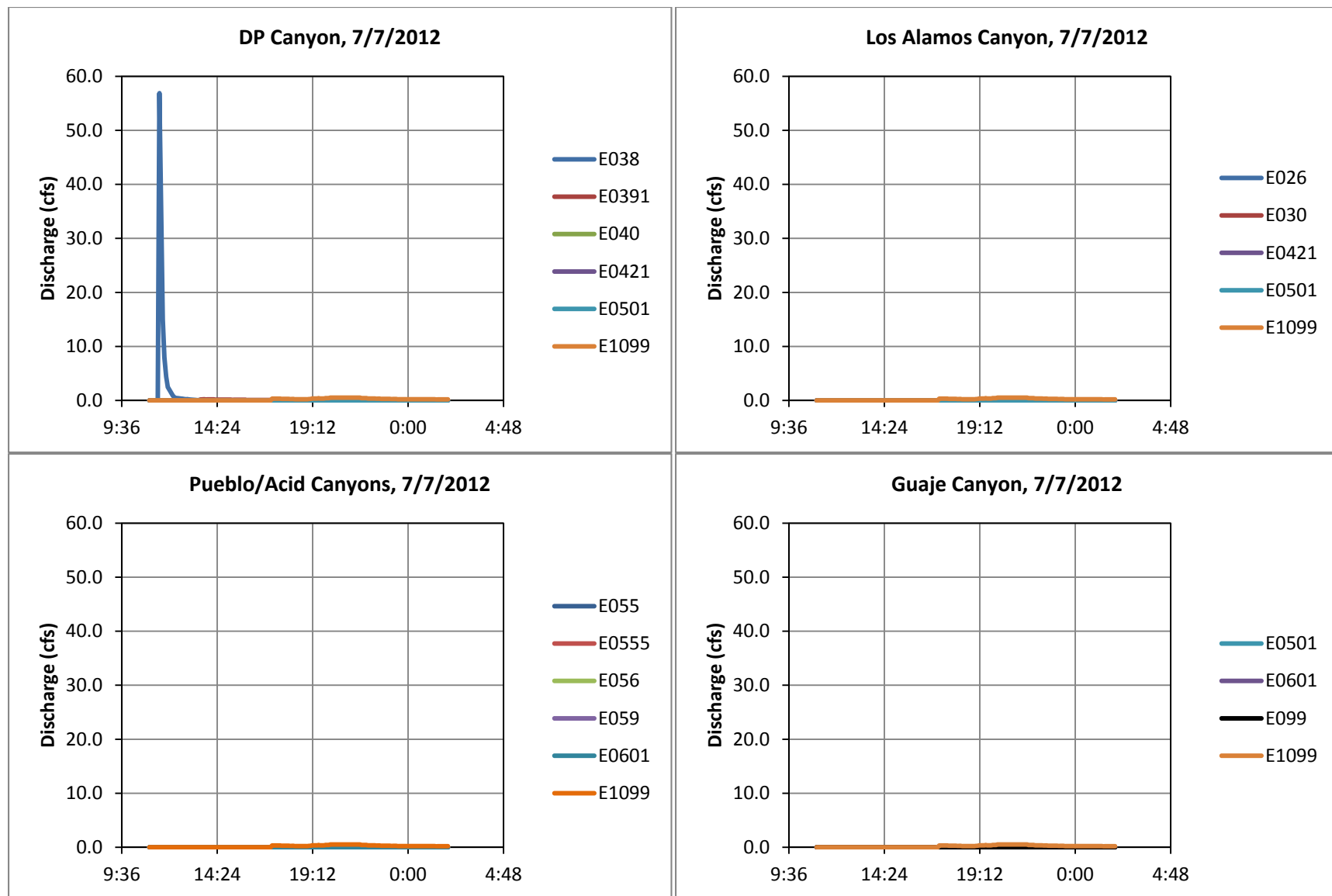


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

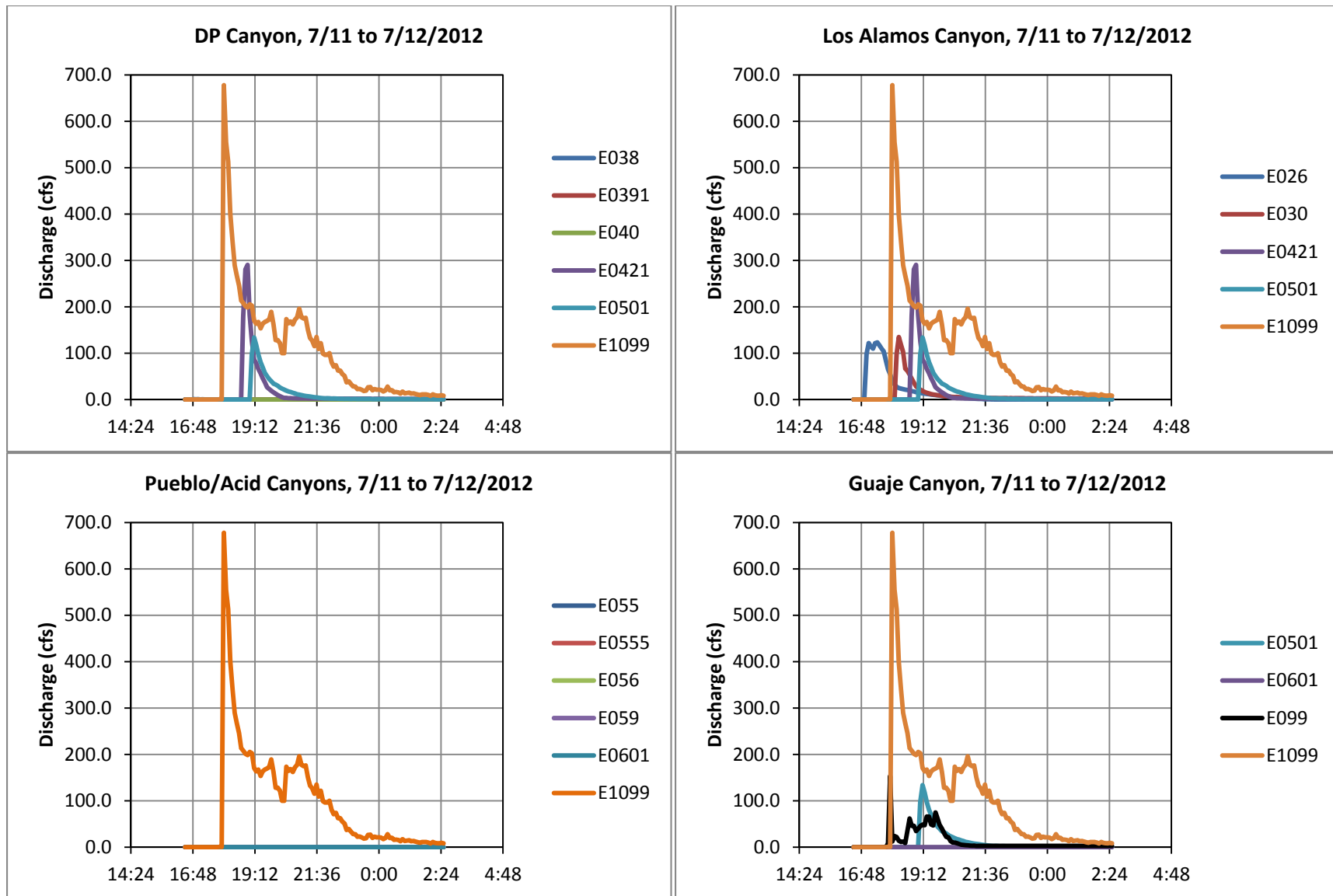


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

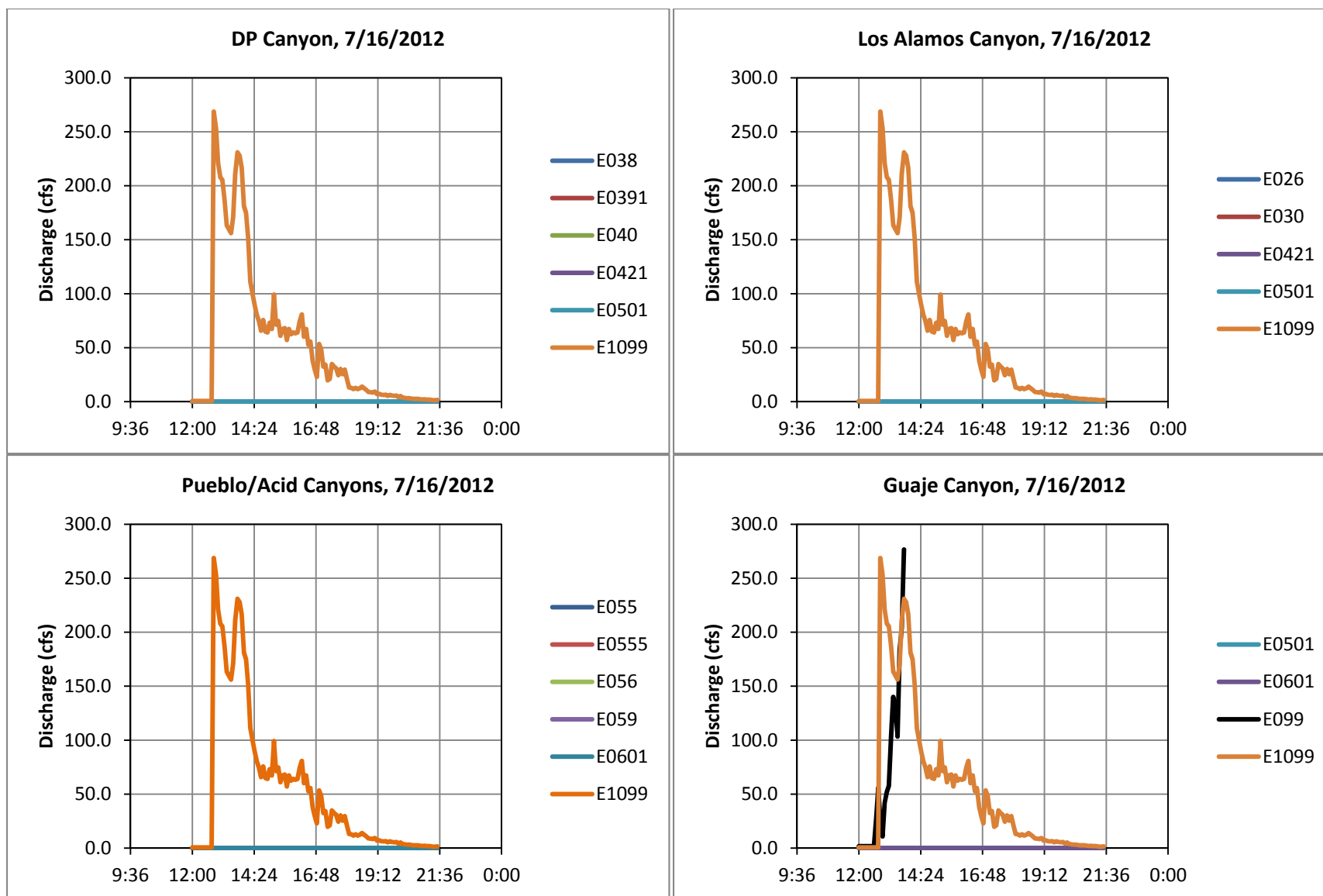


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

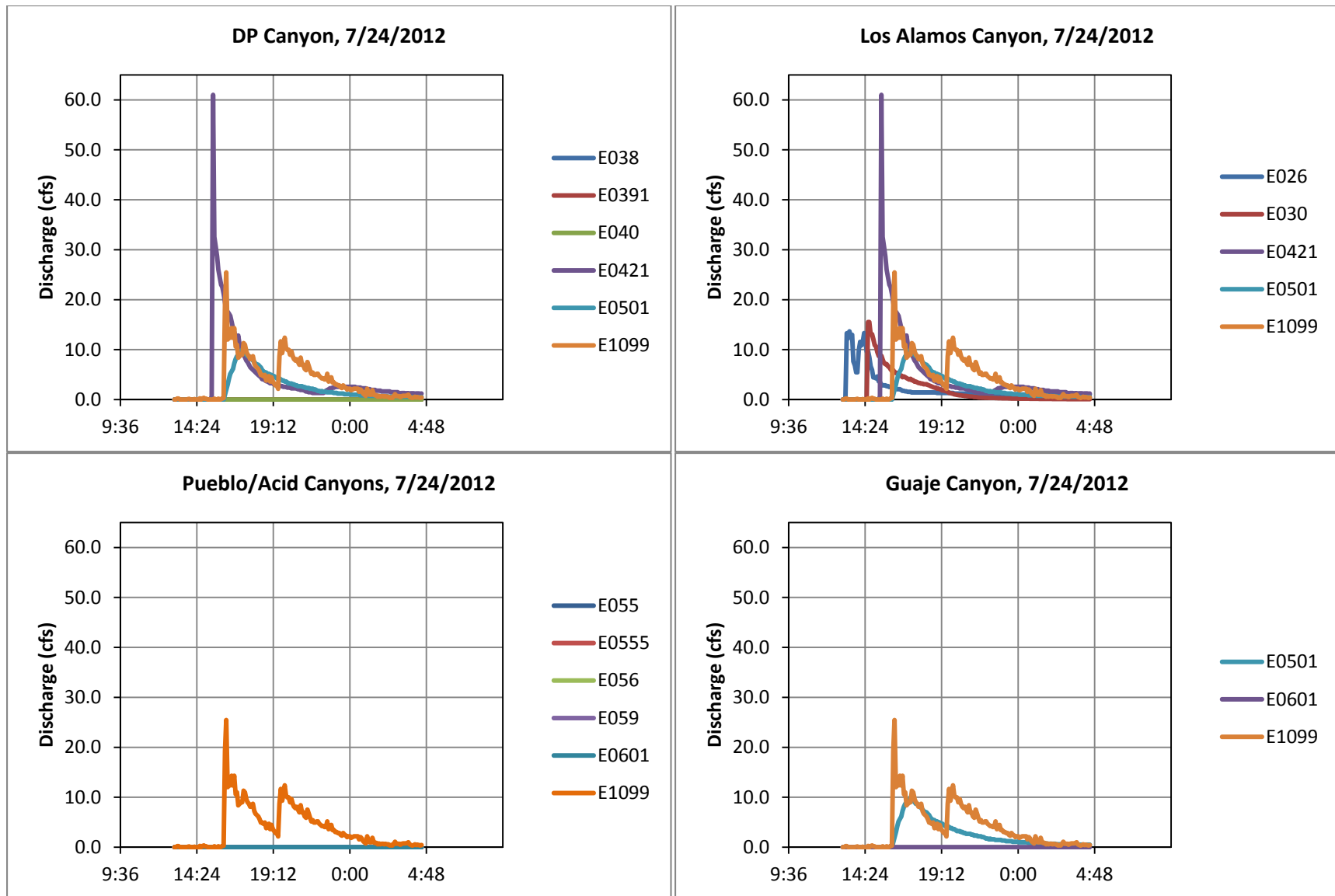


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

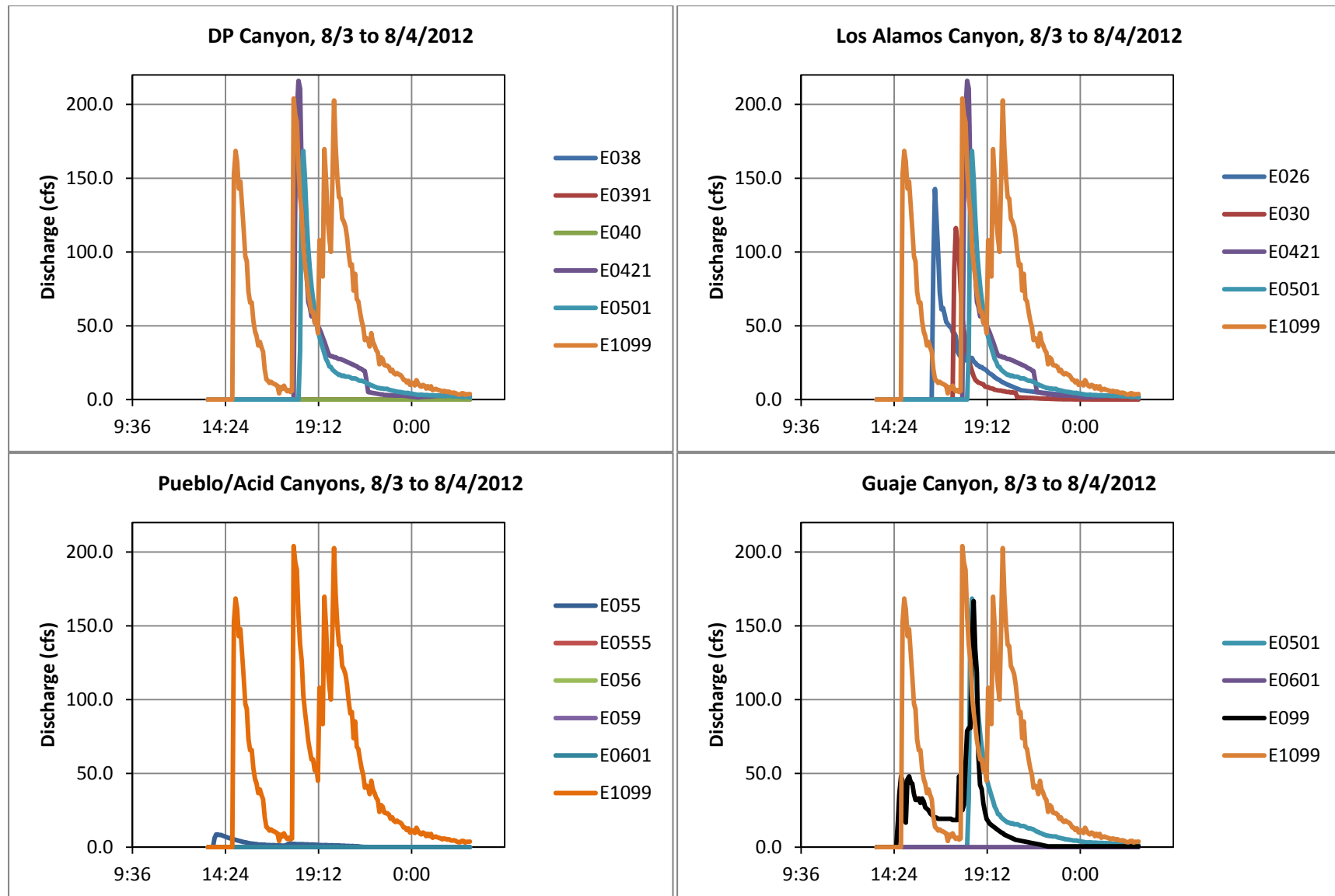


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

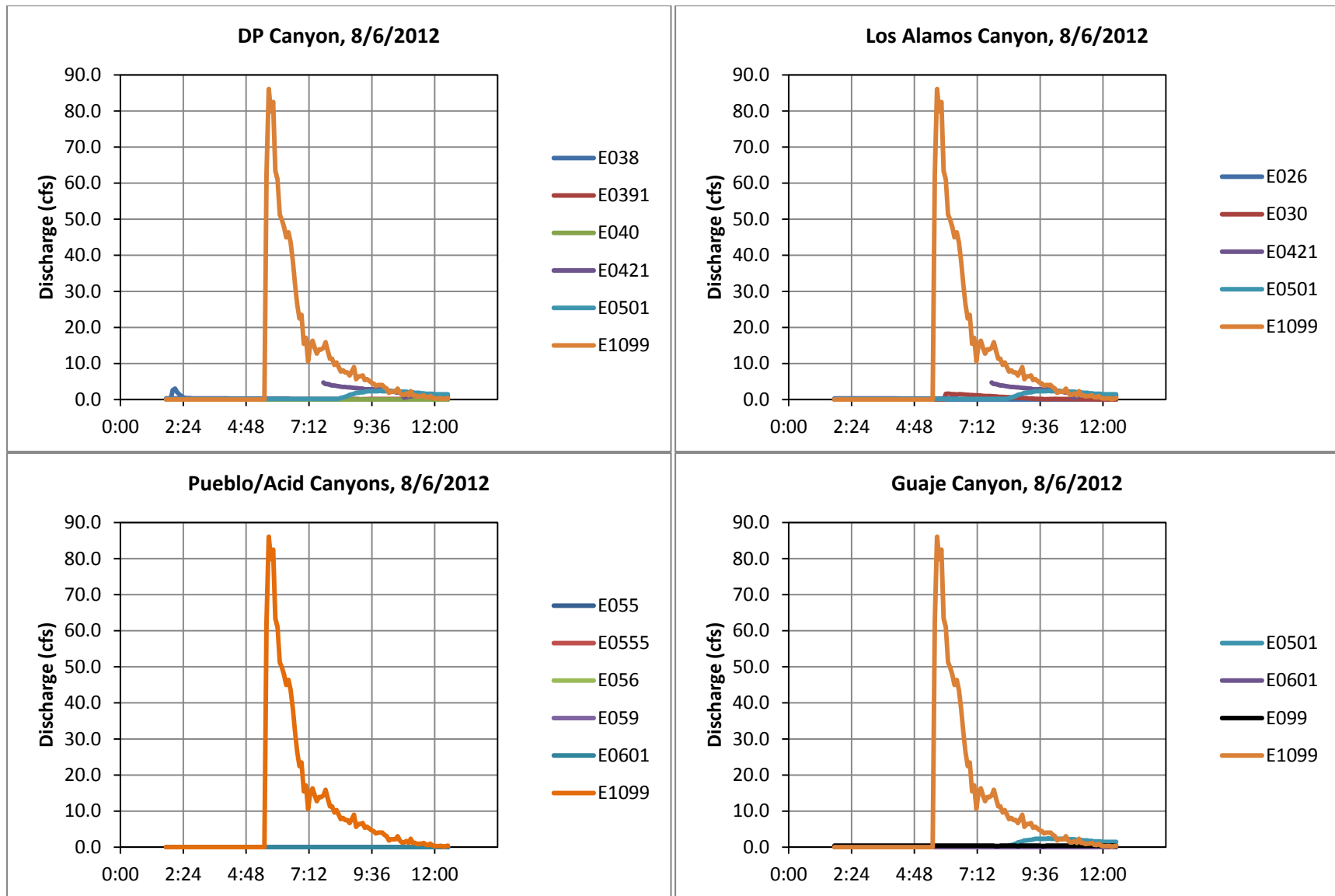


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

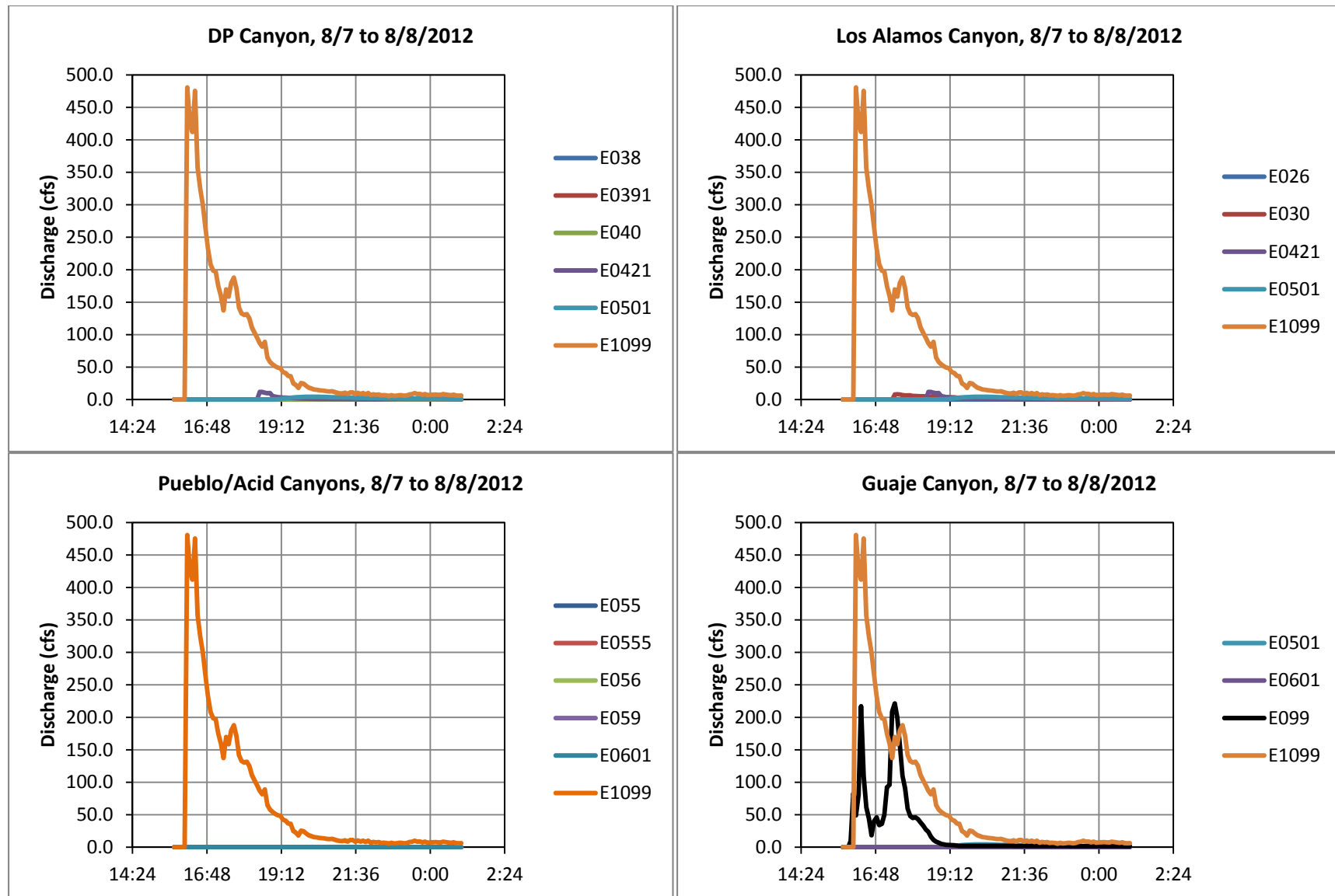


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

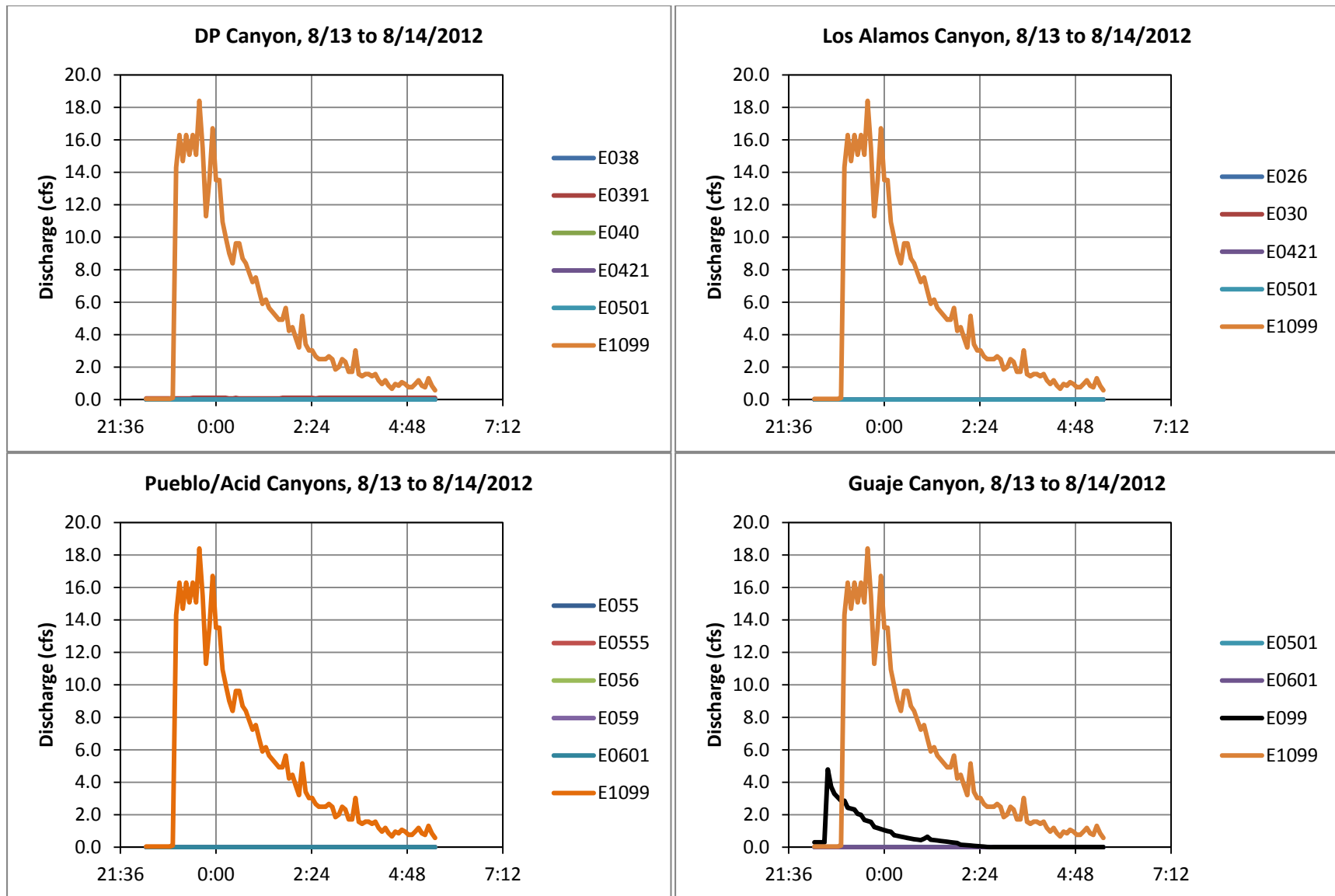


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

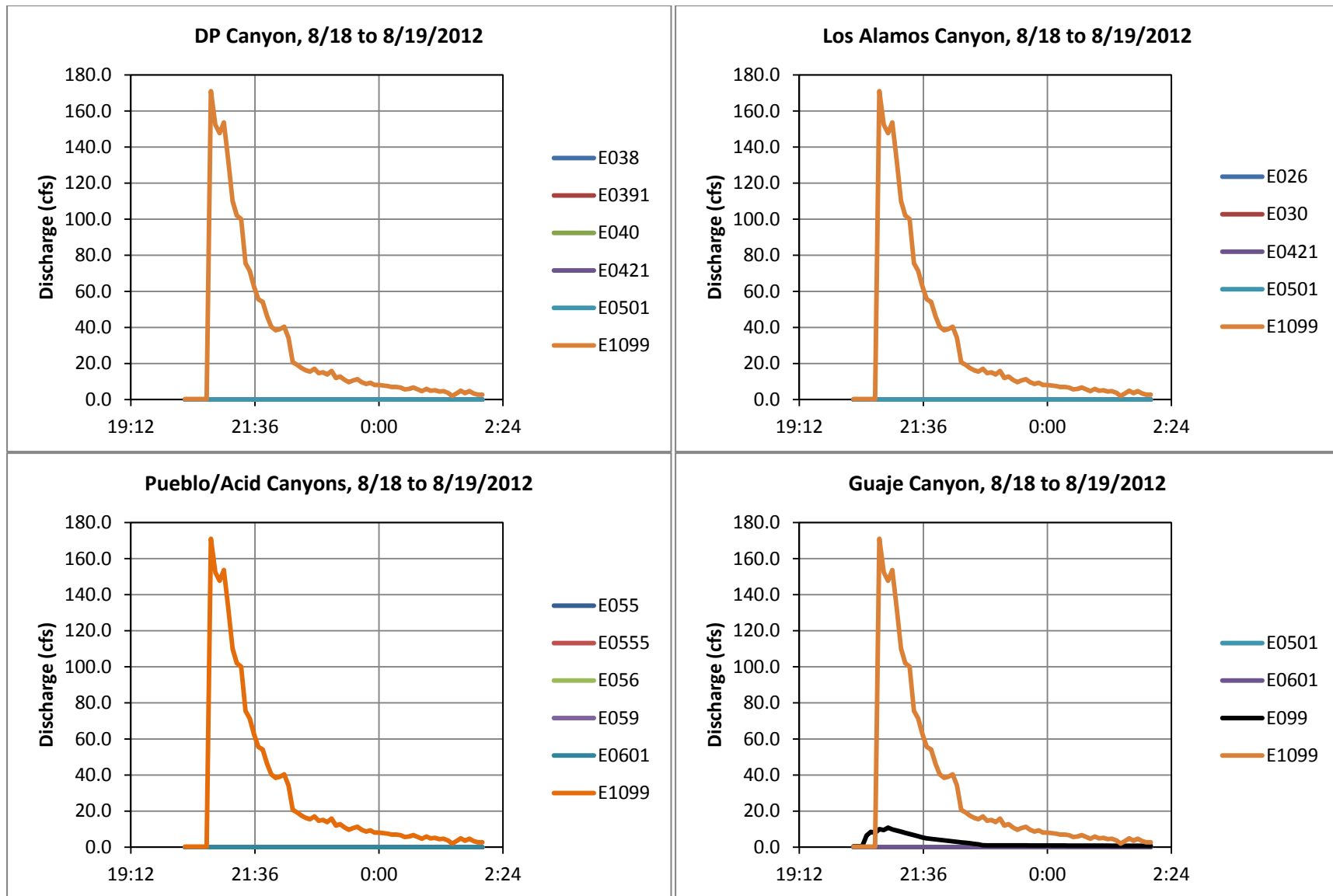


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

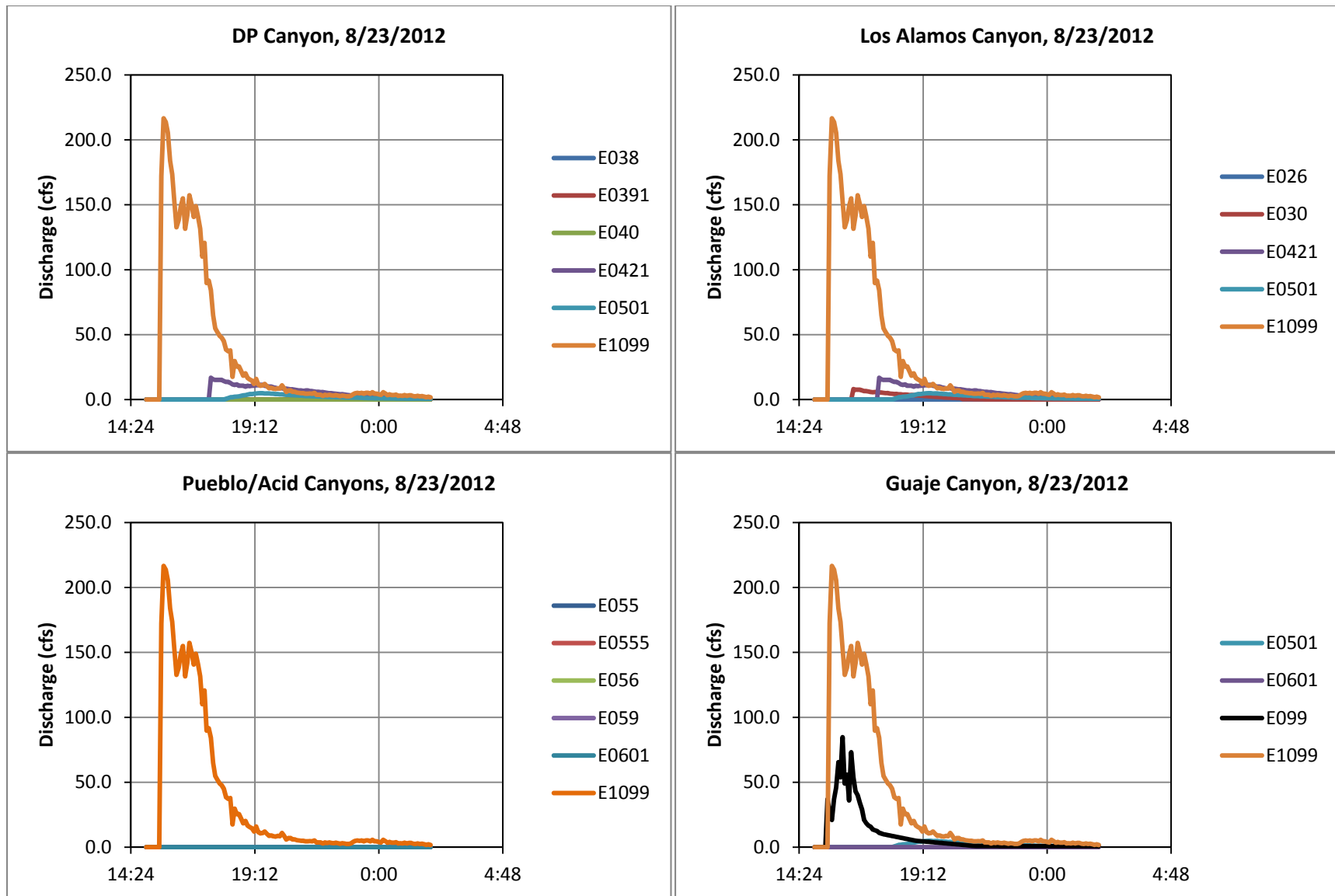


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

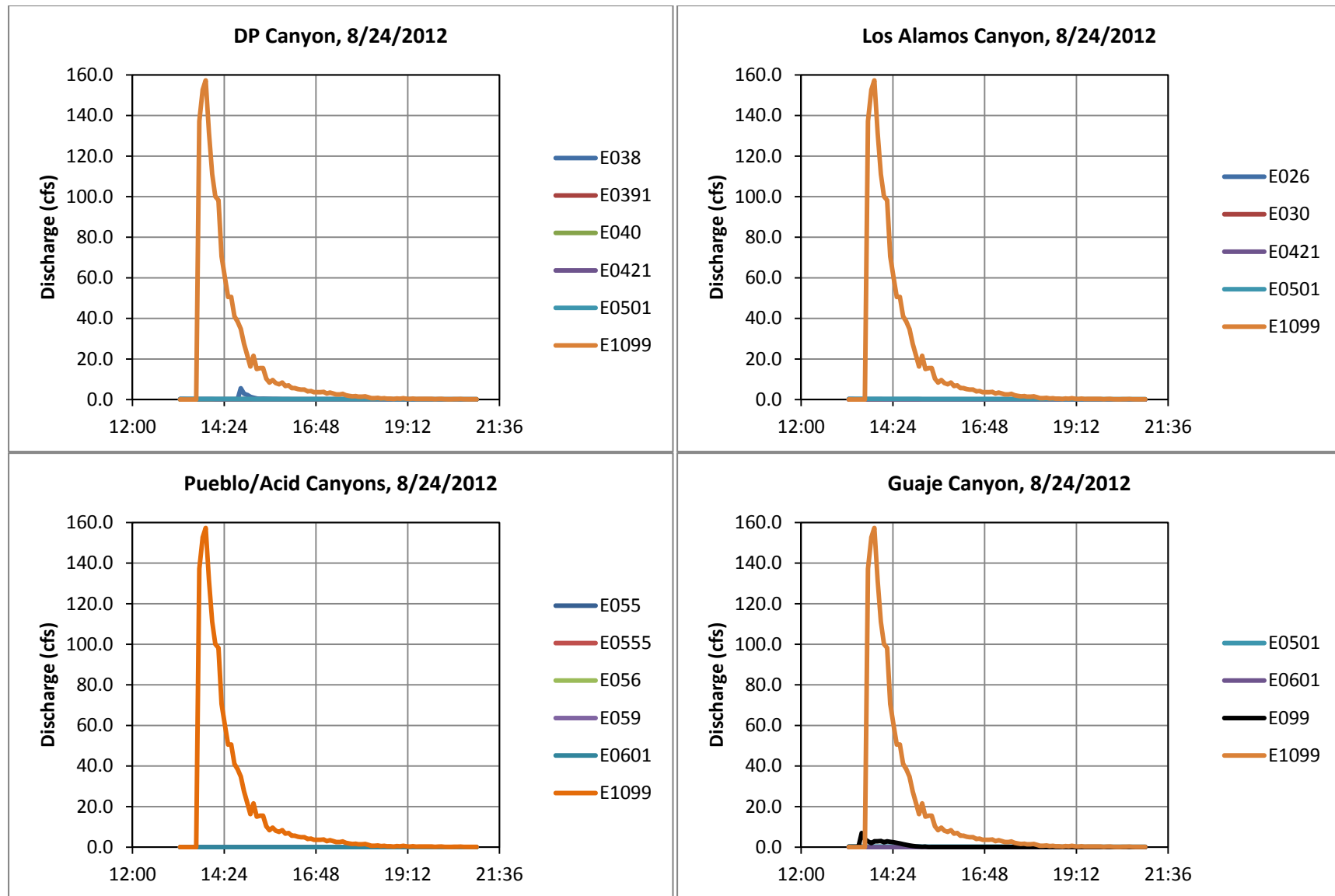


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

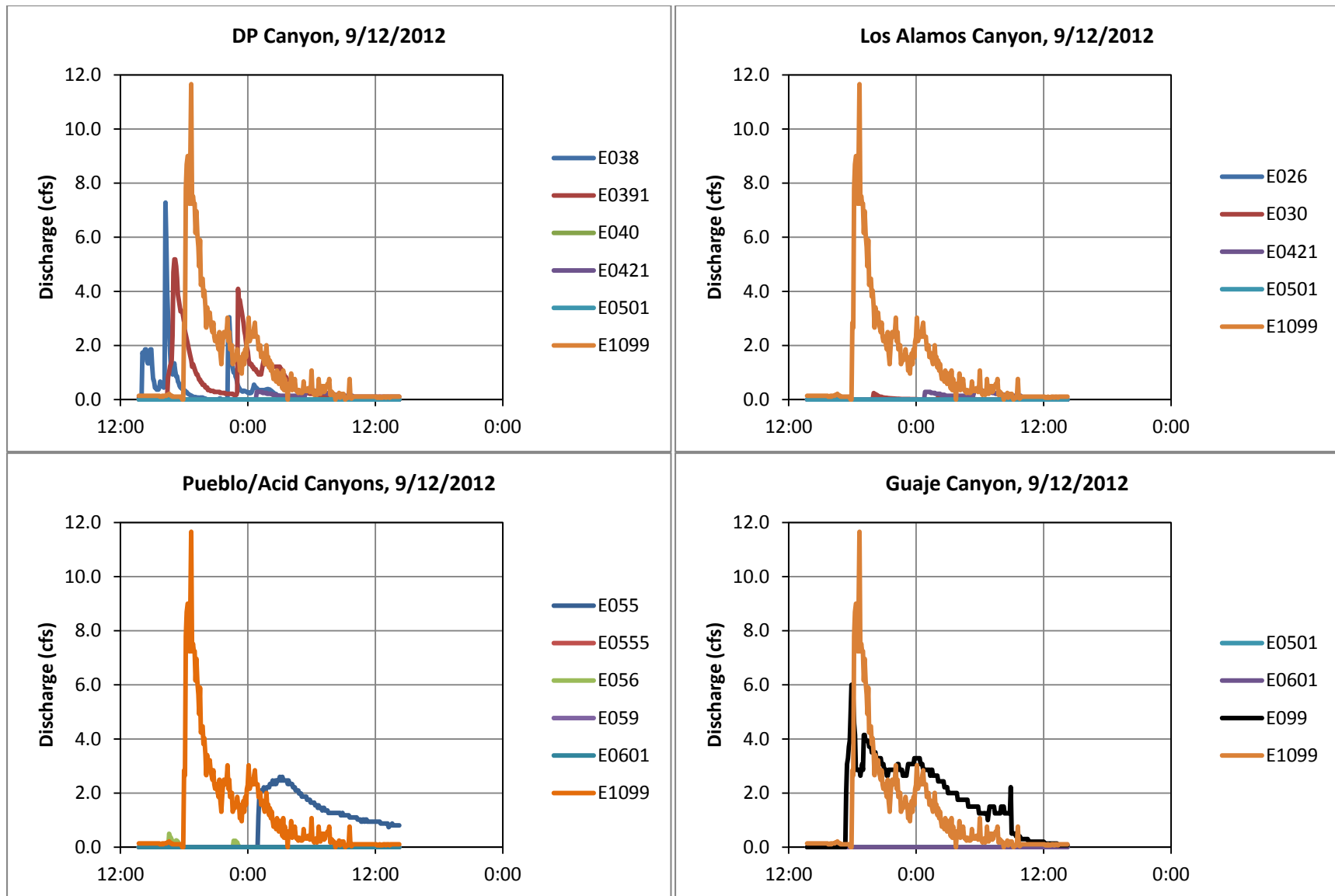


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

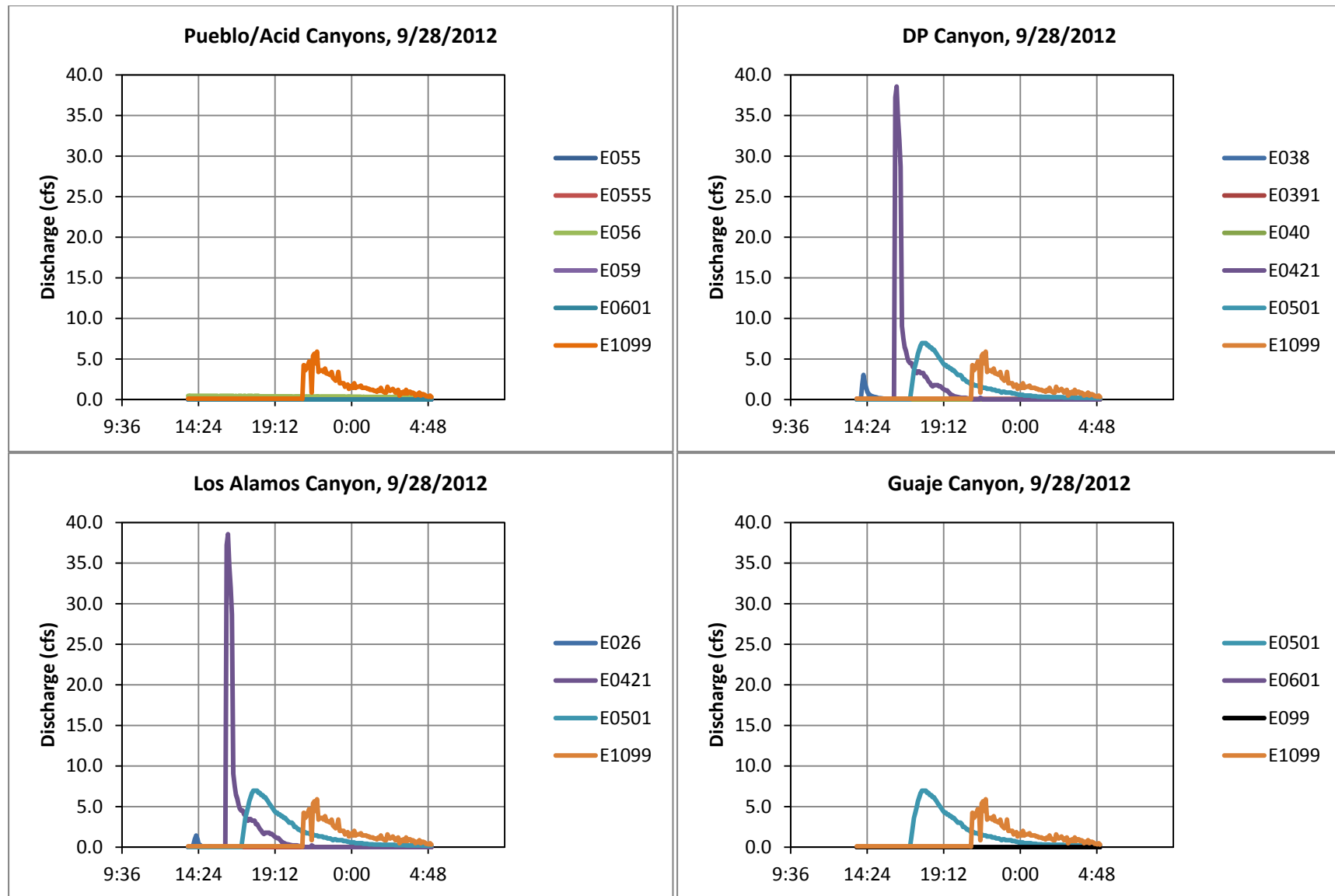


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

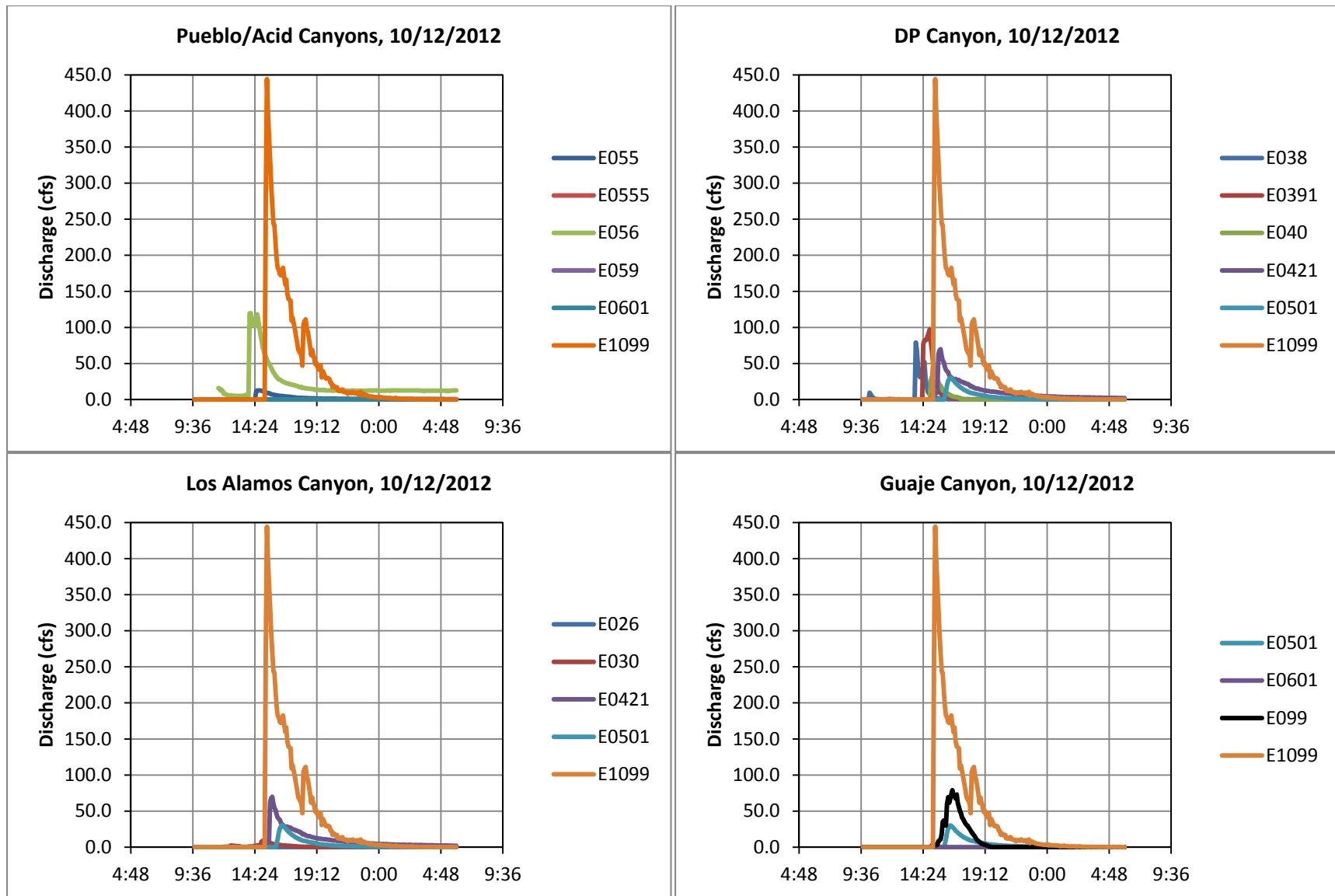


Figure 3.2-3 (continued) Hydrographs during each sample-triggering runoff event for each canyon from up- to downstream reaches

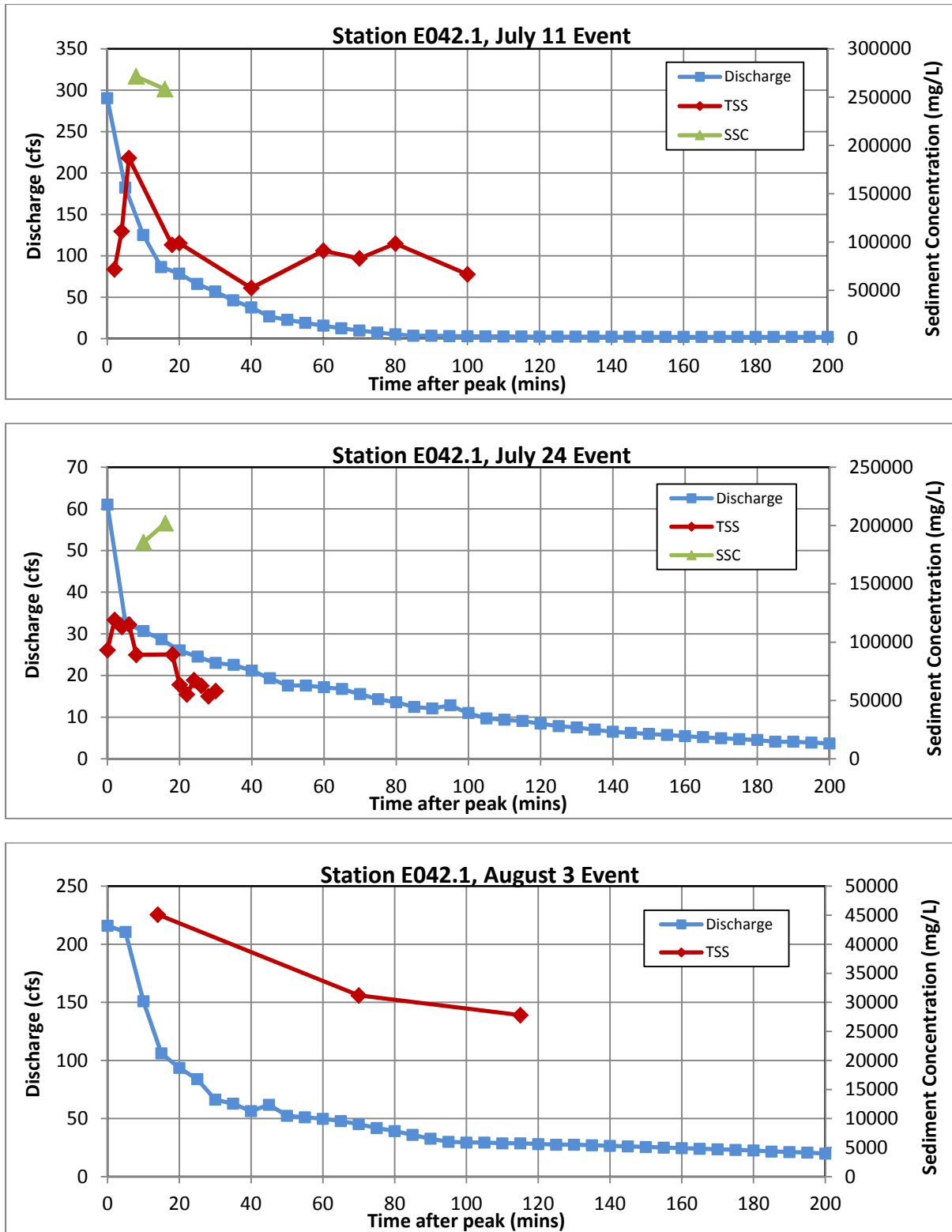


Figure 3.2-4 Discharge, TSS, and SSC for sampled events at E026, E038, E042.1, E050.1, E099, and E109.9

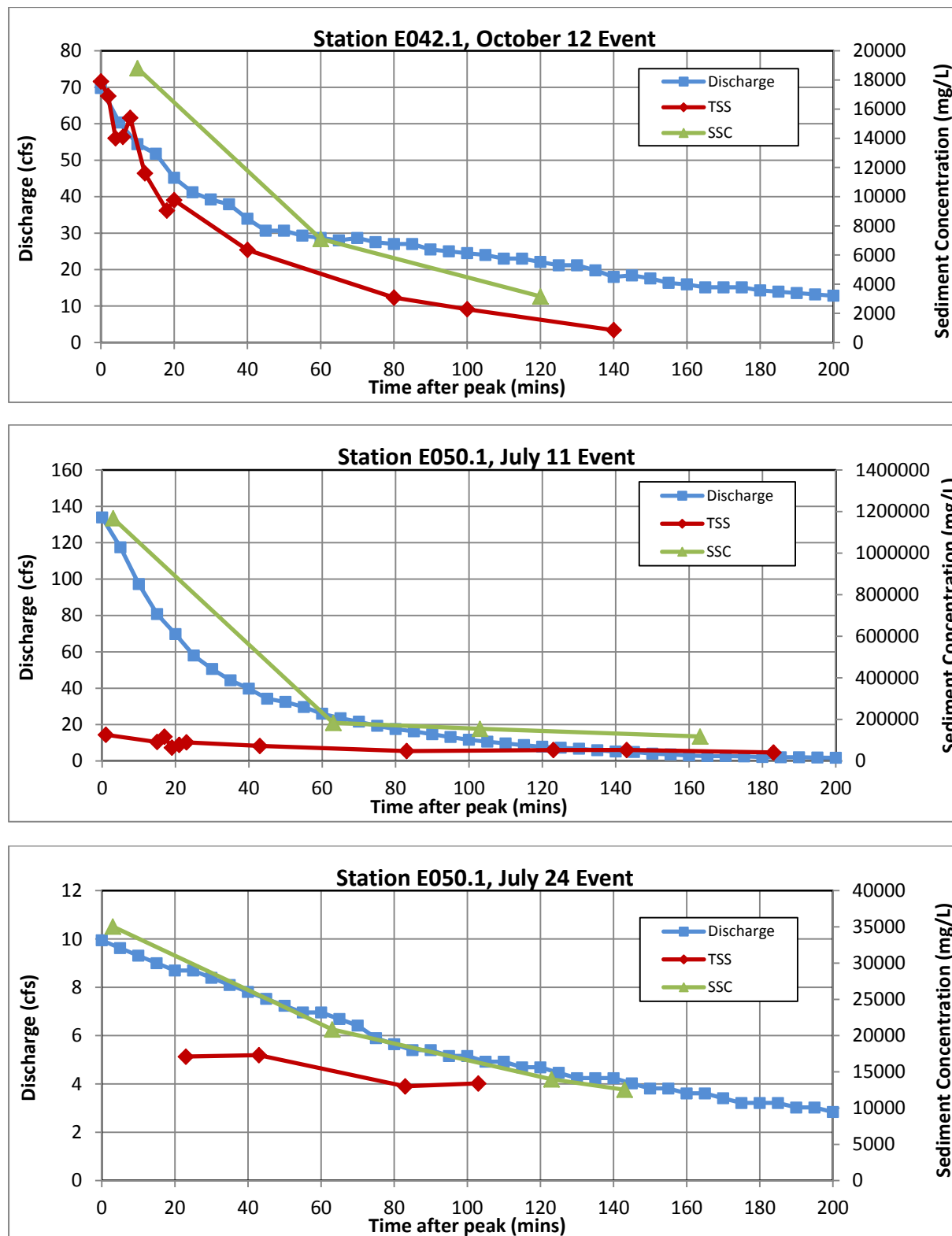


Figure 3.2-4 (continued) Discharge, TSS, and SSC for sampled events at E026, E038, E042.1, E050.1, E099, and E109.9

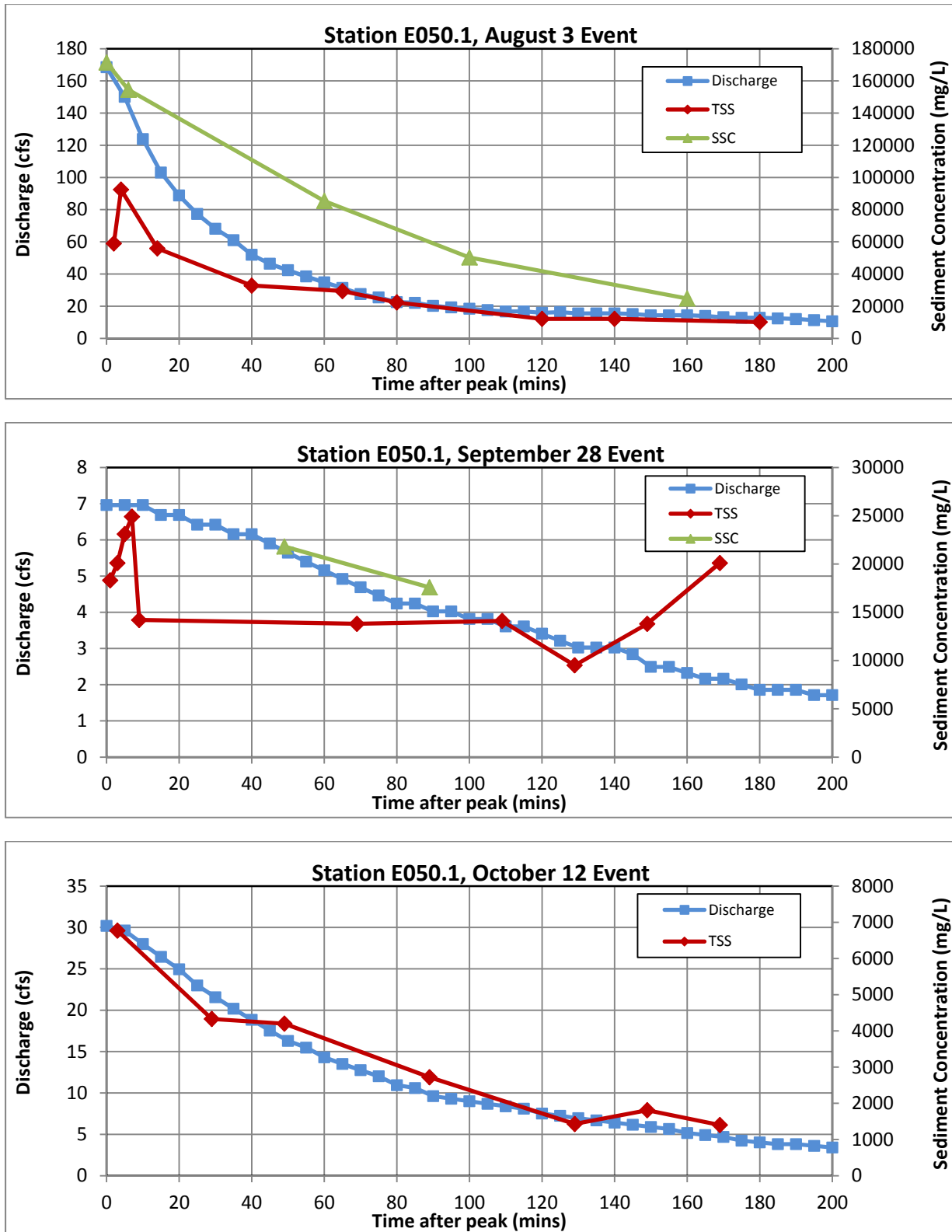


Figure 3.2-4 (continued) Discharge, TSS, and SSC for sampled events at E026, E038, E042.1, E050.1, E099, and E109.9

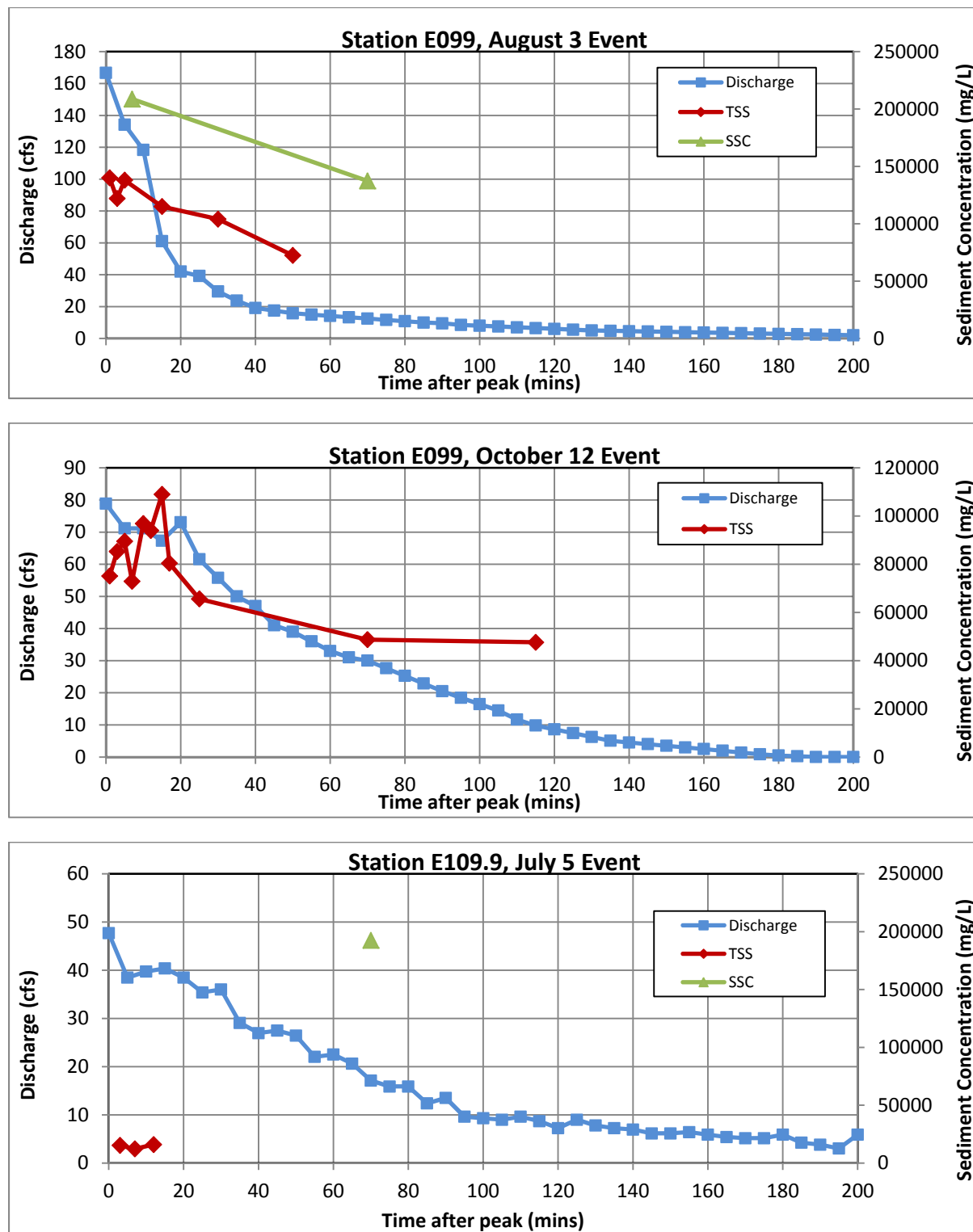


Figure 3.2-4 (continued) Discharge, TSS, and SSC for sampled events at E026, E038, E042.1, E050.1, E099, and E109.9

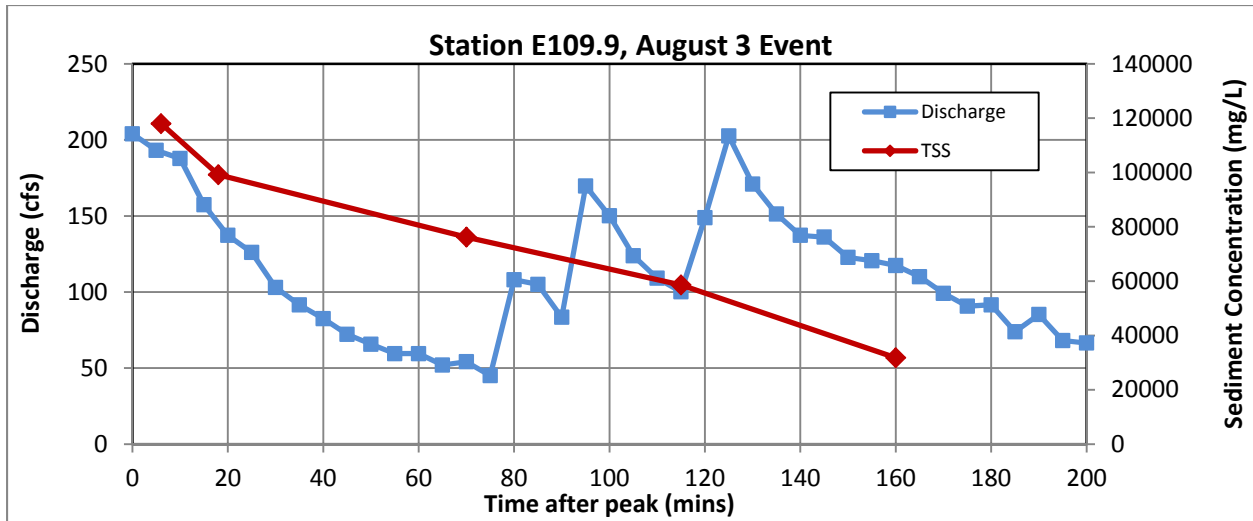


Figure 3.2-4 (continued) Discharge, TSS, and SSC for sampled events at E026, E038, E042.1, E050.1, E099, and E109.9

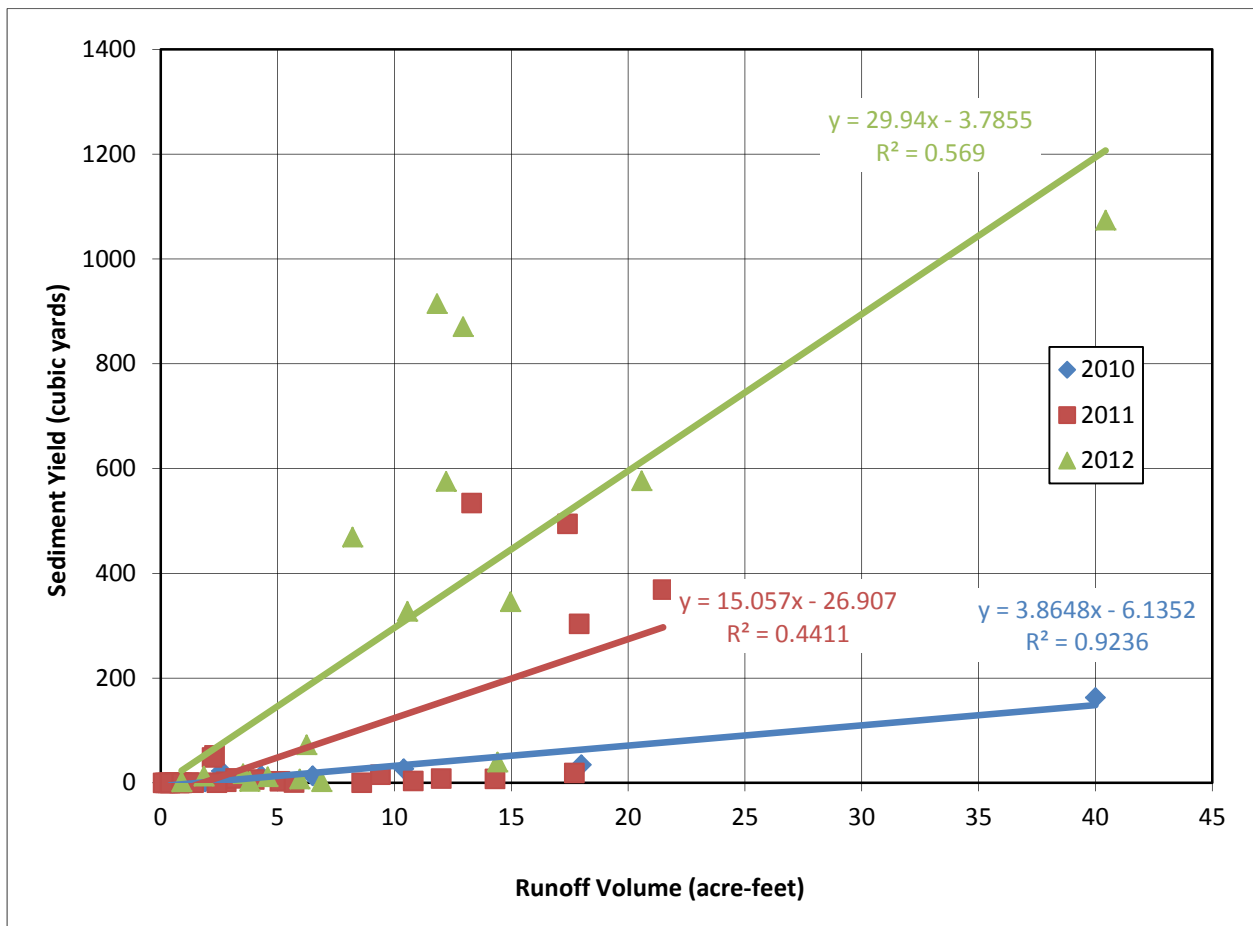


Figure 3.2-5 Relationship between sediment yield and runoff volume over the past 3 yr of monitoring

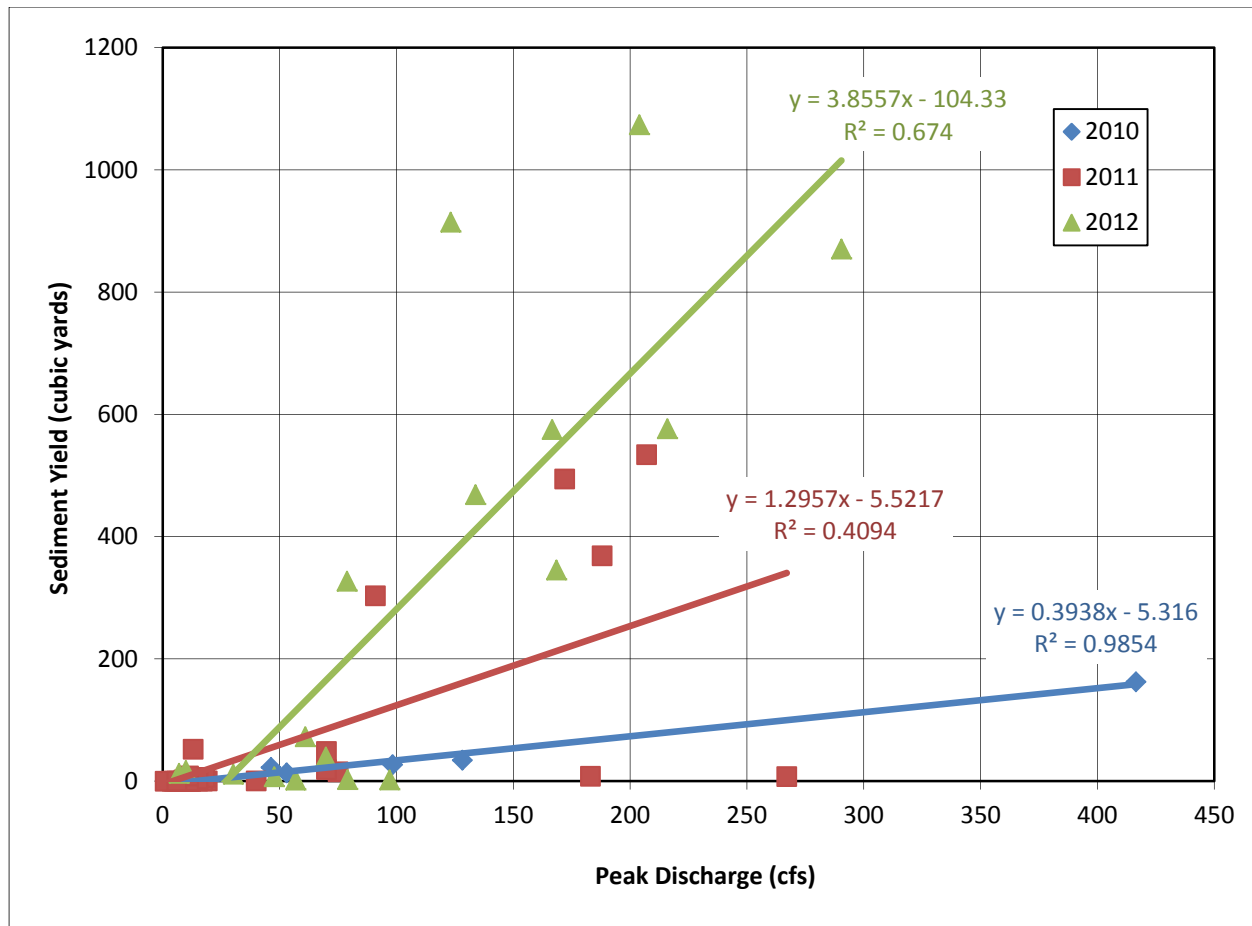


Figure 3.2-6 Relationship between sediment yield and peak discharge over the past 3 yr of monitoring

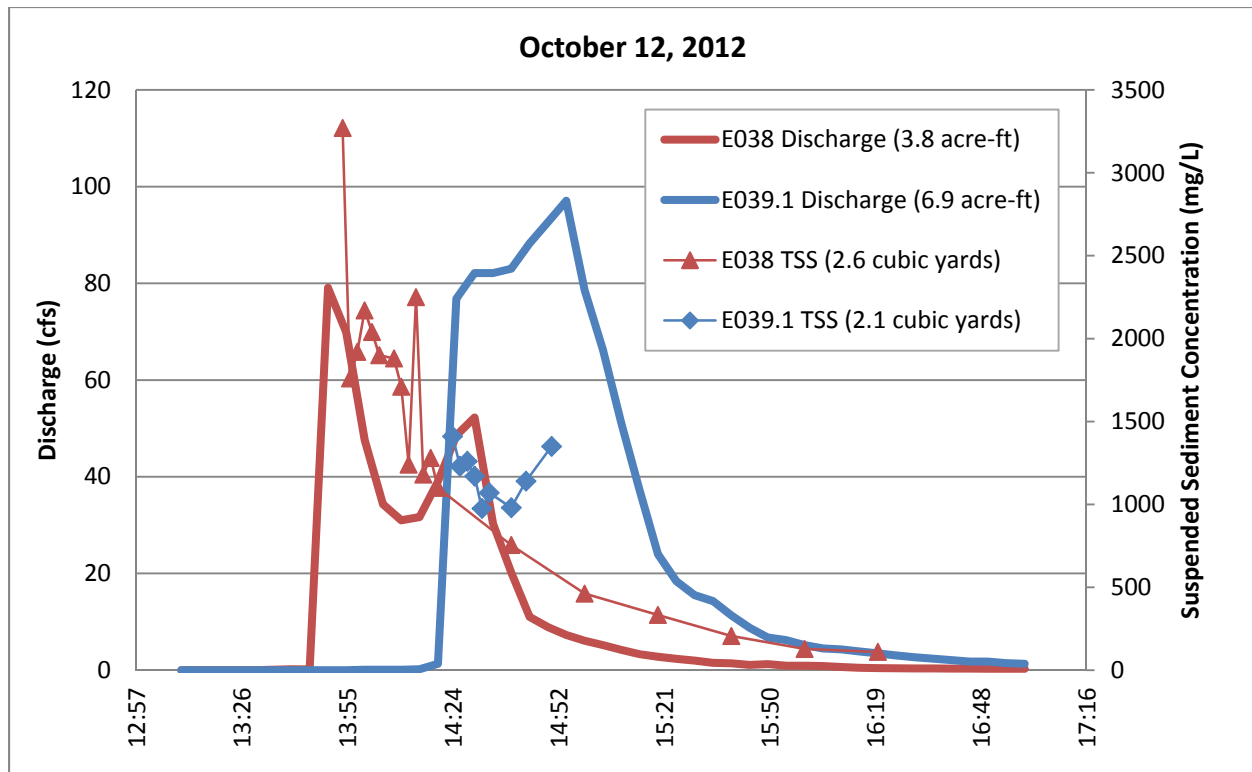


Figure 3.4-1 Discharge and TSS at E038 and E039.1 in DP Canyon on days when sampling of the same runoff event occurred

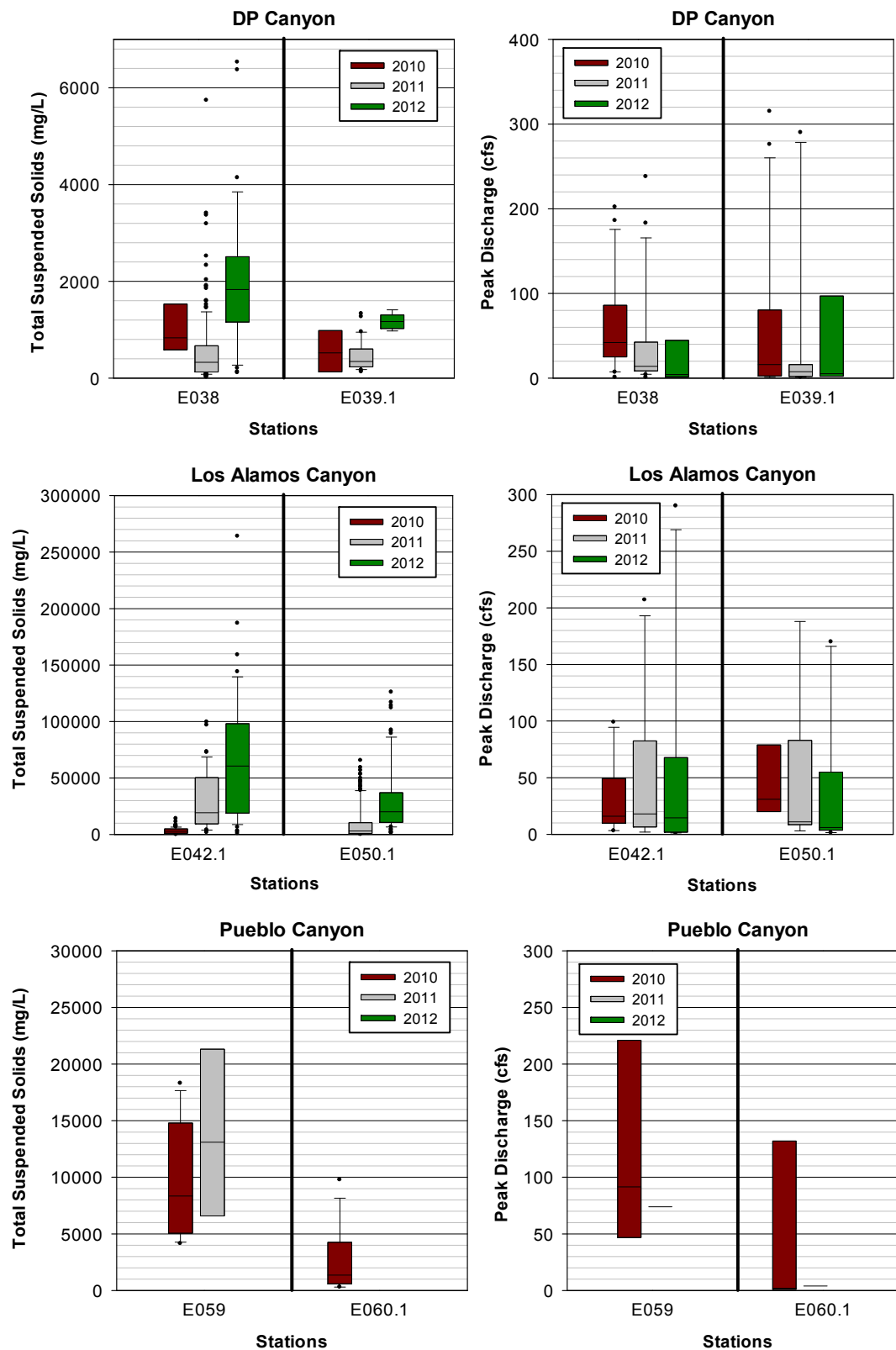


Figure 3.4-2 Box and whisker plots of TSS (left) and peak discharge (right) upstream and downstream of the watershed mitigations in DP (top), Los Alamos (middle), and Pueblo (bottom) Canyons over the past 3 yr of monitoring

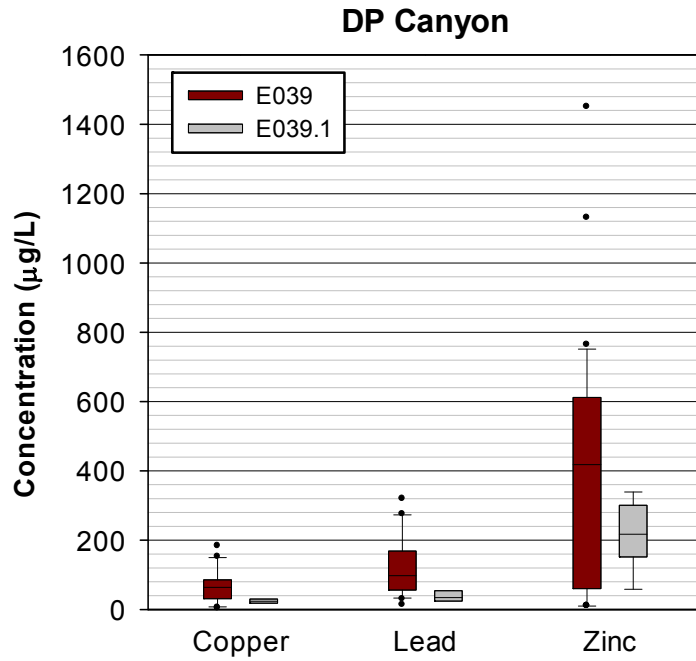


Figure 3.4-3 Box and whisker plots of selected metal concentrations from decommissioned station E039 and replacement station E039.1 in DP Canyon

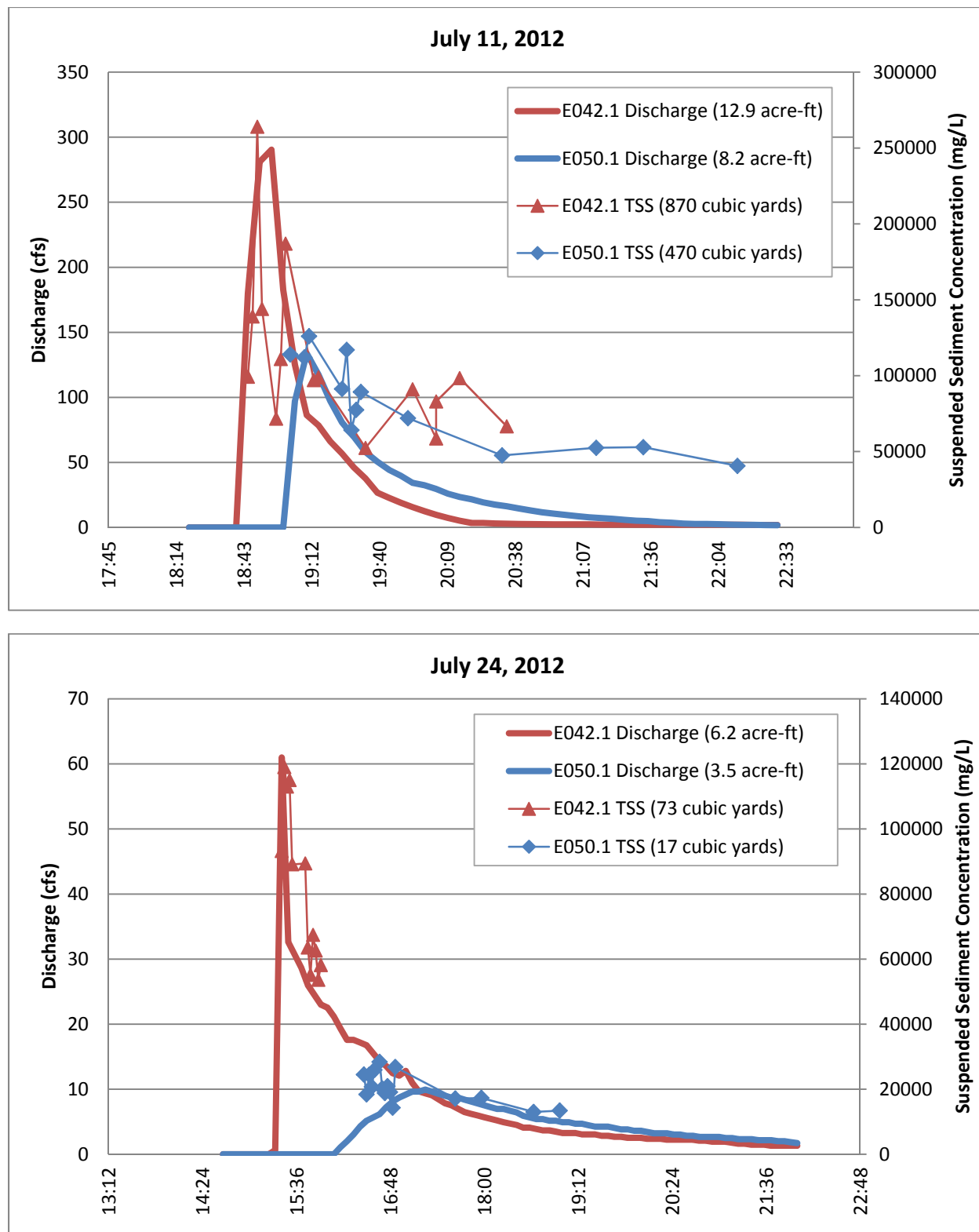


Figure 3.4-4 Discharge and TSS at E042.1 and E050.1 in upper Los Alamos Canyon on days when sampling of the same runoff event occurred

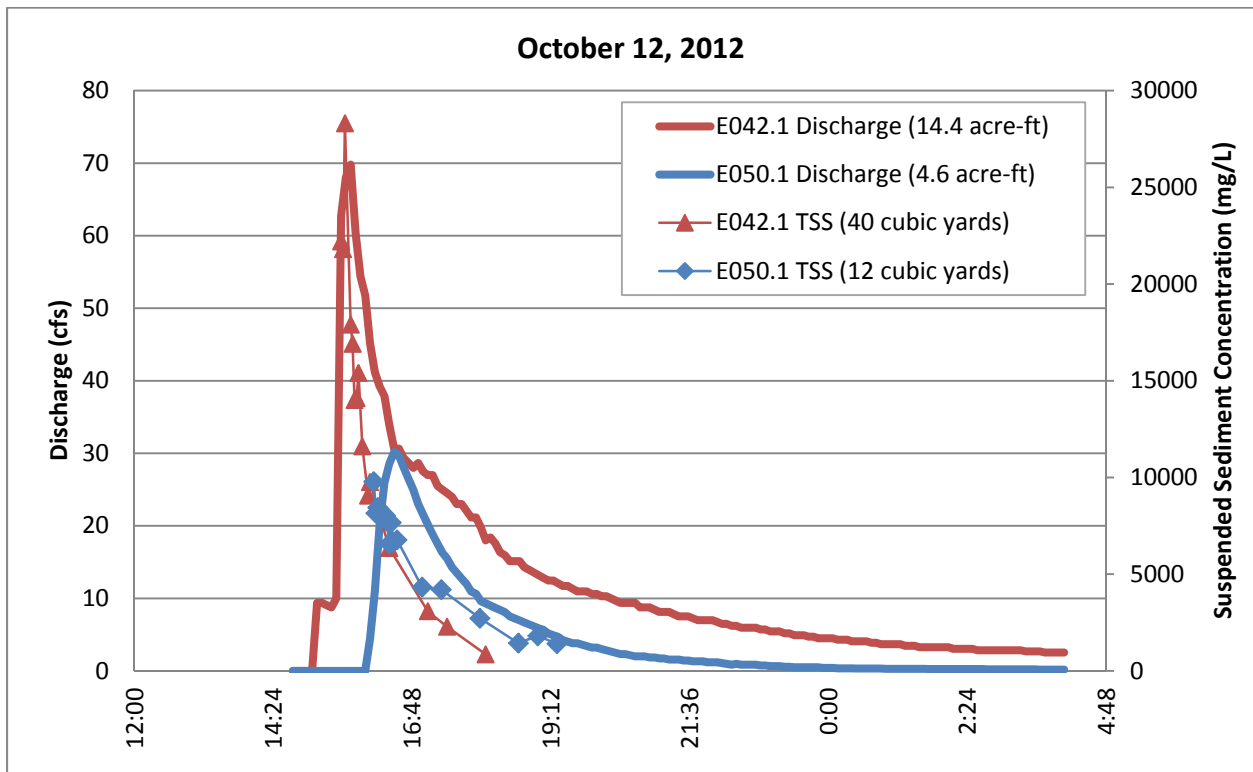
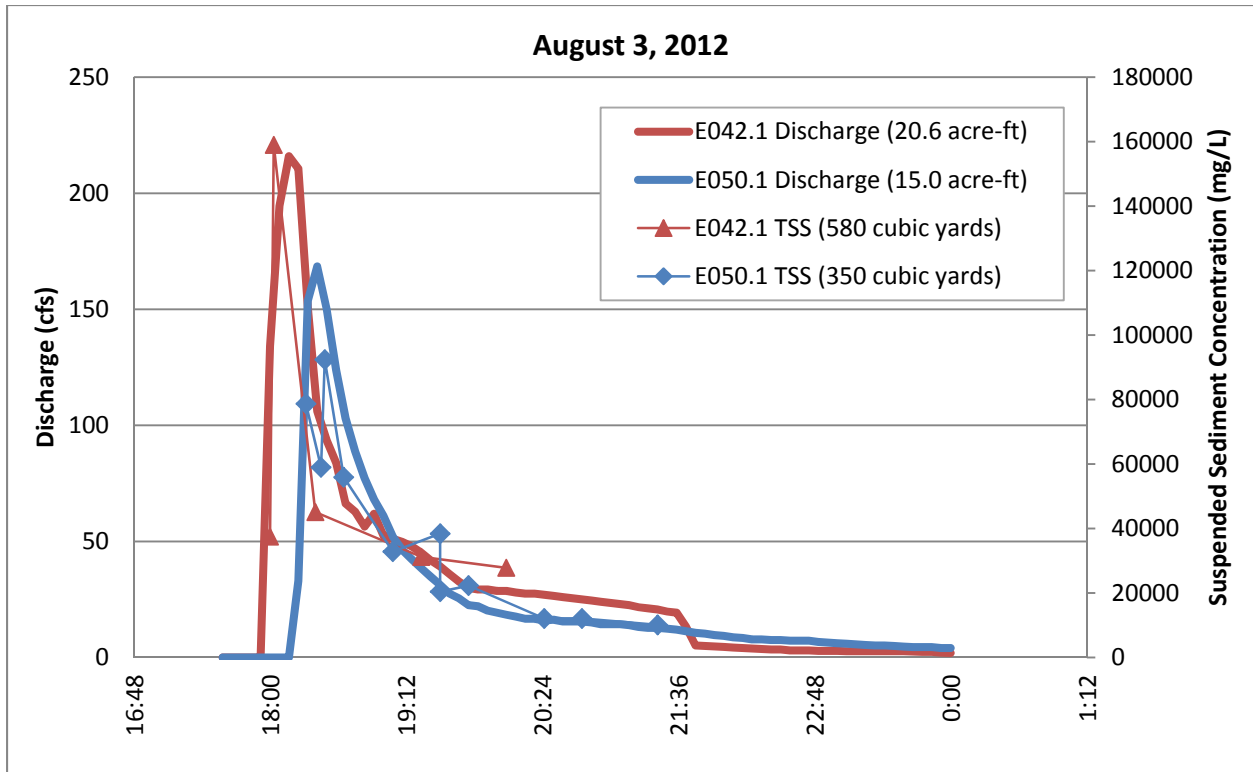


Figure 3.4-4 (continued) Discharge and TSS at E042.1 and E050.1 in upper Los Alamos Canyon on days when sampling of the same event occurred

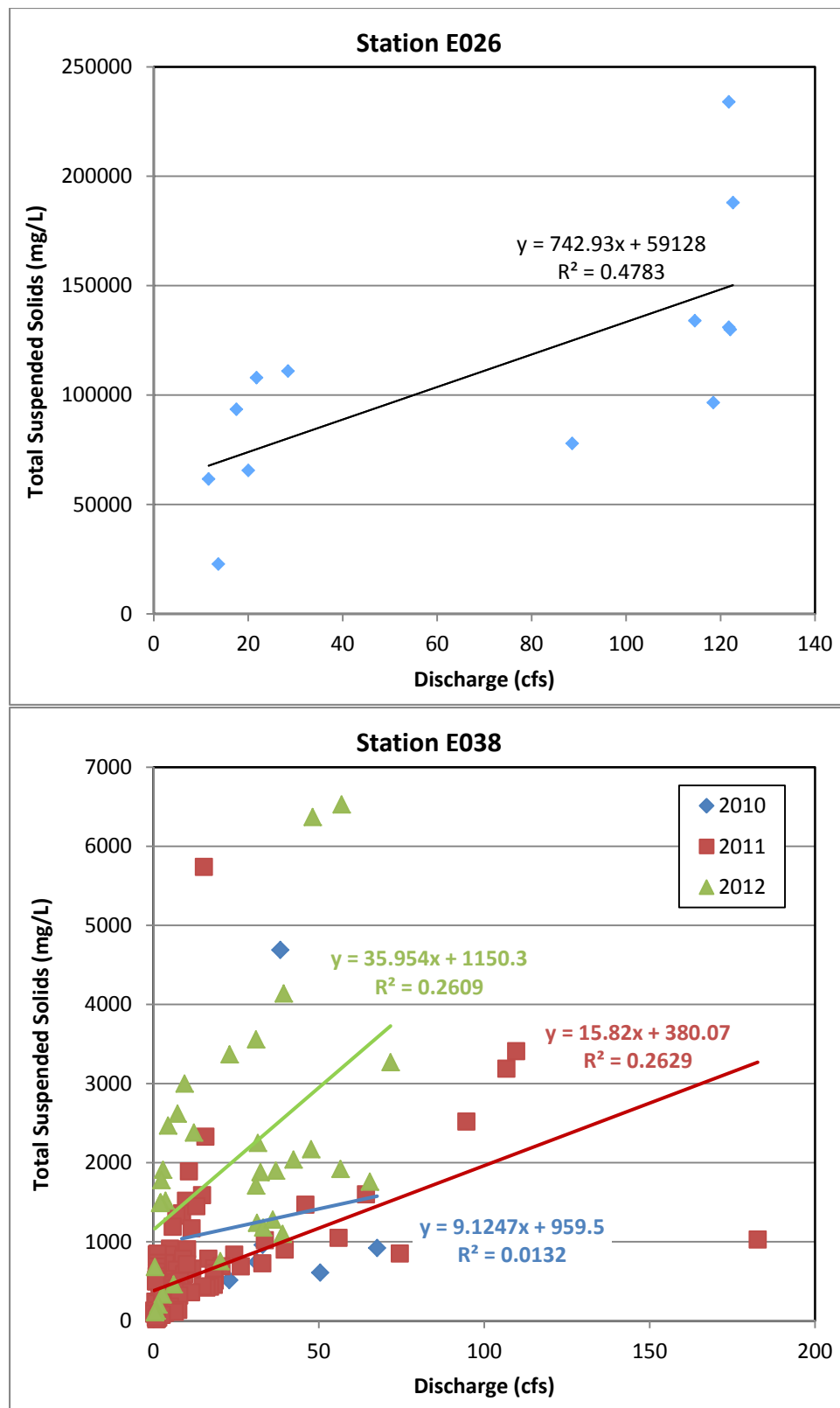


Figure 4.3-1 TSS concentration vs. discharge for each station over the past 3 yr of monitoring (there is no legend if only 1 yr of data is available)

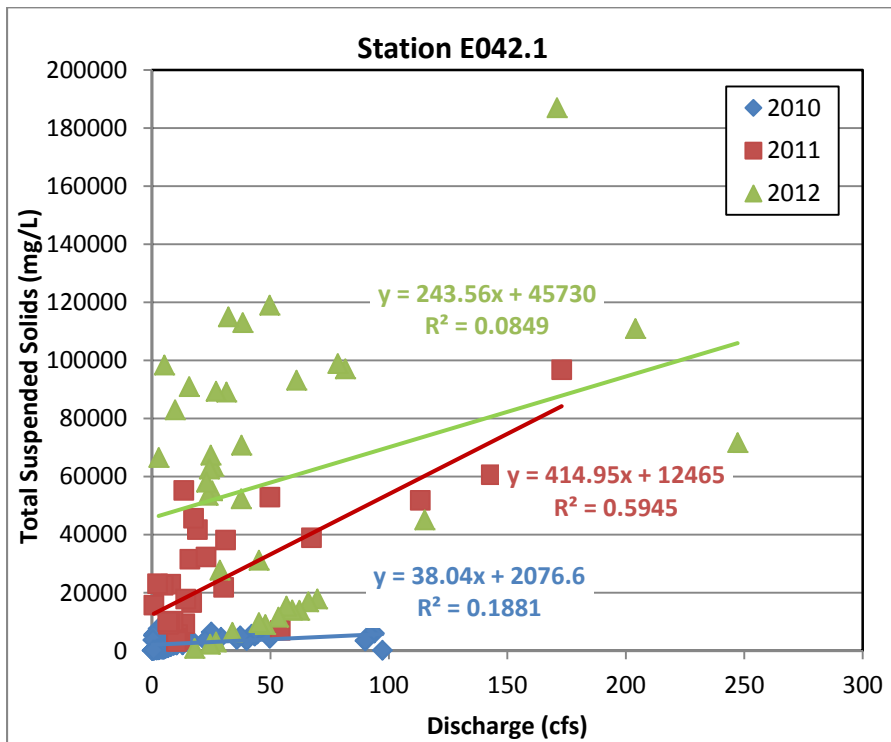
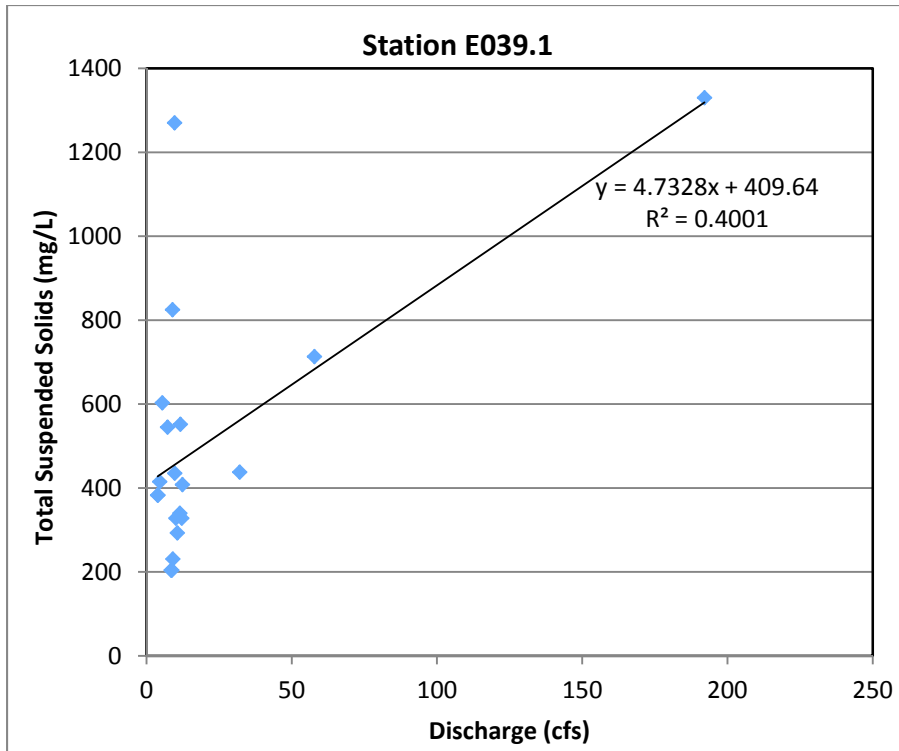


Figure 4.3-1 (continued) Total suspended solids concentration vs. discharge for each station over the past three years of monitoring (there is no legend if only 1 yr of data is available)

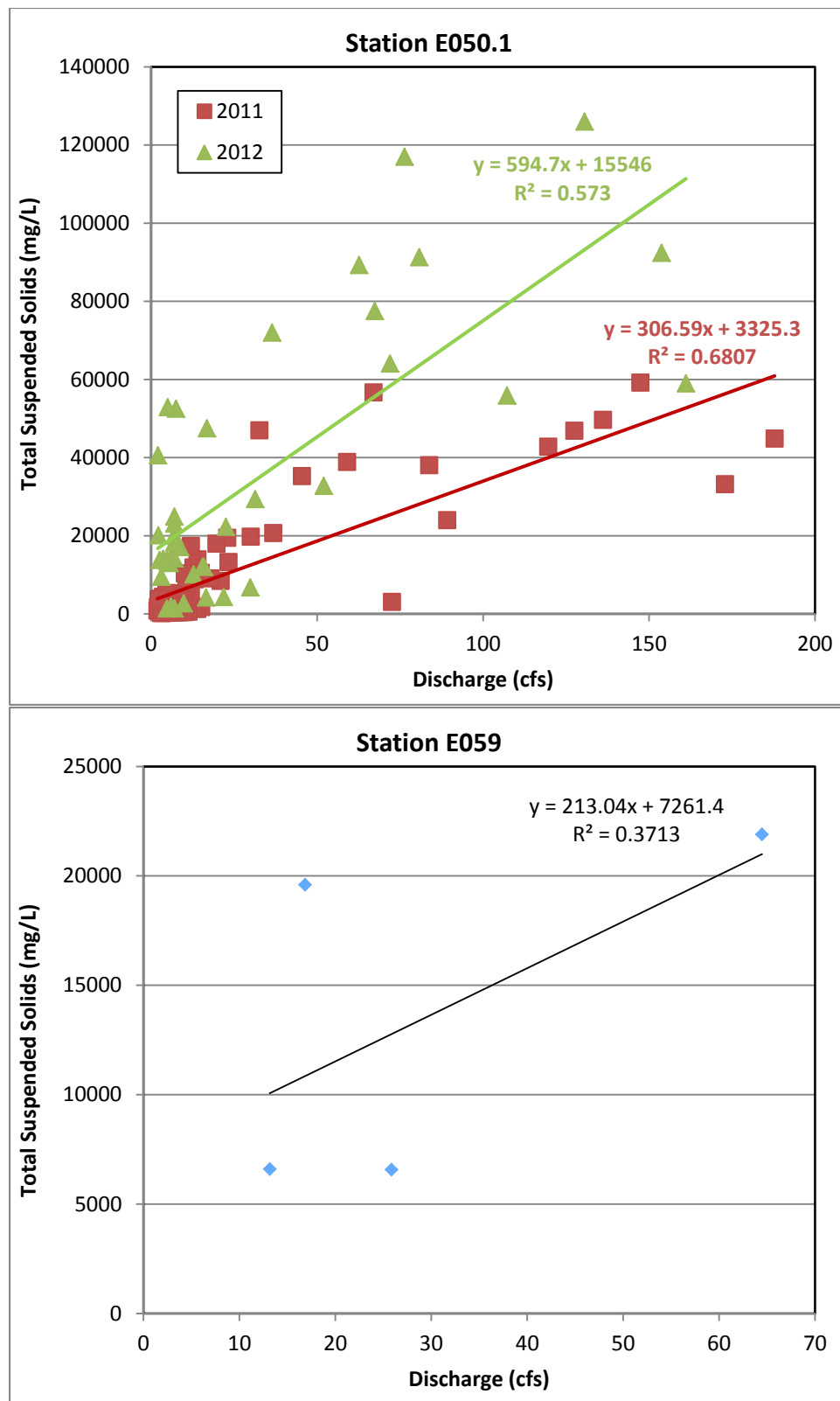


Figure 4.3-1 (continued) Total suspended solids concentration vs. discharge for each station over the past 3 yr of monitoring (there is no legend if only 1 yr of data is available)

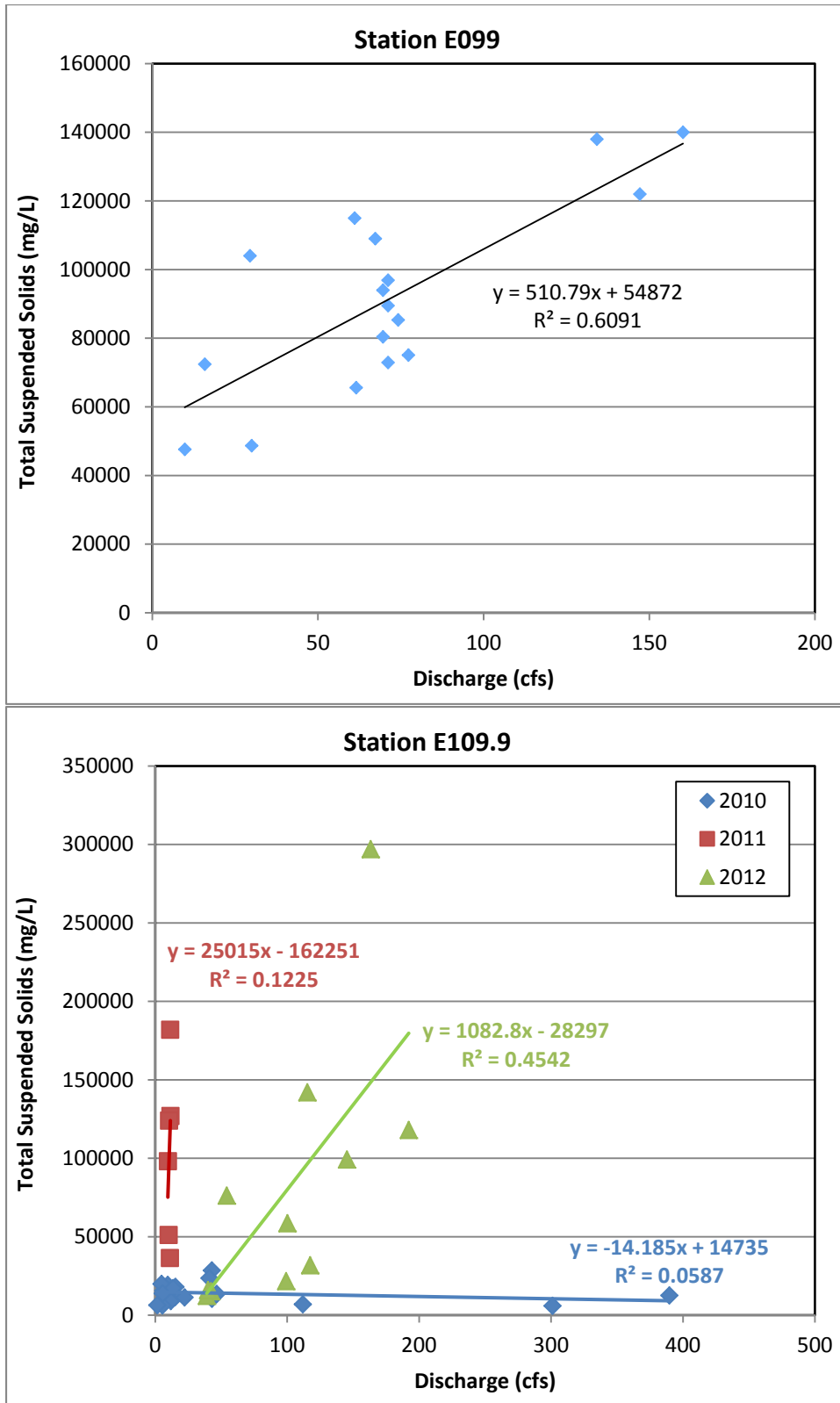


Figure 4.3-1 (continued) Total suspended solids concentration vs. discharge for each station over the past 3 yr of monitoring (there is no legend if only 1 yr of data is available)

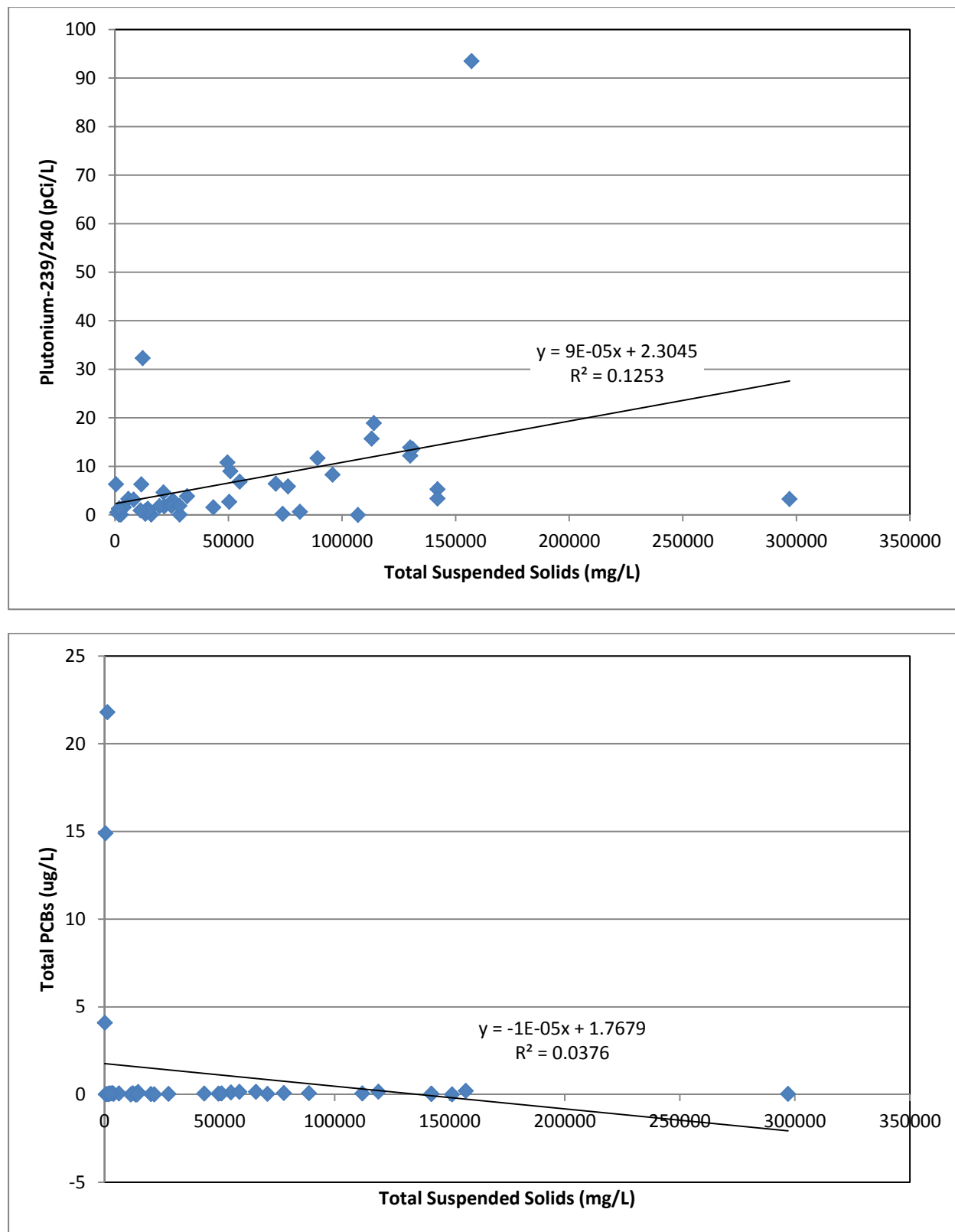


Figure 4.3-2 Relationship of plutonium-239/240 and total PCBs to TSS in the LA/P watershed in 2012

Table 2.1-1
Station Configuration at LA/P Gages

Gage	Stage Measurement Device	Communication Method with Gage Datalogger	Sampler Trip Level (Aboveground)	Sampler Intake Level (Aboveground)
E026	Encoder	Radio telemetry	1.3 ft	4 in.
E030	Encoder	Radio telemetry	1.54 ft	4 in.
E038	Bubbler	Radio telemetry	0.7 ft	4 in.
E039.1	Encoder	Radio telemetry	0.58 ft	4 in.
E040	Probe	Radio telemetry	2.73 ft	4 in.
E042.1	Encoder	Radio telemetry	0.58 ft	4 in.
E050.1	Encoder/bubbler	Radio telemetry	0.4 ft	2.4 in.
E055	Bubbler	Radio telemetry	1.21 ft	4 in.
E055.5	Bubbler	Radio telemetry	0.75 ft	4 in.
E056	Bubbler	Radio telemetry	1.39 ft	4 in.
E059	Encoder	Radio telemetry	0.58 ft	4 in.
E060.1	Encoder/bubbler	Radio telemetry	0.4 ft	2.4 in.
E099	Encoder	Radio telemetry	0.9 ft	6 in.
E109.9	Encoder/bubbler/probe	Radio telemetry	0.4 ft	2.4 in.

Table 2.3-1

Maximum Daily Discharge and Storm Water Sampling in the LA/P Watershed during 2012

Date	Los Alamos Canyon Discharge (cfs)									Pueblo and Acid Canyon Discharge (cfs)				
	DP Canyon			Los Alamos Canyon						Acid Canyon		Pueblo Canyon		
	E038	E039.1	E040	E026	E030	E042.1	E050.1	E099 ^a	E109.9	E055.5	E056	E055	E059	E060.1
7/5/2012	0 NS ^{b,c}	0 NS	0 NS	0 NS	0 NS	0 NS	0 NS	3.7 NS ^d	48 S ^e	0 NS	0 NS	0 NS	0 NS	0 NS
7/7/2012	57 S	<1 NS	0 NS	0 NS	0 NS	0 NS	0 NS	0 NS	<1 NS	0 NS	0 NS	0 NS	0 NS	0 NS
7/11/2012	1.2 NS	<1 NS	0 NS	110 S	130 S	290 S	130 S	150 S	680 S	0 NS	0 NS	0 NS	0 NS	0 NS
7/16/2012	0 NS	<1 NS	0 NS	<1 NS	0 NS	0 NS	<1 NS	280 NS	270 NS	0 NS	0 NS	0 NS	0 NS	0 NS
7/24/2012	0 NS	0 NS	0 NS	14 NS ^f	16 S	61 S	9.9 S	na ^g NS	25 S	0 NS	0 NS	0 NS	0 NS	0 NS
8/3/2012	1.2 NS	2.1 NS	0 NS	130 S	120 S	220 S	170 S	170 S	200 S	0 NS	0 NS	8.6 NS	0 NS	0 NS
8/6/2012	3 NS	<1 NS	0 NS	0 NS	1.7 NS	4.7 NS	2.5 NS	<1 NS	86 NS	0 NS	0 NS	0 NS	0 NS	0 NS
8/7/2012	0 NS	<1 NS	0 NS	0 NS	8.2 NS	12 NS	4.2 NS	220 S	480 S	0 NS	0 NS	0 NS	0 NS	0 NS
8/13/2012	0 NS	<1 NS	0 NS	2.3 NS	0 NS	0 NS	0 NS	4.8 NS	18 NS	0 NS	0 NS	0 NS	0 NS	0 NS
8/18/2012	0 NS	0 NS	0 NS	0 NS	0 NS	0 NS	0 NS	11 NS	170 NS	0 NS	0 NS	0 NS	0 NS	0 NS
8/23/2012	0 NS	<1 NS	0 NS	9.6 NS	8 NS	17 NS	4.9 NS	85 S	220 S	0 NS	0 NS	0 NS	0 NS	0 NS
8/24/2012	5.6 NS	<1 NS	0 NS	0 NS	0 NS	<1 NS	<1 NS	7 NS	160 S	0 NS	0 NS	0 NS	0 NS	0 NS
9/12/2012	7.3 NS	5.2 NS	0 NS	2.3 NS	<1 NS	0 NS	0 NS	6 NS	12 NS	0 NS	<1 NS	0 NS	0 NS	0 NS
9/28/2012	3 NS	<1 NS	0 NS	30 NS	na NS	39 S	7 S	0 NS	5.9 NS	0 NS	0 NS	0 NS	0 NS	0 NS
10/12/2012	79 S	97 S	46 S	4.8 NS	8.7 S	70 S	30 S	79 S	440 S	0 NS	27 S	13 S	0 NS	0 NS

^a -Maximum discharge values reported have an accuracy of ± 50 cfs.

^b NS = Sample was not collected.

^c No highlight in cell indicates no discharge occurred at this station.

^d Green highlight in cell indicates no sample was collected on a day with recorded discharge below the triggering threshold at that station.

^e S = Sample was collected. Cell is highlighted in yellow.

^f Blue highlight in cell indicates no sample was collected on a day with recorded discharge above the triggering threshold at that station.

^g na = Discharge information is not available. Cell is highlighted in grey.

Table 2.4-1
Locations and Analytical Suites for Storm Water Samples

Monitoring Group	Locations	Analytical Suites ^{a,b}
Upper Los Alamos Canyon	E026, E030	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, dioxins and furans, TAL metals, hardness ^c , cyanide, SSC, particle size
DP Canyon gages	E038, E039.1, E040	PCBs (by Method 1668A), gamma spectroscopy radionuclides, isotopic plutonium, isotopic uranium, strontium-90, dioxins and furans, TAL metals, hardness, SSC, particle size
Upper Pueblo Canyon and Acid Canyon gages	E055, E055.5, E056	PCBs (by Method 1668A), isotopic plutonium, dioxins and furans, TAL Metals, hardness, SSC, particle size
Fire-affected lower watershed gages	E042.1, E050.1, 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, cyanide, SSC, particle size
Lower Pueblo Canyon gages	E059, E060.1	PCBs (by Method 1668A), isotopic plutonium, gamma spectroscopy radionuclides, isotopic uranium, americium-241 (by alpha spectroscopy), strontium-90, dioxins and furans, TAL metals, hardness, SSC, particle size
Detention basins and wetland below the SWMU 01-001(f) drainage	CO101038, CO111041	PCBs (by Method 1668A), TAL metals, hardness, isotopic uranium, total organic carbon, SSC
BDD ^d -Required Monitoring	E050.1, E060.1, E109.9	Gross alpha, gross beta, radium-226/radium-228
Graduation Canyon below SWMU 00-019	CO115002	PCBs (by Method 1668A), SSC

^a Suites are listed in order of priority to guide analysis of limited water volume. SSC 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 The results of Ca and Mg are used to calculate hardness.

^d BDD = Buckman Direct Diversion. Analytes requested in addition to the analytical suites assigned to gage stations E050.1, E060.1, and E109.9

Table 2.4-2
Analytical Requirements for Storm Water Samples

Analytical Suite	Method	Detection Limit ^a	Upper Los Alamos Canyon	DP Canyon	Upper Pueblo Canyon and Acid Canyon	Fire-Affected Lower Watershed	Lower Pueblo Canyon	BDD ^b -Required Monitoring	Detention Basins below the SWMU 01-001(f) Drainage	Graduation Canyon below SWMU 00-019
PCBs	EPA:1668A	25 pg/L	√ ^c	√	√	√	√	— ^d	√	√
Isotopic plutonium	HASL-300	0.5 pCi/L	√	√	√	√	√	—	—	—
Gamma spectroscopy	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 metals	EPA:200.7/200.8/245.2	Variable	√	√	√	√	√	—	√	—
Cyanide	EPA:335.4	1.5 µg/L	√	—	—	√	—	—	—	—
Dioxins and furans	EPA:1613B	50 pg/L	√	√	√	√	√	—	—	—
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	—	—	—	—	—	√	—	—
TSS	EPA:160.2	10 mg/L	√	√	√	√	√	—	√	√
Total organic carbon	SW-846:9060	0.5 mg/L	—	—	—	—	—	—	√	—
Particle size	ASTM:C1070	0.01%	√	√	√	√	√	—	—	—
SSC	ASTM:D3977-97	100 mg/L	√	√	√	√	√	—	√	√

^a Method detection limit or minimum detectable activity for radionuclides.

^b BDD = Buckman Direct Diversion.

^c √ = Monitoring planned.

^d — = Monitoring not planned.

Table 2.4-3
Factors Contributing to Analytical Suite Prioritization

Upper Los Alamos Canyon Gages	Priority	Analytical Suite	Glass Bottle	Polyethylene Bottle	Minimum Volume Required (L)
E026, E030, E038, E039.1, E040	1	PCBs	Yes	No	1
	2	Gamma spectroscopy, Iso Pu, Iso U, Am-241 ^a	Yes	Yes	1
	3	Strontium-90	Yes	Yes	1
	4	Dioxins and furans	Yes	No	1
	5	TAL Metals + B + U (F/UF ^b)	No	Yes	0.25/0.25
	6	Cyanidea	Yes	Yes	0.25
Upper Pueblo Canyon Gages					
E055, E055.5, E056	1	PCBs	Yes	No	1
	2	Iso Pu	Yes	Yes	1
	3	Dioxins and furans	Yes	No	1
	4	TAL Metals + B + U (F/UF)	No	Yes	0.25/0.25
E042.1, E050.1, E059, E060.1, E109.9	1	PCBs	Yes	No	1
	2	Gamma spectroscopy, Iso Pu, Iso U, Am-241	Yes	Yes	1
	3	Strontium-90	Yes	Yes	1
	4	Dioxins and furans	Yes	No	1
	5	TAL Metals + B + U (F/UF)	No	Yes	0.25/0.25
	6	Cyanide*	Yes	Yes	0.25
Retention Basin and Wetland below the SWMU 01-001(f) Drainage					
CO111041, CO101038	1	TAL Metals + B + U (F/UF)	No	Yes	0.25/0.25
	2	PCBs	Yes	No	1
	3	Iso U	Yes	Yes	1
	4	Total organic carbon	Yes	Yes	0.04
Graduation Canyon below SWMU 00-019					
C0115002	1	PCBs	Yes	No	1

^a Americium-241 and cyanide were added to analytical suite in response to the Las Conchas fire.

^b F/UF = Analyses of both filtered and unfiltered splits.

Table 2.4-4
Planned and Actual Analyses

CO115002 Sampler in Graduation Canyon, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	13:40	Trigger	PCB Congeners (UF ^a)
2 & 3	Trigger+1	PCB Congeners (UF)		13:42	Trigger+2
CO111041 Sampler at Inlet to Upper Detention Pond below LA-2, Sampled 7/6/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	11:31	Trigger	PCB congeners (UF)
2 &3	Trigger+1	PCB (UF)		11:33	Trigger+2
4	Trigger+3	TAL metals (F ^b /UF)	11:34	Trigger+3	Metals (F)
5	Trigger+4	Isotopic uranium (UF)	11:35	Trigger+4	Metals, total organic carbon (UF)
6	Trigger+5	Total organic carbon (UF)	11:36	Trigger+5	Isotopic uranium (UF)
7	Trigger+6	Extra bottle	11:37	Trigger+6	TSS (UF)
CO111041 Sampler at Inlet to Upper Detention Pond below LA-2, Sampled 9/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	16:05	Trigger	PCB congeners, total organic carbon (UF)
2 & 3	Trigger+1	PCB (UF)		16:07	Trigger+2
4	Trigger+3	TAL metals (F/UF)	16:08	Trigger+3	Metals (F/UF)
5	Trigger+4	Isotopic uranium (UF)	16:09	Trigger+4	Isotopic uranium (UF)
6	Trigger+5	Total organic carbon (UF)	16:10	Trigger+5	TSS (UF)

Table 2.4-4 (continued)

CO111041, Sampler at Inlet to Upper Detention Pond below LA-2, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	10:06	Trigger	PCB congeners (UF)
2 & 3	Trigger+1	PCB (UF)		Trigger+3	Particle size; SSC (UF)
4	Trigger+3	TAL metals (F/UF)	10:10	Trigger+4	Metals (F/UF)
5	Trigger+4	Isotopic uranium (UF)	10:11	Trigger+5	Isotopic uranium (UF)
6	Trigger+5	Total organic carbon (UF)	10:12	Trigger+6	Total organic carbon (UF)
7	Trigger+6	Extra bottle	12:13	Trigger+7	TSS (UF)
E026, Sampler at Los Alamos below Ice Rink, Sampled 7/11/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1&2	Max+10	PCB (UF)	17:15	Max+10	PCB (UF)
3	Max+12	Gamma spectroscopy (UF)	17:19	Max+14	Gamma spectroscopy (UF)
4 & 5	Max+13	Americium-241; isotopic plutonium; isotopic uranium (UF)	17:20	Max+15	Americium-241; isotopic plutonium; isotopic uranium (UF)
6	Max+15	Strontium-90 (UF)			
7 & 8	Max+16	Dioxins and furans (UF)	17:25	Max+20	Dioxins and furans (UF)
9	Max+18	TAL metals (F/UF)	17:27	Max+22	Strontium-90 (UF)
10	Max+19	Cyanide (UF)	17:29	Max+24	Cyanide (UF)
11	Max+20	Extra bottle	17:31	Max+26	TAL metals (F)
12	Max+21	Extra bottle	17:32	Max+27	TAL metals (UF)

Table 2.4-4 (continued)

E026, Sampler at Los Alamos below Ice Rink, Sampled 7/11/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1 & 2	Trigger	SSC	16:59	Trigger	No sample collected: Reason unknown
	Trigger+2	SSC	No sample collected: Reason unknown		
3	Trigger+4	SSC	17:05	Trigger+6	TSS
4	Trigger+6	SSC	No sample collected: Reason unknown		
5	Trigger+8	SSC			
6	Trigger+10	SSC	17:14	Trigger+15	SSC; particle size
7	Trigger+12	SSC	17:17	Trigger+18	TSS
8	Trigger+14	SSC	17:20	Trigger+21	TSS
9	Trigger+16	SSC	17:23	Trigger+24	TSS
10	Trigger+18	SSC; particle size	17:26	Trigger+27	TSS
11	Trigger+20	SSC	17:29	Trigger+30	TSS
12	Trigger+22	SSC	17:49	Trigger+50	SSC; particle size
13	Trigger+24	SSC	18:09	Trigger+70	TSS
14	Trigger+26	SSC	18:29	Trigger+90	TSS
15	Trigger+28	SSC	18:49	Trigger+110	TSS
16	Trigger+30	SSC	19:09	Trigger+130	TSS
17	Trigger+50	SSC	Discharge fell below intake height		
18	Trigger+70	SSC			
19	Trigger+90	SSC			
20	Trigger+110	SSC			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E026, Sampler at Los Alamos below Ice Rink, Sampled 8/3/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1 & 2	Max+10	PCB (UF)	16:40	Max+10	PCB (UF)
			16:42	Max+12	Gamma spectroscopy (UF); TSS
3	Max+12	Gamma spectroscopy (UF)	Silt covered sampler intake preventing sample collection		
4 & 5	Max+13	Americium-241; isotopic plutonium; isotopic uranium (UF)			
6	Max+15	Strontium-90 (UF)			
7 & 8	Max+16	Dioxins and furans (UF)			
9	Max+18	TAL metals (F/UF)			
10	Max+19	Cyanide (UF)			
11	Max+20	Extra bottle			
12	Max+21	Extra bottle			
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1 & 2	Trigger	SSC	Silt covered sampler intake preventing sample collection		
	Trigger+2	SSC			
3	Trigger+4	SSC			
4	Trigger+6	SSC			
5	Trigger+8	SSC			
6	Trigger+10	SSC			
7	Trigger+12	SSC			
8	Trigger+14	SSC			
9	Trigger+16	SSC			
10	Trigger+18	SSC; particle size			
11	Trigger+20	SSC			
12	Trigger+22	SSC			
13	Trigger+24	SSC			
14	Trigger+26	SSC			
15	Trigger+28	SSC			
16	Trigger+30	SSC			
17	Trigger+50	SSC			

Table 2.4-4 (continued)

E026, Sampler at Los Alamos below Ice Rink, Sampled 8/3/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
18	Trigger+70	SSC	Silt covered sampler intake preventing sample collection		
19	Trigger+90	SSC			
20	Trigger+110	SSC			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			
E030, Sampler at Los Alamos above DP Canyon, Sampled 7/11/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	SSC; particle size	18:25	Max+10	SSC; particle size
2 & 3	Max+11	PCB (UF)	18:26	Max+11	PCB (UF)
4	Max+13	Gamma spectroscopy (UF)	18:27	Max+12	Gamma spectroscopy (UF)
5 & 6	Max+14	Americium-241; isotopic plutonium; isotopic uranium (UF)	18:28	Max+13	Americium-241; isotopic plutonium; isotopic uranium (UF)
7	Max+16	Strontium-90 (UF)	18:29	Max+14	Strontium-90 (UF)
8 & 9	Max+17	Dioxins and furans (UF)	18:30	Max+15	Dioxins and furans (UF)
10	Max+19	TAL metals (F/UF)	18:32	Max+17	TAL metals (F/UF)
11	Max+20	Cyanide (UF)	18:33	Max+18	Cyanide (UF)
12	Max+21	SSC	18:33	Max+18	SSC; particle size

Table 2.4-4 (continued)

E030, Sampler at Los Alamos above DP Canyon, Sampled 7/24/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	SSC; particle size	14:45	Max+10	SSC; particle size
2 & 3	Max+11	PCB (UF)	14:46	Max+11	PCB (UF)
4	Max+13	Gamma spectroscopy (UF)	14:47	Max+12	Gamma spectroscopy (UF)
5 & 6	Max+14	Americium-241; isotopic plutonium; isotopic uranium (UF)	14:47	Max+12	Americium-241; isotopic plutonium; isotopic uranium (UF)
7	Max+16	Strontium-90 (UF)	14:49	Max+14	Strontium-90 (UF)
8 & 9	Max+17	Dioxins and furans (UF)	14:50	Max+15	Dioxins and furans (UF)
10	Max+19	TAL metals (F/UF)	14:51	Max+16	TAL metals (F/UF)
11	Max+20	Cyanide (UF)	14:52	Max+17	Cyanide (UF)
12	Max+21	SSC	14:53	Max+18	TSS
E030, Sampler at Los Alamos above DP Canyon, Sampled 8/3/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	SSC; particle size	17:45	Max+10	SSC; particle size
2 & 3	Max+11	PCB (UF)	17:46	Max+11	PCB (UF)
4	Max+13	Gamma spectroscopy (UF)	17:48	Max+13	Gamma spectroscopy (UF)
5 & 6	Max+14	Americium-241; isotopic plutonium; isotopic uranium (UF)	17:50	Max+15	Americium-241; isotopic plutonium; isotopic uranium (UF)
7	Max+16	Strontium-90 (UF)	17:52	Max+17	Strontium-90 (UF)
8 & 9	Max+17	Dioxins and furans (UF)	17:53	Max+18	Dioxins and furans (UF)
10	Max+19	TAL metals (F/UF)	17:56	Max+21	TAL metals (F/UF)
11	Max+20	Cyanide (UF)	17:57	Max+22	Cyanide (UF)
12	Max+21	SSC	17:58	Max+23	TSS

Table 2.4-4 (continued)

E030, Sampler at Los Alamos above DP Canyon, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	SSC; particle size	15:10	Max+10	SSC; particle size
2 & 3	Max+11	PCB (UF)	15:11	Max+11	PCB (UF)
4	Max+13	Gamma spectroscopy (UF)	15:12	Max+12	Gamma spectroscopy (UF)
5 & 6	Max+14	Americium-241; isotopic plutonium; isotopic uranium (UF)	15:13	Max+13	Americium-241; isotopic plutonium; isotopic uranium (UF)
7	Max+16	Strontium-90 (UF)	15:15	Max+15	Strontium-90 (UF)
8 & 9	Max+17	Dioxins and furans (UF)	15:16	Max+16	Dioxins and furans (UF)
10	Max+19	TAL metals (F/UF)	15:18	Max+18	TAL metals (F/UF)
11	Max+20	Cyanide (UF)	15:19	Max+19	Cyanide (UF)
12	Max+21	SSC	15:19	Max+19	TSS
E038, Sampler at DP above Technical Area 21, Sampled 7/7/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1 & 2	Max+10	PCB (UF)	11:40	Max+10	PCB (UF)
3	Max+12	Gamma spectroscopy (UF)	11:42	Max+12	Gamma spectroscopy (UF)
4 & 5	Max+13	Isotopic uranium; isotopic plutonium (UF)	11:43	Max+13	Isotopic uranium; isotopic plutonium (UF)
6	Max+15	Strontium-90 (UF)	11:45	Max+15	Strontium-90 (UF)
7 & 8	Max+16	Dioxins and furans (UF)	11:46	Max+16	Dioxins and furans (UF)
9	Max+18	TAL metals (F/UF)	11:48	Max+18	TAL metals (F/UF)

Table 2.4-4 (continued)

E038, Sampler at DP above Technical Area 21, Sampled 7/7/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	TSS	11:30	Trigger	TSS
2	Trigger+2	TSS	11:32	Trigger+2	TSS
3	Trigger+4	TSS	11:34	Trigger+4	TSS
4	Trigger+6	TSS	11:36	Trigger+6	TSS
5	Trigger+8	TSS	11:38	Trigger+8	TSS
6	Trigger+10	TSS	11:40	Trigger+10	SSC; particle size
7	Trigger+12	TSS	11:42	Trigger+12	TSS
8	Trigger+14	TSS	11:44	Trigger+14	TSS
9	Trigger+16	TSS	11:46	Trigger+16	TSS
10	Trigger+18	SSC; particle size	11:48	Trigger+18	SSC; particle size
11	Trigger+20	TSS	11:50	Trigger+20	TSS
12	Trigger+22	TSS	11:52	Trigger+22	TSS
13	Trigger+24	TSS	11:54	Trigger+24	TSS
14	Trigger+26	TSS	11:56	Trigger+26	TSS
15	Trigger+28	TSS	11:58	Trigger+28	TSS
16	Trigger+30	TSS	12:00	Trigger+30	TSS
17	Trigger+50	TSS	12:20	Trigger+50	TSS
18	Trigger+70	TSS	Discharge fell below intake height		
19	Trigger+90	TSS			
20	Trigger+110	TSS			
21	Trigger+130	TSS			
22	Trigger+150	TSS			
23	Trigger+170	TSS			
24	Trigger+190	TSS			

Table 2.4-4 (continued)

E038, Sampler at DP above Technical Area 21, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1 & 2	Max+10	PCB (UF)	14:00	Max+10	PCB (UF)
3	Max+12	Gamma spectroscopy (UF)	14:01	Max+11	TAL metals (UF)
4&5	Max+13	Isotopic uranium; isotopic plutonium (UF)	14:02	Max+12	TAL metals (F)
6	Max+15	Strontium-90 (UF)	14:03	Max+13	Gamma spectroscopy (UF)
7 & 8	Max+16	Dioxins and furans (UF)	14:05	Max+15	Dioxins and furans (UF)
9	Max+18	TAL metals (F/UF)	14:07	Max+17	Isotopic uranium; isotopic plutonium (UF)
10	Max+19	Extra bottle			
11	Max+20	Extra bottle			
12	Max+21	Extra bottle	14:09	Max+19	Strontium-90 (UF)
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	TSS	13:50	Trigger	No sample collected: reason unknown
2	Trigger+2	TSS	No sample collected: reason unknown		
3	Trigger+4	TSS	13:54	Trigger+4	TSS
4	Trigger+6	TSS	13:56	Trigger+6	TSS
5	Trigger+8	TSS	13:58	Trigger+8	TSS
6	Trigger+10	TSS	14:00	Trigger+10	TSS
7	Trigger+12	TSS	14:02	Trigger+12	TSS
8	Trigger+14	TSS	14:04	Trigger+14	TSS
9	Trigger+16	TSS	14:06	Trigger+16	SSC; particle size
10	Trigger+18	SSC; particle size	14:08	Trigger+18	TSS
11	Trigger+20	TSS	14:10	Trigger+20	TSS
12	Trigger+22	TSS	14:12	Trigger+22	TSS
13	Trigger+24	TSS	14:14	Trigger+24	TSS
14	Trigger+26	TSS	14:16	Trigger+26	TSS
15	Trigger+28	TSS	14:18	Trigger+28	TSS

Table 2.4-4 (continued)

E038, Sampler at DP above Technical Area 21, Sampled 10/12/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
16	Trigger+30	TSS	14:20	Trigger+30	TSS
17	Trigger+50	TSS	14:40	Trigger+50	TSS
18	Trigger+70	TSS	15:00	Trigger+70	TSS
19	Trigger+90	TSS	15:20	Trigger+90	TSS
20	Trigger+110	TSS	15:40	Trigger+110	TSS
21	Trigger+130	TSS	16:00	Trigger+130	TSS
22	Trigger+150	TSS	16:20	Trigger+150	TSS
23	Trigger+170	TSS	Discharge fell below intake height		
24	Trigger+190	TSS			
E039.1, Sampler at DP below Grade-Control Structure, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1 & 2	Max+10	PCB (UF)	14:39	Max-15	PCB (UF)
3	Max+12	Gamma spectroscopy (UF)	14:40	Max-14	Isotopic uranium; isotopic plutonium (UF)
4 & 5	Max+13	Isotopic uranium; isotopic plutonium (UF)		14:41	Max-13
6	Max+15	Strontium-90 (UF)	14:41	Max-13	TAL metals (UF)
7 & 8	Max+16	Dioxins and furans (UF)	14:42	Max-12	Dioxins and furans (UF)
9	Max+18	TAL metals (F/UF)	Power loss at station during sampling event		
10	Max+19	Extra bottle			
11	Max+20	Extra bottle			
12	Max+21	Extra bottle			

Table 2.4-4 (continued)

E039.1, Sampler at DP below Grade-Control Structure, Sampled 10/12/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	14:24	Trigger	TSS
2	Trigger+2	SSC	14:26	Trigger+2	TSS
3	Trigger+4	SSC	14:28	Trigger+4	TSS
4	Trigger+6	SSC	14:30	Trigger+6	TSS
5	Trigger+8	SSC	14:32	Trigger+8	TSS
6	Trigger+10	SSC	14:34	Trigger+10	TSS
7	Trigger+12	SSC	14:36	Trigger+12	SSC; particle size
8	Trigger+14	SSC	14:38	Trigger+14	Gamma spectroscopy (UF)
9	Trigger+16	SSC	14:40	Trigger+16	TSS
10	Trigger+18	SSC; particle size	14:42	Trigger+18	Strontium-90 (UF)
11	Trigger+20	SSC	14:44	Trigger+20	TSS
12	Trigger+22	SSC	Power loss at station during sampling event		
13	Trigger+24	SSC			
14	Trigger+26	SSC	14:51	Trigger+27	TSS
15	Trigger+28	SSC	Power loss at station during sampling event		
16	Trigger+30	SSC			
17	Trigger+50	SSC			
18	Trigger+70	SSC			
19	Trigger+90	SSC			
20	Trigger+110	SSC			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E040, Sampler at DP above Los Alamos Canyon, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	SSC; particle size	15:19	Max+9	Gamma spectroscopy; isotopic plutonium (UF)
2 & 3	Max+11	PCB (UF)	15:21	Max+11	PCB (UF)
4	Max+13	Gamma spectroscopy (UF)	Sample missed; intake buried by silt		
5& 6	Max+14	isotopic uranium; isotopic plutonium (UF)			
7	Max+16	Strontium-90 (UF)			
8 & 9	Max+17	Dioxins and furans (UF)			
10	Max+19	TAL metals (F/UF)			
11	Max+20	SSC			
12	Max+21	Extra bottle			
E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 7/11/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	19:05	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	19:06	Max+11	TAL metals (F/UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	19:07	Max+12	Cyanide (UF)
			19:09	Max+14	Strontium-90 (UF)
5	Max+14	Strontium-90 (UF)	Sample missed: Incorrect ISCO configuration		
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Cyanide (UF)			
9	Max+60	PCB (UF)	20:05	Max+70	TSS
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)	Insufficient discharge to collect		
12	Max+106	Isotopic plutonium (UF)			

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 7/11/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	18:45	Trigger	TSS
2	Trigger+2	SSC	18:47	Trigger+2	TSS
3	Trigger+4	SSC	18:49	Trigger+4	TSS
4	Trigger+6	SSC	18:51	Trigger+6	TSS
5	Trigger+8	SSC	18:53	Trigger+8	Gamma spectroscopy (UF)
6	Trigger+10	SSC	18:55	Trigger+10	Isotopic plutonium (UF)
7	Trigger+12	SSC	18:57	Trigger+12	TSS
8	Trigger+14	SSC	18:59	Trigger+14	TSS
9	Trigger+16	SSC	19:01	Trigger+16	TSS
10	Trigger+18	SSC; particle size	19:03	Trigger+18	SSC; particle size
11	Trigger+20	SSC	19:05	Trigger+20	Isotopic plutonium; americium-241; isotopic uranium (UF)
12	Trigger+22	SSC			
13	Trigger+24	SSC	19:09	Trigger+24	Gamma spectroscopy (UF)
14	Trigger+26	SSC	19:11	Trigger+26	SSC; particle size
15	Trigger+28	SSC	19:13	Trigger+28	TSS
16	Trigger+30	SSC	19:15	Trigger+30	TSS
17	Trigger+50	SSC	19:35	Trigger+50	TSS
18	Trigger+70	SSC; particle size	19:55	Trigger+70	TSS
19	Trigger+90	SSC	20:15	Trigger+90	TSS
20	Trigger+110	SSC; particle size	20:35	Trigger+110	TSS
21	Trigger+130	SSC	Insufficient discharge to collect		
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 7/24/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	15:35	Max+10	TAL metals (UF)
2	Max+11	Gamma spectroscopy (UF)	15:36	Max+11	TAL metals (F)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	15:37	Max+12	Gamma spectroscopy (UF)
			15:38	Max+13	Isotopic plutonium; americium-241 isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	Sample missed; intake buried by silt		
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Cyanide (UF)			
9	Max+60	PCB (UF)			
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)			
12	Max+106	Isotopic plutonium (UF)			
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	15:25	Trigger	TSS
2	Trigger+2	SSC	15:27	Trigger+2	TSS
3	Trigger+4	SSC	15:29	Trigger+4	TSS
4	Trigger+6	SSC	15:31	Trigger+6	TSS
5	Trigger+8	SSC	15:33	Trigger+8	TSS
6	Trigger+10	SSC	15:35	Trigger+10	SSC; particle size
7	Trigger+12	SSC	15:37	Trigger+12	Strontium-90 (UF)
8	Trigger+14	SSC	15:39	Trigger+14	Cyanide (UF)
9	Trigger+16	SSC	15:41	Trigger+16	SSC; particle size
10	Trigger+18	SSC; particle size	15:43	Trigger+18	TSS
11	Trigger+20	SSC	15:45	Trigger+20	TSS
12	Trigger+22	SSC	15:47	Trigger+22	TSS

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 7/24/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
13	Trigger+24	SSC	15:49	Trigger+24	TSS
14	Trigger+26	SSC	15:51	Trigger+26	TSS
15	Trigger+28	SSC	15:53	Trigger+28	TSS
16	Trigger+30	SSC	15:55	Trigger+30	TSS
17	Trigger+50	SSC	Sample missed; intake buried by silt		
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			
E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 8/3/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	18:20	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	18:21	Max+11	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	18:23	Max+13	Isotopic plutonium; americium-241; isotopic uranium (UF)
			18:24	Max+14	TSS
5	Max+14	Strontium-90 (UF)	Sample missed: Incorrect ISCO configuration		
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Cyanide (UF)			
9	Max+60	PCB (UF)	19:20	Max+70	TAL metals (F/UF)
10	Max+61	Isotopic plutonium (UF)	19:20	Max+70	TSS
11	Max+105	PCB (UF)	20:05	Max+115	PCB (UF)
12	Max+106	Isotopic plutonium (UF)	20:05	Max+115	TSS

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 8/3/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	18:00	Trigger	TSS
2	Trigger+2	SSC	18:02	Trigger+2	TSS
3	Trigger+4	SSC	18:04	Trigger+4	Sample not submitted for analysis
4	Trigger+6	SSC	18:06	Trigger+6	SSC; particle size
5	Trigger+8	SSC	18:08	Trigger+8	Strontium-90 (UF)
6	Trigger+10	SSC	Sample missed: Sediment plug in pump tubing.		
7	Trigger+12	SSC			
8	Trigger+14	SSC			
9	Trigger+16	SSC			
10	Trigger+18	SSC; particle size			
11	Trigger+20	SSC			
12	Trigger+22	SSC			
13	Trigger+24	SSC			
14	Trigger+26	SSC			
15	Trigger+28	SSC			
16	Trigger+30	SSC			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 9/28/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	16:25	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	Sample missed: No liquid detected		
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)			
5	Max+14	Strontium-90 (UF)			
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Cyanide (UF)			
9	Max+60	PCB (UF)			
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)			
12	Max+106	Isotopic plutonium (UF)			
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	16:10	Trigger	SSC; particle size
2	Trigger+2	SSC	16:12	Trigger+2	Gamma spectroscopy (UF)
3	Trigger+4	SSC	16:14	Trigger+4	Isotopic plutonium; americium-241; isotopic uranium (UF)
4	Trigger+6	SSC	16:16	Trigger+6	TSS
5	Trigger+8	SSC	Sample missed: No liquid detected		
6	Trigger+10	SSC			
7	Trigger+12	SSC			
8	Trigger+14	SSC			
9	Trigger+16	SSC			
10	Trigger+18	SSC; particle size			

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 9/28/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
11	Trigger+20	SSC	Sample missed: No liquid detected		
12	Trigger+22	SSC			
13	Trigger+24	SSC			
14	Trigger+26	SSC			
15	Trigger+28	SSC			
16	Trigger+30	SSC			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			
E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	15:55	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	15:56	Max+11	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	15:57	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	15:59	Max+14	TAL metals (UF)
6	Max+15	Dioxins and furans (UF)	16:00	Max+15	Dioxins and furans (UF)
7	Max+16	TAL metals (F/UF)	Sample missed: No liquid detected		
8	Max+17	Cyanide (UF)			
9	Max+60	PCB (UF)	16:55	Max+70	PCB (UF)
10	Max+61	Isotopic plutonium (UF)	16:55	Max+70	Isotopic plutonium (UF)
11	Max+105	PCB (UF)	17:40	Max+115	PCB (UF)
12	Max+106	Isotopic plutonium (UF)	17:40	Max+115	Isotopic plutonium (UF)

Table 2.4-4 (continued)

E042.1, Sampler at Los Alamos above Low-Head Weir, Sampled 10/12/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	15:35	Trigger	TSS
2	Trigger+2	SSC	15:37	Trigger+2	TSS
3	Trigger+4	SSC	15:39	Trigger+4	TSS
4	Trigger+6	SSC	15:41	Trigger+6	Gamma spectroscopy (UF)
5	Trigger+8	SSC	15:43	Trigger+8	Isotopic plutonium; americium-241; isotopic uranium (UF)
6	Trigger+10	SSC	15:45	Trigger+10	TSS
7	Trigger+12	SSC	15:47	Trigger+12	TSS
8	Trigger+14	SSC	15:49	Trigger+14	TSS
9	Trigger+16	SSC	15:51	Trigger+16	TSS
10	Trigger+18	SSC; particle size	15:53	Trigger+18	TSS
11	Trigger+20	SSC	15:55	Trigger+20	SSC; particle size
12	Trigger+22	SSC	15:57	Trigger+22	TSS
13	Trigger+24	SSC	15:59	Trigger+24	TAL metals (F)
14	Trigger+26	SSC	16:01	Trigger+26	Strontium-90 (UF)
15	Trigger+28	SSC	16:03	Trigger+28	TSS
16	Trigger+30	SSC	16:05	Trigger+30	TSS
17	Trigger+50	SSC	16:25	Trigger+50	TSS
18	Trigger+70	SSC; particle size	16:45	Trigger+70	SSC; particle size
19	Trigger+90	SSC	17:05	Trigger+90	TSS
20	Trigger+110	SSC; particle size	17:25	Trigger+110	TSS
21	Trigger+130	SSC	17:45	Trigger+130	SSC; particle size
22	Trigger+150	SSC	18:05	Trigger+150	TSS
23	Trigger+170	SSC	Sample missed: No liquid detected		
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 7/11/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	19:14	Max+4	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	19:15	Max+5	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	19:16	Max+6	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	Sample missed: Incorrect ISCO configuration		
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	20:59	Max+109	PCB (UF)
10	Max+61	Isotopic plutonium (UF)	20:59	Max+109	Isotopic plutonium (UF)
11	Max+105	PCB (UF)	21:44	Max+154	PCB (UF)
12	Max+106	Isotopic plutonium (UF)	21:44	Max+154	Isotopic plutonium (UF)
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	19:03	Trigger	TSS
2	Trigger+2	SSC	19:05	Trigger+2	Gamma spectroscopy (UF)
3	Trigger+4	SSC	19:07	Trigger+4	Isotopic plutonium (UF)
4	Trigger+6	SSC	19:09	Trigger+6	TSS
5	Trigger+8	Radium-226 (UF)	19:11	Trigger+8	TSS
6	Trigger+10	SSC	19:13	Trigger+10	SSC; particle size
7	Trigger+12	Radium-228 (UF)	19:15	Trigger+12	Strontium-90 (UF)
8	Trigger+14	SSC	19:17	Trigger+14	TAL metals (F/UF)
9	Trigger+16	SSC	19:19	Trigger+16	Gross alpha/beta; cyanide (UF)
10	Trigger+18	SSC; particle size	19:21	Trigger+18	Radium-226 (UF);
11	Trigger+20	SSC		Trigger+20	Radium-228 (UF)

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 7/11/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
12	Trigger+22	SSC	19:25	Trigger+22	TSS
13	Trigger+24	SSC	19:27	Trigger+24	TSS
14	Trigger+26	SSC	19:29	Trigger+26	TSS
15	Trigger+28	SSC	19:31	Trigger+28	TSS
16	Trigger+30	SSC	19:33	Trigger+30	TSS
17	Trigger+50	SSC	19:53	Trigger+50	TSS
18	Trigger+70	SSC; particle size	20:13	Trigger+70	SSC; particle size
19	Trigger+90	SSC	20:33	Trigger+90	TSS
20	Trigger+110	SSC; particle size	20:53	Trigger+110	SSC; particle size
21	Trigger+130	SSC	21:13	Trigger+130	TSS
22	Trigger+150	SSC	21:33	Trigger+150	TSS
23	Trigger+170	SSC	21:53	Trigger+170	SSC; particle size
24	Trigger+190	SSC	22:13	Trigger+190	TSS
E050.1, Sampler at Los Alamos below Low-Head Weir, Sampler 7/24/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	17:24	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	17:25	Max+11	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	17:26	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	17:28	Max+14	Strontium-90 (UF)
6	Max+15	Dioxins and furans (UF)	Sample missed: Incorrect ISCO configuration		
7	Max+16	TAL metals (F/UF)	18:24	Max+70	Isotopic plutonium (UF)
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	19:09	Max+115	Isotopic plutonium (UF)
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)	19:54	Max+160	PCB (UF)
12	Max+106	Isotopic plutonium (UF)	19:54	Max+160	Isotopic plutonium (UF)

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 7/24/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	16:28	Trigger	TSS
2	Trigger+2	SSC	16:30	Trigger+2	TSS
3	Trigger+4	SSC	16:32	Trigger+4	TSS
4	Trigger+6	SSC	16:34	Trigger+6	TSS
5	Trigger+8	Radium-226 (UF)	16:36	Trigger+8	TSS
6	Trigger+10	SSC	16:38	Trigger+10	Not submitted for analysis
7	Trigger+12	Radium-228 (UF)	16:40	Trigger+12	TSS
8	Trigger+14	SSC	16:42	Trigger+14	TSS
9	Trigger+16	SSC	16:44	Trigger+16	TSS
10	Trigger+18	SSC; particle size	16:46	Trigger+18	TSS
11	Trigger+20	SSC	16:48	Trigger+20	TSS
12	Trigger+22	SSC	16:50	Trigger+22	TSS
13	Trigger+24	SSC	16:52	Trigger+24	TSS
14	Trigger+26	SSC	16:54	Trigger+26	SSC; particle size
15	Trigger+28	SSC	16:56	Trigger+28	Gamma spectroscopy (UF)
16	Trigger+30	SSC	16:58	Trigger+30	ISO Pu
17	Trigger+50	SSC	17:18	Trigger+50	SSC; particle size
18	Trigger+70	SSC; particle size	17:38	Trigger+70	TSS
19	Trigger+90	SSC	17:58	Trigger+90	TSS
20	Trigger+110	SSC; particle size	18:18	Trigger+110	SSC; particle size
21	Trigger+130	SSC	18:38	Trigger+130	TSS
22	Trigger+150	SSC	18:58	Trigger+150	TSS
23	Trigger+170	SSC	19:18	Trigger+170	SSC; particle size
24	Trigger+190	SSC	19:38	Trigger+190	SSC; particle size

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 8/3/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	18:30	Max+5	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	18:31	Max+6	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	18:32	Max+7	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	Sample missed: Incorrect ISCO configuration		
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)	19:30	Max+70	TSS
8	Max+17	Gross alpha/beta; cyanide (UF)	19:30	Max+70	TSS
9	Max+60	PCB (UF)	20:15	Max+115	PCB (UF)
10	Max+61	Isotopic plutonium (UF)	20:15	Max+115	Isotopic plutonium (UF)
11	Max+105	PCB (UF)	21:00	Max+160	PCB (UF)
12	Max+106	Isotopic plutonium (UF)	21:01	Max+160	Isotopic plutonium (UF)
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	Sample missed: No liquid detected		
2	Trigger+2	SSC			
3	Trigger+4	SSC	18:19	Trigger+4	TSS
4	Trigger+6	SSC	18:21	Trigger+6	Isotopic plutonium
5	Trigger+8	Radium-226 (UF)	18:23	Trigger+8	Gamma spectroscopy (UF)
6	Trigger+10	SSC	18:25	Trigger+10	SSC; particle size
7	Trigger+12	Radium-228 (UF)	18:27	Trigger+12	TSS
8	Trigger+14	SSC	18:29	Trigger+14	TSS
9	Trigger+16	SSC	18:31	Trigger+16	SSC; particle size
10	Trigger+18	SSC; particle size	18:33	Trigger+18	Strontium-90 (UF)
11	Trigger+20	SSC	18:35	Trigger+20	TAL (F)
12	Trigger+22	SSC	18:37	Trigger+22	TAL (UF)
13	Trigger+24	SSC	18:39	Trigger+24	TSS

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 8/3/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
14	Trigger+26	SSC	18:41	Trigger+26	Radium-226 (UF); Radium-228 (UF)
15	Trigger+28	SSC			
16	Trigger+30	SSC	18:45	Trigger+30	Gross alpha/beta; cyanide (UF)
17	Trigger+50	SSC	19:05	Trigger+50	TSS
18	Trigger+70	SSC; particle size	19:25	Trigger+70	SSC; particle size
19	Trigger+90	SSC	19:45	Trigger+90	TSS
20	Trigger+110	SSC; particle size	20:05	Trigger+110	SSC; particle size
21	Trigger+130	SSC	20:25	Trigger+130	TSS
22	Trigger+150	SSC	20:45	Trigger+150	TSS
23	Trigger+170	SSC	21:05	Trigger+170	SSC; particle size
24	Trigger+190	SSC	21:25	Trigger+190	TSS
E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 9/28/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	17:59	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	18:01	Max+12	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	18:02	Max+13	Isotopic plutonium; americium-241; isotopic uranium (UF)
			18:03	Max+14	Strontium-90 (UF)
5	Max+14	Strontium-90 (UF)	18:04	Max+15	TAL metals (F/UF)
6	Max+15	Dioxins and furans (UF)	Sample missed: Incorrect ISCO configuration		
7	Max+16	TAL metals (F/UF)			
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	18:59	Max+70	Dioxins and furans (UF)
10	Max+61	Isotopic plutonium (UF)	18:59	Max+70	Gross alpha/beta (UF); cyanide (UF)
11	Max+105	PCB (UF)	19:44	Max+115	PCB (UF)
12	Max+106	Isotopic plutonium (UF)	19:44	Max+115	Isotopic plutonium (UF)

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 9/28/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	17:34	Trigger	TSS
2	Trigger+2	SSC	17:36	Trigger+2	Gamma spectroscopy (UF)
3	Trigger+4	SSC	17:38	Trigger+4	Isotopic plutonium (UF)
4	Trigger+6	SSC	17:40	Trigger+6	TSS
5	Trigger+8	Radium-226 (UF)	17:42	Trigger+8	Radium-226 (UF)
6	Trigger+10	SSC	17:44	Trigger+10	SSC; particle size
7	Trigger+12	Radium-228 (UF)	17:46	Trigger+12	Radium-228 (UF)
8	Trigger+14	SSC	17:48	Trigger+14	TSS
9	Trigger+16	SSC	17:50	Trigger+16	TSS
10	Trigger+18	SSC; particle size	17:52	Trigger+18	TSS
11	Trigger+20	SSC	17:54	Trigger+20	TSS
12	Trigger+22	SSC	17:56	Trigger+22	TSS
13	Trigger+24	SSC	17:58	Trigger+24	TSS
14	Trigger+26	SSC	18:00	Trigger+26	TSS
15	Trigger+28	SSC	18:02	Trigger+28	TSS
16	Trigger+30	SSC	18:04	Trigger+30	TSS
17	Trigger+50	SSC	18:24	Trigger+50	Sample not submitted for analysis
18	Trigger+70	SSC; particle size	18:44	Trigger+70	SSC; particle size
19	Trigger+90	SSC	19:04	Trigger+90	TSS
20	Trigger+110	SSC; particle size	19:24	Trigger+110	SSC; particle size
21	Trigger+130	SSC	19:44	Trigger+130	TSS
22	Trigger+150	SSC	20:04	Trigger+150	TSS
23	Trigger+170	SSC	20:24	Trigger+170	TSS
24	Trigger+190	SSC	20:44	Trigger+190	TSS

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	16:39	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	16:41	Max+12	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	16:42	Max+13	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	16:44	Max+15	Strontium-90 (UF)
6	Max+15	Dioxins and furans (UF)	16:45	Max+16	Dioxins and furans (UF)
7	Max+16	TAL metals (F/UF)	Sample missed: Incorrect ISCO configuration		
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	17:39	Max+70	PCB (UF); Isotopic plutonium (UF)
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)	18:24	Max+115	PCB (UF); Isotopic plutonium (UF)
12	Max+106	Isotopic plutonium (UF)			
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	16:09	Trigger	TSS
2	Trigger+2	SSC	16:11	Trigger+2	TSS
3	Trigger+4	SSC	16:13	Trigger+4	TSS
4	Trigger+6	SSC	16:15	Trigger+6	Gamma spectroscopy (UF)
5	Trigger+8	Radium-226 (UF)	16:17	Trigger+8	Isotopic plutonium (UF)
6	Trigger+10	SSC	16:19	Trigger+10	TSS
7	Trigger+12	Radium-228 (UF)	16:21	Trigger+12	TSS
8	Trigger+14	SSC	16:23	Trigger+14	TSS
9	Trigger+16	SSC	16:25	Trigger+16	TSS
10	Trigger+18	SSC; particle size	16:27	Trigger+18	TSS
11	Trigger+20	SSC	16:29	Trigger+20	TSS
12	Trigger+22	SSC	16:31	Trigger+22	Sample not submitted for analysis
13	Trigger+24	SSC	16:33	Trigger+24	SSC; particle size

Table 2.4-4 (continued)

E050.1, Sampler at Los Alamos below Low-Head Weir, Sampled 10/12/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
14	Trigger+26	SSC	16:35	Trigger+26	Radium-226 (UF); Radium-228 (UF)
15	Trigger+28	SSC	16:37	Trigger+28	TAL metals (F/UF)
16	Trigger+30	SSC	16:39	Trigger+30	Gross alpha/beta; cyanide (UF)
17	Trigger+50	SSC	16:59	Trigger+50	TSS
18	Trigger+70	SSC; particle size	17:19	Trigger+70	TSS
19	Trigger+90	SSC	17:39	Trigger+90	SSC; particle size
20	Trigger+110	SSC; particle size	17:59	Trigger+110	TSS
21	Trigger+130	SSC	18:19	Trigger+130	SSC; particle size
22	Trigger+150	SSC	18:39	Trigger+150	TSS
23	Trigger+170	SSC	18:59	Trigger+170	TSS
24	Trigger+190	SSC	19:19	Trigger+190	TSS
E055, Sampler at Pueblo above Acid, Sampled 10/12/2012					
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	12-Bottle ISCO Start Time (min)
1	Max+10	SSC (UF); particle size	14:55	Max+10	Isotopic plutonium (UF)
2 & 3	Max+11 Max+12	PCB (UF)	Sample missed; intake buried by silt		
4	Max+13	Isotopic plutonium (UF)			
5 & 6	Max+14 Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	SSC			

Table 2.4-4 (continued)

E056, Sampler at Acid above Pueblo, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	SSC (UF); particle size	11:00	Max+10	SSC (UF); particle size
2 & 3	Max+11	PCB (UF)	11:02	Max+12	PCB (UF)
4	Max+13	Isotopic plutonium (UF)	11:03	Max+13	Isotopic plutonium (UF)
5 & 6	Max+14	Dioxins and furans (UF)	11:04	Max+14	Dioxins and furans(UF)
7	Max+16	TAL metals (F/UF)	11:06	Max+16	TAL metals (F/UF)
8	Max+17	SSC	11:07	Max+17	SSC
E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 7/5/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	19:50	Max+10	PCB; dioxins and furans (NA ^c)
2	Max+11	Gamma spectroscopy (UF)	19:51	Max+11	Cyanide(total) (NA)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	19:52	Max+12	TSS
			19:53	Max+13	TAL metals (NA)
5	Max+14	Strontium-90 (UF)	19:54	Max+14	Particle size (NA)
6	Max+15	Dioxins and furans (UF)	Sampler configured incorrectly		
7	Max+16	TAL metals (F/UF)			
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	20:50	Max+70	SSC, Particle size; Gamma spectroscopy; Isotopic plutonium (NA)
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)	Intake buried by silt		
12	Max+106	Isotopic plutonium (UF)			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 7/5/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	19:35	Trigger	SSC, particle size (NA)
2	Trigger+2	SSC	19:37	Trigger+2	Gamma spectroscopy; isotopic plutonium; americium-241; isotopic uranium (F)
3	Trigger+4	SSC	19:39	Trigger+4	TSS
4	Trigger+6	SSC	19:41	Trigger+6	Radium-226; Radium-228 (NA)
5	Trigger+8	SSC	19:43	Trigger+8	TSS
6	Trigger+10	Gamma spectroscopy; isotopic plutonium; americium-241; isotopic uranium (F)	19:45	Trigger+10	Strontium-90 (NA)
7	Trigger+12	SSC; particle size	19:47	Trigger+12	TSS
8	Trigger+14	Strontium-90 (F)	19:49	Trigger+14	Gross alpha; gross beta (NA)
9	Trigger+16	SSC	Sample missed; intake buried by silt		
10	Trigger+18	Radium-226 (UF)			
11	Trigger+20	SSC			
12	Trigger+22	Radium-228 (UF)			
13	Trigger+24	SSC			
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 7/11/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	Max discharge 680 cfs at 18:00; sample missed; too much sediment for sample collection		
2	Max+11	Gamma spectroscopy (UF)			
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)			
5	Max+14	Strontium-90 (UF)			
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	19:55	Max+115	Gamma spectroscopy (NA)
10	Max+61	Isotopic plutonium (UF)	Sample missed; too much sediment for sample collection		
11	Max+105	PCB (UF)	20:40	Max+160	Americium-241 (NA)
12	Max+106	Isotopic plutonium (UF)	20:40	Max+160	Isotopic plutonium (NA)
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	Sample missed; too much sediment for sample collection		
2	Trigger+2	SSC			
3	Trigger+4	SSC			
4	Trigger+6	SSC			
5	Trigger+8	SSC			
6	Trigger+10	Gamma spectroscopy; isotopic plutonium; americium-241; isotopic uranium (F)			
7	Trigger+12	SSC; particle size			
8	Trigger+14	Strontium-90 (F)			
9	Trigger+16	SSC			
10	Trigger+18	Radium-226 (UF)			
11	Trigger+20	SSC			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 7/11/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
12	Trigger+22	Radium-228 (UF)	Sample missed; too much sediment for sample collection		
13	Trigger+24	SSC			
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			
E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 7/24/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	Sample missed; too much sediment for sample collection		
2	Max+11	Gamma spectroscopy (UF)			
3&4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)			
5	Max+14	Strontium-90 (UF)			
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)			
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)			
12	Max+106	Isotopic plutonium (UF)			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 7/24/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	16:10	Trigger	TSS (UF)
2	Trigger+2	SSC	16:12	Trigger+2	Gamma spectroscopy (UF)
3	Trigger+4	SSC	16:14	Trigger+4	Isotopic plutonium (UF)
4	Trigger+6	SSC	16:16	Trigger+6	SSC, particle size (UF)
5	Trigger+8	SSC	sample missed		
6	Trigger+10	Gamma spectroscopy; isotopic plutonium; americium-241; isotopic uranium (F)	16:20	Trigger+10	Gamma spectroscopy (UF)
7	Trigger+12	SSC; particle size	16:22	Trigger+12	Americium-241; Isotopic plutonium; Isotopic uranium (UF)
8	Trigger+14	Strontium-90 (F)	sample missed		
9	Trigger+16	SSC	16:26	Trigger+16	Gross alpha (UF)
10	Trigger+18	Radium-226 (UF)	sample missed		
11	Trigger+20	SSC	16:30	Trigger+20	Cyanide(total) (UF)
12	Trigger+22	Radium-228 (UF)	16:32	Trigger+22	SSC, particle size (UF)
13	Trigger+24	SSC	Sample missed; too much sediment for sample collection		
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/3/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	18:05	Max+10	PCB (UF)
2	Max+11	Gamma spectroscopy (UF)	18:06	Max+11	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	18:08	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	sample missed		
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)	19:05	Max+70	Isotopic Plutonium (UF)
8	Max+17	Gross alpha/beta; cyanide (UF)	19:05	Max+70	TSS (UF)
9	Max+60	PCB (UF)	19:50	Max+115	PCB Congeners (UF)
10	Max+61	Isotopic plutonium (UF)	19:50	Max+115	TSS (UF)
11	Max+105	PCB (UF)	20:35	Max+150	Isotopic Plutonium (UF)
12	Max+106	Isotopic plutonium (UF)	20:35	Max+150	TSS (UF)
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	17:55	Trigger	Sample not collected
2	Trigger+2	SSC	Sample missed		
3	Trigger+4	SSC			
4	Trigger+6	SSC	18:01	Trigger+6	TSS (UF)
5	Trigger+8	SSC	18:03	Trigger+8	Isotopic Radium (UF)
6	Trigger+10	Gamma spectroscopy; isotopic plutonium, americium-241; isotopic uranium (F)	18:05	Trigger+10	Strontium-90 (UF)
7	Trigger+12	SSC; particle size	18:07	Trigger+12	Metals (F)
8	Trigger+14	Strontium-90 (F)	18:09	Trigger+14	Metals (UF)
9	Trigger+16	SSC	18:11	Trigger+16	Cyanide(Total), Gross Alpha (UF)
10	Trigger+18	Radium-226 (UF)	18:13	Trigger+18	TSS (UF)

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/3/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
11	Trigger+20	SSC	Sample not collected; sample line clogged		
12	Trigger+22	Radium-228 (UF)			
13	Trigger+24	SSC			
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			
E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/7/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	16:24	12-01	PCB congeners (UF)
2	Max+11	Gamma spectroscopy (UF)	16:26	12-02	SSC, particle size (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	16:27	12-03	Gamma spectroscopy (UF)
			16:28	12-04	Isotopic plutonium; americium-241; isotopic uranium (UF)
5	Max+14	Strontium-90 (UF)	16:29	12-05	Metals (UF)
6	Max+15	Dioxins and furans (UF)	16:30	12-06	SSC, particle size (UF)
7	Max+16	TAL metals (F/UF)	Sample missed		
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	17:24	12-09	TSS (UF)
10	Max+61	Isotopic plutonium (UF)	sample missed		
11	Max+105	PCB (UF)			
12	Max+106	Isotopic plutonium (UF)			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/7/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	Sample not collected; sample line clogged		
2	Trigger+2	SSC			
3	Trigger+4	SSC			
4	Trigger+6	SSC			
5	Trigger+8	SSC			
6	Trigger+10	Gamma spectroscopy; isotopic plutonium; americium-241; isotopic uranium (F)			
7	Trigger+12	SSC; particle size			
8	Trigger+14	Strontium-90 (F)			
9	Trigger+16	SSC			
10	Trigger+18	Radium-226 (UF)			
11	Trigger+20	SSC			
12	Trigger+22	Radium-228 (UF)			
13	Trigger+24	SSC			
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/23/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	Sample missed; too much sediment for sample collection		
2	Max+11	Gamma spectroscopy (UF)			
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)			
5	Max+14	Strontium-90 (UF)	15:54	Max+15	SSC, Particle Size (UF)
6	Max+15	Dioxins and furans (UF)	15:55	Max+16	PCB (UF)
7	Max+16	TAL metals (F/UF)	Sample missed; too much sediment for sample collection		
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	16:49	Max+70	PCB (UF)
10	Max+61	Isotopic plutonium (UF)	16:49	Max+70	SSC, Particle Size (UF)
11	Max+105	PCB (UF)	17:34	Max+115	Isotopic plutonium; americium-241; isotopic uranium (UF)
12	Max+106	Isotopic plutonium (UF)	17:34	Max+115	Gamma spectroscopy (UF)
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	Sample missed; too much sediment for sample collection		
2	Trigger+2	SSC			
3	Trigger+4	SSC			
4	Trigger+6	SSC			
5	Trigger+8	SSC			
6	Trigger+10	Gamma spectroscopy; isotopic plutonium, americium-241; isotopic uranium (F)			
7	Trigger+12	SSC; particle size			
8	Trigger+14	Strontium-90 (F)			
9	Trigger+16	SSC			
10	Trigger+18	Radium-226 (UF)			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/23/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
11	Trigger+20	SSC	Sample missed; too much sediment for sample collection		
12	Trigger+22	Radium-228 (UF)			
13	Trigger+24	SSC			
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			
E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/24/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	13:59	Max+5	SSC, Particle Size (UF)
2	Max+11	Gamma spectroscopy (UF)	14:01	Max+7	Gamma spectroscopy (UF)
3 & 4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)	14:02	Max+8	Isotopic plutonium; americium-241; isotopic uranium (UF)
			14:03	Max+9	Strontium-90 (UF)
5	Max+14	Strontium-90 (UF)	14:04	Max+10	TSS (UF)
6	Max+15	Dioxins and furans (UF)	14:05	Max+11	PCB (UF)
7	Max+16	TAL metals (F/UF)	Sample missed		
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)	14:59	Max+65	SSC, particle size (UF)
10	Max+61	Isotopic plutonium (UF)	14:59	Max+65	PCB (UF)
11	Max+105	PCB (UF)	15:44	Max+110	SSC, particle size (UF)
12	Max+106	Isotopic plutonium (UF)	15:44	Max+110	Isotopic plutonium (UF)

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 8/24/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	Sample missed; too much sediment for sample collection		
2	Trigger+2	SSC			
3	Trigger+4	SSC			
4	Trigger+6	SSC			
5	Trigger+8	SSC			
6	Trigger+10	Gamma spectroscopy; isotopic plutonium, americium-241; isotopic uranium (F)			
7	Trigger+12	SSC; particle size			
8	Trigger+14	Strontium-90 (F)			
9	Trigger+16	SSC			
10	Trigger+18	Radium-226 (UF)			
11	Trigger+20	SSC			
12	Trigger+22	Radium-228 (UF)			
13	Trigger+24	SSC			
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC			
20	Trigger+110	SSC; particle size			
21	Trigger+130	SSC			
22	Trigger+150	SSC			
23	Trigger+170	SSC			
24	Trigger+190	SSC			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 10/12/2012					
Planned			Actual		
Bottle Number	12-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	12-Bottle ISCO Start Time (min)	Analyses Requested
1	Max+10	PCB (UF)	Sample missed; too much sediment for sample collection		
2	Max+11	Gamma spectroscopy (UF)			
3&4	Max+12	Isotopic plutonium; americium-241; isotopic uranium (UF)			
5	Max+14	Strontium-90 (UF)			
6	Max+15	Dioxins and furans (UF)			
7	Max+16	TAL metals (F/UF)			
8	Max+17	Gross alpha/beta; cyanide (UF)			
9	Max+60	PCB (UF)			
10	Max+61	Isotopic plutonium (UF)			
11	Max+105	PCB (UF)			
12	Max+106	Isotopic plutonium (UF)			
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
1	Trigger	SSC	Trigger at 15:15; Sample missed; too much sediment for sample collection		
2	Trigger+2	SSC			
3	Trigger+4	SSC			
4	Trigger+6	SSC			
5	Trigger+8	SSC			
6	Trigger+10	Gamma spectroscopy; isotopic plutonium, americium-241; isotopic uranium (F)			
7	Trigger+12	SSC; particle size			
8	Trigger+14	Strontium-90 (F)			
9	Trigger+16	SSC			
10	Trigger+18	Radium-226 (UF)			
11	Trigger+20	SSC			
12	Trigger+22	Radium-228 (UF)			
13	Trigger+24	SSC			

Table 2.4-4 (continued)

E109.9, Sampler at Los Alamos above the Rio Grande, Sampled 10/12/2012 (continued)					
Planned			Actual		
Bottle Number	24-Bottle ISCO Start Time (min)	Planned Analyses	Sample Collection Time	24-Bottle ISCO Start Time (min)	Analyses Requested
14	Trigger+26	Radium-226 (F)			
15	Trigger+28	SSC			
16	Trigger+30	Radium-228 (F)			
17	Trigger+50	SSC			
18	Trigger+70	SSC; particle size			
19	Trigger+90	SSC	16:45	Trigger+90	SSC, Particle size (UF)
20	Trigger+110	SSC; particle size	17:05	Trigger+110	Gamma spectroscopy (UF)
21	Trigger+130	SSC	17:25	Trigger+130	isotopic plutonium; americium-241; isotopic uranium (UF)
22	Trigger+150	SSC	No sample collected		
23	Trigger+170	SSC			
24	Trigger+190	SSC	18:25	Trigger+190	TSS (UF)

^a UF = Unfiltered.^b F = Filtered.^c NA = Sample was analyzed as a solid.

Table 2.6-1
Sample Collection and Sample Retrieval Working Day Intervals

Location	Count of Sampled Storm Events	Count Retrieved on First Working Day	Count Retrieved after First Working Day	Comment
CO101038	0	na ^a	na	No samples collected.
CO111041	3	1	2	Sample collected on Friday, 07/06; retrieved Friday, 07/13. Sample collected Wednesday, 09/12, retrieved Monday, 09/17. Late retrieval on 07/13 was the result of delays caused by fire restrictions. Sample collected Wednesday, 09/12, retrieved Monday, 09/17. Delay was the result of a widely distributed moderate storm event on 09/12, and this station is low on priority list of sample retrieval.
CO115002	1	na	1	Sample collected Friday, 10/12, retrieved Tuesday, 10/16. Late retrieval was the result of a widely distributed large storm event on 10/12 that caused most gages to collect, and this station is low on priority list of sample retrieval.
E038	2	1	1	Sample collected Saturday, 07/07; retrieved Tuesday, 07/17, following lifting of Stage III fire restrictions. No discharge exceeded 40 cfs occurred while the sampler was awaiting reset. Late retrieval on 07/07 was the result of delays caused by fire restrictions, and this station is low on priority list of sample retrieval.

Table 2.6-1 (continued)

Location	Count of Sampled Storm Events	Count Retrieved on First Working Day	Count Retrieved after First Working Day	Comment
E039.1	1	na	1	Sample collected Friday, 10/12; retrieved on Tuesday 10/16. No discharge exceeded 10 cfs when sampler was awaiting reset. Late retrieval on 10/12 was the result of a widely distributed large storm event storm event, and this station is low on priority list of sample retrieval.
E040	1	1	na	Sample collected on first working day
E026	2	na	2	Sample collected Wednesday, 07/11; retrieved Friday, 07/13. Sample collected Friday, 08/03; retrieved on Wednesday 08/08. No discharge exceeded 10 cfs when sampler was awaiting reset. Late retrieval on 07/11 and 08/03 was the result of two widely distributed large storm events that caused many gages to collect, and this station is low on priority list of sample retrieval.
E030	4	3	1	Sample collected Friday, 08/03; retrieved Tuesday, 8/7. No discharge exceeded 10 cfs when sampler was awaiting reset. Late retrieval on 08/03 was the result of a widely distributed large storm event that caused many gages to collect, and this station is low on priority list of sample retrieval.
E042.1	5	4	1	Sample collected Friday, 08/03 after normal Laboratory business hours; Sample was retrieved Tuesday, 08/07, at 2:00 p.m. No discharge exceeded 5 cfs when sampler was awaiting reset. Sampler attempted, but was unable, to collect 12 cfs discharge on evening of 08/07 after the sampler had been loaded with bottles and reset. Sample holding times were not missed because of retrieval on 08/07.
E050.1	5	5	na	Samples collected on first working day.
E109.9	8	7	1	Sample collected on Tuesday, 07/24, after normal Laboratory business hours; Sample was retrieved Thursday, 07/26, at 10:00 a.m. San Ildefonso allows access week days only from 8:00 a.m. to 5:00 p.m. No discharge exceeded 5 cfs when the sampler was awaiting reset. Sample holding times were not missed because of retrieval on 07/26.
E055.5	0	na	na	No samples collected,
E056	1	na	1	Sample collected Friday, 10/12; retrieved Tuesday, 10/16. No discharge exceeded 10 cfs when sampler was awaiting reset. Late retrieval on 10/12 was the result of a widely distributed large storm event that caused most gages to collect, and this station is low on priority list of sample retrieval.
E055	1	na	1	Sample collected Friday, 10/12; retrieved Tuesday, 10/16. No discharge exceeded 10 cfs when sampler was awaiting reset. Late retrieval on 10/12 was the result of a widely distributed large storm event that caused most gages to collect, and this station is low on priority list of sample retrieval.
E059	0	na	na	No samples collected.
E060.1	0	na	na	No samples collected.

Note: Following the Laboratory's September 28, 2012, agreement and submittal of the response to notice of disapproval for 2012 monitoring plan, approval was received from NMED in January 2013 directing sample retrieval times within 1 business day of storm water collection and a new prioritization plan, which will be implemented for the 2013 monitoring season.

*na = Not available.

Table 2.6-2
Gage Station Operational Issues during the 2012 Monitoring Year

Station	Operational Issue	Issue Date	Repair Date	Working Days from Issue to Repair
E026 ^a	Silting in stilling well.	7/11/2012	7/13/2012	2
	Silting in stilling well.	7/16/2012	7/18/2012	2
	Silting in stilling well prevented sample collection on 7/24/2012.	7/24/2012	7/26/2012	2
	Silting in stilling well.	7/30/2012	7/31/2012	1
	Gage isolated by sediment flows.	8/3/2012	8/8/2012	3
	Silting in stilling well.	8/10/2012	8/13/2012	1
	Sediment at control.	8/22/2012	8/22/2012	0
	Silting in stilling well.	8/23/2012	8/27/2012	2
	Sediment and boulders upstream of gage.	8/28/2012	9/4/2012	5
	Sediment prevented sample collection on 9/28/2012.	9/28/2012	10/1/2012	1
	Sediment	9/28/2012	10/4/2012	4
	Sediment impeded flow to stilling well.	10/14/2012	10/17/2012	2
	Sediment	10/29/2012	10/31/2012	2
E030	Silting	7/11/2012	7/25/2012	10
	Silting	8/3/2012	8/7/2012	2
	Silting in stilling well.	8/7/2012	8/13/2012	4
	Silting	8/23/2012	9/10/2012	11
	Encoder wheel loose, not properly recording level changes.	9/28/2012	10/3/2012	3
	Crimped wiring on data logger, debris accumulation.	10/6/2012	10/9/2012	2
E038	None	n/a ^b	n/a	n/a
E039.1	Encoder level default to -2.2 ft when power loss occurred during sampling event.	10/12/2012	10/16/2012	2
E040	Probe malfunction, false readings caused ISCO to trigger.	7/15/2012	7/16/2012	1
	Probe malfunction, false readings caused ISCO to trigger.	7/16/2012	7/18/2012	2
	Probe malfunction, false readings caused ISCO to trigger.	7/25/2012	7/26/2012	1
	Probe malfunction, false readings caused ISCO to trigger.	9/18/2012	9/24/2012	4
	Sediment and debris in gage area.	10/12/2012	10/15/2012	1
E042.1	Stilling well intake clogged.	7/11/2012	7/13/2012	2
	Stilling well intake clogged.	7/16/2012	7/17/2012	1
	Stilling well silted.	7/24/2012	7/26/2012	2
	Data transmission error.	8/6/2012	8/6/2012	0
	Silting in well prevented sample collection on 8/7/2012.	8/6/2012	8/7/2012	1
	Silting	8/8/2012	8/13/2012	3
	MSS ^c cleanout dislodged encoder tape	8/13/2012	8/14/2012	1
	Cobbles and sediment deposition prevented sample collection on 8/23/2012.	8/23/2012	8/24/2012	1
	Encoder tape dislodged by MSS cleanout. ISCO triggered by MSS cleanout.	9/13/2012	9/17/2012	2
	Sediment in intakes.	9/28/2012	10/1/2012	1

Table 2.6-2 (continued)

Station	Operational Issue	Issue Date	Repair Date	Working Days from Issue to Repair
E050.1	Stilling well silted.	7/11/2012	7/12/2012	1
E055	None	n/a	n/a	n/a
E055.5	Large tree fell on station, rendering it inoperable.	9/30/2012	10/11/2012	9
	Solar panel, rain gage destroyed. Need to rebuild station.	n/a	n/a	n/a
E056	Intermittent power failure from battery failure.	8/30/2012	9/4/2012	3
	Sediment	9/10/2012	9/13/2012	3
	Sediment	10/12/2012	10/22/2012	6
E059	Power loss; battery not receiving enough charge from solar panel.	10/20/2012	10/29/2012	6
E060.1	None; no flow detected.	n/a	n/a	n/a
E109.9	Silted	7/5/2012	7/6/2012	1
	Silted	7/7/2012	7/9/2012	1
	Silted	7/11/2012	7/12/2012	1
	Encoder tape dislodged by MSS cleanout.	7/12/2012	7/12/2012	0
	Silting prevented sample collection on 7/16/2012.	7/16/2012	7/17/2012	1
	Encoder tape dislodged by MSS cleanout.	7/17/2012	7/17/2012	0
	Silted	7/18/2012	7/18/2012	0
	Silted	7/24/2012	7/25/2012	1
	Encoder tape dislodged by MSS cleanout.	7/25/2012	7/26/2012	1
	Silted	8/4/2012	8/6/2012	1
	Encoder tape dislodged by MSS cleanout.	8/6/2012	8/6/2012	0
	Additional cleanout of sediment prevented sample collection on 8/6/2012.	8/6/2012	8/7/2012	1
	Silted	8/7/2012	8/8/2012	1
	Encoder tape dislodged by MSS cleanout.	8/8/2012	8/8/2012	0
	Silting prevented sample collection on 8/13/2012.	8/13/2012	8/13/2012	0
	Encoder tape dislodged by MSS cleanout.	8/13/2012	8/13/2012	0
	Silted	8/14/2012	8/14/2012	0
	Silting prevented sample collection on 8/18/2012.	8/17/2012	8/20/2012	1
	Encoder tape dislodged by MSS cleanout.	8/20/2012	8/20/2012	0
	Silted	8/20/2012	8/21/2012	1
	Silted	8/23/2012	8/24/2012	1
	Encoder tape dislodged by MSS cleanout.	8/24/2012	8/24/2012	0
	Silted	8/24/2012	8/27/2012	1
	Silting prevented sample collection on 9/12/2012.	9/12/2012	9/13/2012	1
	Silting prevented sample collection on 9/28/2012.	9/28/2012	10/1/2012	1
	Silted	10/12/2012	10/15/2012	1
	Encoder tape dislodged by MSS cleanout.	10/15/2012	10/15/2012	0

^a Gage station E026 has multiple days of nonstandard flow as a result of construction releases upstream from the Los Alamos Reservoir. These flows resulted in repeated sediment deposition which interfered with the stream gage.

^b n/a = Not applicable.

^c MSS = Maintenance and Site Services (Laboratory group).

Table 2.6-3
Gaging Station and Sampler Inspection Intervals

Station	Inspection Date	Days from Previous Inspection
E026	6/5/2012	n/a ^a
E026	6/12/2012	7
E026	6/19/2012	7
E026	6/26/2012	7
E026	7/2/2012	6
E026	7/13/2012	11
E026	7/18/2012	5
E026	7/23/2012	5
E026	7/26/2012	3
E026	7/30/2012	4
E026	8/8/2012	9
E026	8/13/2012	5
E026	8/22/2012	9
E026	8/27/2012	5
E026	9/4/2012	8
E026	9/10/2012	6
E026	9/17/2012	7
E026	9/24/2012	7
E026	10/1/2012	7
E026	10/9/2012	8
E026	10/17/2012	8
E026	10/22/2012	5
E026	10/31/2012	9
E026	11/5/2012	5
E026	11/15/2012	10
E026	11/19/2012	4
E026	11/27/2012	8
E030	6/5/2012	n/a
E030	6/12/2012	7
E030	6/19/2012	7
E030	6/25/2012	6
E030	7/11/2012	16 ^b
E030	7/12/2012	1
E030	7/16/2012	4
E030	7/25/2012	9
E030	8/1/2012	7
E030	8/7/2012	6
E030	8/13/2012	6
E030	8/21/2012	8
E030	8/29/2012	8
E030	9/5/2012	7
E030	9/10/2012	5
E030	9/17/2012	7

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E030	9/24/2012	7
E030	10/3/2012	9
E030	10/9/2012	6
E030	10/15/2012	6
E030	10/22/2012	7
E030	10/31/2012	9
E030	11/5/2012	5
E030	11/13/2012	8
E030	11/19/2012	6
E030	11/27/2012	8
E038	6/7/2012	n/a
E038	6/12/2012	5
E038	6/20/2012	8
E038	6/26/2012	6
E038	7/17/2012	21 ^b
E038	7/26/2012	9
E038	7/30/2012	4
E038	8/9/2012	10
E038	8/15/2012	6
E038	8/23/2012	8
E038	8/28/2012	5
E038	9/6/2012	9
E038	9/11/2012	5
E038	9/17/2012	6
E038	9/25/2012	8
E038	10/4/2012	9
E038	10/11/2012	7
E038	10/16/2012	5
E038	10/25/2012	9
E038	10/30/2012	5
E038	11/6/2012	7
E038	11/15/2012	9
E038	11/21/2012	6
E038	11/27/2012	6
E039.1	6/6/2012	n/a
E039.1	6/13/2012	7
E039.1	6/20/2012	7
E039.1	6/25/2012	5
E039.1	7/2/2012	7
E039.1	7/9/2012	7
E039.1	7/18/2012	9
E039.1	7/31/2012	13
E039.1	8/8/2012	8

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E039.1	8/14/2012	6
E039.1	8/22/2012	8
E039.1	8/29/2012	7
E039.1	9/5/2012	7
E039.1	9/11/2012	6
E039.1	9/17/2012	6
E039.1	9/25/2012	8
E039.1	10/4/2012	9
E039.1	10/11/2012	7
E039.1	10/16/2012	5
E039.1	10/25/2012	9
E039.1	10/30/2012	5
E039.1	11/6/2012	7
E039.1	11/13/2012	7
E039.1	11/21/2012	8
E039.1	11/27/2012	6
E040	6/5/2012	n/a
E040	6/12/2012	7
E040	6/19/2012	7
E040	6/25/2012	6
E040	7/11/2012	16 ^b
E040	7/16/2012	5
E040	7/25/2012	9
E040	8/1/2012	7
E040	8/7/2012	6
E040	8/13/2012	6
E040	8/21/2012	8
E040	8/29/2012	8
E040	9/5/2012	7
E040	9/10/2012	5
E040	9/17/2012	7
E040	9/24/2012	7
E040	10/3/2012	9
E040	10/9/2012	6
E040	10/15/2012	6
E040	8/21/2012	8
E040	10/22/2012	7
E040	10/31/2012	9
E040	11/5/2012	5
E040	11/13/2012	8
E040	11/19/2012	6
E040	11/27/2012	8
E042.1	6/5/2012	n/a
E042.1	6/12/2012	7

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E042.1	6/19/2012	7
E042.1	6/25/2012	6
E042.1	7/2/2012	7
E042.1	7/9/2012	7
E042.1	7/12/2012	3
E042.1	7/16/2012	4
E042.1	7/24/2012	8
E042.1	7/25/2012	1
E042.1	8/1/2012	7
E042.1	8/7/2012	6
E042.1	8/9/2012	2
E042.1	8/13/2012	4
E042.1	8/21/2012	8
E042.1	8/24/2012	3
E042.1	8/29/2012	5
E042.1	9/5/2012	7
E042.1	9/10/2012	5
E042.1	9/17/2012	7
E042.1	9/24/2012	7
E042.1	10/1/2012	7
E042.1	10/10/2012	9
E042.1	10/15/2012	5
E042.1	10/22/2012	7
E042.1	10/31/2012	9
E042.1	11/5/2012	5
E042.1	11/13/2012	8
E042.1	11/19/2012	6
E042.1	11/27/2012	8
E050.1	6/5/2012	n/a
E050.1	6/12/2012	7
E050.1	6/19/2012	7
E050.1	6/25/2012	6
E050.1	7/2/2012	7
E050.1	7/6/2012	4
E050.1	7/12/2012	6
E050.1	7/16/2012	4
E050.1	7/24/2012	8
E050.1	7/25/2012	1
E050.1	8/1/2012	7
E050.1	8/6/2012	5
E050.1	8/15/2012	9
E050.1	8/23/2012	8
E050.1	8/24/2012	1
E050.1	8/29/2012	5

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E050.1	9/5/2012	7
E050.1	9/12/2012	7
E050.1	9/19/2012	7
E050.1	9/24/2012	5
E050.1	10/1/2012	7
E050.1	10/9/2012	8
E050.1	10/15/2012	6
E050.1	10/22/2012	7
E050.1	10/31/2012	9
E050.1	11/5/2012	5
E050.1	11/13/2012	8
E050.1	11/20/2012	7
E050.1	11/28/2012	8
E055.5	6/7/2012	n/a
E055.5	6/12/2012	5
E055.5	6/20/2012	8
E055.5	6/27/2012	7
E055.5	7/18/2012	21 ^b
E055.5	7/27/2012	9
E055.5	8/2/2012	6
E055.5	8/9/2012	7
E055.5	8/13/2012	4
E055.5	8/20/2012	7
E055.5	8/28/2012	8
E055.5	9/6/2012	9
E055.5	9/13/2012	7
E055.5	9/17/2012	4
E055.5	9/25/2012	8
E055.5	10/2/2012	7
E055.5	10/11/2012	9
E055.5	10/18/2012	7
E055.5	10/24/2012	6
E055.5	11/2/2012	9
E055.5	11/6/2012	4
E055.5	11/16/2012	10
E055.5	11/21/2012	5
E055.5	11/28/2012	7
E055	6/6/2012	n/a
E055	6/12/2012	6
E055	6/20/2012	8
E055	6/27/2012	7
E055	7/18/2012	21 ^b
E055	7/24/2012	6
E055	7/31/2012	7

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E055	8/8/2012	8
E055	8/13/2012	5
E055	8/23/2012	10
E055	8/28/2012	5
E055	9/4/2012	7
E055	9/13/2012	9
E055	9/17/2012	4
E055	9/25/2012	8
E055	10/2/2012	7
E055	10/11/2012	9
E055	10/16/2012	5
E055	10/22/2012	6
E055	11/2/2012	11
E055	11/7/2012	5
E055	11/15/2012	8
E055	11/21/2012	6
E055	11/29/2012	8
E056	6/6/2012	n/a
E056	6/6/2012	0
E056	6/20/2012	14
E056	6/27/2012	7
E056	7/18/2012	21 ^b
E056	7/24/2012	6
E056	7/31/2012	7
E056	8/8/2012	8
E056	8/13/2012	5
E056	8/23/2012	10
E056	8/28/2012	5
E056	9/4/2012	7
E056	9/13/2012	9
E056	9/17/2012	4
E056	9/25/2012	8
E056	10/2/2012	7
E056	10/11/2012	9
E056	10/16/2012	5
E056	10/22/2012	6
E056	11/2/2012	11
E056	11/7/2012	5
E056	11/15/2012	8
E056	11/21/2012	6
E056	11/29/2012	8
E059	6/6/2012	n/a
E059	6/12/2012	6
E059	6/19/2012	7

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E059	6/25/2012	6
E059	7/2/2012	7
E059	7/9/2012	7
E059	7/17/2012	8
E059	7/24/2012	7
E059	7/31/2012	7
E059	8/8/2012	8
E059	8/13/2012	5
E059	8/23/2012	10
E059	8/27/2012	4
E059	9/5/2012	9
E059	9/10/2012	5
E059	9/17/2012	7
E059	9/25/2012	8
E059	10/4/2012	9
E059	10/9/2012	5
E059	10/17/2012	8
E059	10/22/2012	5
E059	10/29/2012	7
E059	11/6/2012	8
E059	11/15/2012	9
E059	11/19/2012	4
E059	11/28/2012	9
E060.1	6/5/2012	n/a
E060.1	6/12/2012	7
E060.1	6/19/2012	7
E060.1	6/26/2012	7
E060.1	7/2/2012	6
E060.1	7/6/2012	4
E060.1	7/16/2012	10
E060.1	7/24/2012	8
E060.1	7/30/2012	6
E060.1	8/6/2012	7
E060.1	8/15/2012	9
E060.1	8/23/2012	8
E060.1	8/29/2012	6
E060.1	9/5/2012	7
E060.1	9/12/2012	7
E060.1	9/19/2012	7
E060.1	9/26/2012	7
E060.1	10/1/2012	5
E060.1	10/10/2012	9
E060.1	10/17/2012	7
E060.1	10/24/2012	7

Table 2.6-3 (continued)

Station	Inspection Date	Days from Previous Inspection
E060.1	10/30/2012	6
E060.1	11/5/2012	6
E060.1	11/13/2012	8
E060.1	11/20/2012	7
E060.1	11/28/2012	8
E109.9	6/5/2012	n/a
E109.9	6/12/2012	7
E109.9	6/19/2012	7
E109.9	6/26/2012	7
E109.9	7/2/2012	6
E109.9	7/6/2012	4
E109.9	7/12/2012	6
E109.9	7/16/2012	4
E109.9	7/24/2012	8
E109.9	7/26/2012	2
E109.9	7/30/2012	4
E109.9	8/6/2012	7
E109.9	8/8/2012	2
E109.9	8/14/2012	6
E109.9	8/14/2012	0
E109.9	8/20/2012	6
E109.9	8/24/2012	4
E109.9	8/27/2012	3
E109.9	9/5/2012	9
E109.9	9/13/2012	8
E109.9	9/19/2012	6
E109.9	9/26/2012	7
E109.9	10/1/2012	5
E109.9	10/9/2012	8
E109.9	10/15/2012	6
E109.9	10/24/2012	9
E109.9	10/30/2012	6
E109.9	11/6/2012	7
E109.9	11/13/2012	7
E109.9	11/20/2012	7
E109.9	11/28/2012	8

^a n/a = Not applicable.

^b Stage III fire restrictions in place; could not access field. After field restrictions lifted inspections to lower canyon sites were prioritized.

Table 3.1-1
Drainage Areas, Impermeable Surface Percentages, and
Las Conchas Fire Burn Areas in the Los Alamos Canyon Watershed

Canyon	Gage	Drainage to Gage (acres)	Impermeable Surface (%)^a	Las Conchas Fire, High and Moderate Burn Severity (%)
Acid	E055.5	53	81	0
Acid ^b	E056	237	70	0
Acid	Acid Canyon above E056	290	72	0
Pueblo	E055	2191	25	0
Pueblo ^b	E059	1827	39	0
Pueblo ^b	E060.1	1006	8	0
Pueblo	Pueblo Canyon above E060.1	5310	29	0
DP	E038	144	88	0
DP ^b	E039.1	112	29	0
DP ^b	E040	133	24	0
DP	DP Canyon above E039.1	256	62	0
DP	DP Canyon above E040	388	49	0
LA	E026	4534	2	42
LA ^b	E030	960	30	0
LA ^b	E042.1	601	12	0
LA ^b	E050.1	195	11	0
LA ^b	E109.9 (including Guaje Canyon)	25,800	8	12
LA	Los Alamos Canyon above E050.1	6680	10	29
LA	Los Alamos, Pueblo, and Guaje Canyons above E109.9	37,800	11	13
LA ^b	Los Alamos Canyon between E050.1, E060.1, and E109.9	4761	19	0
Guaje	E099	21,000	5	15

^a Percent of impermeable surface does not account for hydrophobic soils in the Las Conchas burn area.

^b Drainage area shown in this row does not extend to head of watershed above gage, excluding areas of subwatersheds that are also shown in this table.

Table 3.2-1
Travel Time of Flood Bore, Peak Discharge, Increase or Decrease in Peak Discharge, and Percent Change
in Peak Discharge from Upstream to Downstream Stations for Sampled 2012 Runoff Events in Lower LA/P Watershed

Date	Travel Time from E050.1 to E109.9 (min)	Peak Discharge (cfs)		+/- ^a	% ^a	Travel Time from E060.1 to E109.9 (min)	Peak Discharge (cfs)		+/-	%	Travel Time from E099 to E109.9 (min)	Peak Discharge (cfs)		+/-	%
		E050.1	E109.9				E060.1	E109.9				E099	E109.9		
7/5	— ^b	0	48	+	100	—	0	48	+	100	25	3.7	48	+	92
7/7	—	0	0.1	N	N	—	0	0.1	N	N	—	0	0.1	N	N
7/11–7/12	105	130	200 ^c	+	35	—	0	680	+	100	5	150	680	+	78
7/16	—	0.2	270	+	100	—	0	270	+	100	5	280	230 ^c	–	18
7/24	160	9.9	12.4 ^c	+	20	—	0	25	+	100	—	n/a ^d	25	n/a	n/a
8/3–8/4	95	170	200	+	15	—	0	200	+	100	10	50	170 ^c	+	71
	—	—	—	—	—	—	—	—	—	—	45	170	110 ^c	–	35
8/6	-255	2.5	86	G	G	—	0	86	+	100	—	0.4	86	+	100
8/7–8/8	-235	4.2	480	G	G	—	0	480	+	100	5	220	480	+	54
	—	—	—	—	—	—	—	—	—	—	15	220	190 ^c	–	14
8/13–8/14	—	0	18	+	100	—	0	18	+	100	60	4.8	18	+	73
8/18–8/19	—	0	170	+	100	—	0	170	+	100	5	11	150 ^c	+	93
8/23	-220	4.9	220	G	G	—	0	220	+	100	10	37	220	+	83
	—	—	—	—	—	—	—	—	—	—	20	85	160 ^c	+	47
8/24	—	0.7	160	+	100	—	0	160	+	100	20	7	160	+	96
9/12	—	0	12	+	100	—	0	12	+	100	45	6	12	+	50
9/28	235	7	5.9	–	16	—	0	5.9	+	100	—	0	5.9	+	100
10/12	110	30	110 ^c	+	73	—	0	440	+	100	10	79	170 ^c	+	82
Min	95	0	0	—	15	—	0	0	—	100	5	0	0	—	14
Mean	141	24	133	—	69	—	0	188	—	100	20	78	163	—	66
Max	235	170	480	—	100	—	0	680	—	100	60	280	680	—	100

^a + = Increase; – = decrease; % = percent change in peak discharge; N = little to no change in peak discharge; G = negative travel time (i.e., peak of downstream station occurred before peak of upstream station, indicating a different origin creating the downstream peak).

^b — = Result not applicable.

^c Peak discharge is not the peak of the entire storm (see Table 2.3-1 for the storm peak), but is the peak discharge estimated to align with the transmission of water from the upstream to downstream station.

^d n/a = Not available due to maintenance issues.

Table 3.2-2
Summary of Peak Discharge Increases/Decreases in Lower LA/P Watershed

Year	Summary	E050.1 to E109.9	E060.1 to E109.9	E099 to E109.9
2012	Number of Increases	10	14	13
	Number of Decreases	1	0	3
	Mean Increase	74%	100%	75%
	Mean Decrease	16%	0%	22%
2011	Number of Increases	19	22	n/a
	Number of Decreases	4	0	n/a
	Mean Increase	90%	100%	n/a
	Mean Decrease	78%	0%	n/a
2010	Number of Increases	2	3	n/a
	Number of Decreases	2	1	n/a
	Mean Increase	59%	100%	n/a
	Mean Decrease	84%	28%	n/a

Table 3.2-3
Pearson's Correlation Coefficients between Post-Flood-Bore Discharge (Q) and TSS for Each Station Sampled during 2012

Time Lag	E026	E038		E042.1			
	7/11	7/7	10/12	7/11	7/24	8/3	10/12
Q_t, TSS_t	0.66	0.96	0.89	0.38	0.66	1.00	0.99
Q_t, TSS_{t-5}	0.67	0.96	0.89	0.12	0.62	n/a*	0.97
Q_t, TSS_{t-10}	0.70	0.85	0.88	-0.01	0.63	n/a	0.95
Q_t, TSS_{t-15}	0.44	0.81	0.86	-0.02	0.65	n/a	0.96
Q_t, TSS_{t-20}	0.53	0.66	0.74	-0.22	0.48	n/a	0.90
Q_t, TSS_{t-25}	0.83	0.44	0.65	-0.37	0.61	n/a	0.85
Q_t, TSS_{t-30}	0.49	0.21	0.60	-0.59	0.41	n/a	0.88

Time Lag	E050.1					E109.9		E099	
	7/11	7/24	8/3	9/28	10/12	8/3	10/12	7/5	8/3
Q_t, TSS_t	0.90	0.94	0.93	0.54	0.98	0.88	0.76	0.61	0.58
Q_t, TSS_{t-5}	0.79	0.61	0.80	0.88	0.94	0.66	0.76	n/a	0.11
Q_t, TSS_{t-10}	0.73	n/a	0.61	0.76	0.94	0.60	0.48	n/a	-0.95
Q_t, TSS_{t-15}	0.77	n/a	0.62	0.45	0.98	0.32	-0.22	n/a	n/a
Q_t, TSS_{t-20}	0.71	n/a	0.55	0.21	0.87	n/a	-0.81	n/a	n/a
Q_t, TSS_{t-25}	0.71	n/a	0.26	-0.01	n/a	n/a	-0.68	n/a	n/a
Q_t, TSS_{t-30}	0.71	n/a	0.46	0.36	n/a	n/a	-0.34	n/a	n/a

Note: Maximum positive correlations are highlighted.

* n/a = Not applicable because data points are limited (i.e., less than three).

Table 3.2-4
Sediment Yield and Runoff Volume for Sampled 2012 Runoff Events

Station	Date	Sediment Yield (tons)	Sediment Yield (yd ³) ^a	Runoff Volume (acre-feet)	Peak Discharge (cfs)
E026	7/11/2012	2043	915	11.8	120
E038	7/7/2012	4.3	1.9	0.9	57
E038	10/12/2012	5.8	2.6	3.8	79
E039.1 ^b	10/12/2012	4.7	2.1	6.9	97
E042.1	7/11/2012	1944	871	12.9	290
E042.1	7/24/2012	163	73	6.2	61
E042.1	8/3/2012	1288	577	20.6	220
E042.1	10/12/2012	88	40	14.4	70
E050.1	7/11/2012	1047	469	8.2	130
E050.1	7/24/2012	39	17	3.5	10
E050.1	8/3/2012	772	346	15.0	170
E050.1	9/28/2012	29	13	1.8	7.0
E050.1	10/12/2012	26	12	4.6	30
E099	8/3/2012	1285	575	12.2	170
E099	10/12/2012	731	327	10.6	79
E109.9 ^b	7/5/2012	16	7.3	5.9	48
E109.9	8/3/2012	2398	1074	40.4	200

Note: Sediment yield and runoff volume were calculated only from sampled events with reliable hydrographs.

^a Volumetric sediment yield was computed using a soil bulk density of 2650 kg/m³ and volume = mass/density.

^b Samples were not collected throughout the entire hydrograph (see Figure 3.2-3); thus, sediment yields may be underestimated.

Table 3.4-1

Travel Time of Flood Bore, Peak Discharge, Increase or Decrease in Peak Discharge, and Percent Change in Peak Discharge from Upstream to Downstream Stations for 2012 Runoff Events Exceeding Sampling Triggers across the Watershed Mitigations

Date	Travel Time from E038 to E039.1 (min)	Peak Discharge (cfs)		+/- ^a	% ^a	Travel Time from E042.1 to E050.1 (min)	Peak Discharge (cfs)		+/-	%	Travel Time from E059 to E060.1 (min)	Peak Discharge (cfs)		+/-	%
		E038	E039.1				E042.1	E050.1				E059	E060.1		
7/5	— ^b	0	0	N	N	—	0	0	N	N	—	0	0	—	—
7/7	130	57	0.2	—	100	—	0	0	N	N	—	0	0	—	—
7/11–7/12	—	1.2	0.1	—	92	15	290	130	—	55	—	0	0	—	—
7/16	—	0	0.1	N	N	—	0	0.1	N	N	—	0	0	—	—
7/24	—	0	0	N	N	110	61	9.9	—	84	—	0	0	—	—
8/3–8/4	55	6.8	3.7	—	46	15	220	170	—	23	—	0	0	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8/6	—	3.0	0.1	—	97	130	4.7	2.5	—	47	—	0	0	—	—
8/7–8/8	—	0	0.1	N	N	90	12	4.2	—	65	—	0	0	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8/13–8/14	—	0	0.1	N	N	—	0	0	N	N	—	0	0	—	—
8/18–8/19	—	0	0.1	N	N	—	0	0	N	N	—	0	0	—	—
8/23	—	0	0.1	N	N	110	17	4.9	—	71	—	0	0	—	—
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
8/24	—	5.6	0.1	—	98	—	0.7	0.3	—	57	—	0	0	—	—
9/12	50	7.3	5.2	—	29	—	0	0	N	N	—	0	0	—	—
9/28	—	3.0	0.1	—	97	95	39	7	—	82	—	0	0	—	—
10/12	65	79	97	+	19	45	70	30	—	57	—	0	0	—	—
Min	50	0	0	—	19	15	0	0	—	23	—	0	0	—	—
Mean	75	11	7	—	72	76	48	24	—	60	—	0	0	—	—
Max	130	79	97	—	100	130	290	170	—	84	—	0	0	—	—

^a + = Increase; – = decrease; % = percent change in peak discharge; N = little to no change in peak discharge.

^b — = Result not applicable.

Table 4.2-1
NMWQCC Surface Water Standards

Analytical Suite ^a	Analyte Code	Analyte Name	Field Prep	Acute Aquatic ^b	Human Health Persistent	Livestock Watering	Wildlife Habitat
DIOX/FUR	n/a ^c	Dioxin (TEQ)	UF ^d	n/a	0.000000051	n/a	n/a
METALS	Al	Aluminum	F ^e	658	n/a	n/a	n/a
METALS	Sb	Antimony	F	n/a	640	n/a	n/a
METALS	As	Arsenic	F	340	9	200	n/a
METALS	B	Boron	F	n/a	n/a	5000	n/a
METALS	Cd	Cadmium	F	0.59	n/a	50	n/a
METALS	Cr	Chromium	F	n/a	n/a	1000	n/a
METALS	Cr(III)	Chromium(III)	F	213	n/a	n/a	n/a
METALS	Co	Cobalt	F	n/a	n/a	1000	n/a
METALS	Cu	Copper	F	4.3	n/a	500	n/a
METALS	Pb	Lead	F	17	n/a	100	n/a
METALS	Mn	Manganese	F	2000	n/a	n/a	n/a
METALS	Hg	Mercury	F	1.4	n/a	n/a	n/a
METALS	Hg	Mercury	UF	n/a	n/a	10	0.77
METALS	Ni	Nickel	F	170	4600	n/a	n/a
METALS	Se	Selenium	F	n/a	4200	50	n/a
METALS	Se	Selenium	UF	20	n/a	n/a	5
METALS	Ag	Silver	F	0.41	n/a	n/a	n/a
METALS	Tl	Thallium	F	n/a	0.47	n/a	n/a
METALS	V	Vanadium	F	n/a	n/a	100	n/a
METALS	Zn	Zinc	F	54	26,000	25,000	n/a
WET_CHEM	CN(TOTAL)	Cyanide (Total)	UF	22	140	n/a	5.2
PCB_CONG	1336-36-3	Total PCB	UF	n/a	0.00064	n/a	0.014
RAD	GROSSA	Gross alpha	UF	n/a	n/a	15	n/a
RAD	Ra-226+228	Radium-226 and Radium-228	UF	n/a	n/a	30	n/a

^a All units are µg/L except for RAD, which are pCi/L.

^b Hardness-dependent values are calculated using a water hardness value of 30 mg CaCO₃/L.

^c n/a = Not applicable.

^d UF = Unfiltered.

^e F = Filtered.

Table 4.2-2
Maximum Detected Results By Station and Event
above Comparison Values in LA/P Storm Water Samples in 2012

Station	Collection Date	Total PCBs	2,3,7,8-TCDD TEQ	Silver	Aluminum ^a	Arsenic	Cadmium	Cobalt	Chromium ^a	Copper ^a	Gross Alpha	Mercury	Nickel	Lead ^a	Radium-226 and Radium-228	Selenium	Thallium	Vanadium	Zinc ^a
Comparison Value		0.0006	5.1×10^{-8}	0.4	658	9	0.6	1000	210	4.3	15	0.77	170	17	30	5	6.3	100	54
Field Preparation		UF ^b	UF	F ^c	F	F	F	F	F	F	UF	UF	F	F	UF	UF	F	F	F
CO111041	06-Jul-12	14.9	NA ^d	— ^e	—	—	—	—	—	6.3	NA	—	—	—	NA	—	—	—	—
CO111041	12-Sep-12	4.09	NA	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
CO111041	12-Oct-12	21.8	NA	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
CO115002	12-Oct-12	0.0886	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E026	11-Jul-12	—	—	—	—	—	—	—	—	—	NA	—	—	—	NA	51	—	—	—
E026	03-Aug-12	0.0897	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E030	11-Jul-12	0.0508	—	—	—	—	—	—	—	6.5	NA	—	—	—	NA	44	—	—	—
E030	24-Jul-12	0.124	—	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	70
E030	03-Aug-12	0.0552	2.15E-07	—	—	—	—	—	—	—	NA	3.29	—	—	NA	52	—	—	—
E030	12-Oct-12	0.0754	—	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
E038	07-Jul-12	0.0671	1.19E-06	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
E038	12-Oct-12	0.0501	1.68E-06	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
E039.1	12-Oct-12	0.0339	1.58E-07	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
E040	12-Oct-12	0.0493	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E042.1	11-Jul-12	0.214	NA	—	—	—	—	—	—	5	NA	—	—	—	NA	6	—	—	82
E042.1	24-Jul-12	NA	NA	—	—	—	—	—	—	—	NA	5.99	—	—	NA	44	—	—	56
E042.1	03-Aug-12	0.153	NA	—	—	—	—	—	—	—	NA	3.53	—	—	NA	53	—	—	—

Table 4.2-2 (continued)

Station	Collection Date	Total PCBs	2,3,7,8-TCDD TEQ	Silver	Aluminum	Arsenic	Cadmium	Cobalt	Chromium	Copper	Gross Alpha	Mercury	Nickel	Lead	Radium-226 and Radium-228	Selenium	Thallium	Vanadium	Zinc
Comparison Value		0.0006	0.000000051	0.4	658	9	0.6	1000	210	4.3	15	0.77	170	17	30	5	6.3	100	54
Field Preparation		UF	UF	F	F	F	F	F	F	F	UF	UF	F	F	UF	UF	F	F	F
E042.1	28-Sep-12	0.0351	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E042.1	12-Oct-12	0.045	8.21E-07	—	—	—	—	—	—	—	NA	—	—	—	NA	—	—	—	—
E050.1	11-Jul-12	0.165	NA	—	—	—	—	—	—	—	3050	1.19	—	—	102	—	—	—	85
E050.1	24-Jul-12	0.0298	NA																
E050.1	03-Aug-12	0.145	NA	—		—	—	—	—	—	1230	3.33	—	—	74	35	—	—	—
E050.1	28-Sep-12	0.0088	—	—	777	—	—	—	—	—	NA	—	—	—	74	10	—	—	—
E050.1	12-Oct-12	0.0767	1.6E-06	—	—	—	—	—	—	—	21	—	—	—	—	—	—	—	—
E056	12-Oct-12	0.015	9.18E-08	—	—	—	—	—	—	4.9	NA	—	—	—	NA	—	—	—	—
E109.9	07-Jul-12	NA	5.49E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E109.9	24-Jul-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	1260	NA	NA	NA	NA	NA	NA	NA	NA
E109.9	03-Aug-12	0.156	NA	—	—	—	—	—	—	—	1260	3.33	—	—	122	87	—	—	—
E109.9	07-Aug-12	0.036	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.95	NA	NA	NA	106	NA	NA	NA
E109.9	23-Aug-12	0.0554	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E109.9	24-Aug-12	0.0515	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: All units are µg/L, except gross alpha, radium-226, and radium-228, are in pCi/L.

^a Hardness-dependent comparison values based on 30 mg CaCO₃/L hardness.

^b UF = Unfiltered.

^c F = Filtered.

^d NA = Not analyzed.

^e — = Analyte was not detected above comparison value.

^f

Table 4.2-3
Dioxin and Furan TEFs for the Dibenzodioxins and Dibenzofurans

Analyte Code	Analyte	TEF
35822-46-9	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	0.01
67562-39-4	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	0.01
55673-89-7	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	0.01
39227-28-6	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	0.1
57653-85-7	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	0.1
19408-74-3	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	0.1
70648-26-9	Hexachlorodibenzofuran[1,2,3,4,7,8-]	0.1
57117-44-9	Hexachlorodibenzofuran[1,2,3,6,7,8-]	0.1
72918-21-9	Hexachlorodibenzofuran[1,2,3,7,8,9-]	0.1
60851-34-5	Hexachlorodibenzofuran[2,3,4,6,7,8-]	0.1
3268-87-9	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	0.0003
39001-02-0	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	0.0003
40321-76-4	Pentachlorodibenzodioxin[1,2,3,7,8-]	1
57117-41-6	Pentachlorodibenzofuran[1,2,3,7,8-]	0.03
57117-31-4	Pentachlorodibenzofuran[2,3,4,7,8-]	0.3
1746-01-6	Tetrachlorodibenzodioxin[2,3,7,8-]	1
51207-31-9	Tetrachlorodibenzofuran[2,3,7,8-]	0.1

Table 4.2-4
Dioxin and Furan TEQs in 2012 Storm Water Samples

Station	Collection Date	Sample ID	2,3,7,8-TCDD TEQ (µg/L)
E030	8/3/2012	WTLAP-12-14519	2.148E-07
E038	7/7/2012	WTLAP-12-14491	1.1885E-06
E038	10/12/2012	WTLAP-12-14504	1.683E-06
E039.1	10/12/2012	WTLAP-12-14492	1.578E-07
E042.1	10/12/2012	WTLAP-13-24353	8.209E-07
E050.1	10/12/2012	WTLAP-13-24449	1.6E-06
E056	10/12/2012	WTLAP-12-14489	9.18E-08
E109.9	7/5/2012	WTLAP-12-14194	5.49E-07

Table 4.3-1
Calculated SSC and Instantaneous Discharge Determined
for Each Sample Collected during 2012 in the LA/P Watershed

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
CO111041	07/06/2012 11:31	UF ^a	WTLAP-12-14187	1080	396	na ^b
CO111041	07/06/2012 11:33	UF	WTLAP-12-14751	1080	396	na
CO111041	07/06/2012 11:34	F ^c	WTLAP-12-14543	1080	396	na
CO111041	07/06/2012 11:35	UF	WTLAP-12-14558	1080	396	na
CO111041	07/06/2012 11:36	UF	WTLAP-12-14342	1080	396	na
CO111041	07/06/2012 11:37	UF	WTLAP-12-14703	1080	396	na
CO111041	09/12/2012 16:05	UF	WTLAP-12-14203	212	110	na
CO111041	09/12/2012 16:05	UF	WTLAP-12-14696	212	110	na
CO111041	09/12/2012 16:07	UF	WTLAP-12-14754	212	110	na
CO111041	09/12/2012 16:08	F	WTLAP-12-14588	212	110	na
CO111041	09/12/2012 16:08	UF	WTLAP-12-14573	212	110	na
CO111041	09/12/2012 16:09	UF	WTLAP-12-14349	212	110	na
CO111041	09/12/2012 16:10	UF	WTLAP-12-14710	212	110	na
CO111041	10/12/2012 10:06	F	WTLAP-13-24311	1780	1210	na
CO111041	10/12/2012 10:06	UF	WTLAP-13-24310	1780	1210	na
CO115002	10/12/2012 13:40	UF	WTLAP-12-14188	980	na	na
CO115002	10/12/2012 13:42	UF	WTLAP-12-14752	980	na	na
E026	07/11/2012 17:05	UF	WTLAP-12-14818	339000	234000	110
E026	07/11/2012 17:14	UF	WTLAP-12-15340	339000	159000	99
E026	07/11/2012 17:15	UF	WTLAP-12-14195	336000	151000	98
E026	07/11/2012 17:17	UF	WTLAP-12-14820	330000	134000	100
E026	07/11/2012 17:19	UF	WTLAP-12-22216	324000	132000	110
E026	07/11/2012 17:20	UF	WTLAP-12-14821	320000	131000	110
E026	07/11/2012 17:20	UF	WTLAP-12-22220	320000	131000	110
E026	07/11/2012 17:23	UF	WTLAP-12-14822	311000	188000	110
E026	07/11/2012 17:25	UF	WTLAP-12-14496	305000	149000	110
E026	07/11/2012 17:26	UF	WTLAP-12-15274	302000	130000	110
E026	07/11/2012 17:27	UF	WTLAP-12-14455	298000	119000	110
E026	07/11/2012 17:29	UF	WTLAP-12-14664	292000	96600	110
E026	07/11/2012 17:29	UF	WTLAP-12-14823	292000	96600	110
E026	07/11/2012 17:31	F	WTLAP-12-14550	286000	97300	100
E026	07/11/2012 17:32	UF	WTLAP-12-14565	283000	97700	100
E026	07/11/2012 17:49	UF	WTLAP-12-15343	229000	104000	67
E026	07/11/2012 18:09	UF	WTLAP-12-14825	229000	111000	27
E026	07/11/2012 18:29	UF	WTLAP-12-14826	229000	108000	22

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E026	07/11/2012 18:49	UF	WTLAP-12-14827	229000	93500	17
E026	07/11/2012 19:09	UF	WTLAP-12-14828	229000	22800	14
E026	08/03/2012 16:40	UF	WTLAP-12-14211	na	77900	89
E026	08/03/2012 16:42	UF	WTLAP-12-22927	na	77900	81
E030	07/11/2012 18:25	UF	WTLAP-12-14167	318000	na	100
E030	07/11/2012 18:26	UF	WTLAP-12-14192	312000	na	95
E030	07/11/2012 18:27	UF	WTLAP-12-22170	307000	na	88
E030	07/11/2012 18:28	UF	WTLAP-12-22174	302000	na	81
E030	07/11/2012 18:29	UF	WTLAP-12-14452	297000	na	74
E030	07/11/2012 18:30	UF	WTLAP-12-14493	292000	na	67
E030	07/11/2012 18:32	F	WTLAP-12-14547	281000	na	65
E030	07/11/2012 18:32	UF	WTLAP-12-14562	281000	na	65
E030	07/11/2012 18:33	UF	WTLAP-12-14661	276000	na	64
E030	07/11/2012 18:33	UF	WTLAP-12-14705	276000	na	64
E030	07/24/2012 14:45	UF	WTLAP-12-14172	176000	54900	13
E030	07/24/2012 14:46	UF	WTLAP-12-14208	176000	54900	13
E030	07/24/2012 14:47	UF	WTLAP-12-22171	176000	54900	13
E030	07/24/2012 14:48	UF	WTLAP-12-22175	176000	54900	13
E030	07/24/2012 14:49	UF	WTLAP-12-14462	176000	54900	13
E030	07/24/2012 14:50	UF	WTLAP-12-14506	176000	54900	13
E030	07/24/2012 14:51	F	WTLAP-12-14592	176000	54900	13
E030	07/24/2012 14:52	UF	WTLAP-12-14577	176000	54900	13
E030	07/24/2012 14:52	UF	WTLAP-12-14666	176000	54900	13
E030	07/24/2012 14:53	UF	WTLAP-12-14712	176000	54900	12
E030	08/03/2012 17:45	UF	WTLAP-12-14177	149000	43300	95
E030	08/03/2012 17:46	UF	WTLAP-12-14224	149000	43300	91
E030	08/03/2012 17:48	UF	WTLAP-12-22172	149000	43300	83
E030	08/03/2012 17:50	UF	WTLAP-12-22176	149000	43300	74
E030	08/03/2012 17:52	UF	WTLAP-12-14472	149000	43300	67
E030	08/03/2012 17:53	UF	WTLAP-12-14519	149000	43300	64
E030	08/03/2012 17:56	F	WTLAP-12-14607	149000	43300	45
E030	08/03/2012 17:56	UF	WTLAP-12-14622	149000	43300	45
E030	08/03/2012 17:57	UF	WTLAP-12-14671	149000	43300	34
E030	08/03/2012 17:58	UF	WTLAP-12-14719	149000	43300	23
E030	10/12/2012 15:10	UF	WTLAP-12-14182	17600	12200	6.9
E030	10/12/2012 15:11	UF	WTLAP-12-14240	17600	12200	6.6

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E030	10/12/2012 15:12	UF	WTLAP-12-22173	17600	12200	6.4
E030	10/12/2012 15:13	UF	WTLAP-12-22177	17600	12200	6.2
E030	10/12/2012 15:15	UF	WTLAP-12-14482	17600	12200	5.7
E030	10/12/2012 15:16	UF	WTLAP-12-14532	17600	12200	na
E030	10/12/2012 15:18	F	WTLAP-12-14652	17600	12200	5.7
E030	10/12/2012 15:18	UF	WTLAP-12-14637	17600	12200	5.7
E030	10/12/2012 15:19	UF	WTLAP-12-14676	17600	12200	5.7
E030	10/12/2012 15:19	UF	WTLAP-12-14726	17600	12200	5.7
E038	07/07/2012 11:30	UF	WTLAP-12-14762	3800	6530	57
E038	07/07/2012 11:32	UF	WTLAP-12-14763	3800	6370	48
E038	07/07/2012 11:34	UF	WTLAP-12-14764	3800	4140	39
E038	07/07/2012 11:36	UF	WTLAP-12-14765	3800	3560	31
E038	07/07/2012 11:38	UF	WTLAP-12-15266	3800	3370	23
E038	07/07/2012 11:40	UF	WTLAP-12-14190	3800	2880	15
E038	07/07/2012 11:40	UF	WTLAP-12-15338	3800	2880	15
E038	07/07/2012 11:42	UF	WTLAP-12-14766	2920	2380	12
E038	07/07/2012 11:42	UF	WTLAP-12-22224	2920	2380	12
E038	07/07/2012 11:43	UF	WTLAP-12-22228	2490	2690	11
E038	07/07/2012 11:44	UF	WTLAP-12-14767	2050	3000	9.4
E038	07/07/2012 11:45	UF	WTLAP-12-14450	1610	2810	8
E038	07/07/2012 11:46	UF	WTLAP-12-14491	1180	2620	7.3
E038	07/07/2012 11:46	UF	WTLAP-12-14768	1180	2620	7.3
E038	07/07/2012 11:48	F	WTLAP-12-14545	300	2540	5.8
E038	07/07/2012 11:48	UF	WTLAP-12-14560	300	2540	5.8
E038	07/07/2012 11:48	UF	WTLAP-12-15341	300	2540	5.8
E038	07/07/2012 11:50	UF	WTLAP-12-14769	300	2470	4.4
E038	07/07/2012 11:52	UF	WTLAP-12-14770	300	1520	3.6
E038	07/07/2012 11:54	UF	WTLAP-12-14771	300	1910	2.9
E038	07/07/2012 11:56	UF	WTLAP-12-14772	300	1780	2
E038	07/07/2012 11:58	UF	WTLAP-12-14773	300	1500	0.99
E038	07/07/2012 12:00	UF	WTLAP-12-14774	300	1490	2
E038	07/07/2012 12:20	UF	WTLAP-12-14775	300	680	0.42
E038	10/12/2012 13:54	UF	WTLAP-12-14890	2610	3270	72
E038	10/12/2012 13:56	UF	WTLAP-12-14891	2610	1760	56
E038	10/12/2012 13:58	UF	WTLAP-12-15278	2610	1920	28
E038	10/12/2012 14:00	UF	WTLAP-12-14206	2610	2170	48
E038	10/12/2012 14:00	UF	WTLAP-12-14888	2610	2170	48

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E038	10/12/2012 14:01	UF	WTLAP-12-14575	2610	2100	45
E038	10/12/2012 14:02	F	WTLAP-12-14590	2610	2040	42
E038	10/12/2012 14:02	UF	WTLAP-12-14892	2610	2040	42
E038	10/12/2012 14:03	UF	WTLAP-12-22225	2610	1970	40
E038	10/12/2012 14:04	UF	WTLAP-12-14893	2610	1900	37
E038	10/12/2012 14:05	UF	WTLAP-12-14504	2610	1900	34
E038	10/12/2012 14:06	UF	WTLAP-12-15347	2610	1890	34
E038	10/12/2012 14:07	UF	WTLAP-12-22229	2610	1880	33
E038	10/12/2012 14:08	UF	WTLAP-12-14895	2610	1880	32
E038	10/12/2012 14:09	UF	WTLAP-12-14460	2610	1800	32
E038	10/12/2012 14:10	UF	WTLAP-12-14896	2610	1710	31
E038	10/12/2012 14:12	UF	WTLAP-12-14897	2610	1240	31
E038	10/12/2012 14:14	UF	WTLAP-12-14898	2610	2250	32
E038	10/12/2012 14:16	UF	WTLAP-12-14899	2610	1180	33
E038	10/12/2012 14:18	UF	WTLAP-12-14900	2610	1280	36
E038	10/12/2012 14:20	UF	WTLAP-12-14901	2610	1100	39
E038	10/12/2012 14:40	UF	WTLAP-12-14902	2610	755	20
E038	10/12/2012 15:00	UF	WTLAP-12-14903	2610	462	6.1
E038	10/12/2012 15:20	UF	WTLAP-12-14904	2610	333	2.8
E038	10/12/2012 15:40	UF	WTLAP-12-15280	2610	206	1.4
E038	10/12/2012 16:00	UF	WTLAP-12-14905	2610	128	0.93
E038	10/12/2012 16:20	UF	WTLAP-12-15281	2610	110	0.42
E039.1	10/12/2012 14:24	UF	WTLAP-12-14780	1520	1410	62
E039.1	10/12/2012 14:26	UF	WTLAP-12-14781	1520	1230	78
E039.1	10/12/2012 14:28	UF	WTLAP-12-14782	1520	1260	80
E039.1	10/12/2012 14:30	UF	WTLAP-12-14783	1520	1170	82
E039.1	10/12/2012 14:32	UF	WTLAP-12-14784	1520	975	82
E039.1	10/12/2012 14:34	UF	WTLAP-12-14785	1520	1070	82
E039.1	10/12/2012 14:36	UF	WTLAP-12-15339	1520	1040	82
E039.1	10/12/2012 14:38	UF	WTLAP-12-14345	1520	1010	83
E039.1	10/12/2012 14:39	UF	WTLAP-12-14191	1520	995	83
E039.1	10/12/2012 14:40	UF	WTLAP-12-14311	1520	980	83
E039.1	10/12/2012 14:40	UF	WTLAP-12-14786	1520	980	83
E039.1	10/12/2012 14:41	F	WTLAP-12-14546	1520	1020	84
E039.1	10/12/2012 14:41	UF	WTLAP-12-14561	1520	1020	84
E039.1	10/12/2012 14:42	UF	WTLAP-12-14451	1520	1060	85
E039.1	10/12/2012 14:42	UF	WTLAP-12-14492	1520	1060	85

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E039.1	10/12/2012 14:44	UF	WTLAP-12-14787	1520	1140	87
E039.1	10/12/2012 14:51	UF	WTLAP-12-14788	1520	1350	94
E040	10/12/2012 15:19	UF	WTLAP-13-24421	na	na	42
E042.1	07/11/2012 18:45	UF	WTLAP-12-14798	272000	99300	180
E042.1	07/11/2012 18:47	UF	WTLAP-12-14799	272000	139000	220
E042.1	07/11/2012 18:49	UF	WTLAP-12-14800	272000	264000	260
E042.1	07/11/2012 18:51	UF	WTLAP-12-14801	272000	144000	280
E042.1	07/11/2012 18:53	UF	WTLAP-12-22246	272000	120000	290
E042.1	07/11/2012 18:55	UF	WTLAP-12-22250	272000	95800	290
E042.1	07/11/2012 18:57	UF	WTLAP-12-14802	272000	71700	170
E042.1	07/11/2012 18:59	UF	WTLAP-12-14803	272000	111000	58
E042.1	07/11/2012 19:01	UF	WTLAP-12-14804	272000	187000	170
E042.1	07/11/2012 19:03	UF	WTLAP-12-15362	272000	172000	150
E042.1	07/11/2012 19:05	UF	WTLAP-12-14193	268000	157000	130
E042.1	07/11/2012 19:05	UF	WTLAP-12-22236	268000	157000	130
E042.1	07/11/2012 19:06	F	WTLAP-12-14548	267000	150000	120
E042.1	07/11/2012 19:06	UF	WTLAP-12-14563	267000	150000	120
E042.1	07/11/2012 19:07	UF	WTLAP-12-14662	265000	142000	110
E042.1	07/11/2012 19:09	UF	WTLAP-12-14453	262000	127000	94
E042.1	07/11/2012 19:09	UF	WTLAP-12-22232	262000	127000	94
E042.1	07/11/2012 19:11	UF	WTLAP-12-15366	258000	112000	85
E042.1	07/11/2012 19:13	UF	WTLAP-12-14810	258000	97100	82
E042.1	07/11/2012 19:15	UF	WTLAP-12-14811	258000	98900	78
E042.1	07/11/2012 19:35	UF	WTLAP-12-15316	258000	52400	38
E042.1	07/11/2012 19:55	UF	WTLAP-12-14806	258000	91000	16
E042.1	07/11/2012 20:05	UF	WTLAP-12-14808	258000	58600	9.7
E042.1	07/11/2012 20:05	UF	WTLAP-12-14808	258000	83000	9.7
E042.1	07/11/2012 20:05	UF	WTLAP-12-14809	258000	58600	9.7
E042.1	07/11/2012 20:05	UF	WTLAP-12-14809	258000	83000	9.7
E042.1	07/11/2012 20:15	UF	WTLAP-12-14812	258000	98400	5.2
E042.1	07/11/2012 20:35	UF	WTLAP-12-14807	258000	66600	2.8
E042.1	07/24/2012 15:25	UF	WTLAP-12-22393	186000	93200	61
E042.1	07/24/2012 15:27	UF	WTLAP-12-22394	186000	119000	50
E042.1	07/24/2012 15:29	UF	WTLAP-12-22395	186000	113000	38
E042.1	07/24/2012 15:31	UF	WTLAP-12-22396	186000	115000	32
E042.1	07/24/2012 15:33	UF	WTLAP-12-22397	186000	89100	31
E042.1	07/24/2012 15:35	UF	WTLAP-12-15378	186000	89200	31

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E042.1	07/24/2012 15:35	UF	WTLAP-12-22406	186000	89200	31
E042.1	07/24/2012 15:36	F	WTLAP-12-22407	188000	89200	30
E042.1	07/24/2012 15:37	UF	WTLAP-12-14463	191000	89200	30
E042.1	07/24/2012 15:37	UF	WTLAP-12-22233	191000	89200	30
E042.1	07/24/2012 15:38	UF	WTLAP-12-22237	194000	89200	29
E042.1	07/24/2012 15:39	UF	WTLAP-12-22405	197000	89300	29
E042.1	07/24/2012 15:41	UF	WTLAP-12-15382	202000	89300	28
E042.1	07/24/2012 15:43	UF	WTLAP-12-22398	202000	89400	27
E042.1	07/24/2012 15:45	UF	WTLAP-12-22399	202000	63500	26
E042.1	07/24/2012 15:47	UF	WTLAP-12-22400	202000	55100	25
E042.1	07/24/2012 15:49	UF	WTLAP-12-22401	202000	67400	25
E042.1	07/24/2012 15:51	UF	WTLAP-12-22402	202000	62600	24
E042.1	07/24/2012 15:53	UF	WTLAP-12-22403	202000	53600	24
E042.1	07/24/2012 15:55	UF	WTLAP-12-22404	202000	58100	23
E042.1	08/03/2012 18:00	UF	WTLAP-12-15055	207000	37500	130
E042.1	08/03/2012 18:02	UF	WTLAP-12-15051	207000	159000	160
E042.1	08/03/2012 18:06	UF	WTLAP-12-15394	207000	138000	200
E042.1	08/03/2012 18:08	UF	WTLAP-12-14473	207000	128000	210
E042.1	08/03/2012 18:20	UF	WTLAP-12-14225	207000	65800	150
E042.1	08/03/2012 18:21	UF	WTLAP-12-22234	207000	60600	140
E042.1	08/03/2012 18:23	UF	WTLAP-12-22238	207000	50300	120
E042.1	08/03/2012 18:24	UF	WTLAP-12-15065	207000	45100	120
E042.1	08/03/2012 19:20	F	WTLAP-12-14608	207000	31200	45
E042.1	08/03/2012 19:20	UF	WTLAP-12-14623	207000	31200	45
E042.1	08/03/2012 19:20	UF	WTLAP-12-15062	207000	31200	45
E042.1	08/03/2012 20:05	UF	WTLAP-12-14284	207000	27800	29
E042.1	08/03/2012 20:05	UF	WTLAP-12-15054	207000	27800	29
E042.1	09/28/2012 16:10	UF	WTLAP-13-23970	115000	70800	37
E042.1	09/28/2012 16:12	UF	WTLAP-13-23971	115000	70800	38
E042.1	09/28/2012 16:14	UF	WTLAP-13-23972	115000	70800	38
E042.1	09/28/2012 16:16	UF	WTLAP-13-23973	115000	70800	38
E042.1	09/28/2012 16:25	UF	WTLAP-13-23969	115000	70800	32
E042.1	10/12/2012 15:35	UF	WTLAP-13-24400	18800	22200	63
E042.1	10/12/2012 15:37	UF	WTLAP-13-24401	18800	21800	65
E042.1	10/12/2012 15:39	UF	WTLAP-13-24402	18800	28300	67
E042.1	10/12/2012 15:41	UF	WTLAP-13-24399	18800	24800	68
E042.1	10/12/2012 15:43	UF	WTLAP-13-24356	18800	21400	69

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E042.1	10/12/2012 15:45	UF	WTLAP-13-24403	18800	17900	70
E042.1	10/12/2012 15:47	UF ^a	WTLAP-13-24404	18800	16900	66
E042.1	10/12/2012 15:49	UF	WTLAP-13-24405	18800	14000	62
E042.1	10/12/2012 15:51	UF	WTLAP-13-24406	18800	14100	59
E042.1	10/12/2012 15:53	UF	WTLAP-13-24407	18800	15400	57
E042.1	10/12/2012 15:55	UF	WTLAP-13-24346	18800	13500	54
E042.1	10/12/2012 15:55	UF	WTLAP-13-24415	18800	13500	54
E042.1	10/12/2012 15:56	UF	WTLAP-13-24349	18600	12600	44
E042.1	10/12/2012 15:57	UF	WTLAP-13-24350	18300	11600	33
E042.1	10/12/2012 15:57	UF	WTLAP-13-24408	18300	11600	33
E042.1	10/12/2012 15:59	F	WTLAP-13-24352	17900	10800	11
E042.1	10/12/2012 15:59	UF	WTLAP-13-24351	17900	10800	11
E042.1	10/12/2012 16:00	UF	WTLAP-13-24353	17600	10300	na
E042.1	10/12/2012 16:01	UF	WTLAP-13-24418	17400	9900	50
E042.1	10/12/2012 16:03	UF	WTLAP-13-24409	16900	9050	48
E042.1	10/12/2012 16:05	UF	WTLAP-13-24410	16500	9760	45
E042.1	10/12/2012 16:25	UF	WTLAP-13-24411	11800	6350	34
E042.1	10/12/2012 16:45	UF	WTLAP-13-24416	7100	4720	29
E042.1	10/12/2012 16:55	UF	WTLAP-13-24347	6440	3900	29
E042.1	10/12/2012 16:55	UF	WTLAP-13-24354	6440	3900	29
E042.1	10/12/2012 17:05	UF	WTLAP-13-24412	5790	3080	27
E042.1	10/12/2012 17:25	UF	WTLAP-13-24413	4470	2280	24
E042.1	10/12/2012 17:40	UF	WTLAP-13-24348	3490	1740	23
E042.1	10/12/2012 17:40	UF	WTLAP-13-24355	3490	1740	23
E042.1	10/12/2012 17:45	UF	WTLAP-13-24417	3160	1560	22
E042.1	10/12/2012 18:05	UF	WTLAP-13-24414	3160	847	18
E050.1	07/11/2012 19:03	UF	WTLAP-12-14834	1170000	114000	58
E050.1	07/11/2012 19:05	UF	WTLAP-12-22186	1170000	113000	97
E050.1	07/11/2012 19:07	UF	WTLAP-12-22190	1170000	113000	110
E050.1	07/11/2012 19:09	UF	WTLAP-12-14837	1170000	112000	130
E050.1	07/11/2012 19:11	UF	WTLAP-12-14839	1170000	126000	130
E050.1	07/11/2012 19:13	UF	WTLAP-12-15363	1170000	121000	120
E050.1	07/11/2012 19:14	UF	WTLAP-12-14196	1150000	119000	120
E050.1	07/11/2012 19:15	UF	WTLAP-12-14456	1130000	116000	120
E050.1	07/11/2012 19:15	UF	WTLAP-12-22178	1130000	116000	120
E050.1	07/11/2012 19:16	UF	WTLAP-12-22182	1120000	114000	110
E050.1	07/11/2012 19:17	F	WTLAP-12-14551	1100000	111000	110

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E050.1	07/11/2012 19:17	UF	WTLAP-12-14566	1100000	111000	110
E050.1	07/11/2012 19:19	UF	WTLAP-12-14682	1070000	106000	100
E050.1	07/11/2012 19:21	UF	WTLAP-12-15330	1040000	101000	94
E050.1	07/11/2012 19:25	UF	WTLAP-12-14842	970000	91300	81
E050.1	07/11/2012 19:27	UF	WTLAP-12-14843	938000	117000	76
E050.1	07/11/2012 19:29	UF	WTLAP-12-14844	905000	64100	72
E050.1	07/11/2012 19:31	UF	WTLAP-12-14845	872000	77500	67
E050.1	07/11/2012 19:33	UF	WTLAP-12-14846	839000	89300	63
E050.1	07/11/2012 19:53	UF	WTLAP-12-14847	511000	72000	36
E050.1	07/11/2012 20:13	UF	WTLAP-12-15367	183000	59800	24
E050.1	07/11/2012 20:33	UF	WTLAP-12-14848	169000	47500	17
E050.1	07/11/2012 20:53	UF	WTLAP-12-15371	155000	50000	11
E050.1	07/11/2012 20:59	UF	WTLAP-12-14261	151000	50800	28
E050.1	07/11/2012 20:59	UF	WTLAP-12-22194	151000	50800	28
E050.1	07/11/2012 21:13	UF	WTLAP-12-14849	142000	52500	7.5
E050.1	07/11/2012 21:33	UF	WTLAP-12-14850	130000	52900	5
E050.1	07/11/2012 21:44	UF	WTLAP-12-14256	123000	49500	3.7
E050.1	07/11/2012 21:44	UF	WTLAP-12-22195	123000	49500	3.7
E050.1	07/11/2012 21:53	UF	WTLAP-12-15375	118000	46800	2.8
E050.1	07/11/2012 22:13	UF	WTLAP-12-14851	118000	40600	2.1
E050.1	07/24/2012 16:28	UF	WTLAP-12-14960	38600	24500	4.8
E050.1	07/24/2012 16:30	UF	WTLAP-12-14972	38600	18400	5.2
E050.1	07/24/2012 16:32	UF	WTLAP-12-14973	38600	24400	5.4
E050.1	07/24/2012 16:34	UF	WTLAP-12-14970	38600	20700	5.5
E050.1	07/24/2012 16:36	UF	WTLAP-12-14963	38600	25900	5.7
E050.1	07/24/2012 16:40	UF	WTLAP-12-14976	38600	28400	6.2
E050.1	07/24/2012 16:42	UF	WTLAP-12-14965	38600	20200	6.6
E050.1	07/24/2012 16:44	UF	WTLAP-12-14966	38600	18800	7
E050.1	07/24/2012 16:46	UF	WTLAP-12-14964	38600	20900	7.4
E050.1	07/24/2012 16:48	UF	WTLAP-12-14967	38600	19100	7.8
E050.1	07/24/2012 16:50	UF	WTLAP-12-14968	38600	14300	8.1
E050.1	07/24/2012 16:52	UF	WTLAP-12-14969	38600	26800	8.3
E050.1	07/24/2012 16:54	UF	WTLAP-12-15383	38600	26400	8.6
E050.1	07/24/2012 16:56	UF	WTLAP-12-22187	38300	26000	7
E050.1	07/24/2012 16:58	UF	WTLAP-12-22191	38000	25500	3.5
E050.1	07/24/2012 17:18	UF	WTLAP-12-15387	35000	21300	9.8
E050.1	07/24/2012 17:24	UF	WTLAP-12-14212	33600	20100	9.4

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E050.1	07/24/2012 17:25	UF	WTLAP-12-22179	33400	19800	9.3
E050.1	07/24/2012 17:26	UF	WTLAP-12-22183	33200	19600	9.2
E050.1	07/24/2012 17:28	UF	WTLAP-12-14466	32700	19200	9.1
E050.1	07/24/2012 17:38	UF	WTLAP-12-14971	30300	17100	8.7
E050.1	07/24/2012 17:58	UF	WTLAP-12-14974	25600	17300	8.5
E050.1	07/24/2012 18:18	UF	WTLAP-12-22385	20800	15200	6.8
E050.1	07/24/2012 18:24	UF	WTLAP-12-22387	20200	14500	6.5
E050.1	07/24/2012 18:38	UF	WTLAP-12-14975	18600	13000	5.5
E050.1	07/24/2012 18:58	UF	WTLAP-12-22386	16300	13400	6.6
E050.1	07/24/2012 19:09	UF	WTLAP-12-22196	15000	13400	4.7
E050.1	07/24/2012 19:18	UF	WTLAP-12-15391	14000	13400	4.6
E050.1	07/24/2012 19:38	UF	WTLAP-12-15379	12500	13400	4.1
E050.1	07/24/2012 19:54	UF	WTLAP-12-14276	12500	13400	3.6
E050.1	07/24/2012 19:54	UF	WTLAP-12-22197	12500	13400	3.6
E050.1	08/03/2012 18:19	UF	WTLAP-12-15089	171000	78700	130
E050.1	08/03/2012 18:21	UF	WTLAP-12-22192	171000	73800	160
E050.1	08/03/2012 18:23	UF	WTLAP-12-22188	171000	68800	160
E050.1	08/03/2012 18:25	UF	WTLAP-12-15395	171000	63900	170
E050.1	08/03/2012 18:27	UF	WTLAP-12-15091	166000	59000	160
E050.1	08/03/2012 18:29	UF	WTLAP-12-15092	160000	92400	150
E050.1	08/03/2012 18:30	UF	WTLAP-12-14228	157000	88800	150
E050.1	08/03/2012 18:31	UF	WTLAP-12-15399	154000	85100	140
E050.1	08/03/2012 18:31	UF	WTLAP-12-22180	154000	85100	140
E050.1	08/03/2012 18:32	UF	WTLAP-12-22184	153000	81400	140
E050.1	08/03/2012 18:33	UF	WTLAP-12-14476	152000	77800	130
E050.1	08/03/2012 18:35	F	WTLAP-12-14611	149000	70500	120
E050.1	08/03/2012 18:37	UF	WTLAP-12-14626	147000	63200	120
E050.1	08/03/2012 18:39	UF	WTLAP-12-15095	144000	55900	110
E050.1	08/03/2012 18:41	UF	WTLAP-12-15334	142000	54100	100
E050.1	08/03/2012 18:45	UF	WTLAP-12-14675	137000	50600	89
E050.1	08/03/2012 18:45	UF	WTLAP-12-14688	137000	50600	89
E050.1	08/03/2012 19:05	UF	WTLAP-12-15099	111000	32800	52
E050.1	08/03/2012 19:25	UF	WTLAP-12-15093	85400	20400	35
E050.1	08/03/2012 19:25	UF	WTLAP-12-15093	85400	37300	35
E050.1	08/03/2012 19:30	UF	WTLAP-12-15086	81000	20400	31
E050.1	08/03/2012 19:30	UF	WTLAP-12-15086	81000	38400	31
E050.1	08/03/2012 19:30	UF	WTLAP-12-15090	81000	20400	31

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E050.1	08/03/2012 19:30	UF	WTLAP-12-15090	81000	38400	31
E050.1	08/03/2012 19:45	UF	WTLAP-12-15100	67800	22300	23
E050.1	08/03/2012 20:05	UF	WTLAP-12-15403	50300	17200	18
E050.1	08/03/2012 20:15	UF	WTLAP-12-14286	46000	14600	17
E050.1	08/03/2012 20:15	UF	WTLAP-12-22198	46000	14600	17
E050.1	08/03/2012 20:25	UF	WTLAP-12-15101	41800	12100	16
E050.1	08/03/2012 20:45	UF	WTLAP-12-15102	33300	12100	15
E050.1	08/03/2012 21:00	UF	WTLAP-12-14291	26900	11400	14
E050.1	08/03/2012 21:01	UF	WTLAP-12-22199	26500	11300	14
E050.1	08/03/2012 21:05	UF	WTLAP-12-15407	24800	11100	14
E050.1	08/03/2012 21:25	UF	WTLAP-12-15103	24800	10100	13
E050.1	09/28/2012 17:34	UF	WTLAP-13-23981	31800	25900	5.5
E050.1	09/28/2012 17:36	UF	WTLAP-13-24006	31800	27200	5.7
E050.1	09/28/2012 17:38	UF	WTLAP-13-24007	31800	28400	6
E050.1	09/28/2012 17:40	UF	WTLAP-13-23982	31800	29700	6.2
E050.1	09/28/2012 17:42	UF	WTLAP-13-24009	31800	25900	6.4
E050.1	09/28/2012 17:44	UF	WTLAP-13-24008	31800	22200	6.6
E050.1	09/28/2012 17:46	UF	WTLAP-13-24014	31500	18400	6.7
E050.1	09/28/2012 17:48	UF	WTLAP-13-23983	31100	14600	6.8
E050.1	09/28/2012 17:50	UF	WTLAP-13-23984	30800	18200	7
E050.1	09/28/2012 17:52	UF	WTLAP-13-23985	30500	22200	7
E050.1	09/28/2012 17:54	UF	WTLAP-13-23986	30100	21700	7
E050.1	09/28/2012 17:56	UF	WTLAP-13-23987	29800	18300	5.6
E050.1	09/28/2012 17:58	UF	WTLAP-13-23988	29500	20100	2.8
E050.1	09/28/2012 17:59	UF	WTLAP-13-23976	29300	21600	1.4
E050.1	09/28/2012 18:00	UF	WTLAP-13-23989	29100	23100	7
E050.1	09/28/2012 18:01	UF	WTLAP-13-23999	29000	24000	7
E050.1	09/28/2012 18:02	UF	WTLAP-13-23990	28800	24900	7
E050.1	09/28/2012 18:02	UF	WTLAP-13-24001	28800	24900	7
E050.1	09/28/2012 18:03	UF	WTLAP-13-24003	28600	19600	7
E050.1	09/28/2012 18:04	F	WTLAP-13-24005	28500	14200	7
E050.1	09/28/2012 18:04	UF	WTLAP-13-23991	28500	14200	7
E050.1	09/28/2012 18:04	UF	WTLAP-13-24004	28500	14200	7
E050.1	09/28/2012 18:44	UF	WTLAP-13-24013	21800	13900	5.7
E050.1	09/28/2012 18:59	UF	WTLAP-13-23997	20200	13800	6.6
E050.1	09/28/2012 18:59	UF	WTLAP-13-23998	20200	13800	6.6
E050.1	09/28/2012 19:04	UF	WTLAP-13-23994	19700	13800	4.7

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E050.1	09/28/2012 19:24	UF	WTLAP-13-24011	17600	14000	4.1
E050.1	09/28/2012 19:44	UF	WTLAP-13-23996	17600	14100	3.6
E050.1	09/28/2012 19:44	UF	WTLAP-13-24002	17600	14100	3.6
E050.1	09/28/2012 20:04	UF	WTLAP-13-24010	17600	9500	3.1
E050.1	09/28/2012 20:24	UF	WTLAP-13-24012	17600	13800	2.6
E050.1	09/28/2012 20:44	UF	WTLAP-13-24015	17600	20100	2.2
E050.1	10/12/2012 16:09	UF	WTLAP-13-24462	8510	9780	9.6
E050.1	10/12/2012 16:11	UF	WTLAP-13-24463	8510	8150	13
E050.1	10/12/2012 16:13	UF	WTLAP-13-24464	8510	8440	16
E050.1	10/12/2012 16:15	UF	WTLAP-13-24465	8510	8340	20
E050.1	10/12/2012 16:17	UF	WTLAP-13-24466	8510	8230	22
E050.1	10/12/2012 16:19	UF	WTLAP-13-24467	8510	8130	25
E050.1	10/12/2012 16:21	UF	WTLAP-13-24468	8510	8030	26
E050.1	10/12/2012 16:23	UF	WTLAP-13-24471	8510	7710	28
E050.1	10/12/2012 16:25	UF	WTLAP-13-24472	8510	6570	29
E050.1	10/12/2012 16:27	UF	WTLAP-13-24473	8510	7660	29
E050.1	10/12/2012 16:29	UF	WTLAP-13-24476	8510	6640	30
E050.1	10/12/2012 16:33	UF	WTLAP-13-24477	8510	6770	30
E050.1	10/12/2012 16:33	UF	WTLAP-13-24482	8510	6770	30
E050.1	10/12/2012 16:35	UF	WTLAP-13-24483	8370	6580	30
E050.1	10/12/2012 16:37	F	WTLAP-13-24485	8230	6390	29
E050.1	10/12/2012 16:37	UF	WTLAP-13-24484	8230	6390	29
E050.1	10/12/2012 16:39	UF	WTLAP-13-24443	8090	6210	28
E050.1	10/12/2012 16:39	UF	WTLAP-13-24486	8090	6210	28
E050.1	10/12/2012 16:41	UF	WTLAP-13-24446	7950	6020	28
E050.1	10/12/2012 16:42	UF	WTLAP-13-24447	7870	5930	27
E050.1	10/12/2012 16:44	UF	WTLAP-13-24448	7730	5740	27
E050.1	10/12/2012 16:45	UF	WTLAP-13-24449	7660	5640	26
E050.1	10/12/2012 16:59	UF	WTLAP-13-24487	6670	4330	4.6
E050.1	10/12/2012 17:19	UF	WTLAP-13-24488	5260	4200	17
E050.1	10/12/2012 17:39	UF	WTLAP-13-24450	3850	3460	13
E050.1	10/12/2012 17:39	UF	WTLAP-13-24453	3850	3460	13
E050.1	10/12/2012 17:39	UF	WTLAP-13-24489	3850	3460	13
E050.1	10/12/2012 17:59	UF	WTLAP-13-24490	3370	2720	19
E050.1	10/12/2012 18:19	UF	WTLAP-13-24491	2890	2080	8.5
E050.1	10/12/2012 18:24	UF	WTLAP-13-24458	2890	1910	8.2
E050.1	10/12/2012 18:24	UF	WTLAP-13-24461	2890	1910	8.2

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E050.1	10/12/2012 18:39	UF	WTLAP-13-24492	2890	1430	7
E050.1	10/12/2012 18:59	UF	WTLAP-13-24493	2890	1810	8.9
E050.1	10/12/2012 19:19	UF	WTLAP-13-24494	2890	1400	4.7
E055	10/12/2012 14:55	UF	WTLAP-12-14330	na	na	12
E056	10/12/2012 11:00	UF	WTLAP-12-14165	1090	473	6.6
E056	10/12/2012 11:02	UF	WTLAP-12-14185	1090	473	5.2
E056	10/12/2012 11:03	UF	WTLAP-12-14329	1090	473	na
E056	10/12/2012 11:04	UF	WTLAP-12-14489	1090	473	na
E056	10/12/2012 11:06	F	WTLAP-12-14541	1090	473	2.9
E056	10/12/2012 11:06	UF	WTLAP-12-14556	1090	473	2.9
E056	10/12/2012 11:07	UF	WTLAP-12-14701	1090	473	2.8
E109.9	07/05/2012 19:35	NA	WTLAP-12-15490	302000	32900	40
E109.9	07/05/2012 19:37	NA	WTLAP-12-14731	298000	28500	43
E109.9	07/05/2012 19:39	NA	WTLAP-12-15428	294000	24100	46
E109.9	07/05/2012 19:41	NA	WTLAP-12-15510	290000	19700	46
E109.9	07/05/2012 19:43	NA	WTLAP-12-15430	286000	15300	42
E109.9	07/05/2012 19:45	NA	WTLAP-12-14454	282000	13800	38
E109.9	07/05/2012 19:47	NA	WTLAP-12-15431	278000	12300	39
E109.9	07/05/2012 19:49	NA	WTLAP-12-14681	274000	13800	39
E109.9	07/05/2012 19:50	NA	WTLAP-12-14194	272000	14500	40
E109.9	07/05/2012 19:51	NA	WTLAP-12-14663	270000	15300	40
E109.9	07/05/2012 19:52	NA	WTLAP-12-15432	268000	16000	40
E109.9	07/05/2012 19:53	NA	WTLAP-12-14564	266000	16000	40
E109.9	07/05/2012 19:54	NA	WTLAP-12-15491	264000	16000	40
E109.9	07/05/2012 20:50	NA	WTLAP-12-14390	192000	16000	17
E109.9	07/05/2012 20:50	NA	WTLAP-12-15492	192000	16000	17
E109.9	07/11/2012 19:55	NA	WTLAP-12-21951	na	na	160
E109.9	07/11/2012 19:55	NA	WTLAP-12-21952	na	na	160
E109.9	07/11/2012 20:40	NA	WTLAP-12-21953	na	na	160
E109.9	07/11/2012 20:40	NA	WTLAP-12-21954	na	na	160
E109.9	07/24/2012 16:10	UF	WTLAP-12-21968	339000	130000	19
E109.9	07/24/2012 16:12	UF	WTLAP-12-21964	339000	130000	22
E109.9	07/24/2012 16:14	UF	WTLAP-12-21969	339000	130000	24
E109.9	07/24/2012 16:16	UF	WTLAP-12-21972	339000	130000	23
E109.9	07/24/2012 16:20	UF	WTLAP-12-21976	316000	130000	12
E109.9	07/24/2012 16:22	UF	WTLAP-12-21966	305000	130000	12
E109.9	07/24/2012 16:26	UF	WTLAP-12-21982	282000	130000	13

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E109.9	07/24/2012 16:30	UF	WTLAP-12-21980	259000	130000	12
E109.9	07/24/2012 16:32	UF	WTLAP-12-21974	248000	130000	13
E109.9	08/03/2012 18:01	UF	WTLAP-12-22836	na	118000	190
E109.9	08/03/2012 18:03	UF	WTLAP-12-22837	na	115000	190
E109.9	08/03/2012 18:05	UF	WTLAP-12-21961	na	112000	190
E109.9	08/03/2012 18:05	UF	WTLAP-12-21973	na	112000	190
E109.9	08/03/2012 18:06	UF	WTLAP-12-21965	na	110000	180
E109.9	08/03/2012 18:07	F	WTLAP-12-21978	na	109000	180
E109.9	08/03/2012 18:08	UF	WTLAP-12-21967	na	107000	170
E109.9	08/03/2012 18:09	UF	WTLAP-12-21979	na	105000	160
E109.9	08/03/2012 18:11	UF	WTLAP-12-21981	na	102000	150
E109.9	08/03/2012 18:11	UF	WTLAP-12-21983	na	102000	150
E109.9	08/03/2012 18:13	UF	WTLAP-12-22839	na	99200	150
E109.9	08/03/2012 19:05	UF	WTLAP-12-21970	na	76200	54
E109.9	08/03/2012 19:05	UF	WTLAP-12-22833	na	76200	54
E109.9	08/03/2012 19:50	UF	WTLAP-12-21962	na	58600	100
E109.9	08/03/2012 19:50	UF	WTLAP-12-22834	na	58600	100
E109.9	08/03/2012 20:35	UF	WTLAP-12-21971	na	31800	120
E109.9	08/03/2012 20:35	UF	WTLAP-12-22835	na	31800	120
E109.9	08/07/2012 16:24	UF	WTLAP-12-22945	454000	297000	460
E109.9	08/07/2012 16:26	UF	WTLAP-12-22944	454000	297000	450
E109.9	08/07/2012 16:27	UF	WTLAP-12-22946	445000	297000	430
E109.9	08/07/2012 16:28	UF	WTLAP-12-22947	437000	297000	400
E109.9	08/07/2012 16:29	UF	WTLAP-12-22948	428000	297000	380
E109.9	08/07/2012 16:30	UF	WTLAP-12-22949	420000	297000	360
E109.9	08/07/2012 17:24	UF	WTLAP-12-22950	420000	297000	160
E109.9	08/23/2012 15:54	UF	WTLAP-12-23215	360000	na	190
E109.9	08/23/2012 15:55	UF	WTLAP-12-23216	357000	na	180
E109.9	08/23/2012 16:49	UF	WTLAP-12-23217	236000	na	140
E109.9	08/23/2012 16:49	UF	WTLAP-12-23218	236000	na	140
E109.9	08/23/2012 17:34	UF	WTLAP-12-23219	236000	na	69
E109.9	08/23/2012 17:34	UF	WTLAP-12-23220	236000	na	69
E109.9	08/24/2012 13:59	UF	WTLAP-12-23240	214000	142000	32
E109.9	08/24/2012 14:01	UF	WTLAP-12-23241	211000	142000	130
E109.9	08/24/2012 14:02	UF	WTLAP-12-23243	209000	142000	120
E109.9	08/24/2012 14:03	UF	WTLAP-12-23244	208000	142000	120
E109.9	08/24/2012 14:04	UF	WTLAP-12-23245	206000	142000	120

Table 4.3-1 (continued)

Station	Sample Collection Date and Time	Field Prep	Sample ID	Calculated SSC (mg/L)	Calculated TSS (mg/L)	Calculated Instantaneous Discharge (cfs)
E109.9	08/24/2012 14:05	UF	WTLAP-12-23246	204000	142000	110
E109.9	08/24/2012 14:59	UF	WTLAP-12-23247	113000	142000	110
E109.9	08/24/2012 14:59	UF	WTLAP-12-23248	113000	142000	110
E109.9	08/24/2012 15:44	UF	WTLAP-12-23249	84500	142000	8.4
E109.9	08/24/2012 15:44	UF	WTLAP-12-23251	84500	142000	8.4
E109.9	10/12/2012 16:45	UF	WTLAP-13-24312	138000	21700	160
E109.9	10/12/2012 17:05	UF	WTLAP-13-24313	138000	21700	140
E109.9	10/12/2012 17:25	UF	WTLAP-13-24315	138000	21700	100
E109.9	10/12/2012 18:25	UF	WTLAP-13-24317	138000	21700	99
E109.9	10/12/2012 17:05	UF	WTLAP-13-24313	138000	21700	140
E109.9	10/12/2012 17:25	UF	WTLAP-13-24315	138000	21700	100
E109.9	10/12/2012 18:25	UF	WTLAP-13-24317	138000	21700	99

^a UF = Unfiltered.^b na = Not available.^c F = Filtered.

Table 4.4-1
Analytical Results Obtained below the SWMU 01-001(f) Drainage

Sample Location	Analyte	Sample ID	Field Prep	Result ^a	Unit
CO111041	Aluminum	WTLAP-12-14543	F ^b	52.9	µg/L
CO111041	Aluminum	WTLAP-12-14558	UF ^c	10300	µg/L
CO111041	Aluminum	WTLAP-12-14588	F	633	µg/L
CO111041	Aluminum	WTLAP-12-14573	UF	2000	µg/L
CO111041	Aluminum	WTLAP-13-24311	F	281	µg/L
CO111041	Aluminum	WTLAP-13-24310	UF	11900	µg/L
CO111041	Antimony	WTLAP-12-14543	F	4.21	µg/L
CO111041	Antimony	WTLAP-12-14558	UF	4.78	µg/L
CO111041	Antimony	WTLAP-12-14588	F	3.4	µg/L
CO111041	Antimony	WTLAP-12-14573	UF	3.38	µg/L
CO111041	Antimony	WTLAP-13-24311	F	< 1	µg/L
CO111041	Antimony	WTLAP-13-24310	UF	2.9	µg/L
CO111041	Arsenic	WTLAP-12-14543	F	< 5	µg/L
CO111041	Arsenic	WTLAP-12-14558	UF	3.26	µg/L
CO111041	Arsenic	WTLAP-12-14588	F	< 1.7	µg/L
CO111041	Arsenic	WTLAP-12-14573	UF	2.08	µg/L
CO111041	Arsenic	WTLAP-13-24311	F	< 1.7	µg/L

Table 4.4-1 (continued)

Sample Location	Analyte	Sample ID	Field Prep	Result ^a	Unit
CO111041	Arsenic	WTLAP-13-24310	UF	2.38	µg/L
CO111041	Barium	WTLAP-12-14543	F	22.7	µg/L
CO111041	Barium	WTLAP-12-14558	UF	129	µg/L
CO111041	Barium	WTLAP-12-14588	F	18.9	µg/L
CO111041	Barium	WTLAP-12-14573	UF	40.9	µg/L
CO111041	Barium	WTLAP-13-24311	F	17.5	µg/L
CO111041	Barium	WTLAP-13-24310	UF	195	µg/L
CO111041	Beryllium	WTLAP-12-14543	F	< 0.5	µg/L
CO111041	Beryllium	WTLAP-12-14558	UF	0.797	µg/L
CO111041	Beryllium	WTLAP-12-14588	F	< 0.2	µg/L
CO111041	Beryllium	WTLAP-12-14573	UF	0.207	µg/L
CO111041	Beryllium	WTLAP-13-24311	F	< 0.2	µg/L
CO111041	Beryllium	WTLAP-13-24310	UF	1.12	µg/L
CO111041	Boron	WTLAP-12-14543	F	15.1	µg/L
CO111041	Boron	WTLAP-12-14558	UF	19.7	µg/L
CO111041	Boron	WTLAP-12-14588	F	15.7	µg/L
CO111041	Boron	WTLAP-12-14573	UF	15	µg/L
CO111041	Boron	WTLAP-13-24311	F	< 15	µg/L
CO111041	Boron	WTLAP-13-24310	UF	20.1	µg/L
CO111041	Cadmium	WTLAP-12-14543	F	< 1	µg/L
CO111041	Cadmium	WTLAP-12-14558	UF	0.611	µg/L
CO111041	Cadmium	WTLAP-12-14588	F	< 0.11	µg/L
CO111041	Cadmium	WTLAP-12-14573	UF	0.13	µg/L
CO111041	Cadmium	WTLAP-13-24311	F	< 0.11	µg/L
CO111041	Cadmium	WTLAP-13-24310	UF	0.876	µg/L
CO111041	Calcium	WTLAP-12-14543	F	8.72	mg/L
CO111041	Calcium	WTLAP-12-14558	UF	12	mg/L
CO111041	Calcium	WTLAP-12-14588	F	7.85	mg/L
CO111041	Calcium	WTLAP-12-14573	UF	8.53	mg/L
CO111041	Calcium	WTLAP-13-24311	F	8.73	mg/L
CO111041	Calcium	WTLAP-13-24310	UF	17.6	mg/L
CO111041	Chromium	WTLAP-12-14543	F	< 10	µg/L
CO111041	Chromium	WTLAP-12-14558	UF	12.3	µg/L
CO111041	Chromium	WTLAP-12-14588	F	< 2	µg/L
CO111041	Chromium	WTLAP-12-14573	UF	3.07	µg/L
CO111041	Chromium	WTLAP-13-24311	F	< 2	µg/L
CO111041	Chromium	WTLAP-13-24310	UF	13.3	µg/L
CO111041	Cobalt	WTLAP-12-14543	F	1.54	µg/L

Table 4.4-1 (continued)

Sample Location	Analyte	Sample ID	Field Prep	Result ^a	Unit
CO111041	Cobalt	WTLAP-12-14558	UF	3.56	µg/L
CO111041	Cobalt	WTLAP-12-14588	F	2.94	µg/L
CO111041	Cobalt	WTLAP-12-14573	UF	< 1	µg/L
CO111041	Cobalt	WTLAP-13-24311	F	1.19	µg/L
CO111041	Cobalt	WTLAP-13-24310	UF	5.68	µg/L
CO111041	Copper	WTLAP-12-14543	F	6.25	µg/L
CO111041	Copper	WTLAP-12-14558	UF	32	µg/L
CO111041	Copper	WTLAP-12-14588	F	4.16	µg/L
CO111041	Copper	WTLAP-12-14573	UF	7.72	µg/L
CO111041	Copper	WTLAP-13-24311	F	4.02	µg/L
CO111041	Copper	WTLAP-13-24310	UF	40.3	µg/L
CO111041	Hardness	WTLAP-12-14543	F	25.6	mg/L
CO111041	Hardness	WTLAP-12-14558	UF	42.9	mg/L
CO111041	Hardness	WTLAP-12-14588	F	23.5	mg/L
CO111041	Hardness	WTLAP-12-14573	UF	26.7	mg/L
CO111041	Hardness	WTLAP-13-24311	F	25.5	mg/L
CO111041	Hardness	WTLAP-13-24310	UF	60.6	mg/L
CO111041	Iron	WTLAP-12-14543	F	67.7	µg/L
CO111041	Iron	WTLAP-12-14558	UF	6790	µg/L
CO111041	Iron	WTLAP-12-14588	F	324	µg/L
CO111041	Iron	WTLAP-12-14573	UF	1760	µg/L
CO111041	Iron	WTLAP-13-24311	F	220	µg/L
CO111041	Iron	WTLAP-13-24310	UF	9910	µg/L
CO111041	Lead	WTLAP-12-14543	F	< 2	µg/L
CO111041	Lead	WTLAP-12-14558	UF	29.3	µg/L
CO111041	Lead	WTLAP-12-14588	F	0.569	µg/L
CO111041	Lead	WTLAP-12-14573	UF	6.84	µg/L
CO111041	Lead	WTLAP-13-24311	F	< 0.5	µg/L
CO111041	Lead	WTLAP-13-24310	UF	47.2	µg/L
CO111041	Magnesium	WTLAP-12-14543	F	0.942	mg/L
CO111041	Magnesium	WTLAP-12-14558	UF	3.13	mg/L
CO111041	Magnesium	WTLAP-12-14588	F	0.937	mg/L
CO111041	Magnesium	WTLAP-12-14573	UF	1.31	mg/L
CO111041	Magnesium	WTLAP-13-24311	F	0.892	mg/L
CO111041	Magnesium	WTLAP-13-24310	UF	4.07	mg/L
CO111041	Manganese	WTLAP-12-14543	F	3.93	µg/L
CO111041	Manganese	WTLAP-12-14558	UF	327	µg/L
CO111041	Manganese	WTLAP-12-14588	F	7.49	µg/L

Table 4.4-1 (continued)

Sample Location	Analyte	Sample ID	Field Prep	Result ^a	Unit
CO111041	Manganese	WTLAP-12-14573	UF	82.3	µg/L
CO111041	Manganese	WTLAP-13-24311	F	6.19	µg/L
CO111041	Manganese	WTLAP-13-24310	UF	500	µg/L
CO111041	Mercury	WTLAP-12-14543	F	< 0.2	µg/L
CO111041	Mercury	WTLAP-12-14558	UF	< 0.2	µg/L
CO111041	Mercury	WTLAP-12-14588	F	< 0.067	µg/L
CO111041	Mercury	WTLAP-12-14573	UF	< 0.067	µg/L
CO111041	Mercury	WTLAP-13-24311	F	< 0.067	µg/L
CO111041	Mercury	WTLAP-13-24310	UF	0.136	µg/L
CO111041	Nickel	WTLAP-12-14543	F	2.78	µg/L
CO111041	Nickel	WTLAP-12-14558	UF	9.49	µg/L
CO111041	Nickel	WTLAP-12-14588	F	1.32	µg/L
CO111041	Nickel	WTLAP-12-14573	UF	2.13	µg/L
CO111041	Nickel	WTLAP-13-24311	F	1.1	µg/L
CO111041	Nickel	WTLAP-13-24310	UF	11.5	µg/L
CO111041	Potassium	WTLAP-12-14543	F	4.18	mg/L
CO111041	Potassium	WTLAP-12-14558	UF	6.19	mg/L
CO111041	Potassium	WTLAP-12-14588	F	2.39	mg/L
CO111041	Potassium	WTLAP-12-14573	UF	2.82	mg/L
CO111041	Potassium	WTLAP-13-24311	F	3.09	mg/L
CO111041	Potassium	WTLAP-13-24310	UF	6.43	mg/L
CO111041	Selenium	WTLAP-12-14543	F	< 5	µg/L
CO111041	Selenium	WTLAP-12-14558	UF	< 5	µg/L
CO111041	Selenium	WTLAP-12-14588	F	< 1.5	µg/L
CO111041	Selenium	WTLAP-12-14573	UF	< 1.5	µg/L
CO111041	Selenium	WTLAP-13-24311	F	< 1.5	µg/L
CO111041	Selenium	WTLAP-13-24310	UF	< 1.5	µg/L
CO111041	Silver	WTLAP-12-14543	F	< 1	µg/L
CO111041	Silver	WTLAP-12-14558	UF	< 1	µg/L
CO111041	Silver	WTLAP-12-14588	F	< 0.2	µg/L
CO111041	Silver	WTLAP-12-14573	UF	< 0.2	µg/L
CO111041	Silver	WTLAP-13-24311	F	< 0.2	µg/L
CO111041	Silver	WTLAP-13-24310	UF	< 0.2	µg/L
CO111041	Sodium	WTLAP-12-14543	F	7.53	mg/L
CO111041	Sodium	WTLAP-12-14558	UF	8.03	mg/L
CO111041	Sodium	WTLAP-12-14588	F	7.63	mg/L
CO111041	Sodium	WTLAP-12-14573	UF	8.05	mg/L
CO111041	Sodium	WTLAP-13-24311	F	3.52	mg/L

Table 4.4-1 (continued)

Sample Location	Analyte	Sample ID	Field Prep	Result ^a	Unit
CO111041	Sodium	WTLAP-13-24310	UF	4.85	mg/L
CO111041	SSC	WTLAP-12-14751	UF	1080	mg/L
CO111041	SSC	WTLAP-12-14754	UF	212	mg/L
CO111041	SSC	WTLAP-13-24310	UF	1780	mg/L
CO111041	Thallium	WTLAP-12-14543	F	< 2	µg/L
CO111041	Thallium	WTLAP-12-14558	UF	< 2	µg/L
CO111041	Thallium	WTLAP-12-14588	F	< 0.45	µg/L
CO111041	Thallium	WTLAP-12-14573	UF	< 0.45	µg/L
CO111041	Thallium	WTLAP-13-24311	F	< 0.45	µg/L
CO111041	Thallium	WTLAP-13-24310	UF	< 0.45	µg/L
CO111041	Total Organic Carbon	WTLAP-12-14558	UF	20.9	mg/L
CO111041	Total Organic Carbon	WTLAP-12-14696	UF	10.6	mg/L
CO111041	Total Organic Carbon	WTLAP-13-24310	UF	12.5	mg/L
CO111041	Total PCB	WTLAP-12-14187	UF	14.9	µg/L
CO111041	Total PCB	WTLAP-12-14203	UF	4.09	µg/L
CO111041	Total PCB	WTLAP-13-24310	UF	21.8	µg/L
CO111041	TSS	WTLAP-12-14703	UF	396	mg/L
CO111041	TSS	WTLAP-12-14710	UF	110	mg/L
CO111041	TSS	WTLAP-13-24310	UF	1210	mg/L
CO111041	Uranium	WTLAP-12-14543	F	1.42	µg/L
CO111041	Uranium	WTLAP-12-14558	UF	31.3	µg/L
CO111041	Uranium	WTLAP-12-14588	F	3.32	µg/L
CO111041	Uranium	WTLAP-12-14573	UF	13.1	µg/L
CO111041	Uranium	WTLAP-13-24311	F	0.871	µg/L
CO111041	Uranium	WTLAP-13-24310	UF	37.4	µg/L
CO111041	Uranium-234	WTLAP-12-14342	UF	6.6	pCi/L
CO111041	Uranium-234	WTLAP-12-14349	UF	3.86	pCi/L
CO111041	Uranium-234	WTLAP-13-24310	UF	26.9	pCi/L
CO111041	Uranium-235/236	WTLAP-12-14342	UF	0.329	pCi/L
CO111041	Uranium-235/236	WTLAP-12-14349	UF	0.175	pCi/L
CO111041	Uranium-235/236	WTLAP-13-24310	UF	1.29	pCi/L
CO111041	Uranium-238	WTLAP-12-14342	UF	7.44	pCi/L
CO111041	Uranium-238	WTLAP-12-14349	UF	4.36	pCi/L
CO111041	Uranium-238	WTLAP-13-24310	UF	31.2	pCi/L
CO111041	Vanadium	WTLAP-12-14543	F	1.74	µg/L
CO111041	Vanadium	WTLAP-12-14558	UF	14	µg/L
CO111041	Vanadium	WTLAP-12-14588	F	2.56	µg/L
CO111041	Vanadium	WTLAP-12-14573	UF	4.78	µg/L

Table 4.4-1 (continued)

Sample Location	Analyte	Sample ID	Field Prep	Result ^a	Unit
CO111041	Vanadium	WTLAP-13-24311	F	2.18	µg/L
CO111041	Vanadium	WTLAP-13-24310	UF	20.1	µg/L
CO111041	Zinc	WTLAP-12-14543	F	33.9	µg/L
CO111041	Zinc	WTLAP-12-14558	UF	305	µg/L
CO111041	Zinc	WTLAP-12-14588	F	13.8	µg/L
CO111041	Zinc	WTLAP-12-14573	UF	52.6	µg/L
CO111041	Zinc	WTLAP-13-24311	F	23.8	µg/L
CO111041	Zinc	WTLAP-13-24310	UF	550	µg/L

^a < = Nondetected result.^b F= Filtered.^c UF= Unfiltered.

Table 4.4-2
Analytical Results from Graduation Canyon

Sample Location	Analyte	Sample ID	Field Prep	Result	Unit
CO115002	Total PCBs	WTLAP-12-14188	UF*	0.0886	µg/L
CO115002	Suspended Sediment Concentration	WTLAP-12-14752	UF	980	mg/L

* UF= Unfiltered.

Appendix A

*2012 Geomorphic Changes at Sediment Transport Mitigation
Sites in the Los Alamos and Pueblo Canyon Watershed*

CONTENTS

A-1.0 INTRODUCTION	A-1
A-2.0 HYDROLOGIC EVENTS DURING 2012 MONSOON SEASON	A-1
A-3.0 SURVEYS AT SEDIMENT TRANSPORT MITIGATION SITES	A-1
A-3.1 Pueblo Canyon Cross-Vane Structures.....	A-2
A-3.2 Upper Pueblo Canyon Willow-Planting Area	A-3
A-3.3 Pueblo Canyon Wing Ditch.....	A-4
A-3.4 Lower Pueblo Canyon Willow-Planting Area	A-4
A-3.5 Pueblo Canyon GCS	A-5
A-3.6 Upper Los Alamos Canyon Sediment Detention Basins	A-6
A-3.7 DP Canyon GCS.....	A-6
A-3.8 Los Alamos Canyon Low-Head Weir.....	A-7
A-4.0 OBSERVATIONS OF WILLOWS IN PUEBLO CANYON.....	A-8
A-5.0 SOUTH FORK OF ACID CANYON INSPECTION	A-9
A-6.0 SUMMARY	A-10
A-7.0 REFERENCES AND MAP DATA SOURCES	A-10
A-7.1 References	A-10
A-7.2 Map Data Sources	A-12

Figures

Figure A-1.0-1	Los Alamos and Pueblo Canyon watersheds, showing sediment transport mitigation sites and stream gages.....	A-13
Figure A-3.1-1	Orthophoto showing the locations of surveyed cross-sections and thalweg profiles at the Pueblo Canyon CVSs.....	A-14
Figure A-3.1-2	Geomorphic map showing the locations of surveyed cross-sections and thalweg profile at Pueblo Canyon CVS #1; geomorphic mapping from 1997	A-15
Figure A-3.1-3	Cross-sections and thalweg profile at Pueblo Canyon CVS #1	A-16
Figure A-3.1-4	Cross-sections and thalweg profile at Pueblo Canyon CVS #2	A-17
Figure A-3.1-5	Cross-sections and thalweg profile at Pueblo Canyon CVS #3	A-18
Figure A-3.2-1	Orthophoto showing the locations of surveyed cross-sections and thalweg profiles in the upper Pueblo Canyon willow-planting area	A-19
Figure A-3.2-2	Geomorphic map showing the locations of surveyed cross-sections and thalweg profiles in the upper Pueblo Canyon willow-planting area; geomorphic mapping from 1997	A-20
Figure A-3.2-3	Cross-sections and thalweg profile in upper third of upper Pueblo Canyon willow-planting area.....	A-21
Figure A-3.2-4	Cross-sections and thalweg profile in middle third of upper Pueblo Canyon willow-planting area.....	A-23
Figure A-3.2-5	Cross-sections and thalweg profile in lower third of upper Pueblo Canyon willow-planting area.....	A-25

Figure A-3.3-1	Orthophoto showing the locations of surveyed cross-sections and thalweg profiles near the Pueblo Canyon wing ditch; also shown is road reconstruction by Los Alamos County. Construction was completed before the January 2013 survey..	A-27
Figure A-3.3-2	Geomorphic map showing the locations of surveyed cross-sections and thalweg profiles near the Pueblo Canyon wing ditch; geomorphic mapping from 1997.....	A-28
Figure A-3.3-3	Cross-sections below the Pueblo Canyon wing ditch	A-29
Figure A-3.3-4	Thalweg profiles near the Pueblo Canyon wing ditch	A-31
Figure A-3.4-1	Orthophoto showing the locations of surveyed cross-sections and stream banks in the lower Pueblo Canyon willow-planting area.....	A-32
Figure A-3.4-2	Geomorphic map showing the locations of surveyed cross-sections and stream banks in the lower Pueblo Canyon willow-planting area; geomorphic mapping from 1996–1997.....	A-33
Figure A-3.4-3	Cross-sections in the lower Pueblo Canyon willow-planting area.....	A-34
Figure A-3.6-1	October 2011 topography and isopachs of total thickness of accumulated sediment in Basin 1 from 2012 monsoon season at the upper Los Alamos Canyon sediment detention basins	A-40
Figure A-3.7-1	Orthophoto showing the locations of surveyed cross-sections and thalweg profile near the DP Canyon GCS	A-41
Figure A-3.7-2	Geomorphic map showing the locations of surveyed cross-sections and thalweg profile near the DP Canyon GCS; geomorphic mapping from 1998.....	A-42
Figure A-3.7-3	Cross-sections and thalweg profile near the DP Canyon GCS.....	A-43
Figure A-3.8-1	Topographic map of sediment retention Basin 3 above the Los Alamos Canyon low-head weir and isopachs of total thickness of accumulated sediment in Basin 3 from 2012 monsoon season	A-48
Figure A-3.8-2	Topographic map of sediment retention Basin 3 above the Los Alamos Canyon low-head weir and isopachs of total thickness of accumulated sediment in Basin 3 from 2011 and 2012 monsoon seasons (July 2011 to November 2012)	A-49

Tables

Table A-3.1-1	Summary of Geomorphic Changes at Pueblo Canyon CVS Cross-Sections	A-51
Table A-3.2-1	Summary of Geomorphic Changes at the Upper Pueblo Canyon Willow-Planting Area Cross-Sections	A-52
Table A-3.3-1	Summary of Geomorphic Changes at the Pueblo Canyon Wing Ditch Cross-Sections	A-53
Table A-3.4-1	Summary of Geomorphic Changes at the Lower Pueblo Canyon Willow-Planting Area Cross-Sections	A-54
Table A-3.7-1	Summary of Geomorphic Changes at Cross-Sections above the DP Canyon GCS..	A-56
Table A-3.7-2	Summary of Geomorphic Changes at Cross-Sections below the DP Canyon GCS ..	A-57
Table A-3.8-1	Sediment Volume Changes at Los Alamos Canyon Low-Head Weir	A-57
Table A-3.8-2	Sediment Accumulation at Los Alamos Canyon Low-Head Weir, 2000–2012	A-58

Attachments

Attachment A-1 Photographs of Sediment Transport Mitigation Sites

Attachment A-2 Cross-Section Survey Data (on CD included with this document)

A-1.0 INTRODUCTION

This report evaluates geomorphic changes that occurred in 2012 at sediment transport mitigation sites in the Los Alamos and Pueblo Canyon watersheds within and near Los Alamos National Laboratory (LANL or the Laboratory). Survey data reported previously (LANL 2011, 200902) are compared with subsequent survey data obtained in fall 2012 and winter 2013, following the summer 2012 monsoon season, as specified in the “Los Alamos National Laboratory Environmental Surveillance Program Sampling and Analysis Plan for Sediment, 2012” (LANL 2012, 213568). These surveys will be repeated after the 2013 monsoon season, and results will be presented in a report to the New Mexico Environment Department (NMED) by March 31, 2014. NMED has specified that results of inspections of stream bank armoring in the south fork of Acid Canyon be included in the annual report on geomorphic changes in the Los Alamos and Pueblo Canyon watersheds (NMED 2010, 109693), and these results are included herein. NMED has also specified that future reports include information on the health and success of willow plantings and photographic documentation of willow plantings, grade-control structures (GCSs), and examples of erosion and deposition at surveyed cross-sections (NMED 2011, 204349), and these are also included herein. Figure A-1.0-1 shows the locations of sites discussed in this report, and Attachment A-1 presents photographs of the sediment transport mitigation sites.

A-2.0 HYDROLOGIC EVENTS DURING 2012 MONSOON SEASON

The largest runoff events in 2012 at the sediment transport mitigation sites in the Los Alamos and Pueblo Canyon watersheds occurred following heavy rain on the Los Alamos townsite (for events in Acid and DP Canyons) or the Las Conchas burn area (for events in Los Alamos Canyon) (LANL 2012, 218411). The maximum measured discharge at these sites occurred on July 11, 2012, at the E042.1 gaging station above the Los Alamos Canyon low-head weir. The peak discharge at E042.1 was 170 cubic feet per second (cfs), 20% less than measured in 2011 (207 cfs; LANL 2012, 218411). Other gages near the sediment transport mitigation sites had maximum measured discharges on October 12, 2012:

- Peak discharge was between 79 and 46 cfs below the DP Canyon GCS (79 cfs at E038 in upper DP canyon and 46 cfs at E040 in lower DP Canyon; no data recorded at E039.1). This discharge is less than the 2011 peak discharge, which was 290 cfs at E039.1.
- In Pueblo Canyon above the Los Alamos County wastewater treatment plant (WWTP) outfall at gage E059, no flow was recorded in 2012. Peak discharge was 12.7 cfs at E055 in upper Pueblo Canyon on October 12, 2012. This flow did not reach E059. Maximum apparent discharge at the E060.1 gaging station, below the Pueblo Canyon GCS was 6.2 cfs, recorded on January 11, 2012. This “flow” was likely a buildup of ice in the gage. Peak discharge in 2011 at gage E059 was estimated at 131 cfs.
- In the south fork of Acid Canyon at gage E056, discharge data on October 12, 2012, could not be validated. Peak discharge for the remainder of the year was 1.9 cfs on September 21 and 22, 2012, which is much less than measured in 2011 (20 cfs; LANL 2012, 218411).

A-3.0 SURVEYS AT SEDIMENT TRANSPORT MITIGATION SITES

Surveys were conducted at all sediment transport mitigation sites specified in the 2012 monitoring plan (LANL 2012, 213568), with the exception of the Pueblo Canyon GCS. The Pueblo Canyon GCS was not surveyed because of the lack of any flows through this area from monsoon flood events and the absence of significant net deposition or incision in the lower Pueblo willow-planting area upstream of the Pueblo Canyon GCS survey area. Surveys were conducted using a combination of a differentially-

corrected global positioning system (GPS) and a total station tied to GPS control points, depending on tree cover. Surveys were supplemented with sediment thickness measurements obtained from hand-dug or hand-augered holes at some locations. The general locations of all survey areas are shown in Figure A-1.0-1, and these surveys are discussed below. Surveyed cross-sections are shown in figures with a vertical exaggeration (VE) of 2.5 times, and channel thalweg profiles are shown with a VE of 5 times, 15 times, or 20 times. Raw survey data (x and y coordinates using the New Mexico State Plane coordinate system and elevations of all survey points) for surveyed cross-sections are included electronically as Attachment A-2 (on CD included with this document). Distances along each cross-section and along each thalweg profile that are used for the figures in this report were calculated using basic trigonometry (Pythagorean theorem) and are also included in Attachment A-2.

Cross-section Figures A-3.1-3, A-3.1-4, A-3.1-5, A-3.2-3, A-3.2-4, A-3.2-5, A-3.3-3, A-3.3-4, A-3.4-1, and A-3.7-3 include previous survey data and the latest resurvey data, indicating where erosion and deposition have occurred along each section over the last year. Each surveyed cross-section was field checked to confirm elevational differences between surveys indicated erosion or deposition and were not artifacts of the surveys (such as can result from different survey point spacing or slight differences in survey location) or topographic changes not related to flooding (e.g., gopher mounds or road blading outside the floodplain). The net changes in cross-sectional area along each section were calculated and used to estimate total deposition or erosion over the surveyed area, normalized as m^3 per 100 m of channel for comparison with previous studies. In Tables A-3.1-1, A-3.2-1, A-3.3-1, A-3.4-1, A-3.7-1, and A-3.7-1, the net deposition or erosion that occurred in each area in 2012 is compared with changes that occurred in 2011. At each cross-section, the changes in thalweg elevation from 2009 to 2012 are compiled in tables and are used to indicate whether, on average, the channel elevation has been stable, aggrading, or incising. In the figures showing channel thalwegs, the distance along the survey can vary between the original survey and the resurvey because of changes in thalweg sinuosity, resulting in changes in thalweg gradient. These changes in thalweg gradient are also summarized in this report.

A-3.1 Pueblo Canyon Cross-Vane Structures

Two cross-sections were originally surveyed in the vicinity of each of the three Pueblo Canyon cross-vane structures (CVSs) in April 2010, one 50 ft upcanyon and one 50 ft downcanyon of the apex rock of each structure. Channel thalweg profiles were also surveyed over these 100-ft distances. These cross-sections and thalweg profiles were resurveyed in December 2010, October 2011, and November, 2012. Cross-section and thalweg profile locations for all CVSs are shown on an orthophotograph in Figure A-3.1-1, and the cross-sections and thalweg profile for the upper CVS (CVS #1) are also shown on a geomorphic map in Figure A-3.1-2 (geomorphic mapping from 1997; LANL 2004, 087390). The cross-sections and thalweg profiles for CVS #1, CVS #2, and CVS #3 are shown in Figures A-3.1-3, A-3.1-4, and A-3.1-5, respectively, and in Photos 1-1 and 1-2 in Attachment A-1. Net sediment deposition occurred at two of the six CVS cross-sections, and net sediment erosion occurred at the other four cross-sections during the summer 2012 monsoon season, as summarized in Table A-3.1-1.

Maximum aggradation (net sediment deposition) was 0.3 ft at CVS #2 +50 ft (Photo 1-1, Attachment A-1), and the maximum incision (net erosion) was 0.6 ft, also at CVS #2 +50 ft (Photo 1-1, Attachment A-1). Normalized net erosion at the CVSs averaged $-14 \text{ m}^3/100 \text{ m}$, compared with an estimated $1768 \text{ m}^3/100 \text{ m}$ of post-1942 sediment in reach P-2W, which contains CVS #1, as measured in 1997 (LANL 2004, 087390). This net erosion, 0.8% of the estimated 1942–1997 total, represents a very modest decrease. Net deposition occurred at these sites in 2010 and 2011. The 2012 net erosion is approximately 52% of the 2011 net deposition (Table A-3.1-1). On average, the channel thalweg at the CVS cross-sections incised by 0.1 ft in 2012, compared with 0.1 ft of aggradation in 2011 (Table A-3.1-1). Figures A-3.1-3 through A-3.1-5 also indicate minor changes to the channel thalweg that occurred during

the summer 2012 monsoon season. At all three CVSs, the thalweg gradient showed a modest decrease associated with channel incision and slight increases in sinuosity.

These data are consistent with conclusion from previous assessments, which indicate this part of Pueblo Canyon has been relatively stable with net sediment deposition since 1998 (LANL 2012, 218411). The net erosion which occurred in 2012 transported a very small amount of this sediment a relatively short distance downstream, between CVS #3 and E059.1.

A-3.2 Upper Pueblo Canyon Willow-Planting Area

A total of 18 cross-sections were surveyed in November 2009 in the part of Pueblo Canyon downstream from the new Los Alamos WWTP outfall and upstream from the access road to the WWTP where willows were planted in spring 2008 and spring 2009. These cross-sections were divided into groups of six within the upper, middle, and lower thirds of the willow-planting area and within each group the cross-sections were spaced at 100-ft intervals. Longitudinal channel thalweg profiles were also surveyed over 500-ft intervals through each of these three areas. These cross-sections and thalweg profiles were resurveyed in April 2010, October 2011, and November 2012–January 2013. Stream banks in this area were surveyed in March 2012. Cross-section locations, thalweg profile locations, and stream banks are shown on an orthophotograph in Figure A-3.2-1, and the cross-sections, thalweg profile, and stream banks for the middle and lower thirds of the area are also shown on a geomorphic map in Figure A-3.2-2 (geomorphic mapping from 1997; LANL 2004, 087390). The cross-sections and thalweg profiles in the upper, middle, and lower thirds of the willow-planting area are shown in Figures A-3.2-3, A-3.2-4, and A-3.2-5, respectively. Geomorphic changes that occurred at these cross-sections during 2012 from effluent discharge are summarized in Table A-3.2-1 (no flows occurred in this section of Pueblo Canyon from summer 2012 monsoon storms, as indicated by the absence of any flows recorded at E059.1).

Maximum deposition of new sediment was 1.6 ft at section UW-3 in the upper third of the upper Pueblo Canyon willow-planting area (also referred to as the upper willow-planting area), and the maximum erosion was 2.9 ft at section LW-4 in the lower third of this area. The new sediment at section UW-3 was associated with the burial of the previous channel in an area of extensive sediment deposition immediately downstream from a southside tributary draining the new Los Alamos Entrada Park (Photo 1-3, Attachment A-1). The erosion at section LW-4 was associated with lateral migration of the stream bank (Photo 1-4, Attachment A-1), and bank migration was also recorded at one other section (LW-6). Twelve of the cross-sections had net sediment deposition during 2012, two cross-sections had net erosion, and four cross-sections were unchanged. Normalized net sediment deposition in the upper willow-planting area averaged $23 \text{ m}^3/100 \text{ m}$, compared with an estimated $3357 \text{ m}^3/100 \text{ m}$ of post-1942 sediment in reach P-3W, which includes part of the surveyed area, as measured in 1997 (LANL 2004, 087390). This net deposition, 0.7% of the estimated 1942–1997 total, represents a small increase.

Net deposition also occurred at these sites in 2010 and 2011. The 2012 net deposition is approximately 19 times the 2011 net deposition, mainly from the much greater erosion that occurred in the lower third of the upper Pueblo Canyon willow-planting area in 2011 (Table A-3.2-1). On average, the channel thalweg in the upper third and middle third of the Upper Pueblo willow-planting area aggraded by 0.2 to 0.3 ft in 2012, whereas the channel thalweg remained nearly unchanged in the lower third of this area (Table A-3.2-1). This is broadly similar to a general pattern of upstream aggradation and downstream incision that occurred in 2011 and 2010. Figures A-3.2-3 through A-3.2-5 also indicate changes to the channel thalweg gradient that occurred in 2012. In the upper third of the willow-planting area, the thalweg gradient decreased since the previous survey; in the middle third, the thalweg gradient increased, and in the lower third the thalweg gradient remained unchanged. Gradient changes in the upper and middle third of the Upper Pueblo willow-planting area are associated with changes in sinuosity and bed elevation.

These data are consistent with conclusions from previous assessments that indicate this part of Pueblo Canyon net sediment deposition has been relatively stable since 1998 (LANL 2012, 218411). The net deposition observed in 2012 is consistent with the deposition measured in 2010 and 2011.

A-3.3 Pueblo Canyon Wing Ditch

Five cross-sections were surveyed at 100-ft intervals downcanyon from the Pueblo Canyon wing ditch in November 2009. Longitudinal thalweg profiles of the active channel and a formerly abandoned channel to the south where the wing ditch directs water were also surveyed over this distance. These cross-sections and thalweg profiles were resurveyed in May 2011, October 2011, and January 2013. The wing ditch is a short distance downstream from where the road to the Los Alamos County WWTP crosses the Pueblo Canyon stream channel, and the culverts at this crossing were plugged during a runoff event on August 16, 2010. In 2011, the County of Los Alamos rebuilt the road crossing to better withstand large runoff events and to pass flow more effectively (Figure A-3.3-1). The formerly abandoned channel to the south now receives flow during periods of high effluent discharge and stormwater runoff, helping to effectively distribute water across this part of the wetland (a function that the wing ditch was designed to perform; it is no longer needed for this purpose). Cross-section and thalweg profile locations are shown on an orthophotograph in Figure A-3.3-1, and the cross-sections and thalweg profile locations are also shown on a geomorphic map in Figure A-3.3-2 (geomorphic mapping from 1996–1997; LANL 2004, 087390). The cross-sections are shown in Figure A-3.3-3, and the thalweg profiles are shown in Figure A-3.3-4. Geomorphic changes that occurred at these cross-sections during 2012 from effluent discharge are summarized in Table A-3.3-1 (no flows occurred in this section of Pueblo Canyon from summer 2012 monsoon storms, as indicated by the absence of any flows recorded at E059.1).

Maximum sediment deposition was 0.6 ft in an area of channel migration in the northern part of cross-section WD-4 (Photo 1-5, Attachment A-1), and the maximum incision (net erosion) was 0.9 ft in a side channel near the northern channel at cross-section WD-4 (Photo 1-6, Attachment A-1). All five of the cross-sections had net erosion during 2012. Normalized net erosion over the surveyed area below the wing ditch averaged $-52 \text{ m}^3/100 \text{ m}$, compared with an estimated $6991 \text{ m}^3/100 \text{ m}$ of post-1942 sediment in reach P-3E, a short distance east of the surveyed area, as measured in 1997 (LANL 2004, 087390). This calculated net erosion, 0.7% of the estimated 1942–1997 total, represents a small decrease in total sediment volume. The 2012 net erosion is approximately 4 times the 2011 net deposition. Erosion in 2012 removed approximately one-third of the sediment deposited in 2010 and 2011 in this area. The 2012 erosion may represent remobilization of sediment deposited during the August 2010 runoff event and remobilization of sediment deposited during construction activities conducted next to the wing ditch. On average, the main channel thalweg near the wing ditch incised by 0.5 ft in 2012, compared with 0.4 ft of aggradation in 2011 (Table A-3.3-1). As presented in Figure A-3.3-4, the average thalweg gradient of the active channel increased slightly in 2012. The formerly abandoned south channel was not surveyed because ice was present in the channel at the time of the survey.

A-3.4 Lower Pueblo Canyon Willow-Planting Area

A total of 23 cross-sections were surveyed in September 2009 at 100-ft intervals within reaches P-3FE and P-4W in an area where willows were planted in spring 2009. The surveys extended for 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). A longitudinal channel thalweg profile was also surveyed over this 2200-ft interval. These cross-sections and thalweg profiles were resurveyed in April and May 2011 and in October and November 2011. Cross-sections were resurveyed in November and December 2012. The thalweg was not resurveyed in 2012 because ice was present in the channel at the time of the survey. Stream banks in this area were surveyed in January and March 2012. Cross-section

and thalweg profile locations and stream banks are shown on an orthophotograph in Figure A-3.4-1 and on a geomorphic map in Figure A-3.4-2 (geomorphic mapping from 1996–1997; LANL 2004, 087390). The cross-sections are shown in Figure A-3.4-3, and the channel thalweg profiles are shown in Figure A-3.4-4. Geomorphic changes that occurred at these cross-sections during 2012 from effluent discharge are summarized in Table A-3.4-1 (no flows occurred in this section of Pueblo Canyon from summer 2012 monsoon storms, as indicated by the absence of any flows recorded at E059.1).

In the upper half of the lower Pueblo Canyon willow-planting area (also referred to as the lower willow-planting area, which is reach P-3FE), maximum deposition of new sediment was 0.7 ft at cross-section PU –100 ft (100 ft upstream from the transition zone), and the maximum erosion was 1.3 ft at cross-section PU –400 ft (Figure A-3.4-3 and Table A-3.4-1). The deposition at PU –100 ft was associated with bank collapse onto a bench within the northern channel, and the erosion at PU –400 ft was associated with channel incision within the southern channel. Four of the 11 cross-sections above the approximate transition point (PU 0-ft section) had net sediment deposition, four had net erosion, and three had no measureable change. Normalized net erosion in the upper half of the lower willow-planting area averaged $-1.6 \text{ m}^3/100 \text{ m}$, compared with an estimated $5117 \text{ m}^3/100 \text{ m}$ of post-1942 sediment in reach P-3FE, which includes the surveyed area, as measured in 1997 (LANL 2004, 087390). This net erosion, less than 0.01% of the estimated 1942–1997 total, represents an insignificant change that is probably within measurement error.

In the lower half of the lower willow-planting area (reach P-4W), maximum deposition of new sediment was 1.2 ft at cross-section PU +800 ft, and the maximum erosion was 2.3 ft, also at section PU +800 ft (Figure A-3.4-3 and Table A-3.4-1). The erosion and deposition were both associated with lateral bank migration (Photo 1-7, Attachment A-1). Cross-section PU +600 ft had the highest measured erosion and deposition in 2010, indicating the channel is continuing to adjust in this downstream area. Ten of the 11 cross-sections below the approximate transition point had net sediment deposition, and 1 had net erosion. Lateral headcut migration and net erosion occurred at cross-section PU 0 ft, where the emergence of alluvial groundwater perched on Puye Formation bedrock results in seepage erosion. The surface above the headcut is dry, whereas wetland vegetation (reed canary grass and willows) is established below the headcut (Photo 1-8, Attachment A-1). Net sediment deposition occurred in the lower half of the lower willow-planting area, averaging $2.4 \text{ m}^3/100 \text{ m}$, compared with an estimated $9871 \text{ m}^3/100 \text{ m}$ of post-1942 sediment in reach P-4W, which includes the surveyed area, as measured in 1997 (LANL 2004, 087390). This calculated net deposition, 0.02% of the estimated 1942–1997 total, represents an insignificant increase that is probably within measurement error.

A-3.5 Pueblo Canyon GCS

A total of 15 cross-sections were surveyed in April 2010 at 100-ft intervals upstream of the Pueblo Canyon GCS, and 3 cross-sections were surveyed at 100-ft intervals downstream from the GCS. A longitudinal channel thalweg profile was also surveyed over this 1800-ft interval. Because some ground disturbance associated with site restoration occurred after the April 2010 surveys were completed, the area of disturbance was resurveyed in June 2010. These surveys were repeated in April and October 2011. Stream banks in this area were surveyed in January 2012.

Because of the lack of monsoonal flows through this area, downstream attenuation of WWTP effluent discharge and the absence of significant net deposition or incision in the Lower Pueblo willow planting area upstream of the Pueblo Canyon Grade-Control Structure survey area, this area was not resurveyed following the summer 2012 monsoon season. Previous geomorphic changes are documented in a Laboratory report (LANL 2012, 218411). In January 2013, the Pueblo Canyon GCS was revisited to document the condition of the willows and the structure. Photographs of the GCS are included in Attachment A-1, Photos 1-9 and 1-10.

A-3.6 Upper Los Alamos Canyon Sediment Detention Basins

The upper Los Alamos Canyon sediment detention basins, constructed at the base of the drainage below Solid Waste Management Unit 01-001(f) (LA-SMA-2 or Hillside 140), were excavated on July 8 to July 11, 2011, after the Las Conchas fire (LANL 2011, 206488). The basins were resurveyed in July 2011, and Basin 1 was resurveyed in October 2011 (no appreciable sediment was deposited in Basin 2 between July and October 2011). In January, 2013, Basin 1 was resurveyed, and the topography at that time is presented in Figure A-3.6-1. Figure A-3.6-1 also shows variations in total sediment thickness determined by subtracting the October 2011 topographic surface from the January 2013 surface. Maximum sediment thickness resulting from the 2012 monsoon season is 30 cm (1.0 ft) in the southern part of the small delta where the drainage enters the northeast part of the basin. Sediment in the northern part of the delta proximal to the drainage is mostly coarse-grained, whereas fine-grained sediment was observed in hand-dug holes in the center of the basin. Based on field observations, 2012 sediment in the central part of the basin is 4–5 cm thick. This is consistent with sediment thickness determined from the survey data (Figure A-3.6-1). 2012 sediment deposition did not extent into the western third of the basin. An estimated 30 m³ of sediment accumulated in Basin 1 during the summer 2012 monsoon season, compared with approximately 15–30 m³ of sediment that was deposited in Basin 1 during the 2011 monsoon season. No appreciable sediment was deposited in Basin 2 during the summer 2012 or summer 2011 monsoon seasons. Based on the deposition of sediment observed in Basin 1, and the absence of any appreciable sediment deposition in Basin 2, nearly all of the sediment transported by the small drainage below Solid Waste Management Unit 01-001(f) is being contained in the upper Los Alamos Canyon sediment detention basins. Photographs of the sediment detention basins are shown in Photo 1-11, Attachment A-1.

A-3.7 DP Canyon GCS

A total of 11 cross-sections were surveyed in April and May 2010 at 100-ft intervals upstream of the DP Canyon GCS, and 2 cross-sections were surveyed at 125 ft and 225 ft downstream from the GCS, downstream from the E039.1 gaging station. A longitudinal channel thalweg profile was also surveyed over this 1325-ft interval. The area above the GCS was first resurveyed in November and December 2010, and the area below the GCS was resurveyed in March 2011 (after ice melted from the channel bed). The area above and below the GCS was resurveyed in October 2011, and most recently in November–December 2012. In February 2013, an additional cross-section was surveyed, 20 ft above the GCS (DPGCS -20 ft). The DPGCS -20 ft cross section was not used in the sediment volume calculations for 2012. Beginning with post-2013 monsoons season surveys, the DPGCS -20 cross-section will be resurveyed along with the other DPGCS cross-sections, and those data will be included in sediment volume calculations. Cross-section and thalweg profile locations are shown on an orthophotograph in Figure A-3.7-1 and on a geomorphic map in Figure A-3.7-2 (geomorphic mapping from 1998; LANL 2004, 087390). The cross-sections and thalweg profile are shown in Figure A-3.7-3. Photographs of the GCS are shown in Photos 1-12 and 1-13, Attachment A-1.

Net sediment deposition occurred at nine cross-sections above the GCS during the summer 2012 monsoon season, net sediment erosion occurred at one cross-section, and one section was unchanged as summarized in Table A-3.7-1. Maximum sediment depositional thickness was 1.8 ft at the cross-section 200 ft above the GCS [Photos 1-14 and 1-15; 2013 and 2011 photos of channel at -200 ft, Attachment A-1], and the maximum erosion was 1.5 ft, also at the cross-section 200 ft above the GCS (Photo 1-15, Attachment A-1). Maximum sediment deposition was associated with aggradation of the main channel and maximum incision was associated with incision of adjacent side channels (Figure A-3.7-3). Normalized net sediment deposition above the GCS averaged 46 m³/100 m, compared with an estimated 749 m³/100 m of post-1942 sediment in reach DP-2, which contains the GCS, as

measured in 1999 (LANL 2004, 087390). This net deposition, 6% of the estimated 1942–1999 total, represents a modest yearly increase. The 2012 net sediment deposition is approximately 3 times the 2011 net deposition. Most of the 2012 sediment occurred between DPGCS-300 ft and DPGSC-900 ft, with the greatest sediment volume deposited at DPGSC-500 ft (Photo 1-16, Attachment A-1). This sediment deposition includes both channel aggradation and overbank deposition.

In the area below the GCS net sediment deposition occurred at one cross-section, and one cross-section had no measurable erosion or deposition, (Figure A-3.7-3 and Table A-3.7-2). Maximum sediment deposition was 0.7 ft, within the channel at the cross-section 225 ft below the GCS. This deposition occurred in an area that had incised in 2011.

On average, the stream channel upstream of the GCS aggraded by 0.2 ft in 2012, compared with 0.1 ft of aggradation in 2011 (Table A-3.7-1). Downstream of the GCS, the channel aggraded by an average of 0.1 ft in 2012, compared with 0.5 ft of incision in 2011 (Table A-3.7-2). As shown in Figure A-3.7-3, the channel thalweg gradient decreased slightly both above and below the GCS in 2012.

A-3.8 Los Alamos Canyon Low-Head Weir

The sediment retention basins above the Los Alamos Canyon low-head weir were excavated from July 8 to July 11, 2011, following the Las Conchas fire (LANL 2011, 206488). The upper two basins (Basins 1 and 2) were resurveyed in October 2011, after the 2011 monsoon season, and the lower basin (Basin 3) was resurveyed in March 2012 after ponded water had evaporated. Basins 1 and 3 were resurveyed in November 2012; Basin 2 had standing water and was not resurveyed in November 2012. Basins 1 and 2 were excavated in October 2012, before the November 2012 resurvey. Figure A-3.8-1 shows variations in total sediment thickness in Basin 3, determined by subtracting the March 2012 surface from the November 2012 surface. Maximum sediment thickness in Basin 3 resulting from the 2012 monsoon season is 1.1 m (3.6 ft). An estimated 2300 m³ of sediment accumulated in Basin 3 during the summer 2012 monsoon season. The volume of sediment that accumulated in Basins 1 and 2 during this time period was estimated based on comparing the volumes excavated in fall 2012 (MacGregor 2013, 238456), to the volumes calculated in Basins 1 and 2 after the summer 2011 monsoon season (LANL 2012, 218411). Based on the size of the respective excavations, 850 yd³ (650 m³) was excavated from Basin 2 and 150 yd³ (115 m³) was excavated from Basin 1 (MacGregor 2013, 238456). Therefore, the fall 2012 excavation removed all the sediment that had been deposited in Basin 2 (440 m³) as of March 2012, plus an additional 210 m³. The smaller excavation in Basin 1 removed approximately half of the volume (240 m³) of sediment that had accumulated in Basin 1 as of March 2012. Based on these calculations, approximately 210 m³ of 2012 sediment was removed from the two basins.

Additional sediment was deposited in Basins 1 and 2 after the fall 2012 excavation. Estimated average sediment thickness in Basin 1, calculated from hand-dug pits, is approximately 20 cm. Based on the size of the sediment deposition area in Basin 1 (85 m²) and the estimated average sediment thickness of 20 cm, approximately 20 m³ of sediment was deposited in Basin 1 after the fall 2012 excavation. Estimated average sediment thickness in Basin 2, calculated from hand-dug pits, is also 20 cm. Based on the size of the sediment deposition area in Basin 2 (180 m²) and the estimated average sediment thickness of 20 cm, approximately 40 m³ of sediment was deposited in Basin 2 after the fall 2012 excavation. Total sediment deposited in Basin 2 is 210 m³ (excavated in fall 2012) plus 40 m³ of sediment deposited after excavation, or 250 m³ total sediment. Table A-3.8-1 summarizes volume changes in each of the three sediment retention basins during this period. The weir is shown in Photo 1-17, Attachment A-1; the lower retention basin is shown in Photo 1-18, Attachment A-1.

Field observations indicated that approximately 20% of the 2012 sediment deposited in Basin 1 was coarse-grained sediment transported as bed load, and approximately 80% was fine-grained sediment transported as suspended load. This is in contrast to 2011 sediment deposits in Basin 1, which were approximately 50% coarse-grained sediment that was transported as bed load (LANL 2012, 218411). Basin 2 sediment deposited in 2012 was fine-grained, whereas 2011 sediments were predominantly fine-grained but included approximately 5% coarse-grained sediment. Basin 3 deposits comprised fine-grained sediment in 2011 and 2012. The total sediment accumulation rate in the basins above the weir during the 2012 monsoon season was higher than measured in previous years, as shown in Table A-3.8-2. Annual sediment deposition at the Los Alamos Canyon low-head weir in 2011 and 2012 was nearly an order of magnitude greater than the annual sediment deposition recorded in 2010, the year before the Las Conchas fire (Table A-3.8-2). The high sedimentation rate after the Las Conchas fire is probably related to operation of the Los Alamos Reservoir. After the Cerro Grande fire, the reservoir was maintained to impound floodwaters, which let most of the sediment from the burn area settle out (Lavine et al. 2006, 213454; Reneau et al. 2007, 102886). In contrast, after the Las Conchas fire, floodwaters were allowed to bypass the dam because it was being rebuilt when the fire occurred and was not considered able to withstand large floods. The predominance of fine sediment accumulated above the weir in 2011 is consistent with observations after the Cerro Grande fire when the transport of fine-grained sediment was much higher than that of coarse-grained sediment in the first year, and the transport distance greater for fine-grained sediment (Lavine et al. 2006, 213454; Reneau et al. 2007, 102886). The continued predominance of fine sediment at the weir shows that, at the weir location, fine-grained sediment transport has continued into the second year following the Las Conchas fire.

A-4.0 OBSERVATIONS OF WILLOWS IN PUEBLO CANYON

From 2008 to 2010, willows were planted in three areas in Pueblo Canyon downstream from the new Los Alamos WWTP, with the goal of enhancing riparian habitat, stabilizing surfaces, and slowing floodwaters. These areas are referred to as the upper willow-planting area (section A-3.2), the lower willow-planting area (section A-3.4), and the Pueblo Canyon GCS (section A-3.5). Observations were made of willows in these areas during fall 2011 and winter 2013. Willow success was variable in these areas and appears to be related to substrate conditions and preexisting vegetation as well as to the occurrence and persistence of water and substrate stability, as discussed below.

In 2013, the upper willow-planting area had the tallest willows and the thickest patches of willows in the surveyed areas. In the upper, middle, and lower thirds of the upper willow-planting area, willows reached maximum measured heights of 4.9 m (compared with 4.1 m measured in fall 2011), 5.8 m (compared with 4.8 m measured in fall 2011), and 3.7 m (compared with 2.9 m measured in fall 2011), respectively. Willow patches were locally thick, with continuous foliage between stems in parts of the upper and middle thirds of this area (Photo 1-19, Attachment A-1). Between the thickest willow patches, willows that had been laid down by floods in August 2010 and resprouted in 2011 have continued to grow, indicating their root systems remain viable. This area has continuous surface-water flow and a sandy or gravelly, aggrading substrate, and the willows were planted in generally bare ground with little competition from other vegetation. These conditions appear to be ideal for the success of willow plantings.

In the lower third of the upper willow-planting area, willows were less continuous and there were generally gaps between the foliage from nearby stems. No willows were observed in 2013 in most of the area between the LW-3 and LW-5 cross-sections, and they were sparse between the LW-5 and LW-6 cross-sections, which is similar to the extent of willows observed in 2011. This corresponds to an area of unstable conditions from 2010 through 2012, with eroding banks and an incising channel (Figure A-3.2-5 and Photo 1-4, Attachment A-1). The poor willow success in this area appears to be directly related to the unstable substrate conditions.

In the upper half of the lower willow-planting area, above the transition zone, willows were planted in a thin strip along the main channel and locally along a side channel (Photos 1-7 and 1-20, Attachment A-1). This is an area with thick preexisting vegetation dominated by reed canary grass (*Phalaris arundinacea*), and much of the area has a fine-grained substrate. Most planted willow stalks did not survive, with willow success ranging from 0% to about 30% in different parts of this area (compared with willow success ranging from 0% to about 50% observed in 2011). The living willows are mostly stump sprouts or root sprouts, with the sprouts commonly clustered around the base of the original stems. Willow spacing is typically 1 m to 10 m. The tallest measured willow above the transition zone was 3.5 m tall, near the PU -500 ft cross-section (Photo 1-20, Attachment A-1). The poor success in this area appears to be related to the thick preexisting vegetation, which would compete with the willows, and/or the commonly fine-grained substrate. Damage to willow stalks by animals was also observed during the previous willow survey conducted in 2011 (Photo 1-21, Attachment A-1), which may also contribute to the poor success rate in this area.

In the lower half of the lower willow-planting area, below the transition zone, willows were also planted with a typical spacing of 1 m to 10 m in a thin strip along the main channel, and the success rate here was also generally low. As noted in the 2011 survey, willow success was best near the lower end of the planting area, where the area between incised banks widens and coarse sediment has been deposited. Many of the living willows in this area are stump sprouts. Willows have also been successfully established in an area of seepage in the transition zone (Photo 1-8, Attachment A-1).

One dense willow patch is located on a post-1942 geomorphic surface near the PU +100 ft cross-section, with willows up to 4 m to 5 m tall (Photo 1-22, Attachment A-1). These willows were established before the recent planting and indicate locally favorable conditions on higher surfaces, at least at the time they were established. The channel has probably incised since they were established, and because of the relatively low water table, it is uncertain if new willows could be successfully established on high surfaces in this area at this time.

Upstream from the Pueblo Canyon GCS, willows were planted in the disturbed area along the channel for a distance of approximately 250 ft. Approximately 10% to 20% of these willows survived, often consisting of short sprouts from the base of the stems or the roots. The maximum measured height of the living willows was 2.5 m for a willow growing next to the intake above the GCS (Photo 1-23, Attachment A-1). In summer and fall 2012, effluent released from the WWTP appears to have reached this downstream area more often than it did in 2011, and the willows are apparently having better success than was observed in 2011 (when only a 10% survival rate was observed). However, the generally dry conditions above the Pueblo Canyon GCS continue to contribute to the poor success rate in this area.

In summary, observations of willows conducted in 2012 are consistent with observations made in 2011. The willow plantings were most successful in areas with little or no existing vegetation at the time of planting, a stable or aggrading surface with a sandy or gravelly substrate, and continuous surface-water flow. Willow success was generally poor in areas with thick existing vegetation, fine-grained or unstable substrate, and little or no surface-water flow. Replanting in these areas with low past success rates may also be generally unsuccessful.

A-5.0 SOUTH FORK OF ACID CANYON INSPECTION

The stream bank armoring that was emplaced in the south fork of Acid Canyon in April 2010 (LANL 2010, 109280) was inspected after the 2011 monsoon season, and again after the 2012 monsoon season. The rock armoring remained intact, as shown in Photo 1-24, Attachment A-1.

A-6.0 SUMMARY

Net sediment deposition occurred in most surveyed areas in the Los Alamos and Pueblo Canyon watersheds that experienced monsoonal flood events in 2012, which is consistent with the goal of the sediment transport mitigation work plans (LANL 2008, 101714; LANL 2008, 105716). With the exception of the CVSs, none of the areas in Pueblo Canyon containing sediment transport mitigation structures or willow plantings experienced summer monsoon floods in 2012. These areas experienced relatively minimal erosion or sediment deposition in 2012, which can be attributed to erosion and sediment transport caused by the effluent stream from the WWTP. The primary erosional process in areas that only experienced flows related to effluent discharge was bank erosion, and the primary depositional processes were channel aggradation and local sloughing of banks. The CVSs experienced a small amount of erosion during the 2012 monsoon season that removed approximately one-half of the sediment deposited in this area in 2011. The wing ditch area also experienced a small amount of erosion during the 2012 monsoon season that removed approximately one-third of the sediment deposited in 2010 and 2011 in this area. The 2012 erosion may represent remobilization of sediment deposited during the August 2010 runoff event and remobilization of sediment associated with construction activities conducted next to the wing ditch.

Net sediment deposition for 2012 in the DP Canyon GCS area is greater than that recorded in 2011. Net sediment deposition at the Los Alamos Canyon low-head weir is greater than that recorded in 2011 and is nearly an order of magnitude greater than the annual sediment deposition recorded in 2010, the year before the Las Conchas fire. Sediment deposition at the upper Los Alamos Canyon sediment detention basins in 2012 was similar to the amount recorded in 2011, and nearly all of the sediment transported by the small drainage below Solid Waste Management Unit 01-001(f) is being contained in the upper Los Alamos Canyon sediment detention basins. Except for sediment accumulated behind engineered structures, such as the Los Alamos Canyon low-head weir, it is not certain if the mitigation actions enhanced sediment deposition, as sediment deposition is a natural geomorphic process. Nevertheless, the surveys document that these parts of the watersheds are currently operating as desired and are not undergoing net erosion over the time frame of this monitoring program. Bank erosion was documented in several areas, but bank erosion is to be expected and is associated with lateral channel migration; the surveys indicate this eroded sediment was largely redeposited within each canyon. Field observations also indicate that much of the eroded sediment in Pueblo Canyon, which contains relatively low contaminant concentrations, was originally deposited in the floods that occurred after the Cerro Grande fire. In addition, some of the bank erosion includes noncontaminated pre-1943 sediment, and erosion of these areas does not contribute to the contaminant load in stormwater. No actions are recommended at this time except for continued annual resurveys.

A-7.0 REFERENCES AND MAP DATA SOURCES

A-7.1 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.

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- LANL (Los Alamos National Laboratory), September 2011. "Las Conchas Wildfire Effects and Mitigation Actions in Affected Canyons," Los Alamos National Laboratory document LA-UR-11-4793, Los Alamos, New Mexico. (LANL 2011, 206488)
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- MacGregor, A., February 21, 2013. [Volume of Sediment Excavated from Basins 1 and 2 in the Weir]. E-mail message to D. Katzman (LANL) from A. MacGregor (LANL), Los Alamos, NM. (MacGregor 2013, 238456)
- NMED (New Mexico Environment Department), May 11, 2010. "Approval, Documentation of Completion of Armoring of Stream Banks in South Fork Acid 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 2010, 109693)

NMED (New Mexico Environment Department), July 1, 2011. "Approval with Modifications, 2010 Geomorphic Changes at Sediment Transport Mitigation Sites in the Los Alamos and Pueblo Canyon Watersheds," 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, 204349)

Reneau, S.L., D. Katzman, G.A. Kuyumjian, A. Lavine, and D.V. Malm, February 2007. "Sediment Delivery After a Wildfire," *Geology*, Vol. 35, No. 2, pp. 151–154. (Reneau et al. 2007, 102886)

A-7.2 Map Data Sources

The following list provides data sources for maps included in the main body of this report.

Title; Owner ID; Intended Scale; Publication Date.

2000 LIDAR Hypsography; Los Alamos National Laboratory, Earth and Environmental Sciences GISLab; 1:1,200; Work in progress.

Drainage; Los Alamos National Laboratory, Environment and Remediation Support Services; 1:24,000; May 15, 2006.

Gaging stations; Los Alamos National Laboratory, Waste and Environmental Services Division; 1:2,500; March 19, 2011.

Grade control structures; Los Alamos National Laboratory, Environment and Remediation Support Services; Unknown; May 17, 2011.

LANL boundary; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Unknown; August 16, 2010.

LANL area orthophoto; Los Alamos National Laboratory, Earth and Environmental Sciences GISLab; 1"=200'; February 25, 2009.

Location IDs; Los Alamos National Laboratory, ESH&Q Waste and Environmental Services Division; 1:2,500; May 19, 2011.

Other property boundary; Los Alamos National Laboratory, Earth and Environmental Sciences GISLab; Unknown; August 16, 2010.

Pueblo and DP Canyon cross sections and thalwegs; Los Alamos National Laboratories, Earth and Environmental Sciences GISLab; Unknown; May 2011.

Roads, surfaced; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Unknown; November 30, 2010.

Technical area boundary; Los Alamos National Laboratory, Site Planning and Project Initiation Group, Infrastructure Planning Office; Unknown; August 16, 2010.

Watershed; Los Alamos National Laboratory, Environment and Remediation Support Services; 1:2,500; November 2, 2006.

Wells; Los Alamos National Laboratory, ESH&Q Waste and Environmental Services Division; 1:2,500; May 19, 2011.

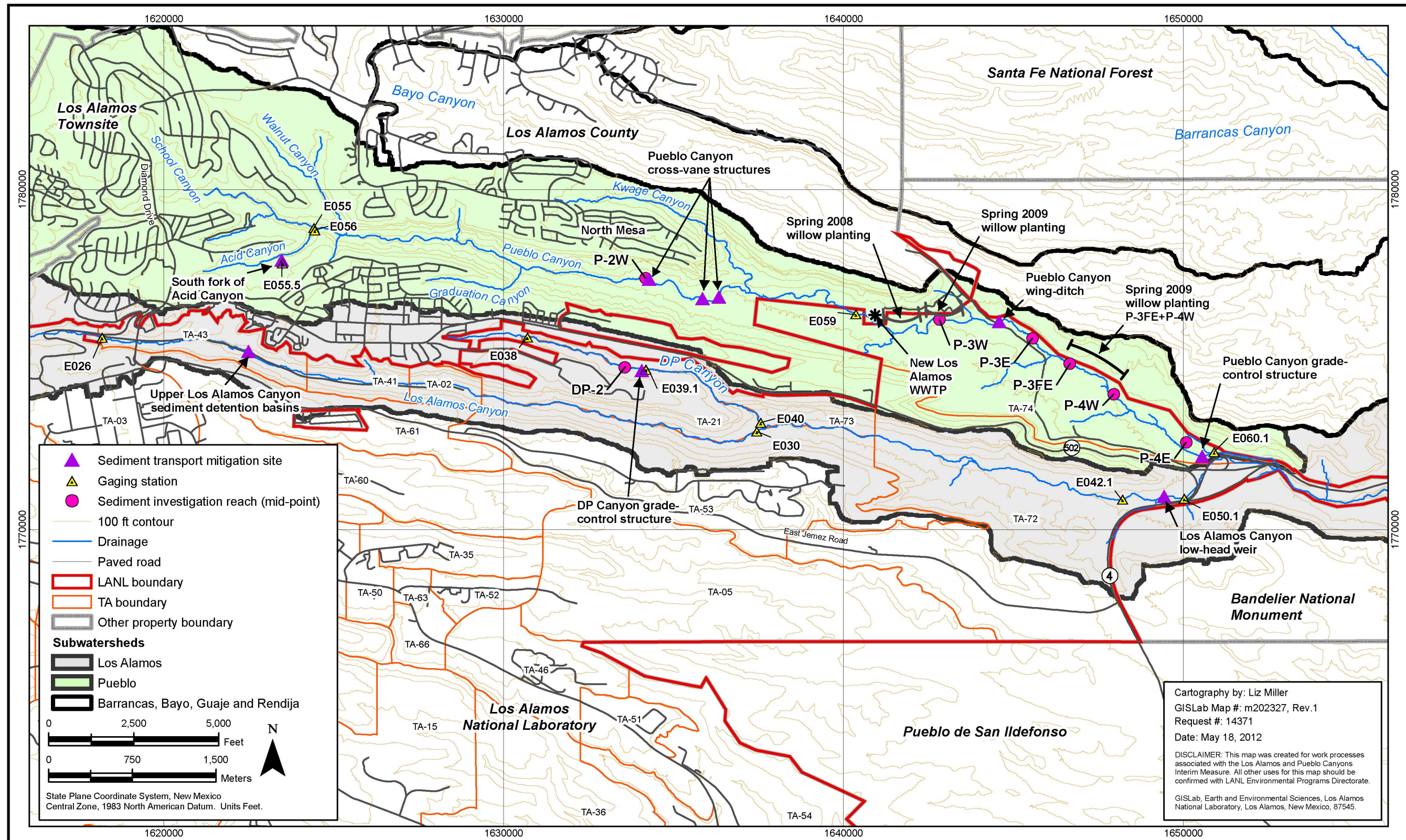


Figure A-1.0-1 Los Alamos and Pueblo Canyon watersheds, showing sediment transport mitigation sites and stream gages



Figure A-3.1-1 Orthophoto showing the locations of surveyed cross-sections and thalweg profiles at the Pueblo Canyon CVSs

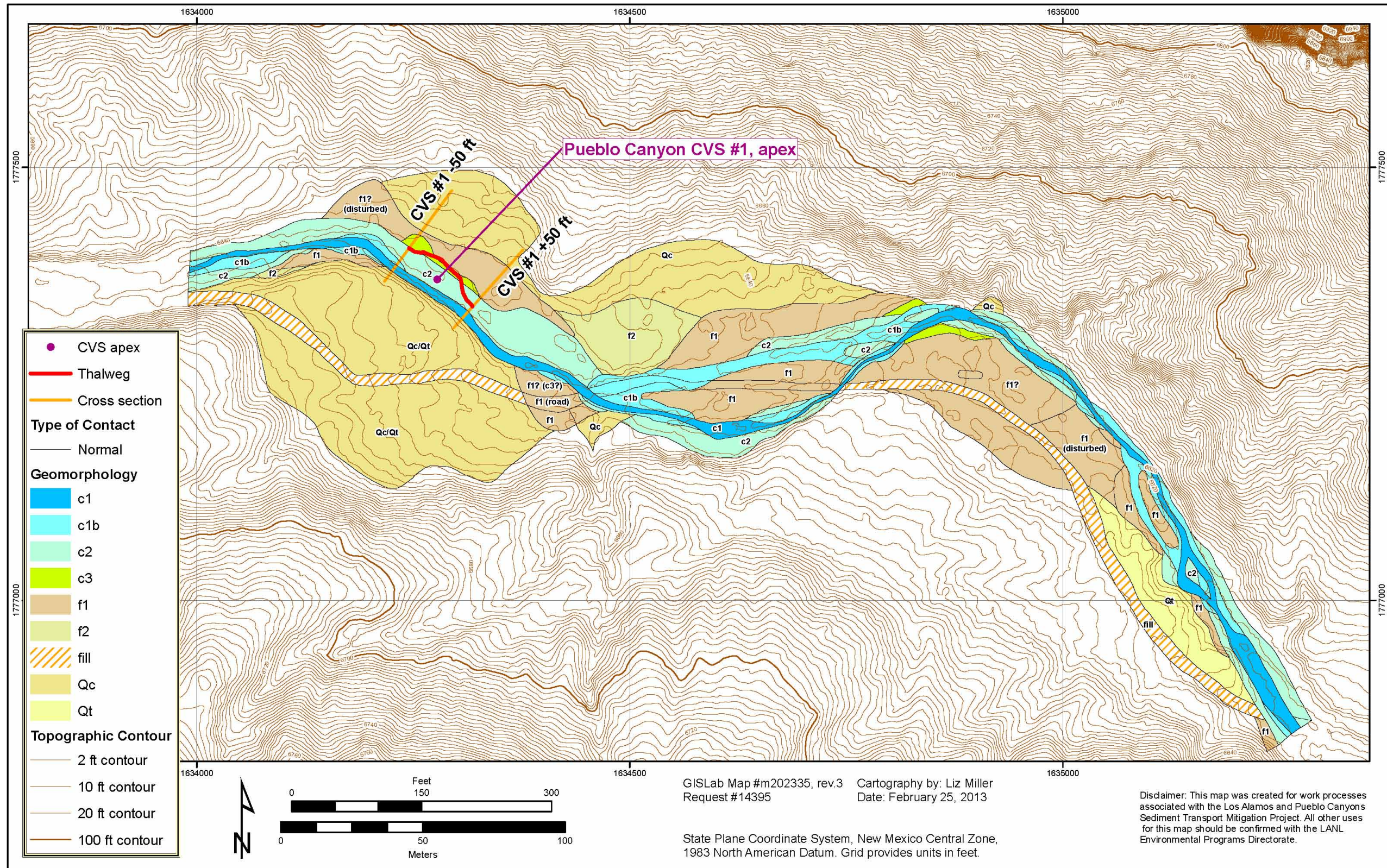


Figure A-3.1-2 Geomorphic map showing the locations of surveyed cross-sections and thalweg profile at Pueblo Canyon CVS #1; geomorphic mapping from 1997

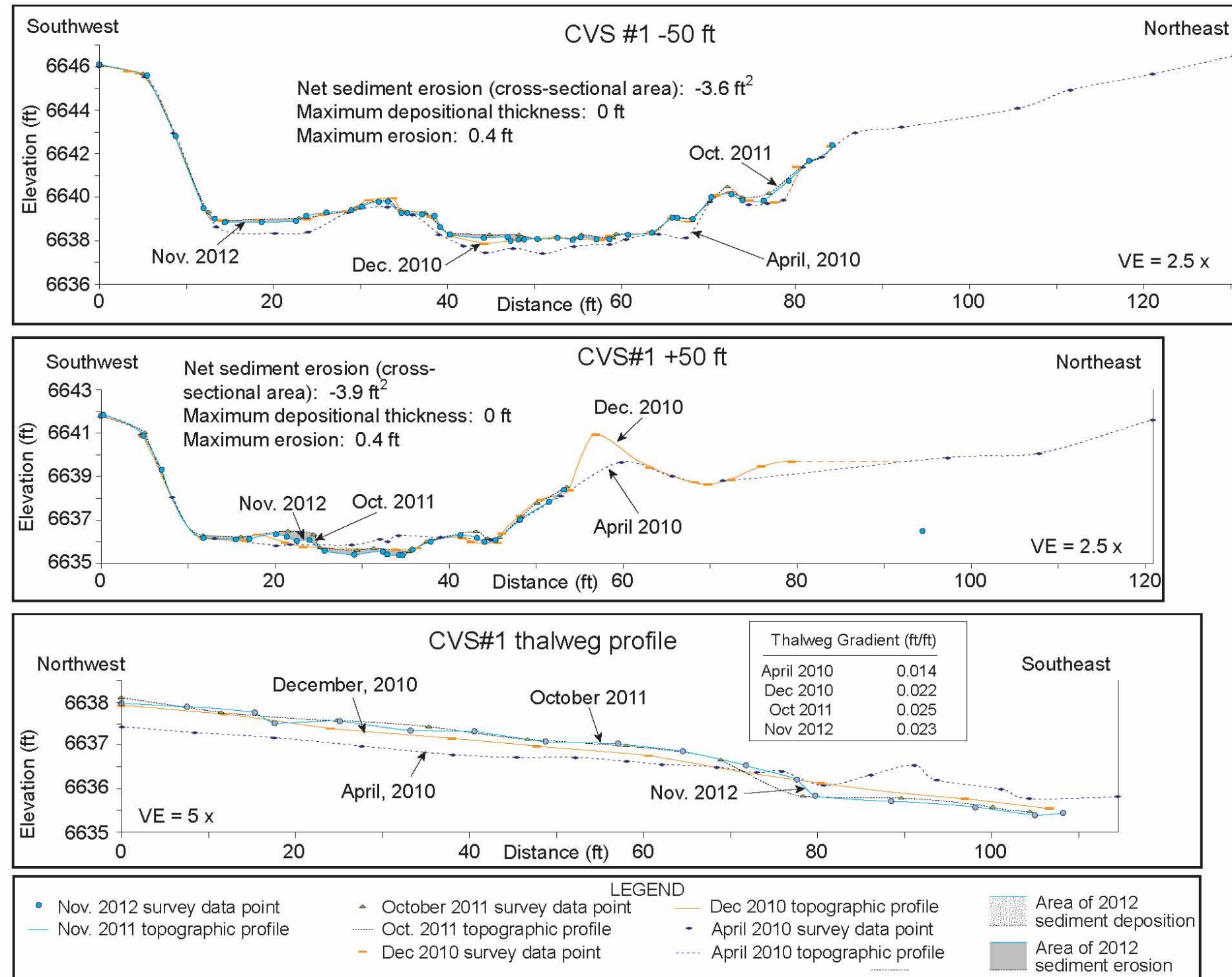


Figure A-3.1-3 Cross-sections and thalweg profile at Pueblo Canyon CVS #1

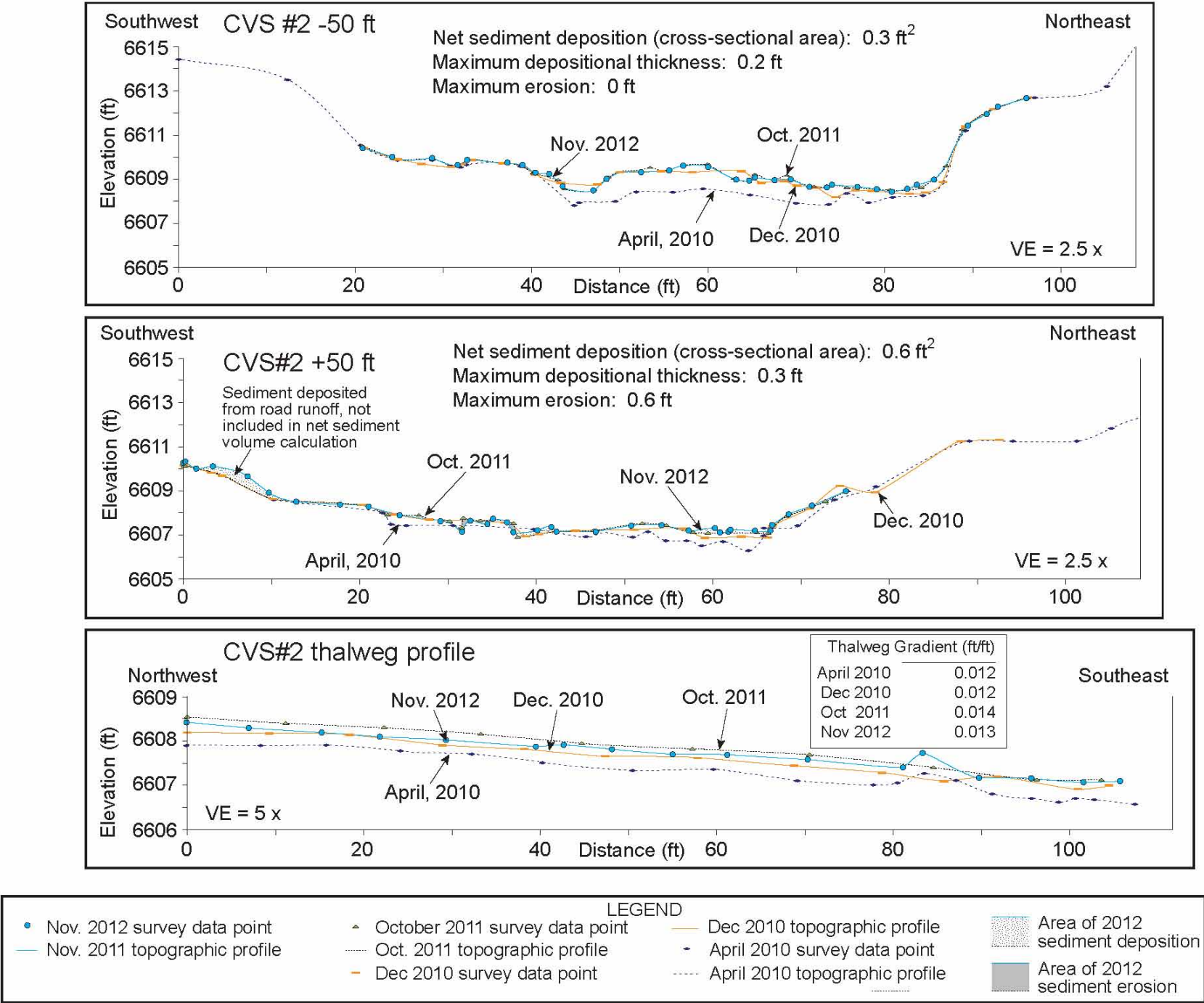


Figure A-3.1-4 Cross-sections and thalweg profile at Pueblo Canyon CVS #2

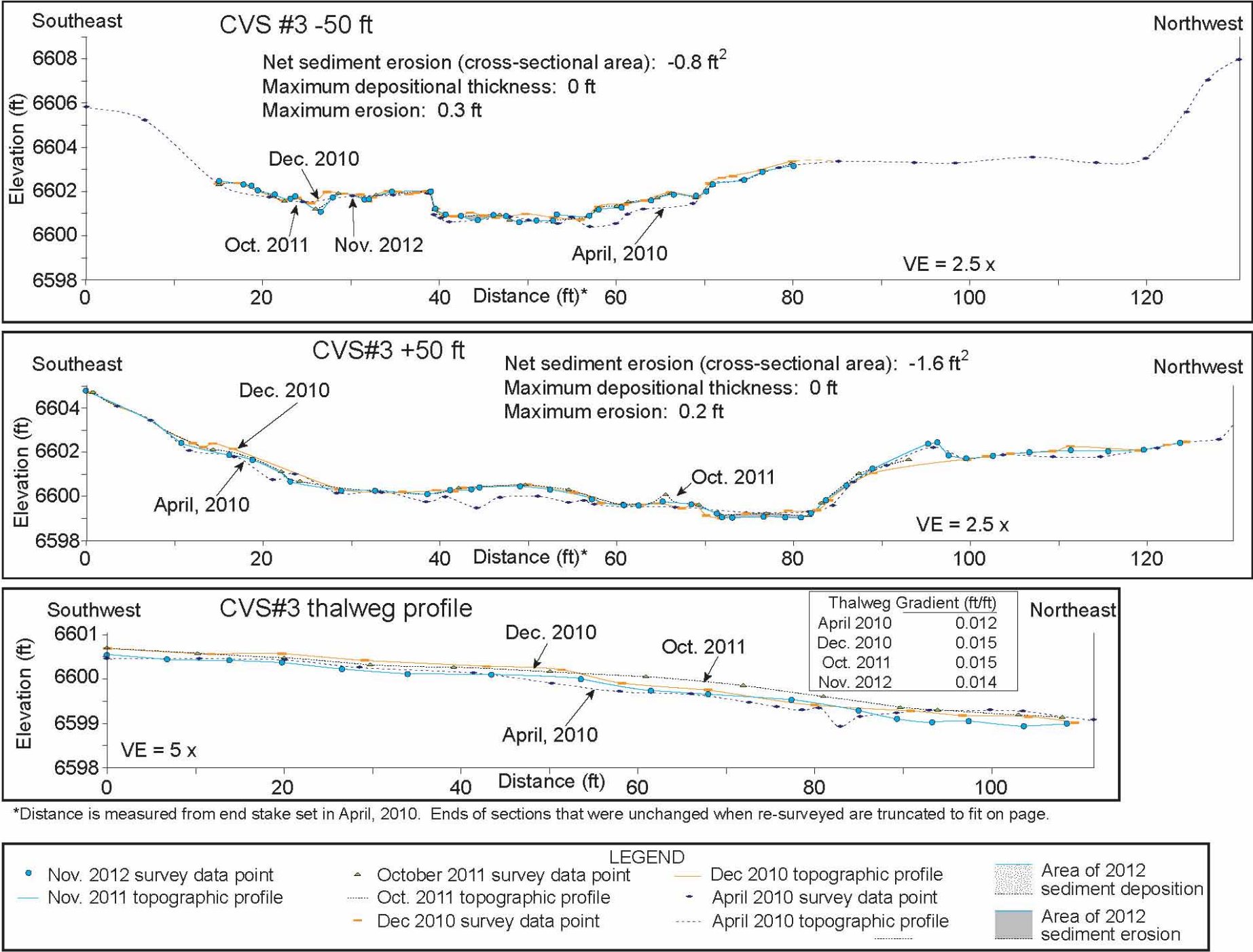


Figure A-3.1-5 Cross-sections and thalweg profile at Pueblo Canyon CVS #3

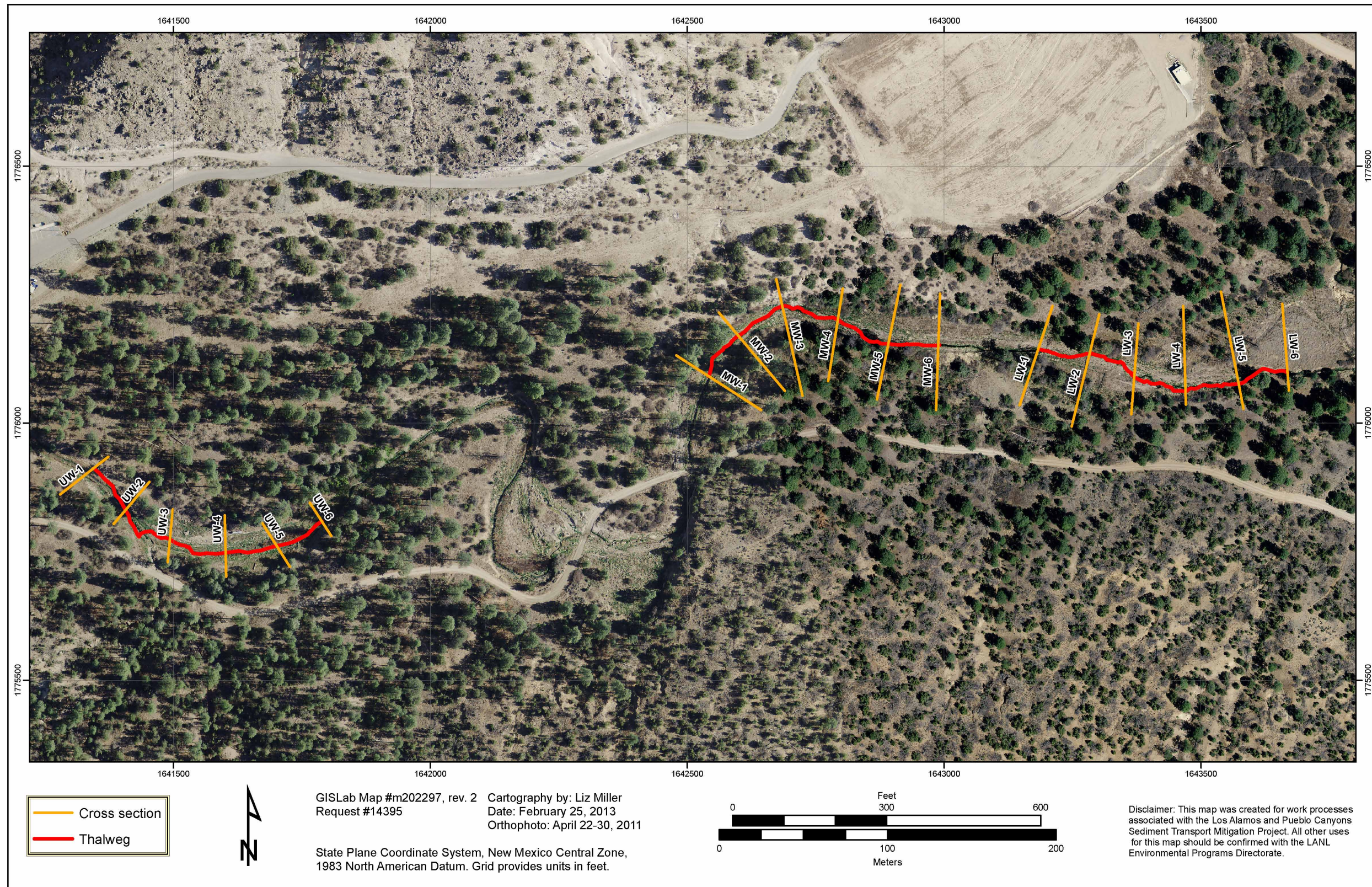


Figure A-3.2-1 Orthophoto showing the locations of surveyed cross-sections and thalweg profiles in the upper Pueblo Canyon willow-planting area

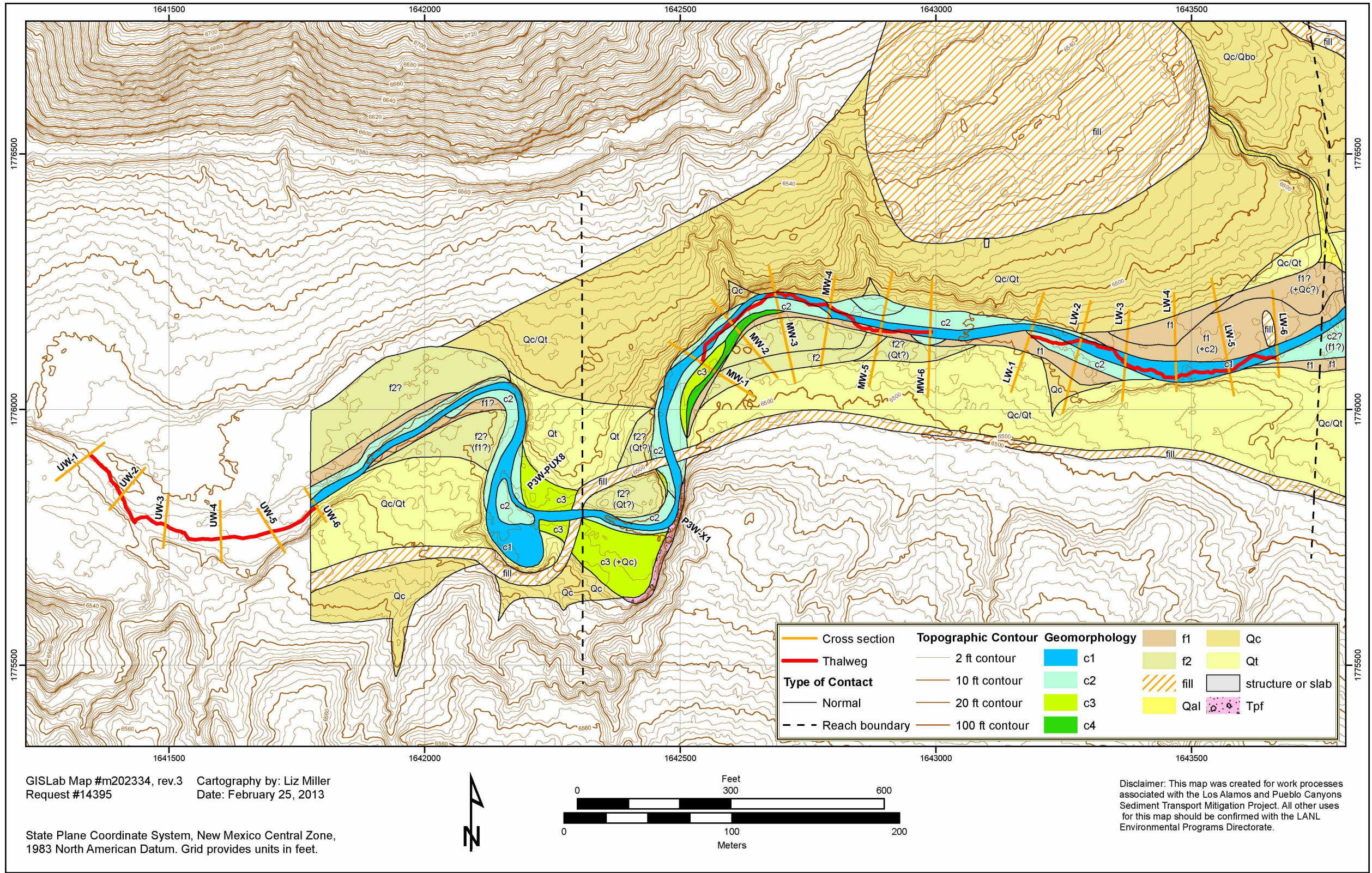


Figure A-3.2-2 Geomorphic map showing the locations of surveyed cross-sections and thalweg profiles in the upper Pueblo Canyon willow-planting area; geomorphic mapping from 1997

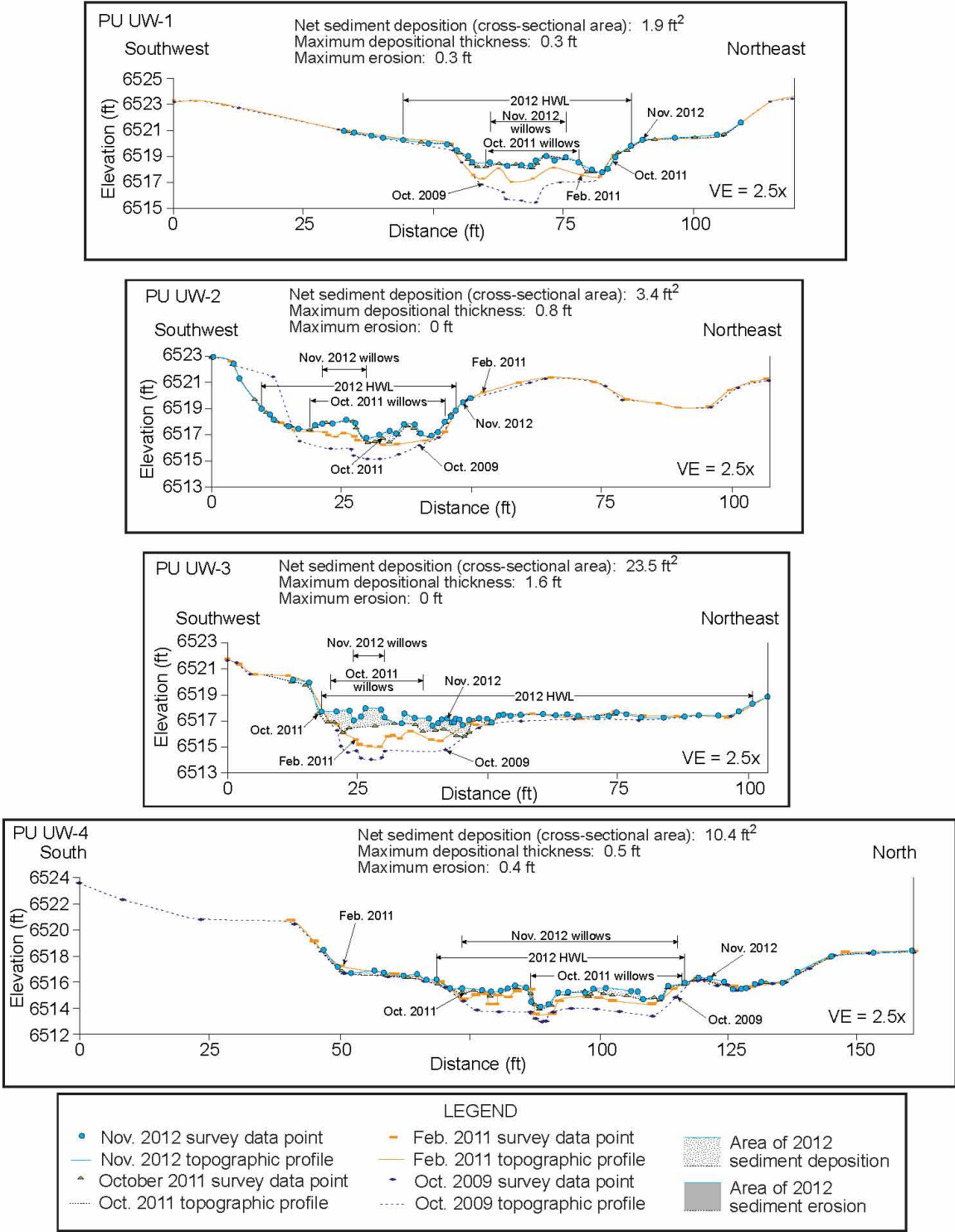


Figure A-3.2-3 Cross-sections and thalweg profile in upper third of upper Pueblo Canyon willow-planting area

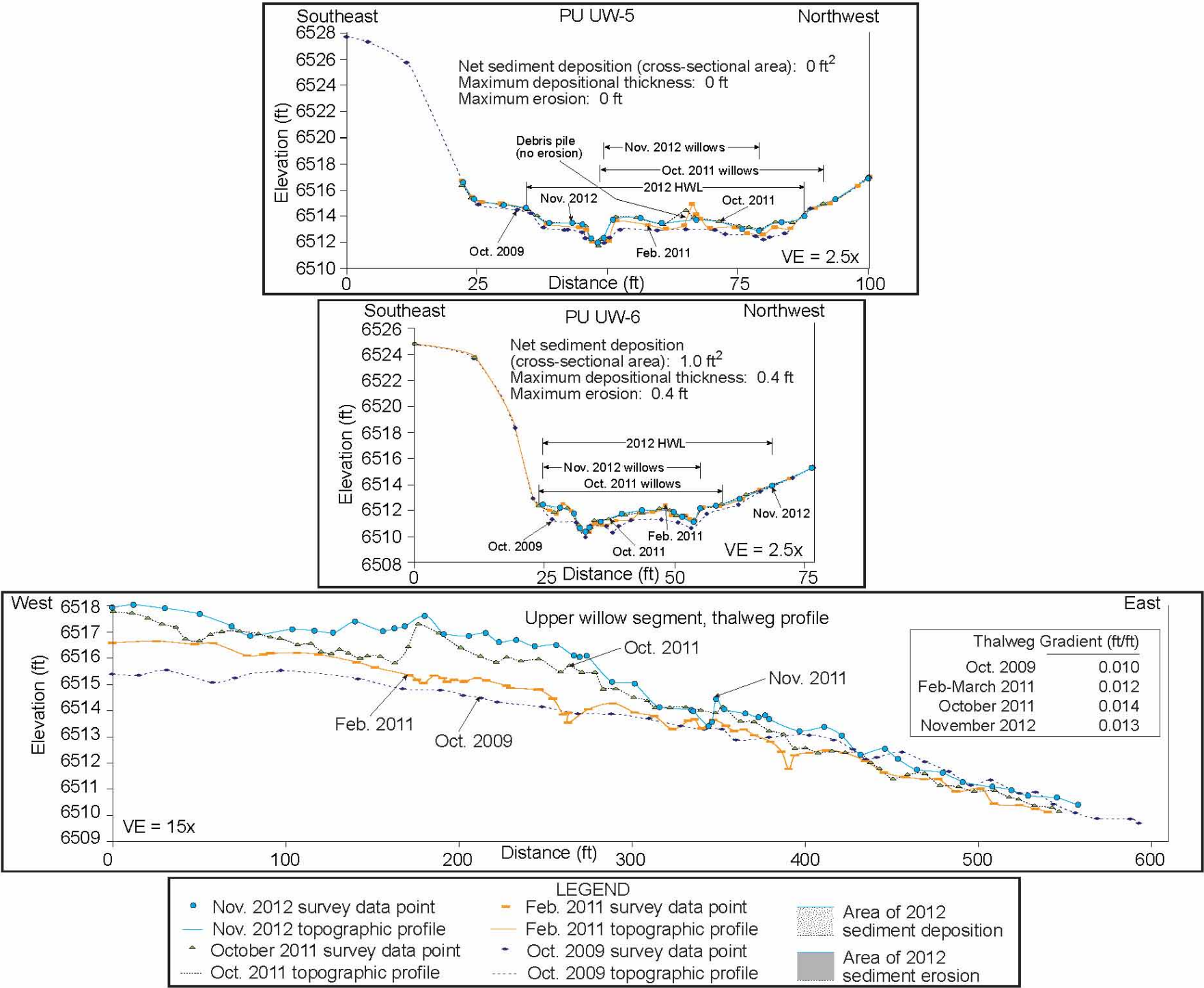


Figure A-3.2-3 (continued) Cross-sections and thalweg profile in upper third of upper Pueblo Canyon willow-planting area

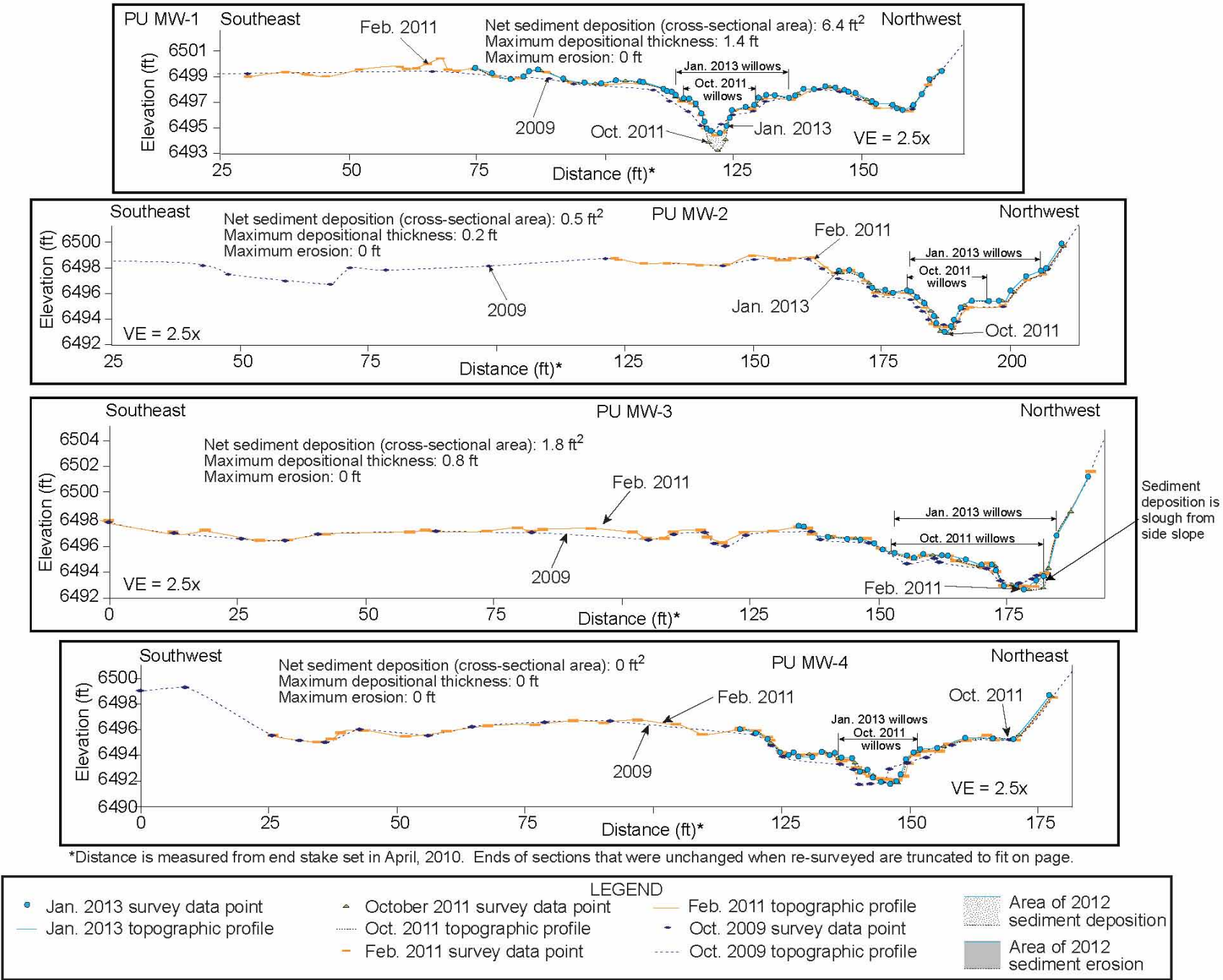


Figure A-3.2-4 Cross-sections and thalweg profile in middle third of upper Pueblo Canyon willow-planting area

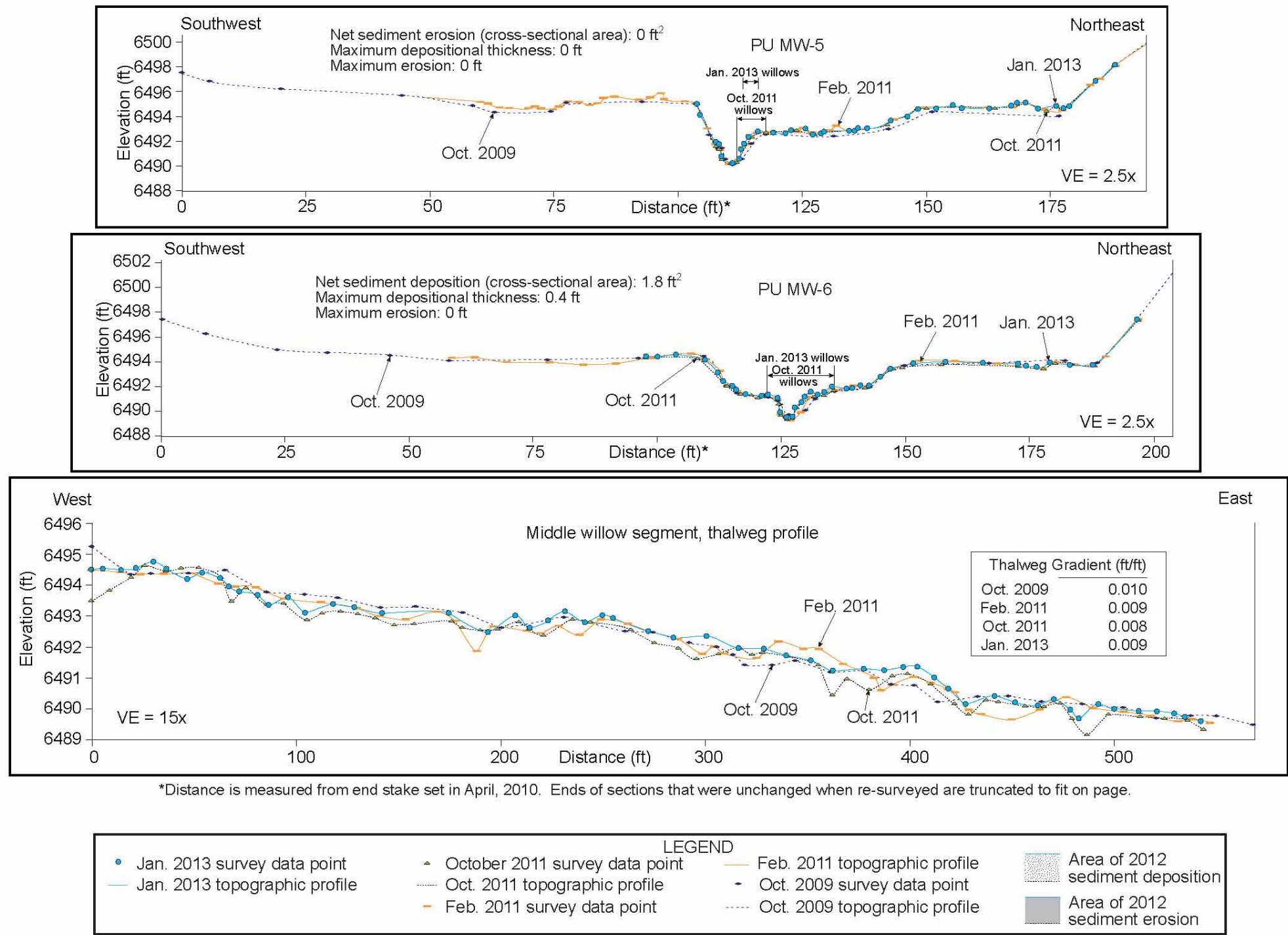


Figure A-3.2-4 (continued) Cross-sections and thalweg profile in middle third of upper Pueblo Canyon willow-planting area

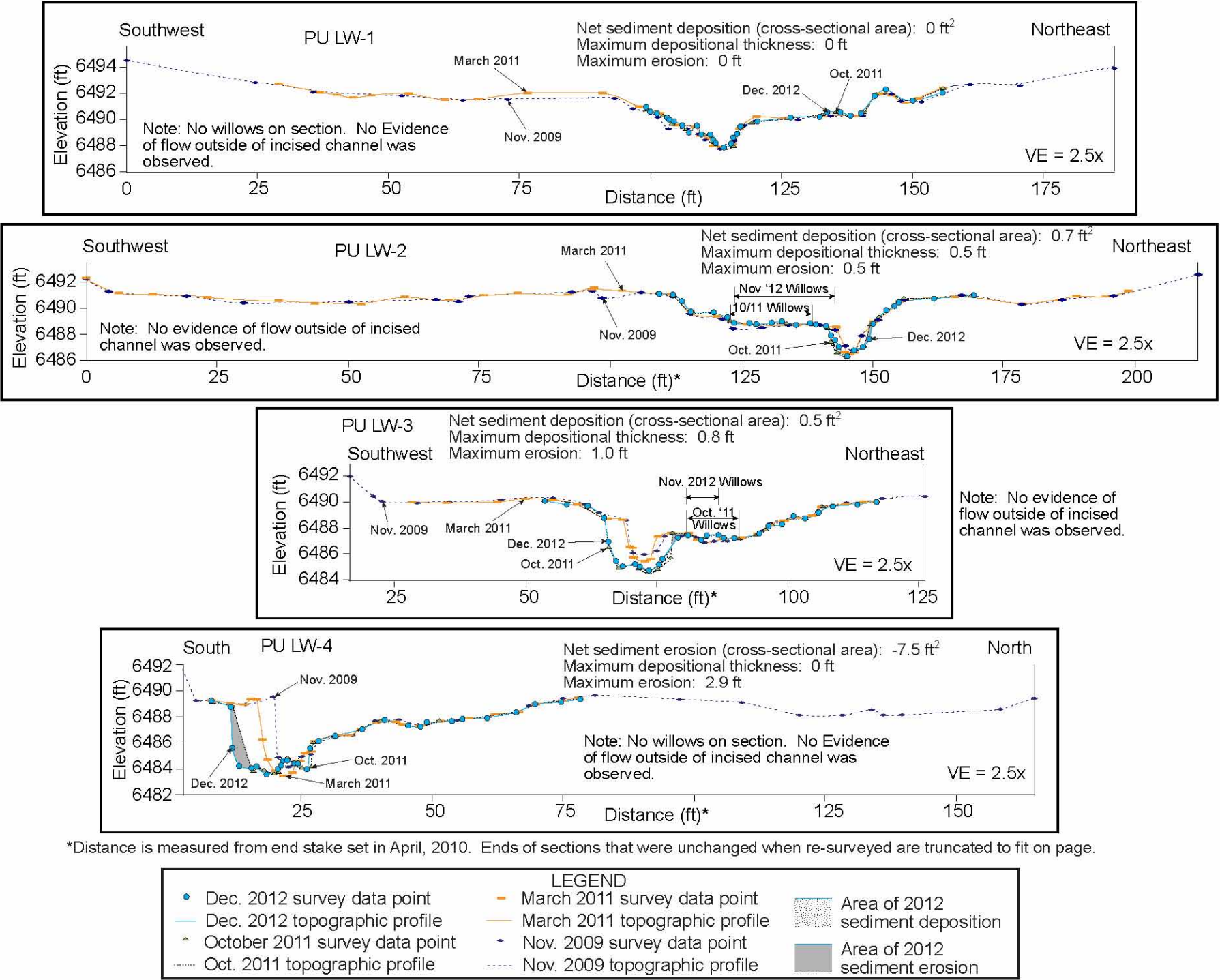


Figure A-3.2-5 Cross-sections and thalweg profile in lower third of upper Pueblo Canyon willow-planting area

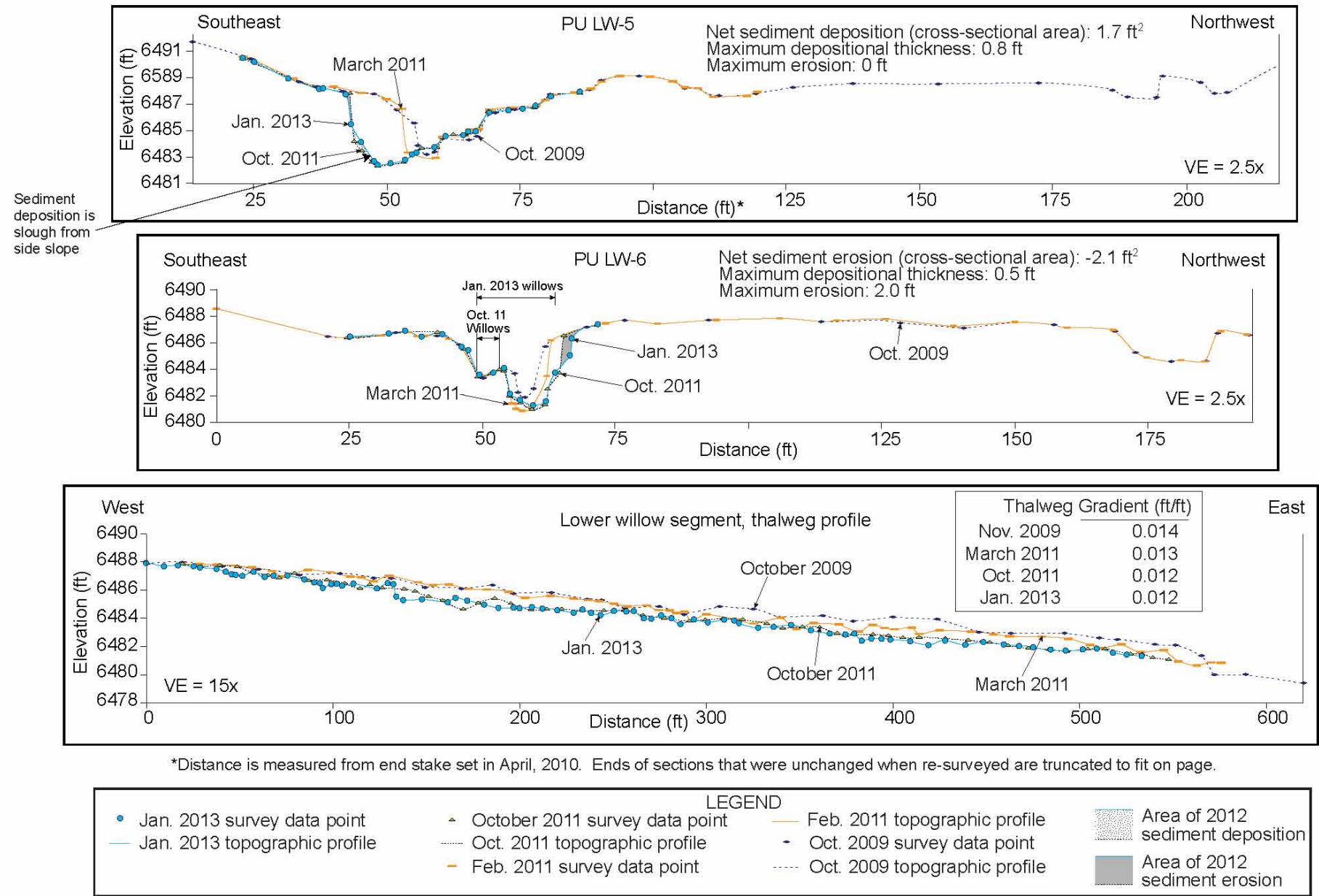


Figure A-3.2-5 (continued) Cross-sections and thalweg profile in lower third of upper Pueblo Canyon willow-planting area

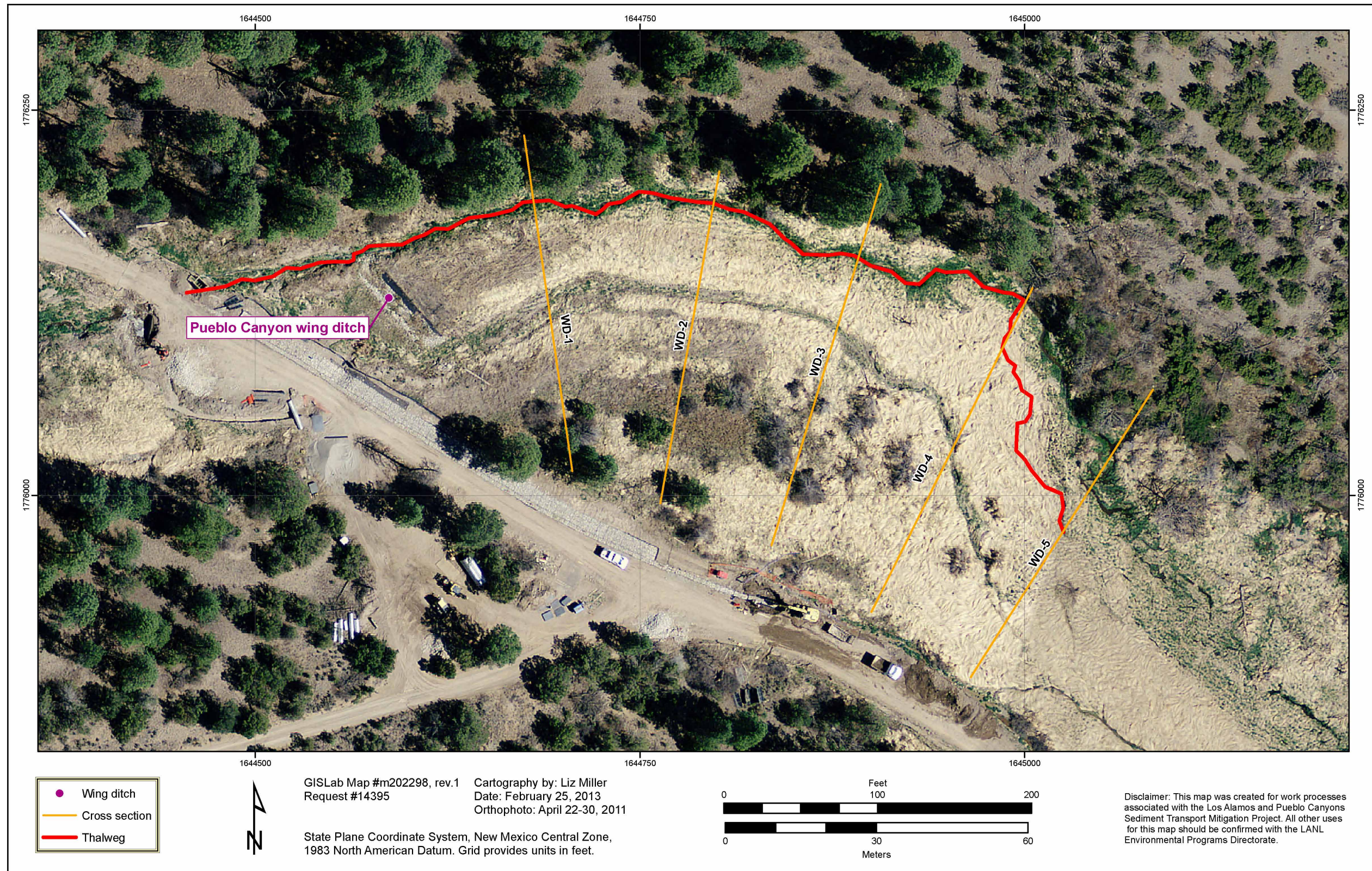


Figure A-3.3-1 Orthophoto showing the locations of surveyed cross-sections and thalweg profiles near the Pueblo Canyon wing ditch; also shown is road reconstruction by Los Alamos County. Construction was completed before the January 2013 survey.

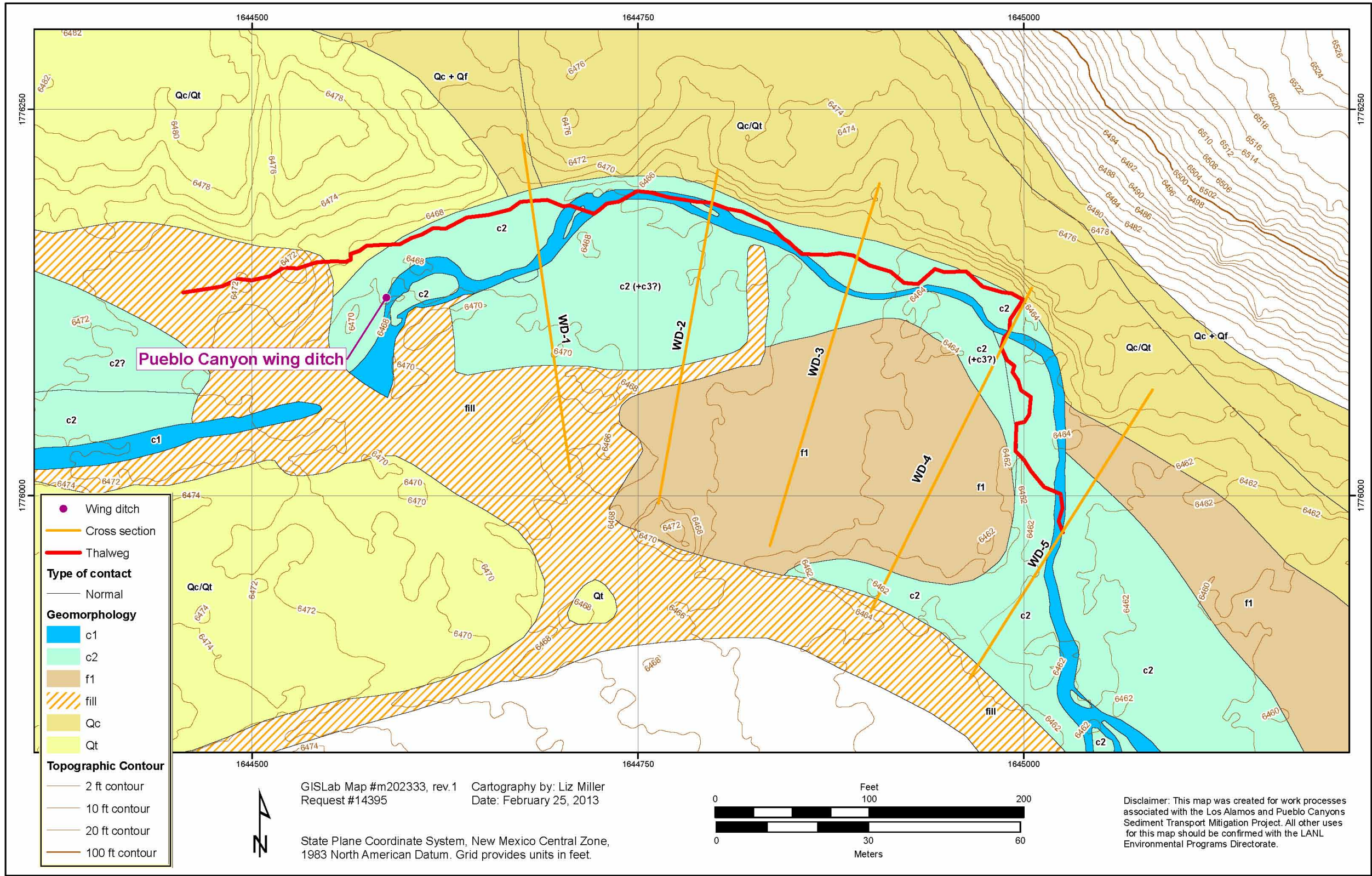


Figure A-3.3-2 Geomorphic map showing the locations of surveyed cross-sections and thalweg profiles near the Pueblo Canyon wing ditch; geomorphic mapping from 1997

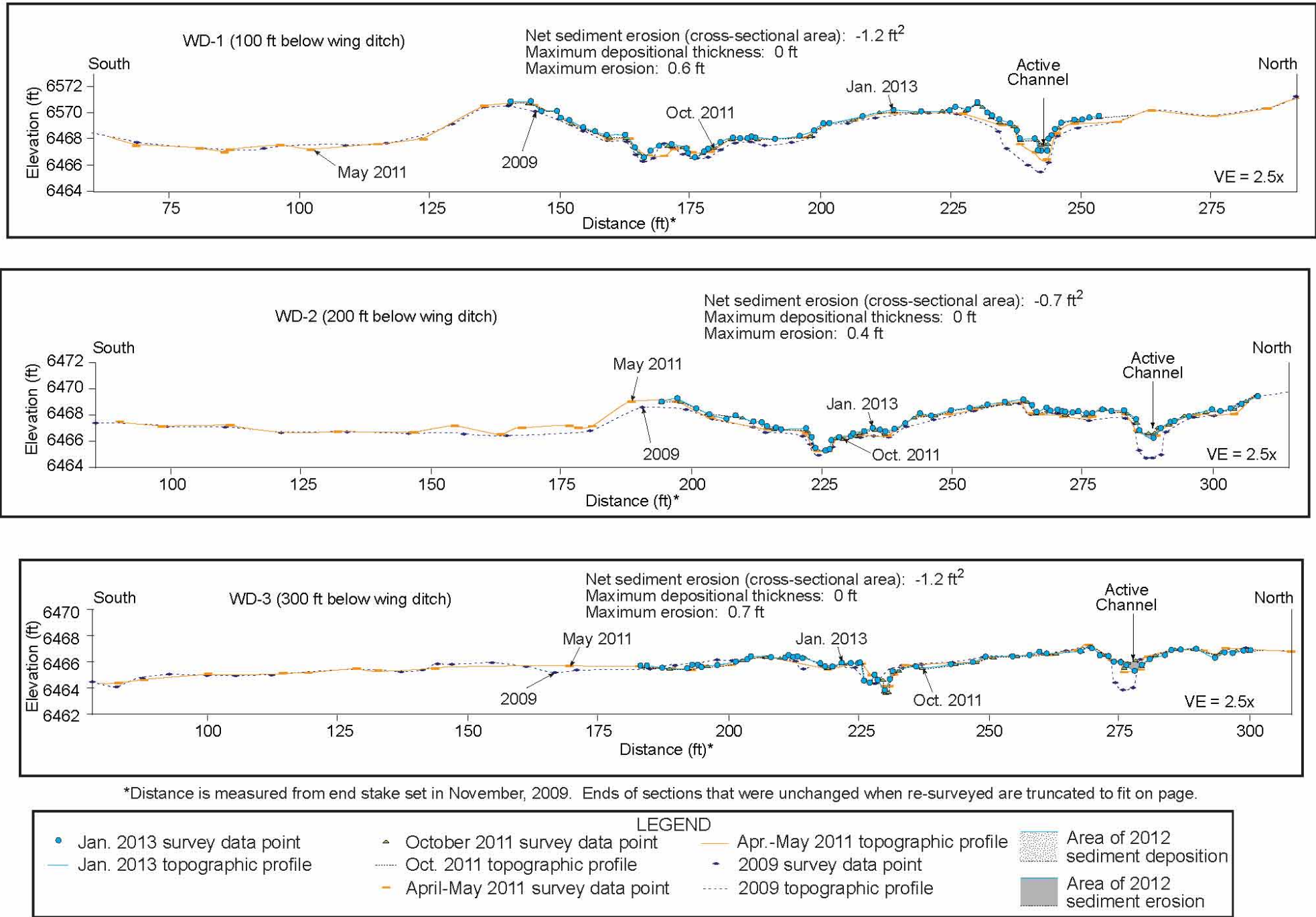


Figure A-3.3-3 Cross-sections below the Pueblo Canyon wing ditch

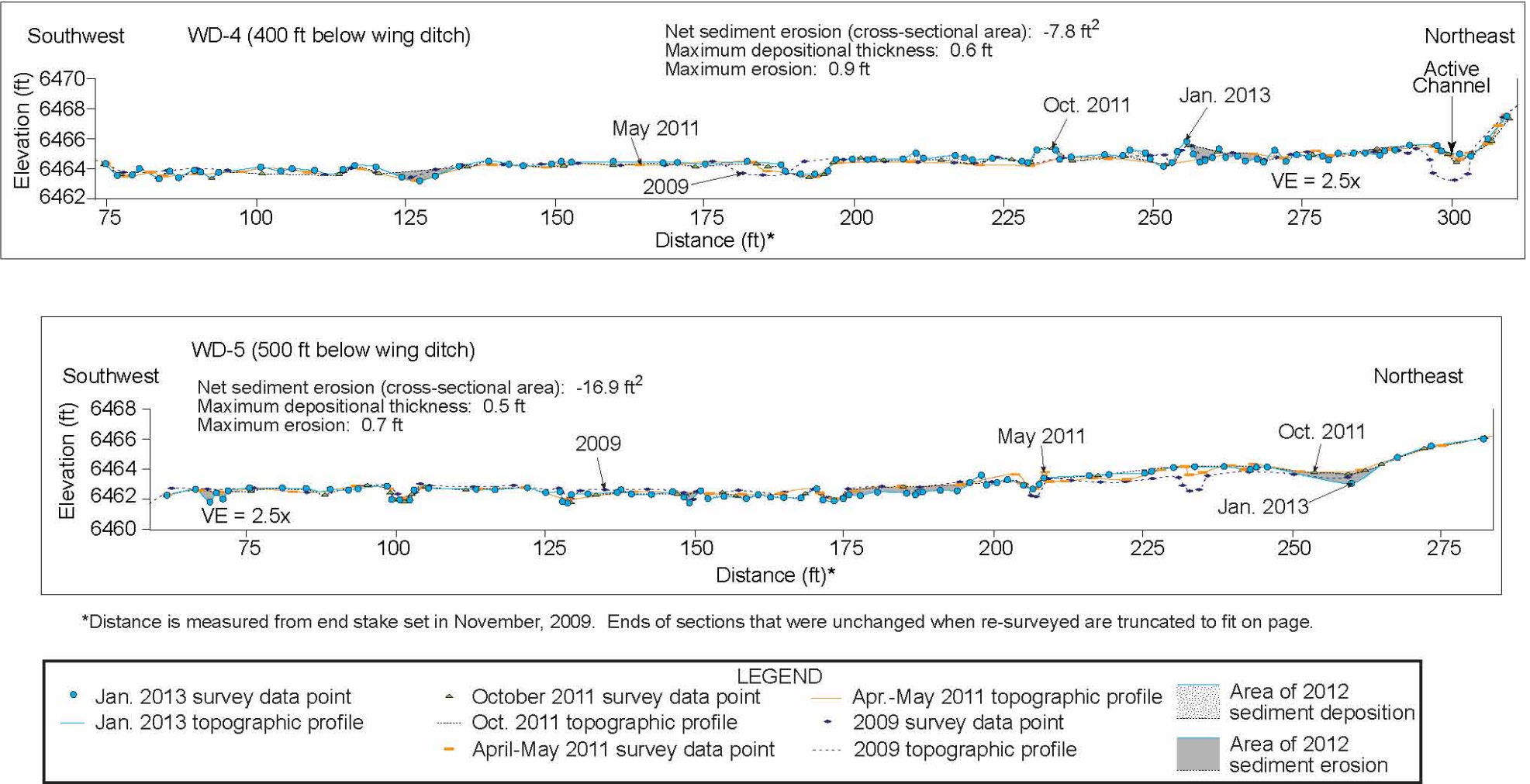


Figure A-3.3-3 (continued) Cross-sections below the Pueblo Canyon wing ditch

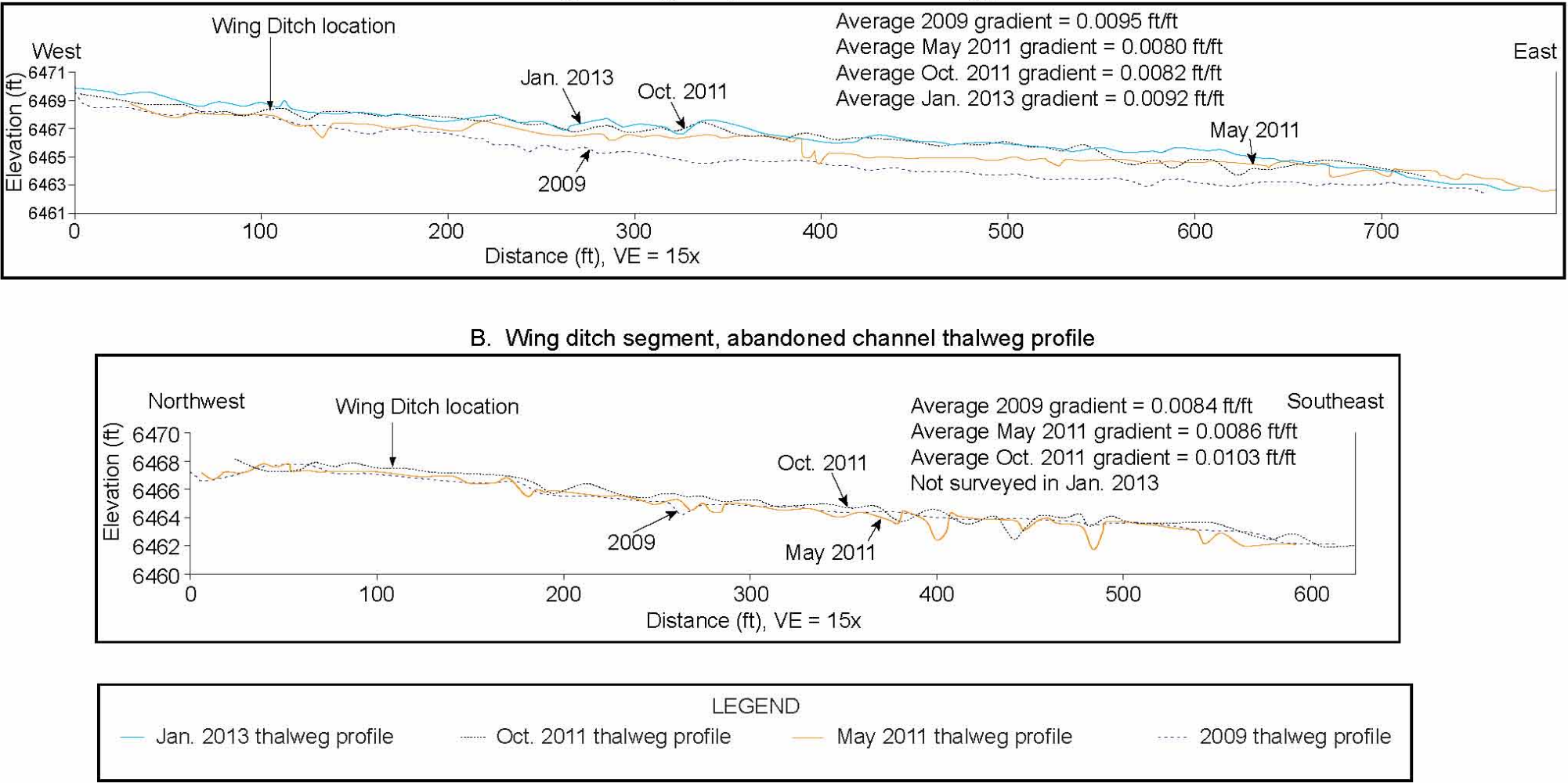


Figure A-3.3-4 Thalweg profiles near the Pueblo Canyon wing ditch

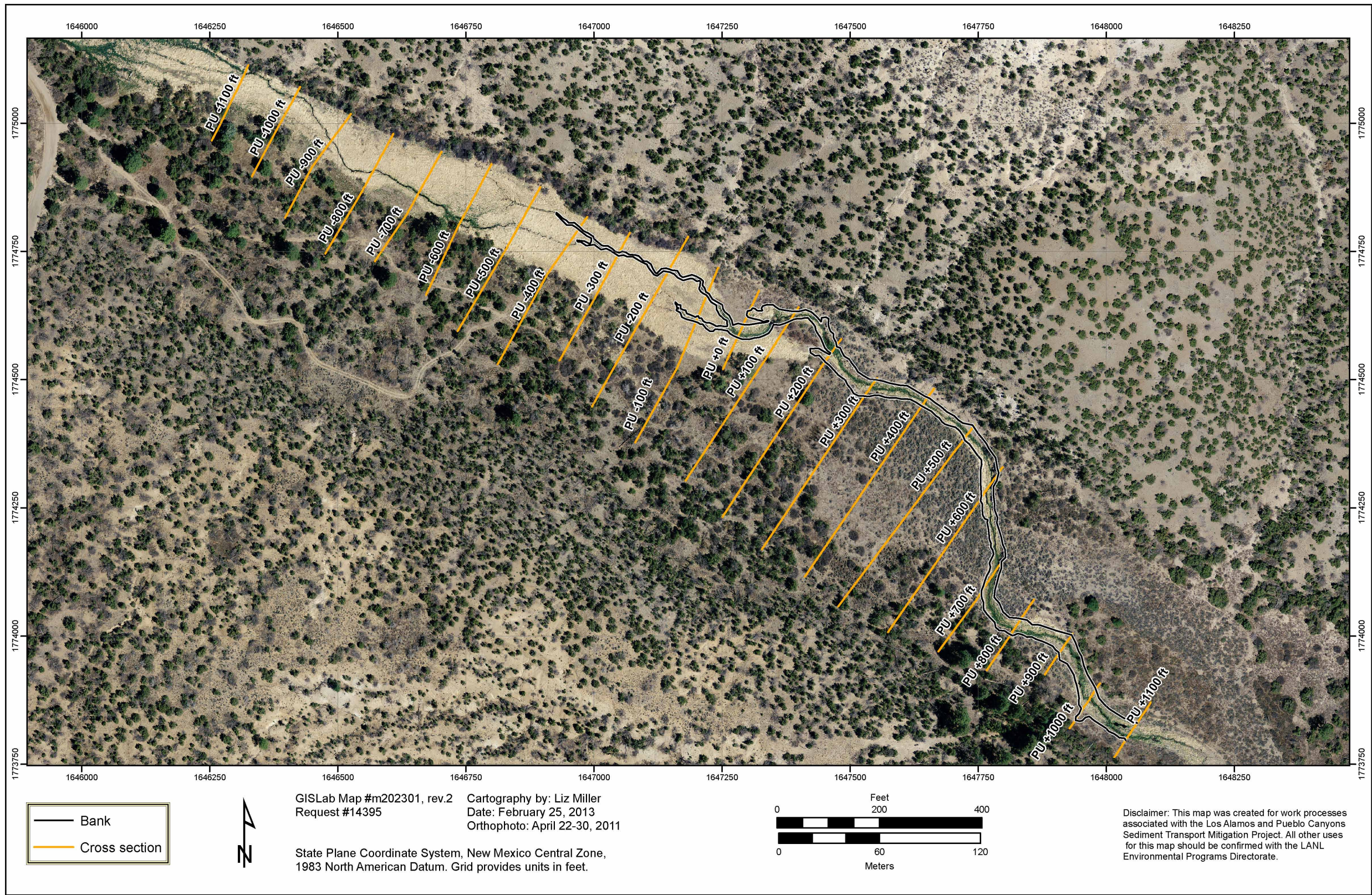


Figure A-3.4-1 Orthophoto showing the locations of surveyed cross-sections and stream banks in the lower Pueblo Canyon willow-planting area

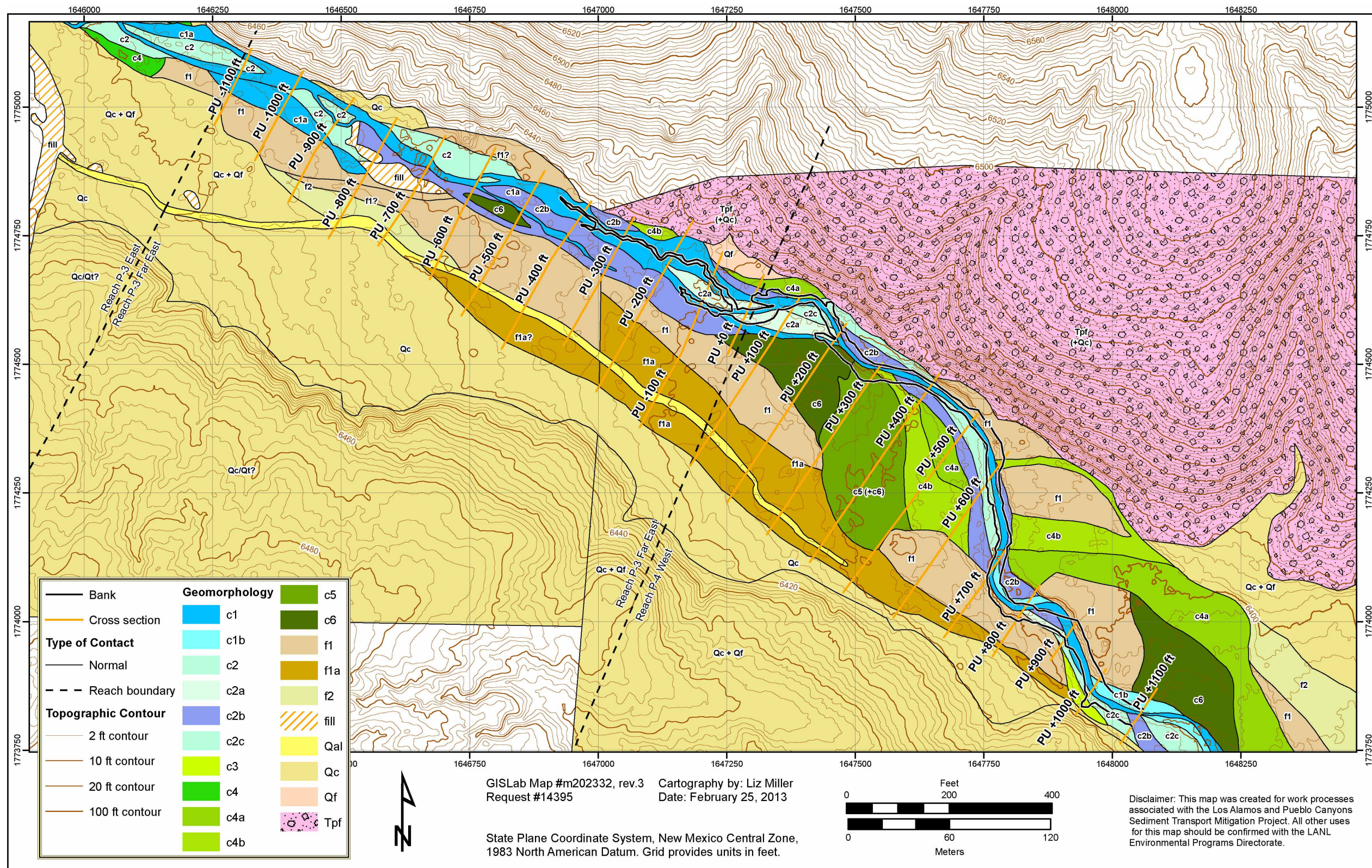


Figure A-3.4-2 Geomorphic map showing the locations of surveyed cross-sections and stream banks in the lower Pueblo Canyon willow-planting area; geomorphic mapping from 1996–1997

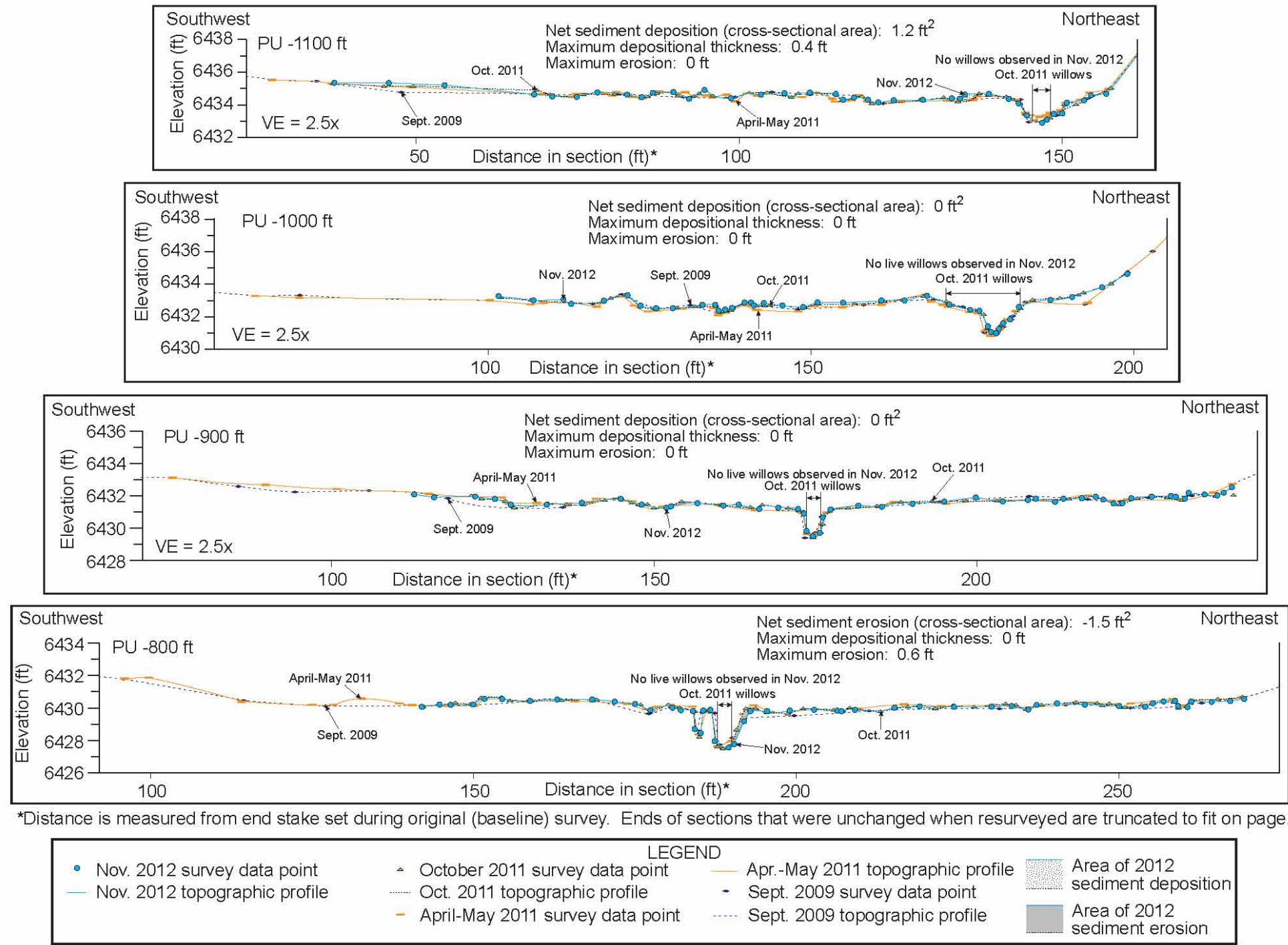


Figure A-3.4-3 Cross-sections in the lower Pueblo Canyon willow-planting area

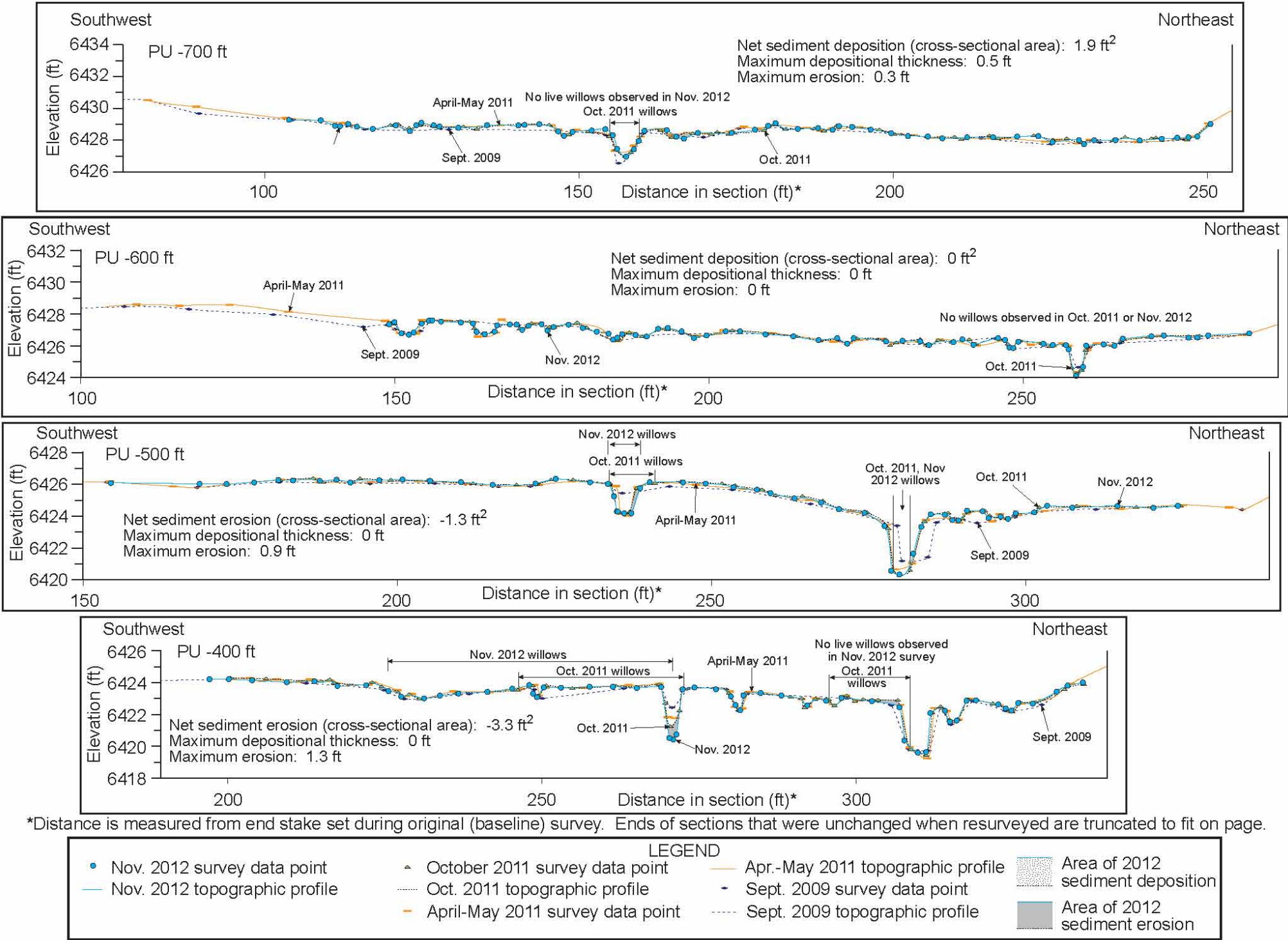


Figure A-3.4-3 (continued) Cross-sections in the lower Pueblo Canyon willow-planting area

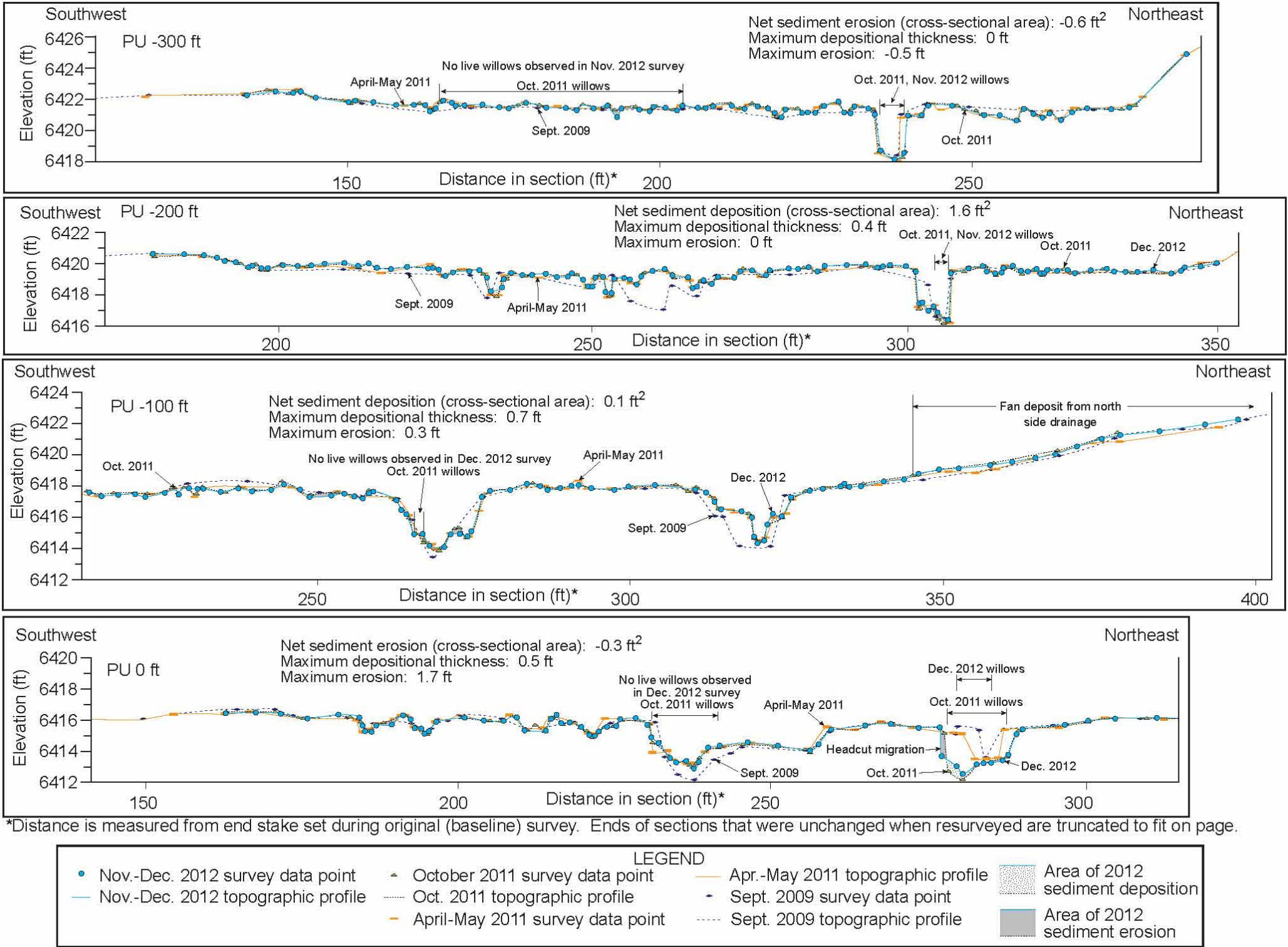
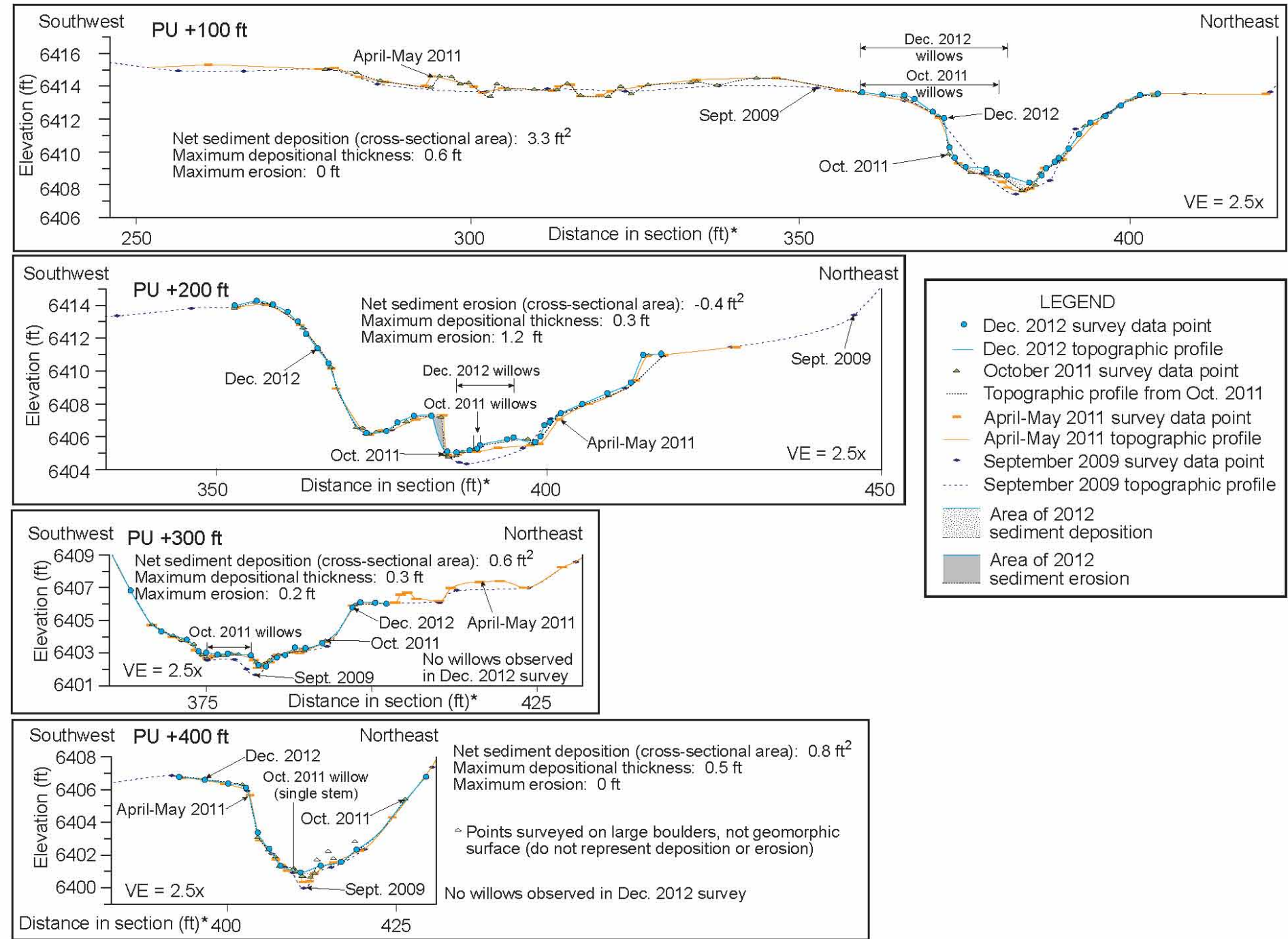


Figure A-3.4-3 (continued) Cross-sections in the lower Pueblo Canyon willow-planting area



*Distance is measured from end stake set during original (baseline) survey. Ends of sections that were unchanged when resurveyed are truncated to fit on page.

Figure A-3.4-3 (continued) Cross-sections in the lower Pueblo Canyon willow-planting area

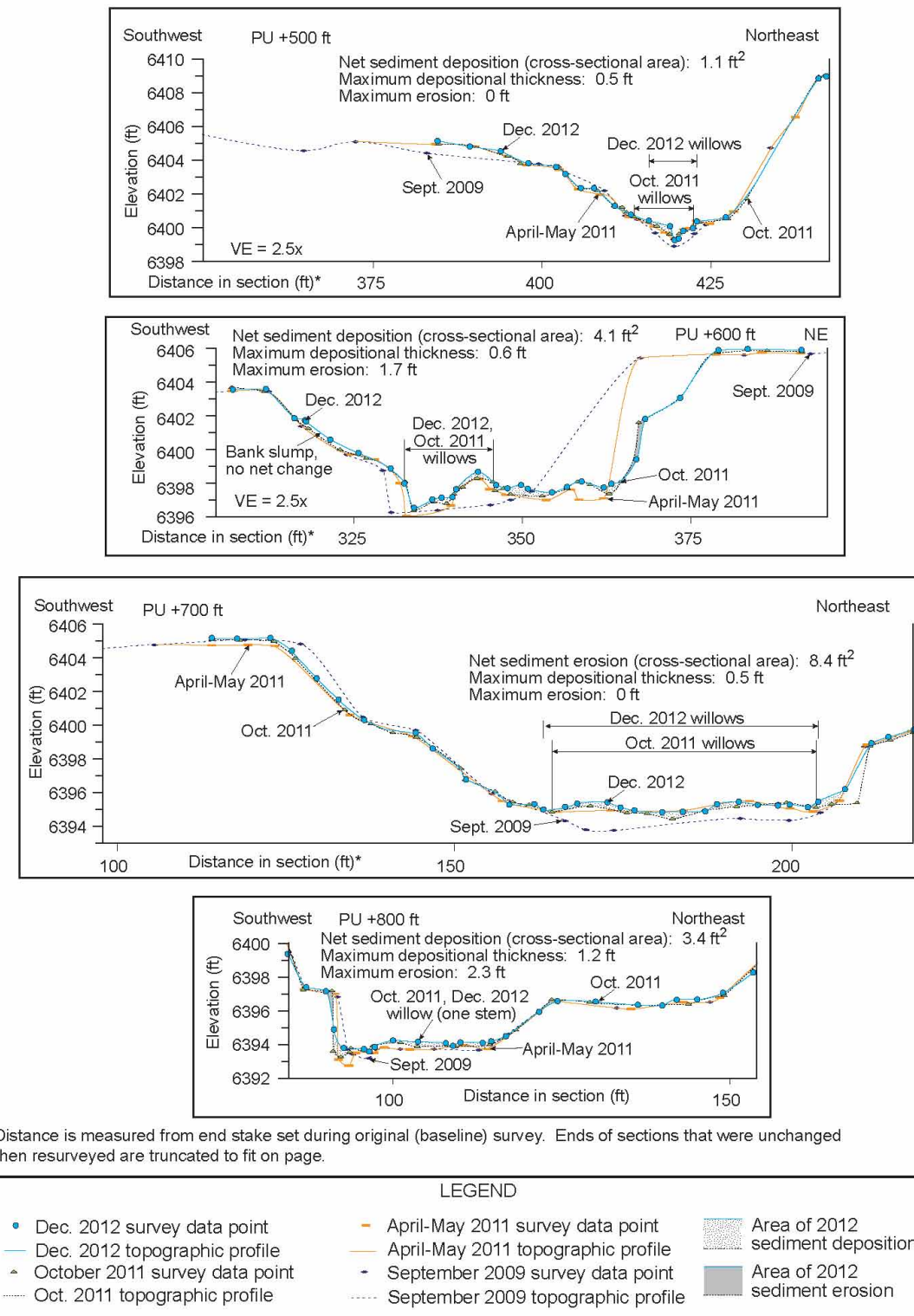


Figure A-3.4-3 (continued) Cross-sections in the lower Pueblo Canyon willow-planting area

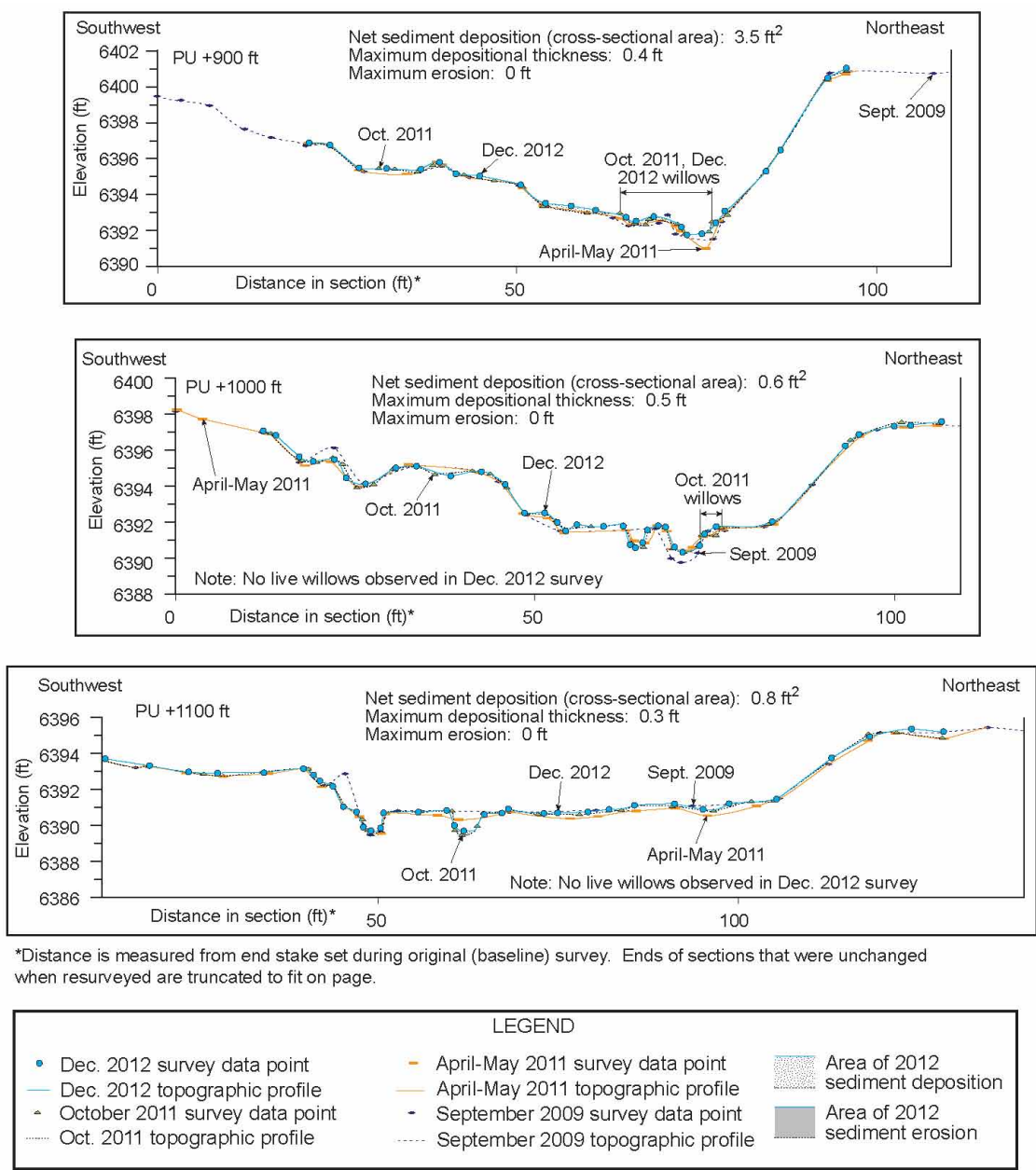


Figure A-3.4-3 (continued) Cross-sections in the lower Pueblo Canyon willow-planting area

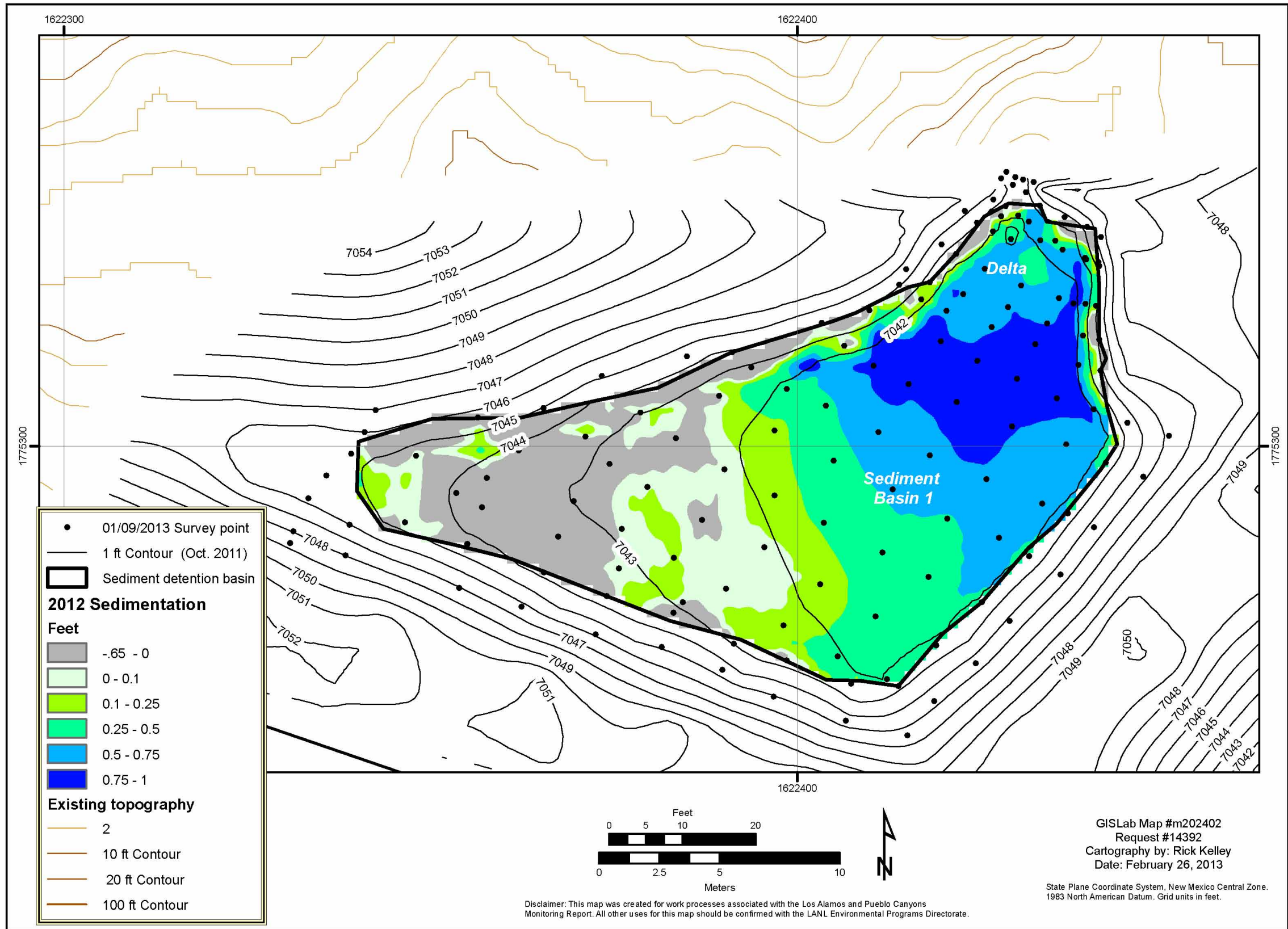


Figure A-3.6-1 October 2011 topography and isopachs of total thickness of accumulated sediment in Basin 1 from 2012 monsoon season at the upper Los Alamos Canyon sediment detention basins

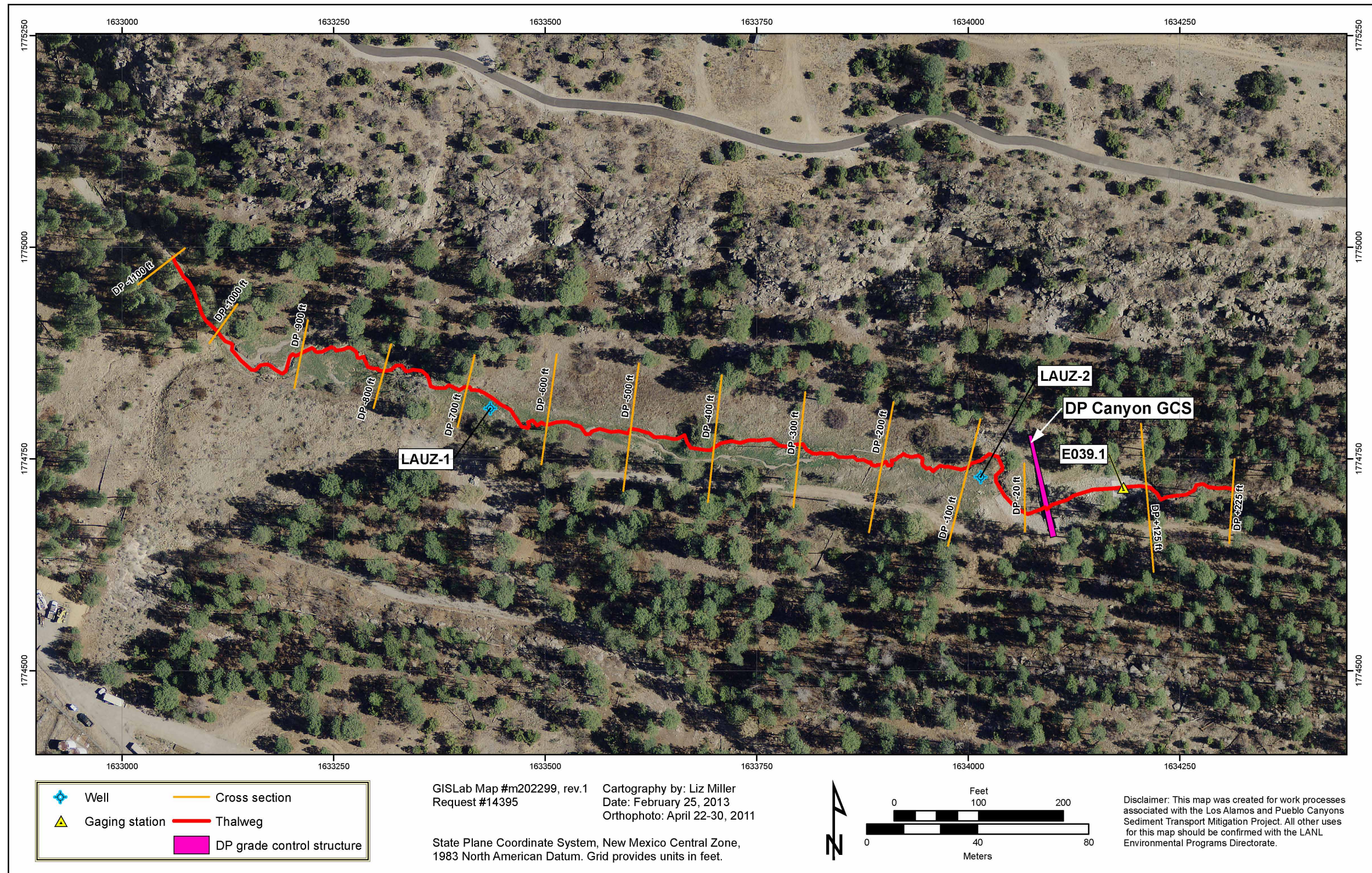


Figure A-3.7-1 Orthophoto showing the locations of surveyed cross-sections and thalweg profile near the DP Canyon GCS

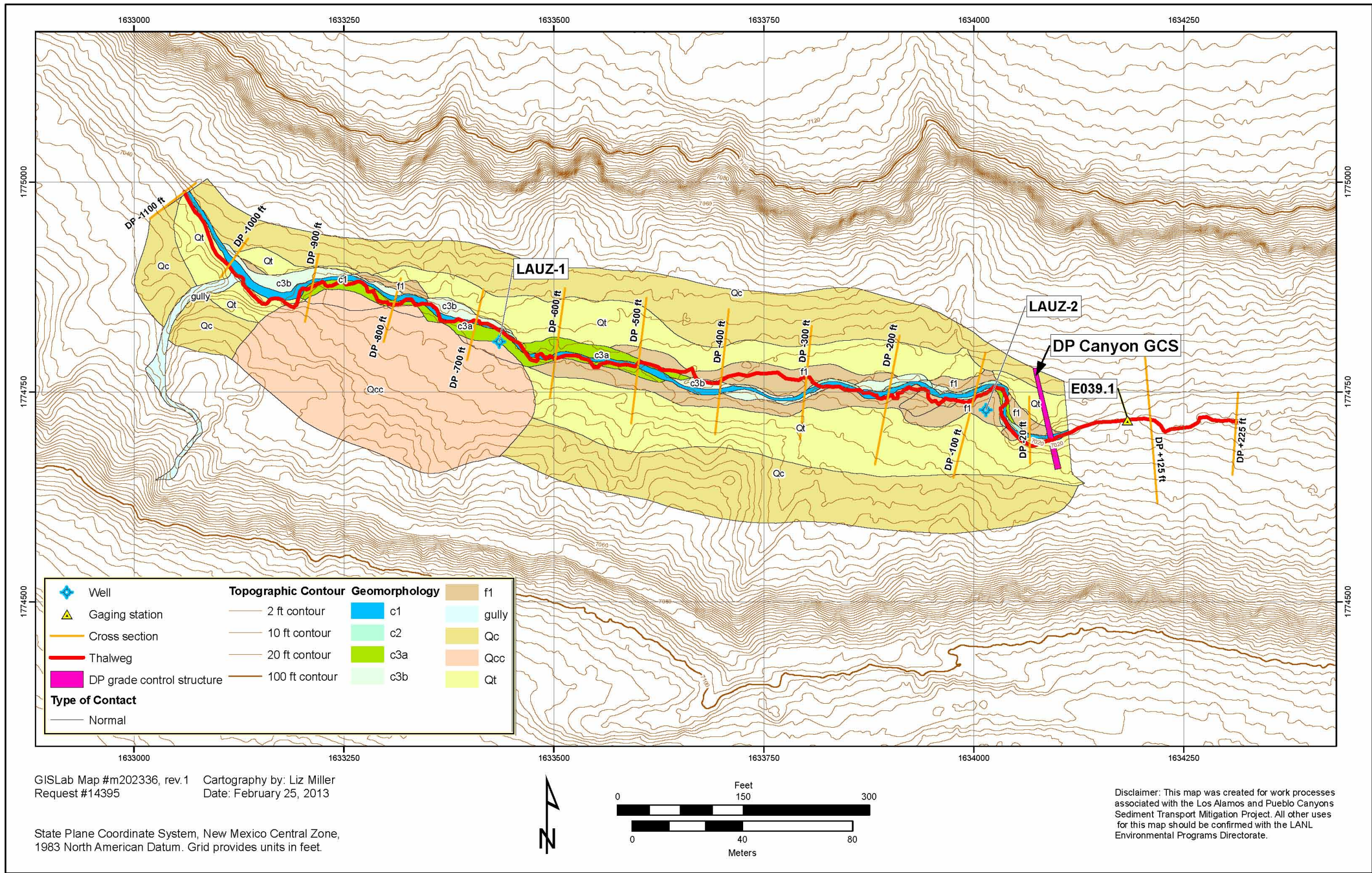


Figure A-3.7-2 Geomorphic map showing the locations of surveyed cross-sections and thalweg profile near the DP Canyon GCS; geomorphic mapping from 1998

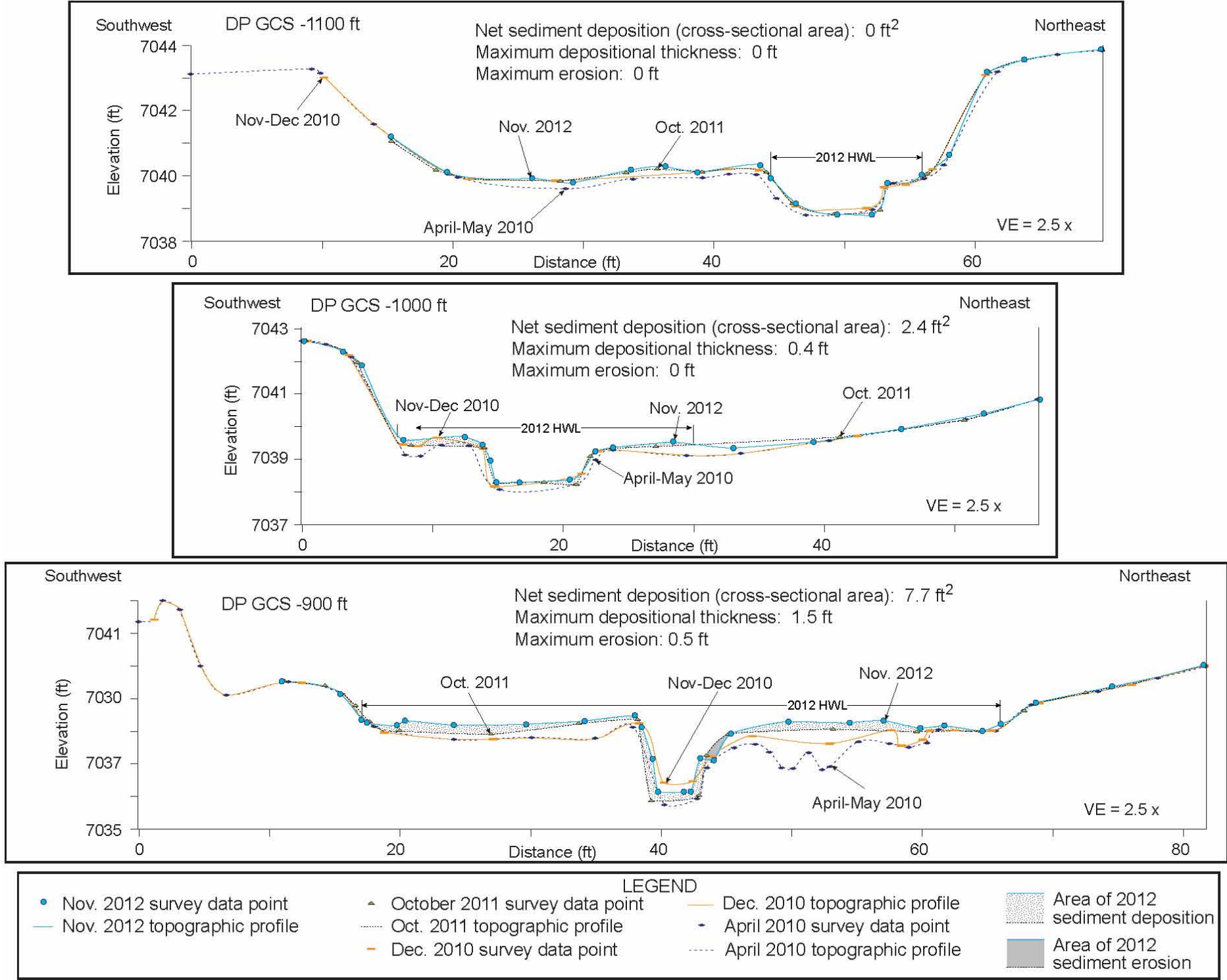


Figure A-3.7-3 Cross-sections and thalweg profile near the DP Canyon GCS

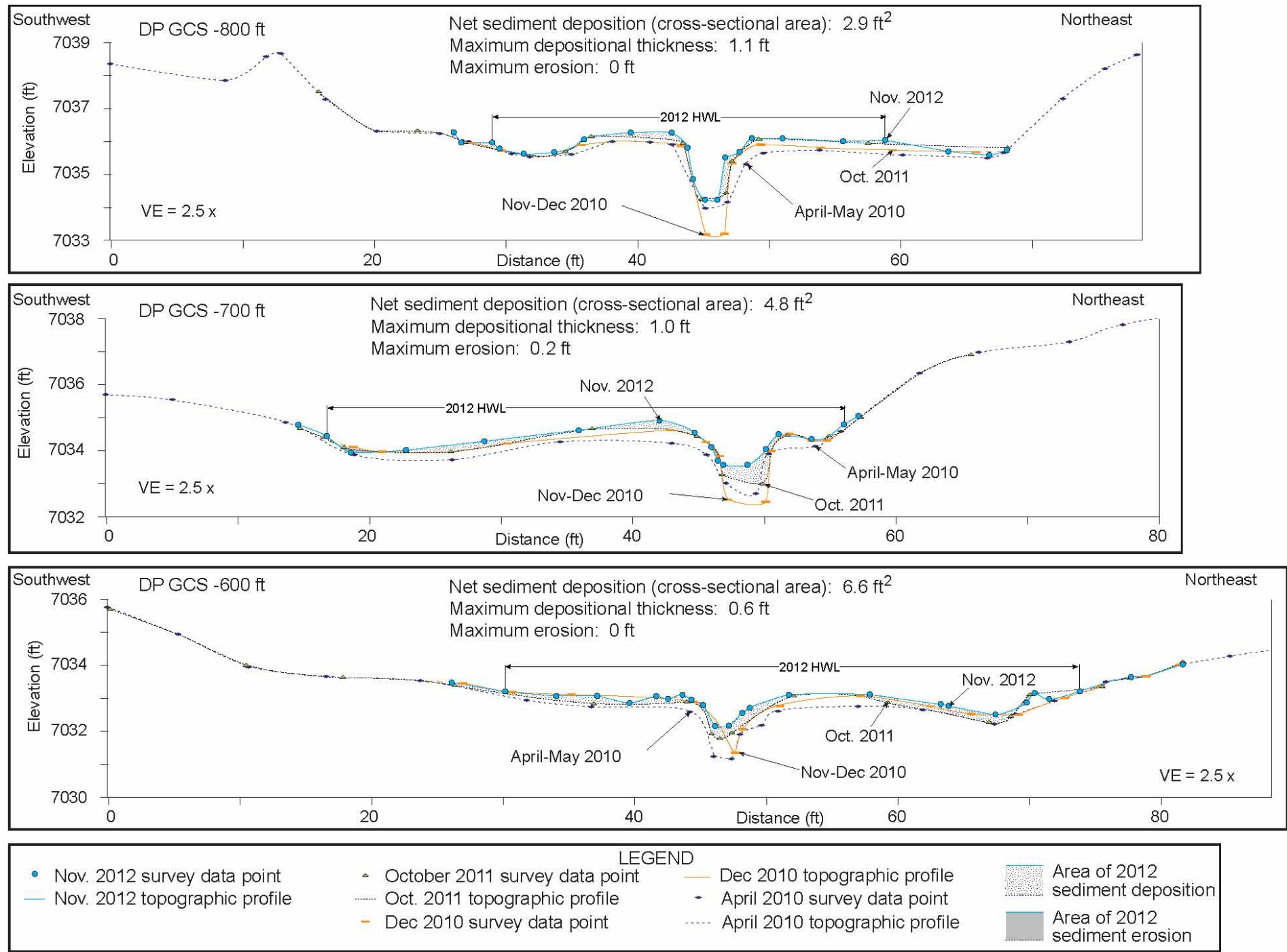


Figure A-3.7-3 (continued) Cross-sections and thalweg profile near the DP Canyon GCS

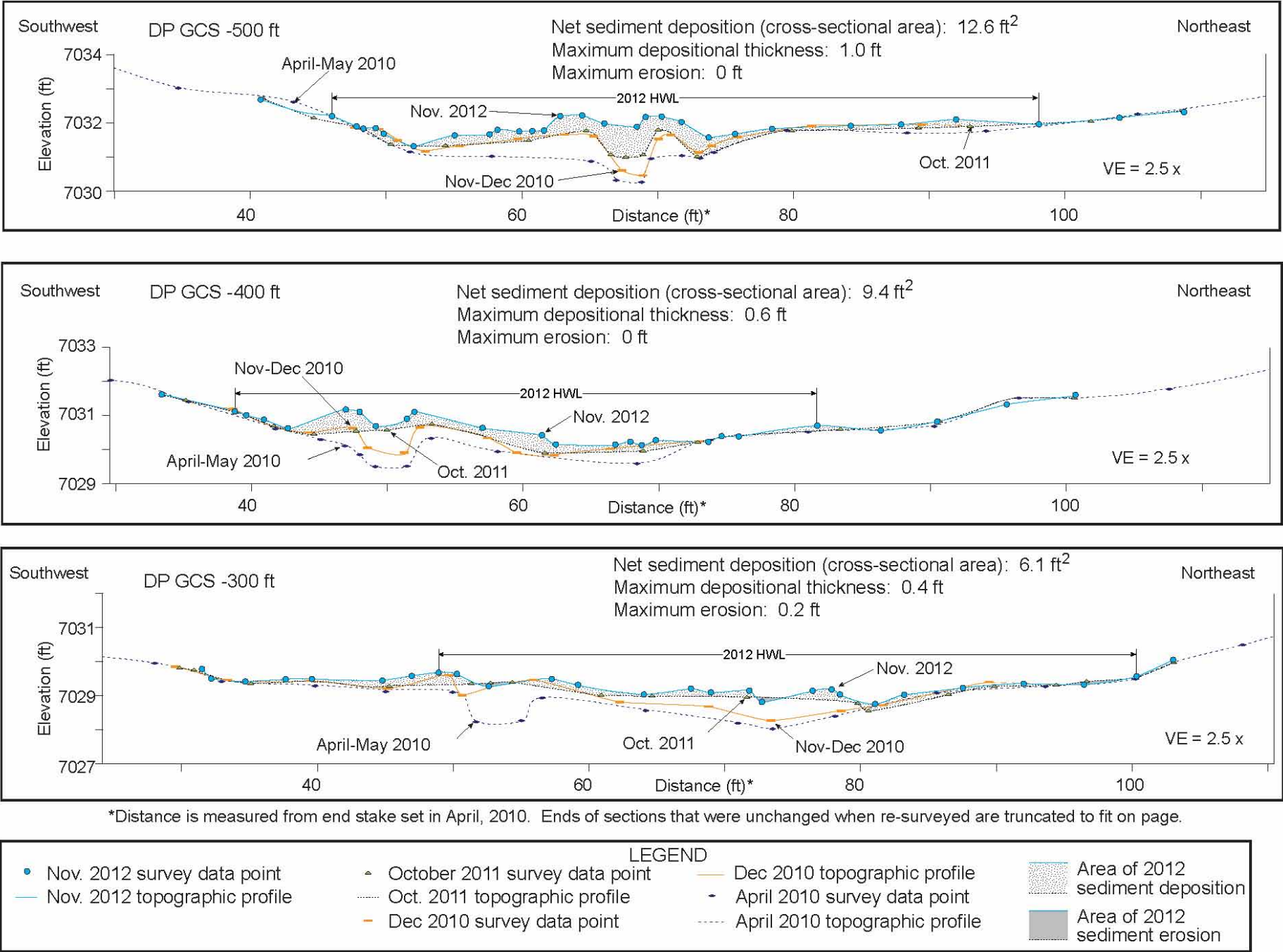


Figure A-3.7-3 (continued) Cross-sections and thalweg profile near the DP Canyon GCS

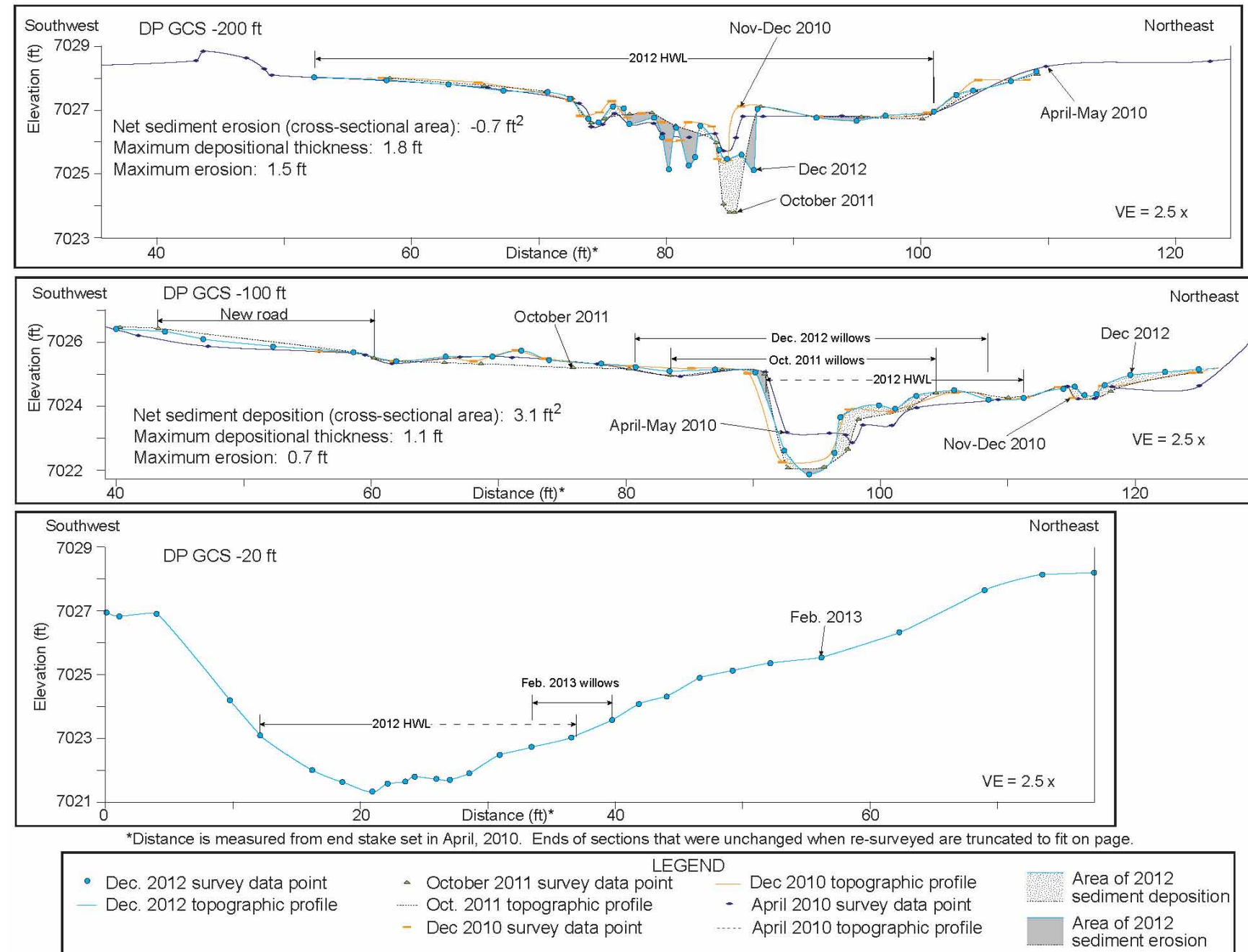


Figure A-3.7-3 (continued) Cross-sections and thalweg profile near the DP Canyon GCS

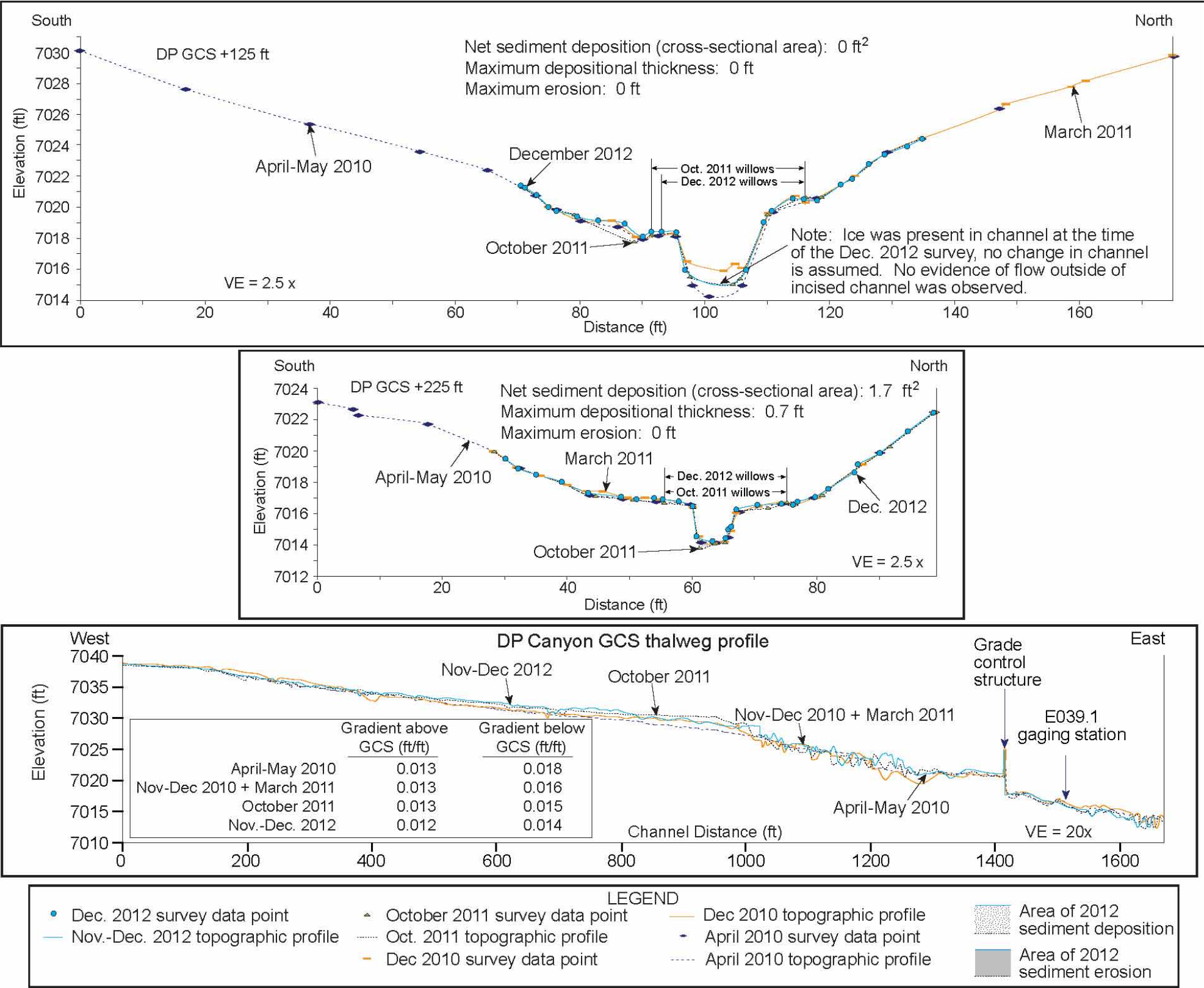


Figure A-3.7-3 (continued) Cross-sections and thalweg profile near the DP Canyon GCS

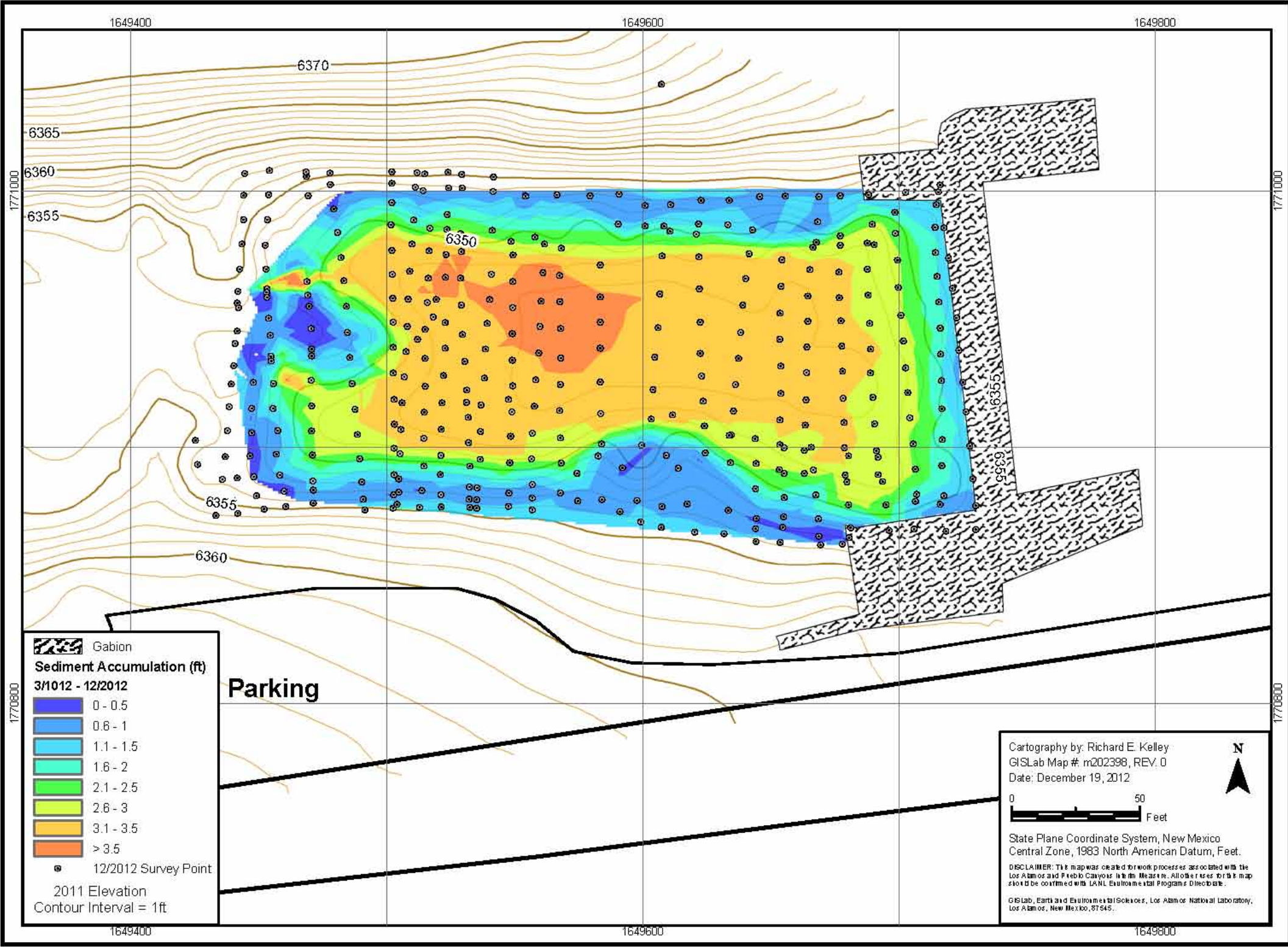


Figure A-3.8-1 Topographic map of sediment retention Basin 3 above the Los Alamos Canyon low-head weir and isopachs of total thickness of accumulated sediment in Basin 3 from 2012 monsoon season

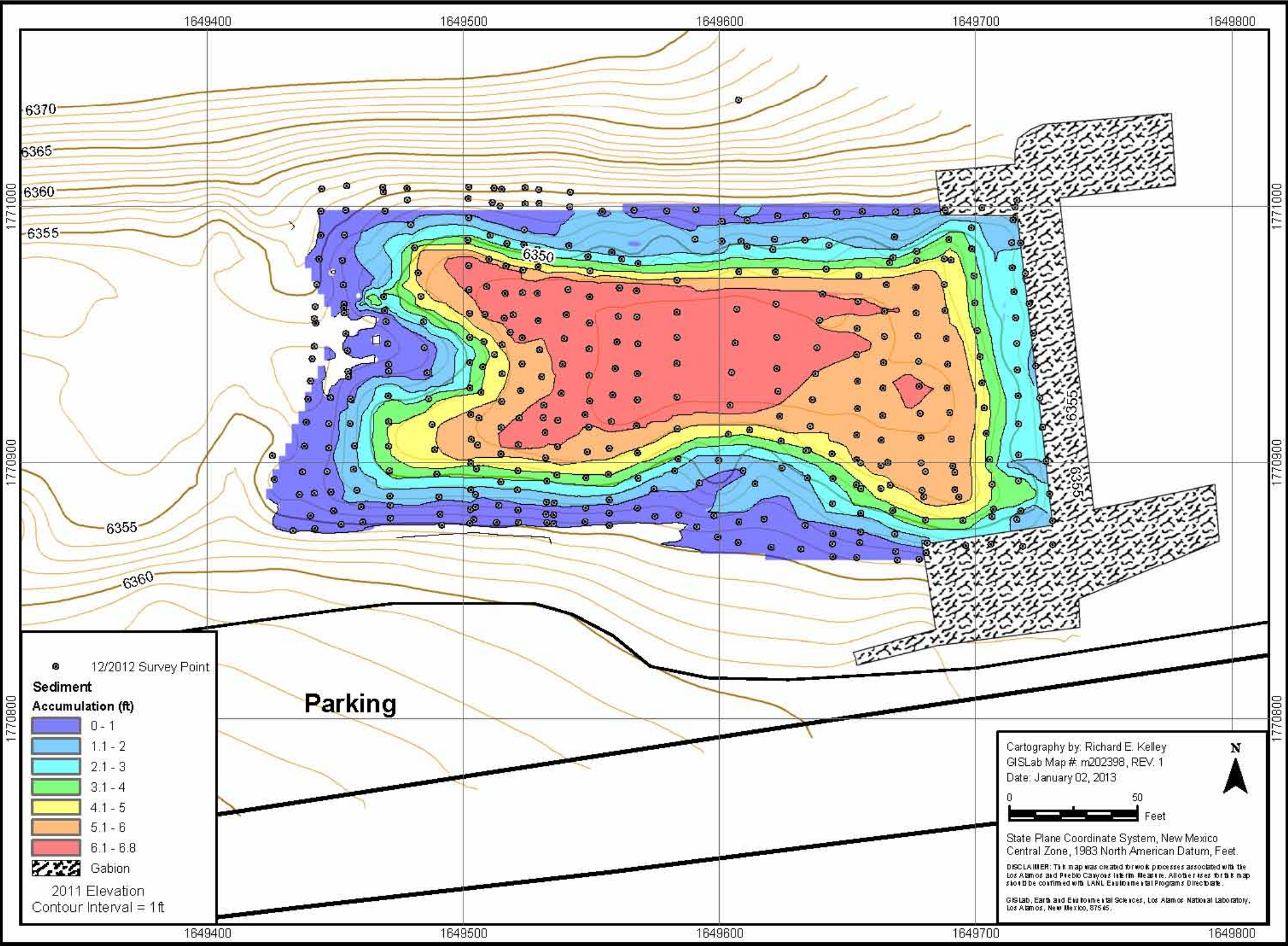


Figure A-3.8-2 Topographic map of sediment retention Basin 3 above the Los Alamos Canyon low-head weir and isopachs of total thickness of accumulated sediment in Basin 3 from 2011 and 2012 monsoon seasons (July 2011 to November 2012)

Table A-3.1-1
Summary of Geomorphic Changes at Pueblo Canyon CVS Cross-Sections

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross-Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition (m ³ /100 m)*	2011 Normalized Net Sediment Deposition (m ³ /100 m)*	2010 Normalized Net Sediment Deposition (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
CVS#1 -50 ft	0.0	0	-3.6	-33	33	207	-0.2	0.2	0.5
CVS#1 +50 ft	0.0	0.4	-3.9	-36	44	101	0.0	-0.1	-0.3
CVS#2 -50 ft	0.2	0.0	0.3	3	40	281	-0.1	0.4	0.3
CVS#2 +50 ft	0.3	0.6	0.6	6	30	81	0.0	0.1	0.4
CVS#3 -50 ft	0.0	0.3	-0.8	-7	-15	112	-0.2	0.0	0.2
CVS#3 +50 ft	0.0	0.2	-1.6	-15	29	118	-0.2	0.1	0.0
Average			-1.5	-14	27	150	-0.1	0.1	0.2

* Normalized net sediment deposition is total estimated volume per 100 ft divided by distance between surveyed cross-sections (100 ft = 0.0305 km).

Table A-3.2-1
Summary of Geomorphic Changes at the Upper Pueblo Canyon Willow-Planting Area Cross-Sections

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross-Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition (m ³ /100 m)*	2011 Normalized Net Sediment Deposition (m ³ /100 m)*	2010 Normalized Net Sediment Deposition (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
Upper Third of Upper Willow-Planting Area									
PU UW-1	0.3	0.3	1.9	18	200	276	-0.1	1.2	1.0
PU UW-2	0.8	0.0	3.4	32	175	95	0.2	0.3	1.1
PU UW-3	1.6	0.0	23.5	218	141	371	0.7	0.8	1.0
PU UW-4	0.5	0.4	10.4	97	125	415	-0.1	0.5	0.6
PU UW-5	0.0	0.0	0.0	0	154	175	0.2	-0.2	0.4
PU UW-6	0.4	0.4	1.0	9	28	151	0.1	0.0	0.2
Average, Upper Third			6.7	62	137	247	0.2	0.4	0.7
Middle Third of Upper Willow-Planting Area									
PU MW-1	1.4	0.0	6.4	59	25	187	1.1	-0.9	-0.4
PU MW-2	0.2	0.0	0.5	5	34	90	0.1	-0.8	0.1
PU MW-3	0.8	0.0	1.8	17	1	265	0.2	-0.1	-0.3
PU MW-4	0.0	0.0	0.0	0	30	162	0.1	-0.2	0.4
PU MW-5	0.0	0.0	0.0	0	0	388	0.0	0.1	0.0
PU MW-6	0.4	0.0	1.8	17	12	-41	0.2	0.0	-0.5
Average, Middle Third			1.8	16	17	175	0.3	-0.3	-0.1

Table A-3.2-1 (continued)

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross-Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition (m ³ /100 m)*	2011 Normalized Net Sediment Deposition (m ³ /100 m)*	2010 Normalized Net Sediment Deposition (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
Lower Third of Upper Willow-Planting Area									
PU LW-1	0.0	0.0	0.0	0	12	129	0.0	-0.1	0.1
PU LW-2	0.5	0.5	0.7	6	-36	70	0.0	-0.2	-0.3
PU LW-3	0.8	1.0	0.5	5	-212	2	0.1	-0.8	-0.5
PU LW-4	0.0	2.9	-7.5	-70	-197	-147	-0.1	0.1	-0.7
PU LW-5	0.8	0.0	1.7	16	-388	-4	-0.1	-0.4	-0.3
PU LW-6	0.5	2.0	-2.1	-19	-82	-123	0.1	0.2	-1.0
Average, Lower Third			-1.1	-10	-150	-12	0.0	-0.2	-0.4
Average, Upper Pueblo Canyon			2.4	23	1.2	137	0.2	0.0	0.0

*Normalized net sediment deposition is total estimated volume per 100 ft divided by distance between surveyed cross-sections (100 ft = 0.0305 km).

Table A-3.3-1
Summary of Geomorphic Changes at the Pueblo Canyon Wing Ditch Cross-Sections

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross-Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition (m ³ /100 m)*	2011 Normalized Net Sediment Deposition (m ³ /100 m) ^a	2010 Normalized Net Sediment Deposition (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
WD-1	0.0	0.6	-1.2	-11	67	219	-0.6	1.3	1.0
WD-2	0.0	0.4	-0.7	-6	25	424	-0.2	0.0	1.7
WD-3	0.0	0.7	-1.2	-11	-39	50	-0.6	0.7	1.3
WD-4	0.6	0.9	-7.8	-72	0	-125	0.2	0.1	1.4
WD-5	0.5	0.7	-16.9	-157	16	58	-1.1	0.0	1.1
Average			-5.6	-52	14	125	-0.5	0.4	1.3

*Normalized net sediment deposition is total estimated volume per 100 ft divided by distance between surveyed cross-sections (100 ft = 0.0305 km).

Table A-3.4-1
Summary of Geomorphic Changes at the Lower Pueblo Canyon Willow-Planting Area Cross-Sections

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross-Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2011 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2010 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
Upper Half of Lower Willow-Planting Area (P-3FE)									
PU -1100 ft	0.4	0.0	1.2	11	-7	68	-0.1	0.1	0.1
PU -1000 ft	0.0	0.0	0.0	0	66	-45	0.0	0.2	0.0
PU -900 ft	0.0	0.0	0.0	0	13	119	0.1	-0.2	0.3
PU -800 ft	0.0	0.6	-1.5	-14	-7	236	0.1	-0.2	0.1
PU -700 ft	0.5	0.3	1.9	18	-8	252	-0.1	-0.5	0.8
PU -600 ft	0.0	0.0	0.0	0	0	179	-0.1	2.3	0.3
PU -500 ft	0.0	0.9	-1.3	-12	-4	110	0.0	2.8	0.5
PU -400 ft	0.0	1.3	-3.3	-31	-3	130	0.2	1.3	0.5
PU -300 ft	0.0	0.5	-0.6	-6	-18	97	-0.1	-0.9	0.3
PU -200 ft	0.4	0.0	1.6	15	-6	255	0.2	-0.3	0.3
PU -100 ft	0.7	0.3	0.1	1	3	142	-0.1	-0.4	0.4
Average, Upper Half			-0.2	-1.6	2.6	140	0.0	0.4	0.3

Table A-3.4-1 (continued)

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross-Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2011 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2010 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
Lower Half of Lower Willow-Planting Area(P-4W)									
PU 0 ft	0.5	1.7	-0.3	-3	-140	-16	-0.1	-0.2	1.0
PU +100 ft	0.6	0.0	3.3	31	9	94	0.5	0.4	0.2
PU +200 ft	0.3	1.2	-0.4	-4	6	9	0.3	0.0	0.4
PU +300 ft	0.3	0.2	0.6	6	2	96	-0.1	0.1	0.4
PU +400 ft	0.5	0.0	0.8	7	39	15	0.2	0.4	0.4
PU +500 ft	0.5	0.0	1.1	10	0	93	-0.1	-0.2	0.4
PU +600 ft	0.6	1.7	4.1	38	-230	-298	0.2	1.2	-0.2
PU +700 ft	0.5	0.0	8.4	78	-80	140	0.4	0.2	1.1
PU +800 ft	1.2	2.3	3.4	32	31	-24	0.3	0.4	-0.4
PU +900 ft	0.4	0.0	3.5	32	24	-6	0.0	0.6	-0.5
PU +1000 ft	0.5	0.0	0.6	6	30	-18	0.0	0.2	0.6
PU +1100 ft	0.3	0.0	0.8	7	81	-116	0.2	0.1	0.1
Average, Lower Half			2.4	22	-8.1	-1.4	0.2	0.3	0.2

* Normalized net sediment deposition is total estimated volume per 100 ft divided by distance between surveyed cross-sections (100 ft = 0.0305 km).

Table A-3.7-1
Summary of Geomorphic Changes at Cross-Sections above the DP Canyon GCS

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross- Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2011 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2010 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
DPGCS -1100 ft	0.0	0.0	0.0	0	2	50	0.2	-0.4	0.2
DPGCS -1000 ft	0.4	0.0	2.4	22	39	26	0.1	0.1	0.1
DPGCS -900 ft	1.5	0.5	7.7	71	57	110	0.5	-0.8	0.7
DPGCS -800 ft	1.1	0.0	2.9	27	100	30	0.0	1.1	-0.8
DPGCS -700 ft	1.0	0.2	4.8	45	38	59	0.5	0.6	-0.5
DPGCS -600 ft	0.6	0.0	6.6	61	1	93	0.3	0.5	0.2
DPGCS -500 ft	1.0	0.0	12.6	117	6	130	0.3	0.5	0.2
DPGCS -400 ft	0.6	0.0	9.4	87	15	100	-0.4	0.7	0.4
DPGCS -300 ft	0.4	0.2	6.1	57	45	150	-0.4	0.1	0.8
DPGCS -200 ft	1.8	1.5	-0.7	-6	-52	50	1.4	-1.7	-0.3
DPGCS -100 ft	1.1	0.7	3.1	29	-67	18	-0.2	-0.2	-0.6
Average			5.0	46	17	74	0.2	0.1	0.0

* Normalized net sediment deposition is total estimated volume per 100 ft divided by distance between surveyed cross-sections (100 ft = 0.0305 km).

Table A-3.7-2
Summary of Geomorphic Changes at Cross-Sections below the DP Canyon GCS

Section Name	2012 Maximum New Sediment Thickness (ft)	2012 Maximum Erosion (ft)	2012 Net Sediment Cross- Sectional Area (ft ²)	2012 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2011 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2010 Normalized Net Sediment Deposition or Erosion (m ³ /100 m)*	2012 Thalweg Elevation Change (ft)	2011 Thalweg Elevation Change (ft)	2010 Thalweg Elevation Change (ft)
DPGCS +125 ft	0.0	0.0	0.0	0.0	-113	189	0	-0.9	1.7
DPGCS +225 ft	0.7	0.0	1.7	15.8	-35	20	0.3	-0.1	0.0
Average			0.9	7.9	-74	105	0.1	-0.5	0.8

* Normalized net sediment deposition is total estimated volume per 100 ft divided by distance between surveyed cross-sections (100 ft = 0.0305 km).

Table A-3.8-1
Sediment Volume Changes at Los Alamos Canyon Low-Head Weir

Site	Total Net Change (ft ³)	Total Net Change (m ³)	Estimated Percent Coarse Sediment	Estimated Percent Fine Sediment	Estimated Volume Coarse Sediment (m ³)	Estimated Volume Fine Sediment (m ³)
July 2011 to March 2012						
Basin 1 (west)	8400	240	50%	50%	120	120
Basin 2 (central)	15500	440	5%	95%	22	418
Basin 3 (east)	50600	1430	0%	100%	0	1430
Total		2110			142	1968
March 2012 to November 2012						
Basin 1 (west)*	700	20	20%	80%	4	16
Basin 2 (central*)	8800	250	0%	100%	0	250
Basin 3 (east)	81100	2300	0%	100%	0	2300
Total		2570			4	2566

* Basins excavated before survey; estimate based on amount excavated that exceeded previous volume plus post-excavation average sediment thickness times area.

Table A-3.8-2
Sediment Accumulation at Los Alamos Canyon Low-Head Weir, 2000–2012

Period	Total Sedimentation (m³)	Approximate Annual Sedimentation (m³/yr)
June 2000 to May 2002	822	411
May 2002 to August 2005	3377	1126
August 2005 to July 2007	2555	1278
July 2007 to September 2008	138	138
September 2008 to May 2009	0	—*
May 2009 to July 2010	510	510
July 2010 to March 2011	274	274
March 2011 to July 2011	0	—
July 2011 to March 2012	2110	2110
March 2012 to November 2012	2570	2570
June 2000 to November 2012	12356	950

*— = Not calculated; not in stormwater runoff season.

Attachment A-1

Photographs of Sediment Transport Mitigation Sites



Photo A1-1 January 2013 photograph of cross-section CVS #2 +50 ft, below Pueblo Canyon CVS #2, looking upstream



Photo A1-2 January 2013 photograph of CVS #3, below Pueblo Canyon CVS #3, looking upstream



Photo A1-3 **January 2013 photograph of aggraded area at cross-section UW-3 in the upper third of the upper Pueblo Canyon willow-planting area where sediment from a tributary drainage buried the previous channel**



Photo A1-4 **January 2013 photograph of eroding bank in the area of maximum sediment deposition at cross-section LW-4, looking downstream**



Photo A1-5 January 2013 photograph of area of maximum sediment deposition below the Pueblo Canyon wing ditch at cross-section WD-4



Photo A1-6 January 2013 photograph of area of maximum sediment erosion below the Pueblo Canyon wing ditch at cross-section WD-4



Photo A1-7 January 2013 photograph of erosion and deposition in an area of lateral bank migration in the lower half of the lower Pueblo Canyon willow-planting area



Photo A1-8 January 2013 photograph of southern headcut at cross-section PU 0 ft, in the lower half of the lower Pueblo Canyon willow-planting area, where the emergence of alluvial groundwater perched on Puye Formation bedrock results in seepage erosion. Wetland vegetation and willows are established below headcut.



Photo A1-9 February 2013 photograph of the Pueblo Canyon GCS, looking downstream



Photo A1-10 February 2013 photograph of the Pueblo Canyon CGS, looking upstream



Photo A1-11 February 2013 photograph of the upper sediment retention basin at LA-SMA2, looking downstream



Photo A1-12 February 2013 photograph of the DP Canyon GCS, looking downstream



Photo A1-13 February 2013 photograph of the DP Canyon GCS, looking upstream

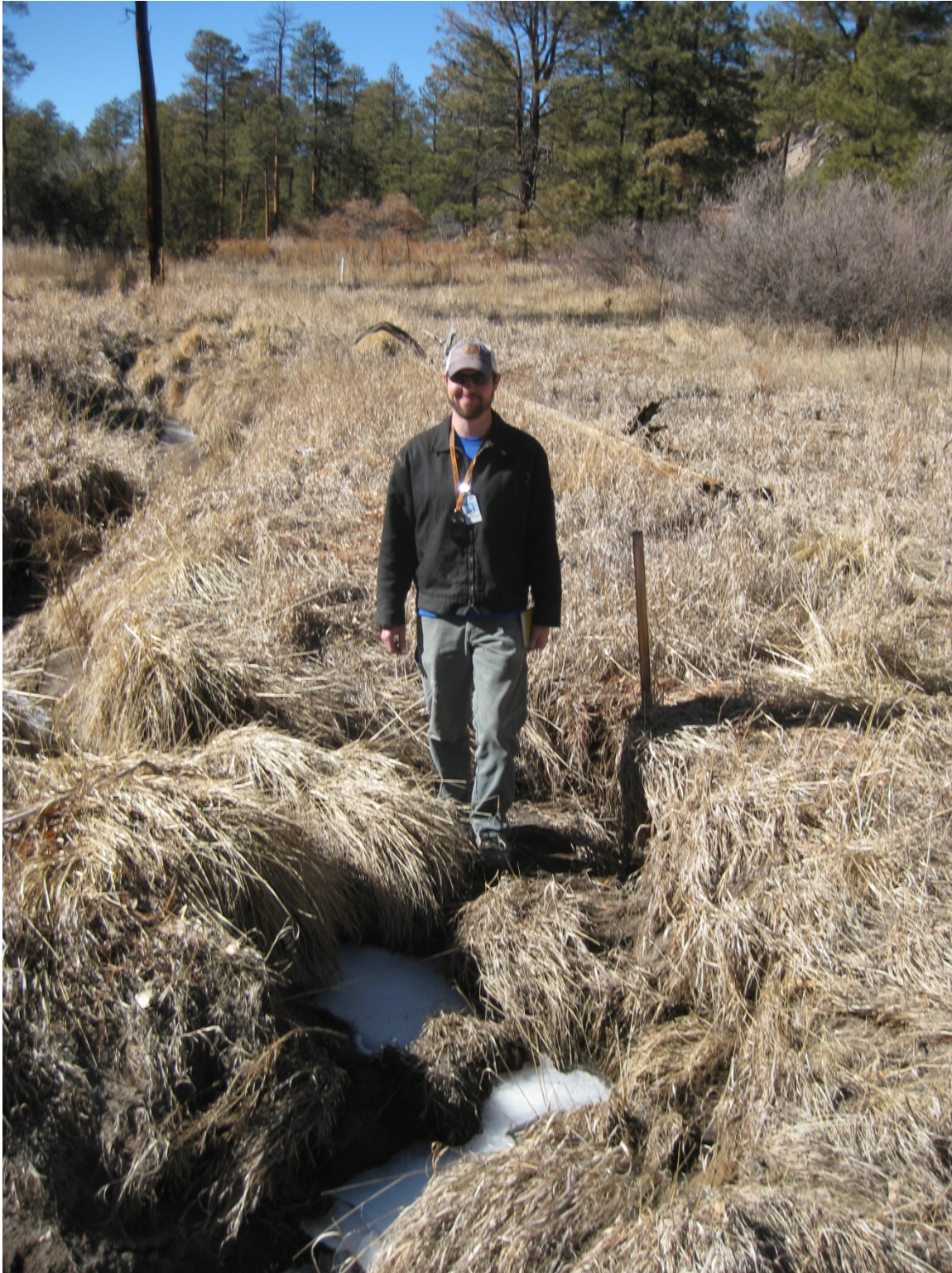


Photo A1-14 February 2013 photograph of maximum sediment deposition and erosion at DP-200 ft section looking upstream



Photo A1-15 November 2011 photograph of DP -200 ft section looking upstream



Photo A1-16 February 2013 photograph of maximum sediment volume accumulation at DP-500 ft section looking upstream



Photo A1-17 February 2013 photograph of the Los Alamos Canyon low-head weir looking upstream



Photo A1-18 February 2013 photograph of sediment accumulation in the lower basin at the Los Alamos Canyon low-head weir



(a)



(b)

Photo A1-19 Thick willow patches in upper and middle third of upper Pueblo Canyon willow-planting area: (a) January 2013 photograph of willows in the upper third of the willow-planting area looking downstream near UW-3 section; (b) January 2013 photograph of willows in the middle third of the willow-planting area looking upstream past cross-section MW-2.



Photo A1-20 January 2013 photograph of sparse willows near cross-section PU –500 ft in upper half of lower Pueblo Canyon willow-planting area, in an area with thick reed canary grass. Willow shown is the tallest observed in the upper half of lower Pueblo Canyon willow-planting area



Photo A1-21 November 2011 photograph of willow stem in the upper half of lower Pueblo Canyon willow-planting area that has been damaged by animals



Photo A1-22 November 2011 photograph of thick willow patch on high surface near transition zone in lower Pueblo Canyon willow-planting area



Photo A1-23 February 2013 photograph of the largest observed willow in the Pueblo Canyon GCS willow-planting area, near the GCS inlet



Photo A1-24 February 2013 photograph of rock armoring along stream banks in the south fork of Acid Canyon looking upstream

Attachment A-2

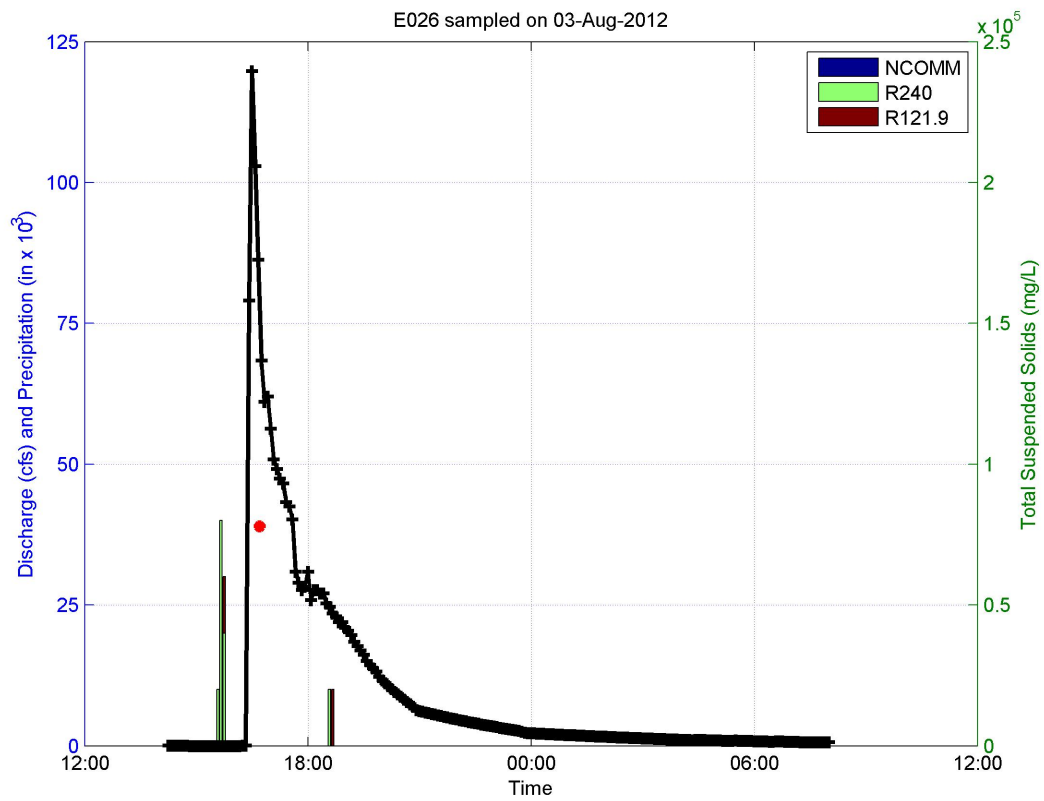
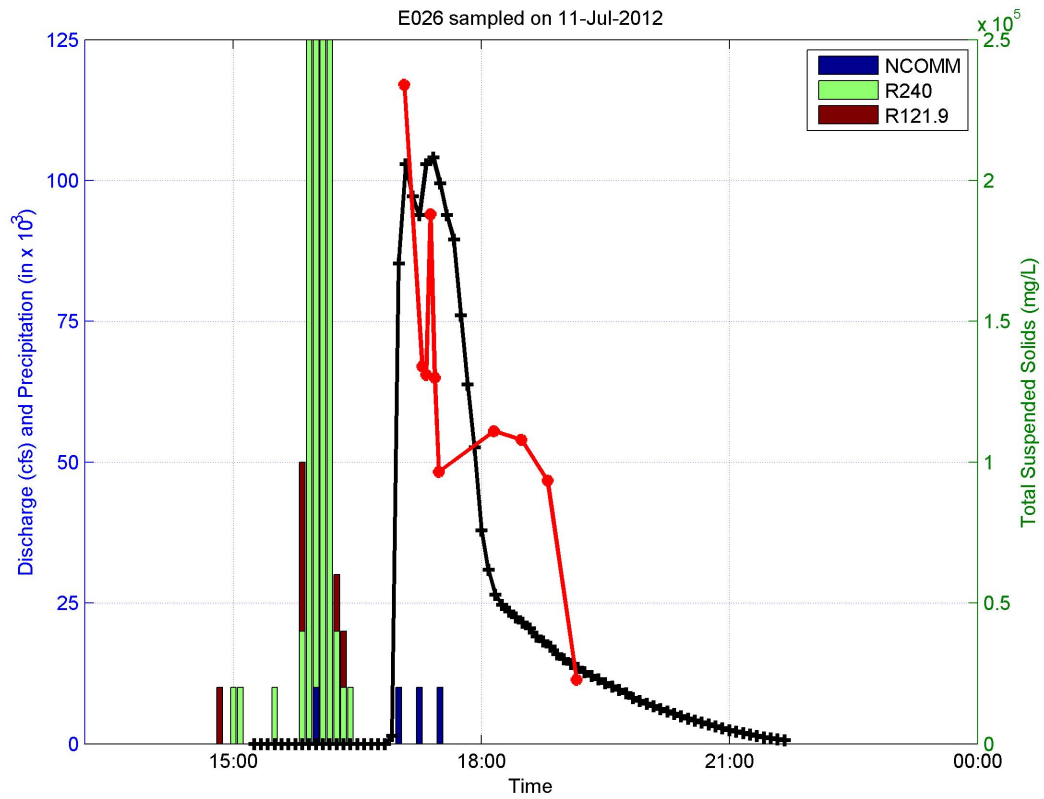
*Cross-Section Survey Data
(on CD included with this document)*

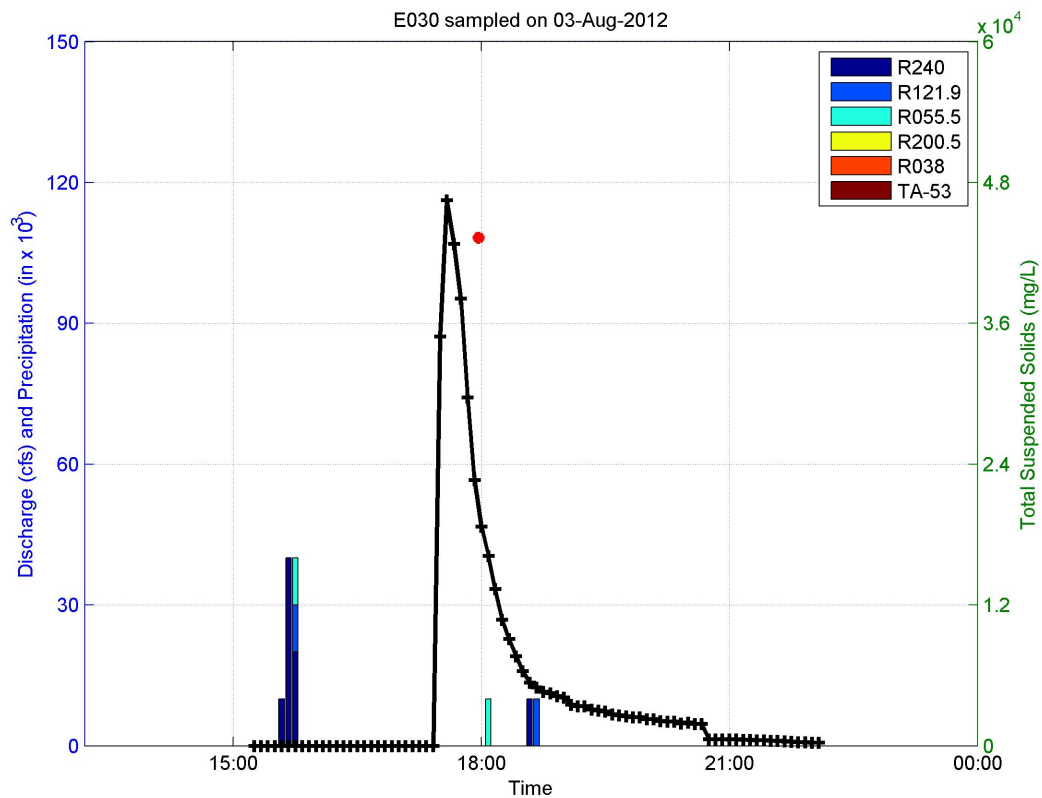
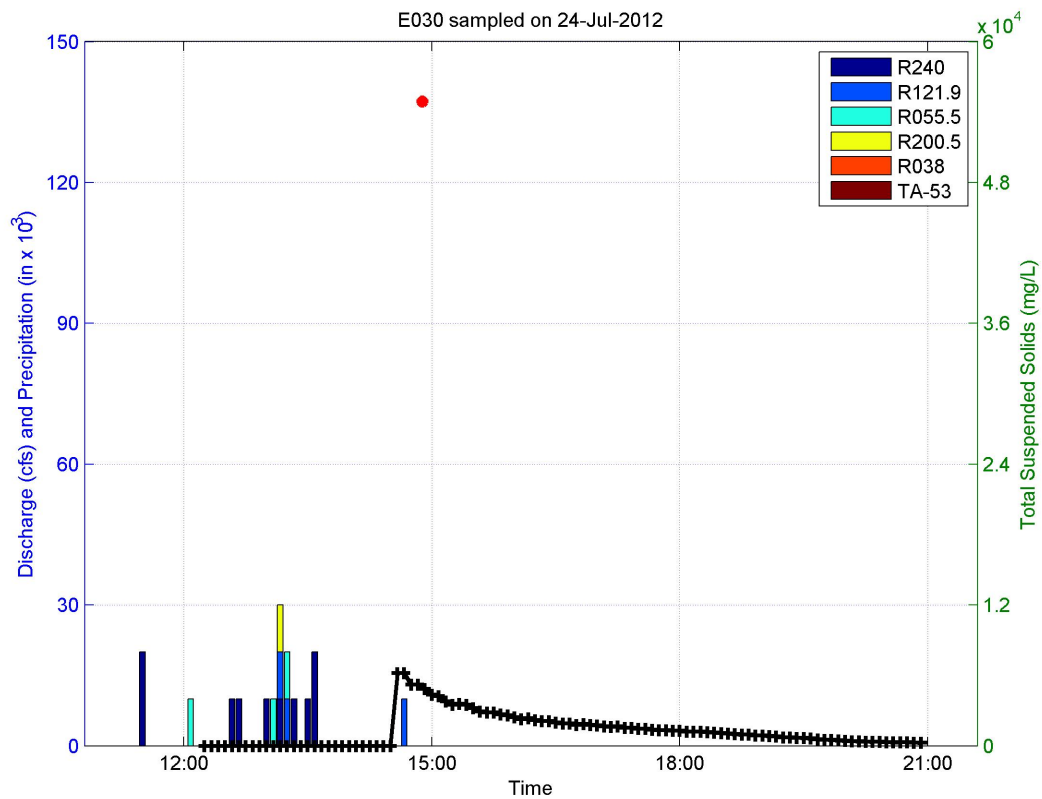
Appendix B

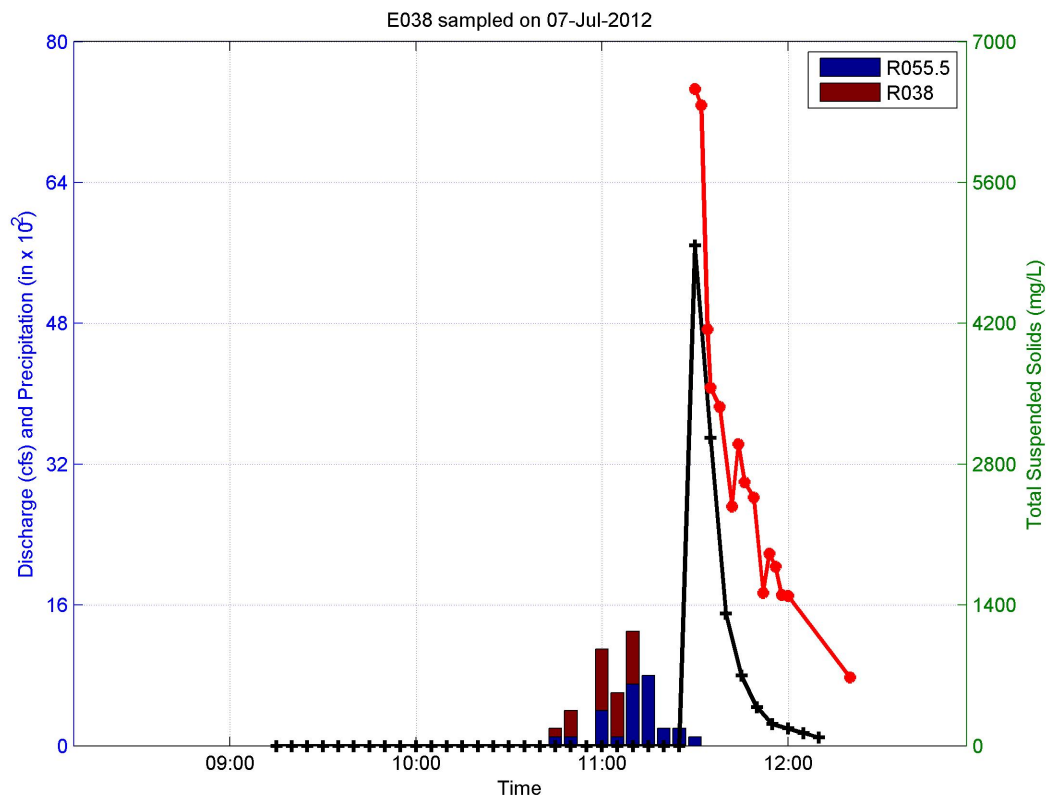
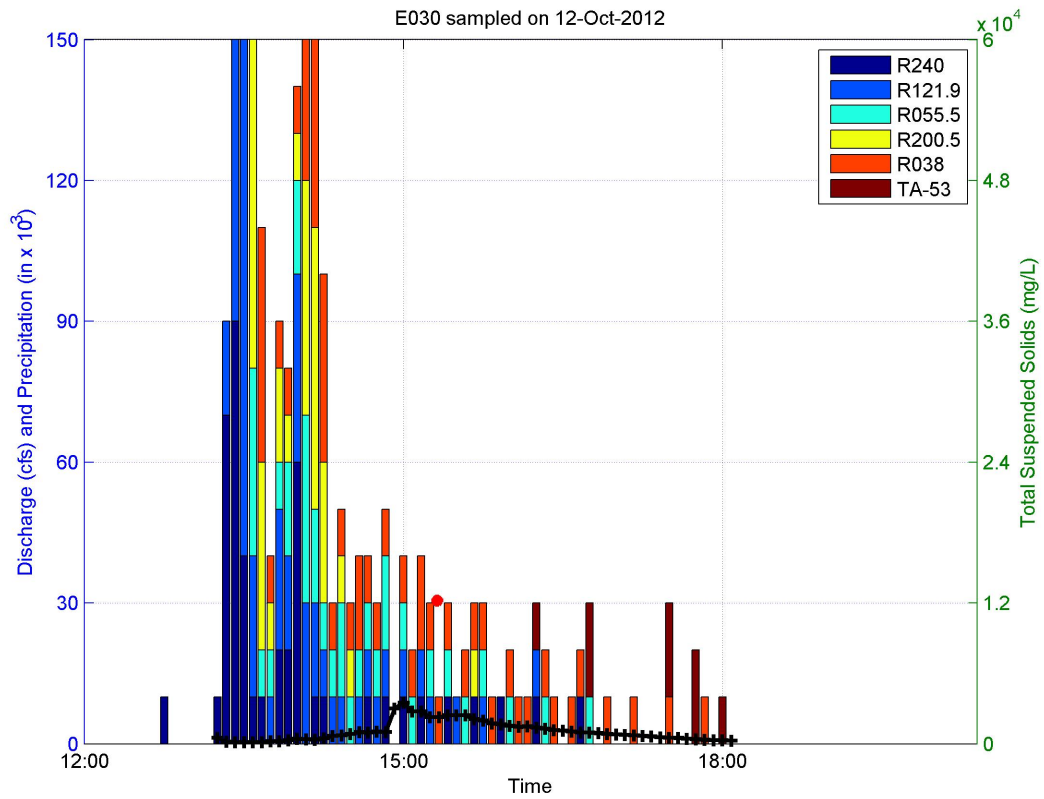
*Hydrographs, Hyetographs, and Sedigraphs
for Samples Collected*

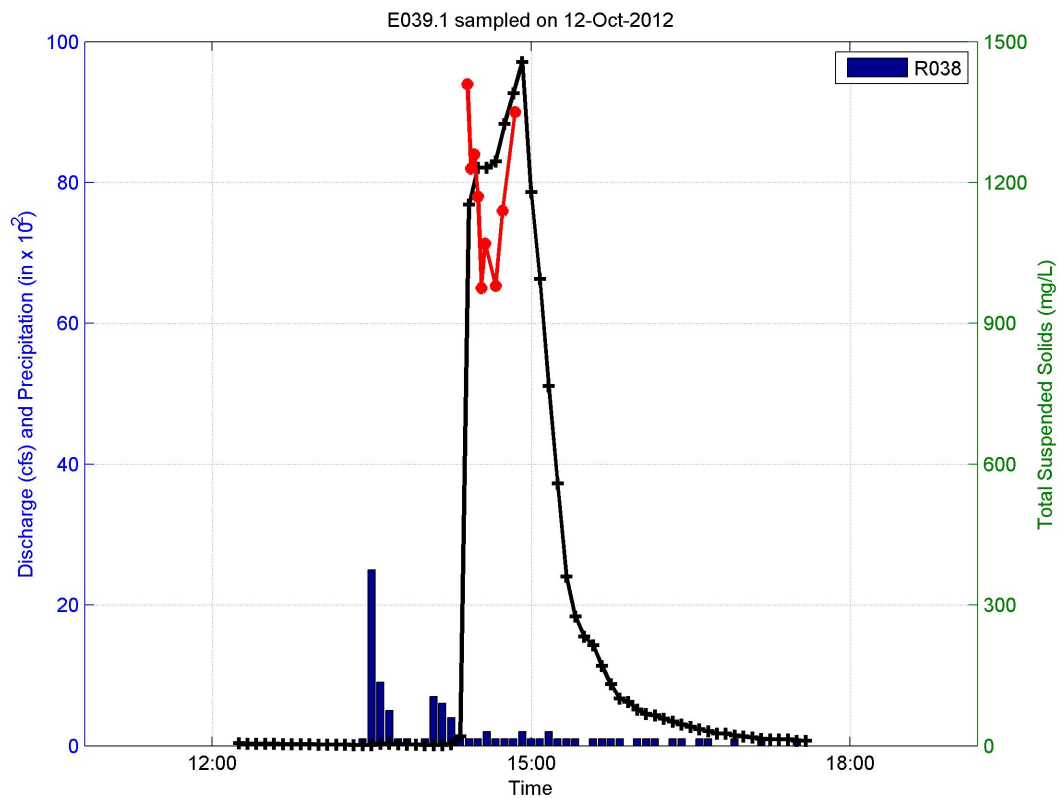
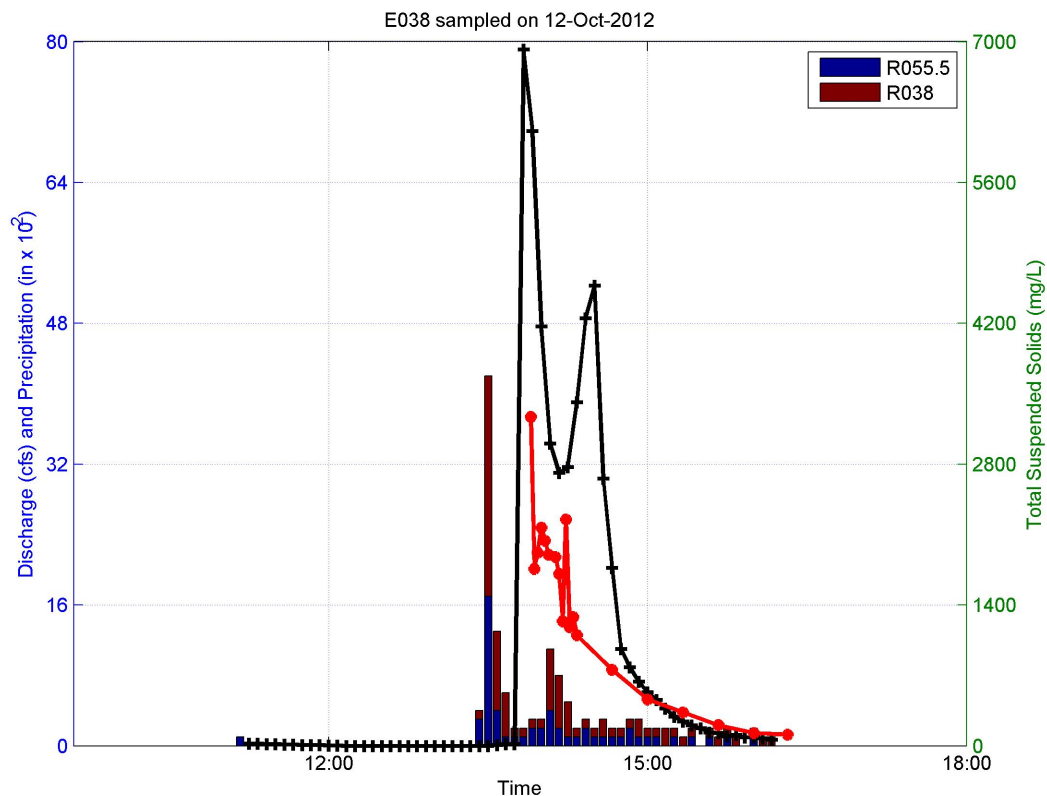
This appendix summarizes the relationships between precipitation, discharge, and total suspended solids (TSS) determined for each storm runoff event sampled. Plots of discharge versus time (hydrographs) at gages from each storm runoff event resulting in sample collection are presented, with the exception of events with missing or questionable discharge data as stated in Section 2. These hydrographs are overlaid with precipitation measured at associated rain gages (hyetographs) and TSS measured from storm water samples collected during runoff events (sedigraphs).

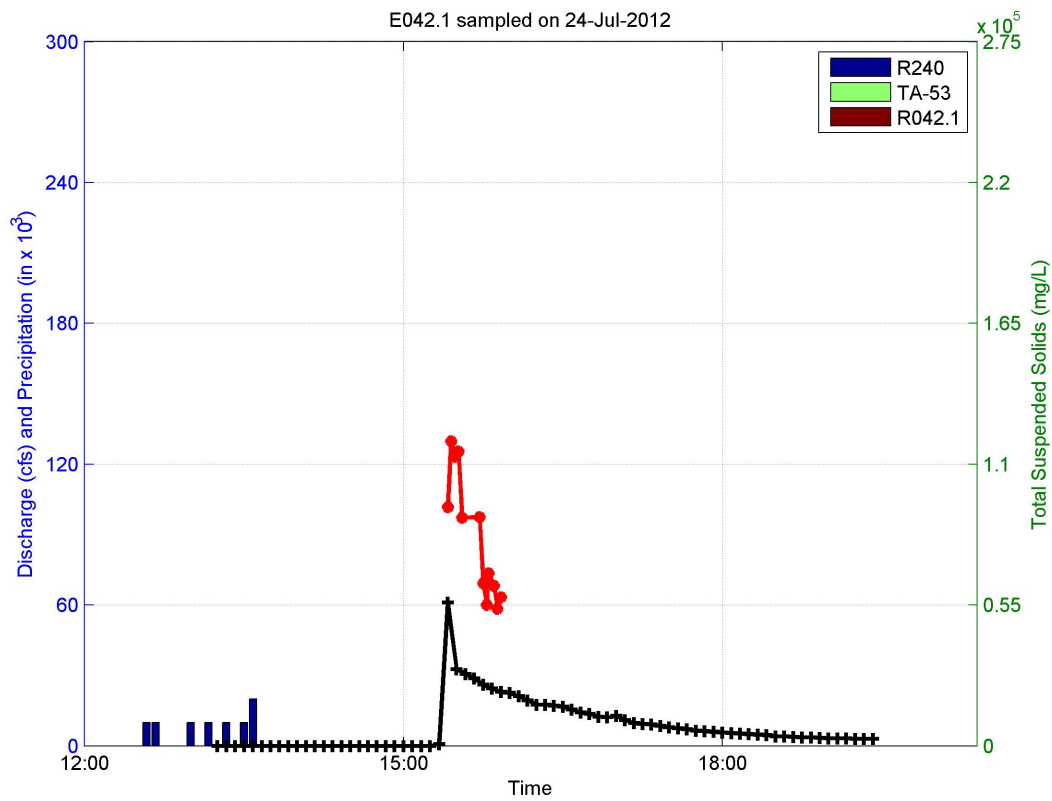
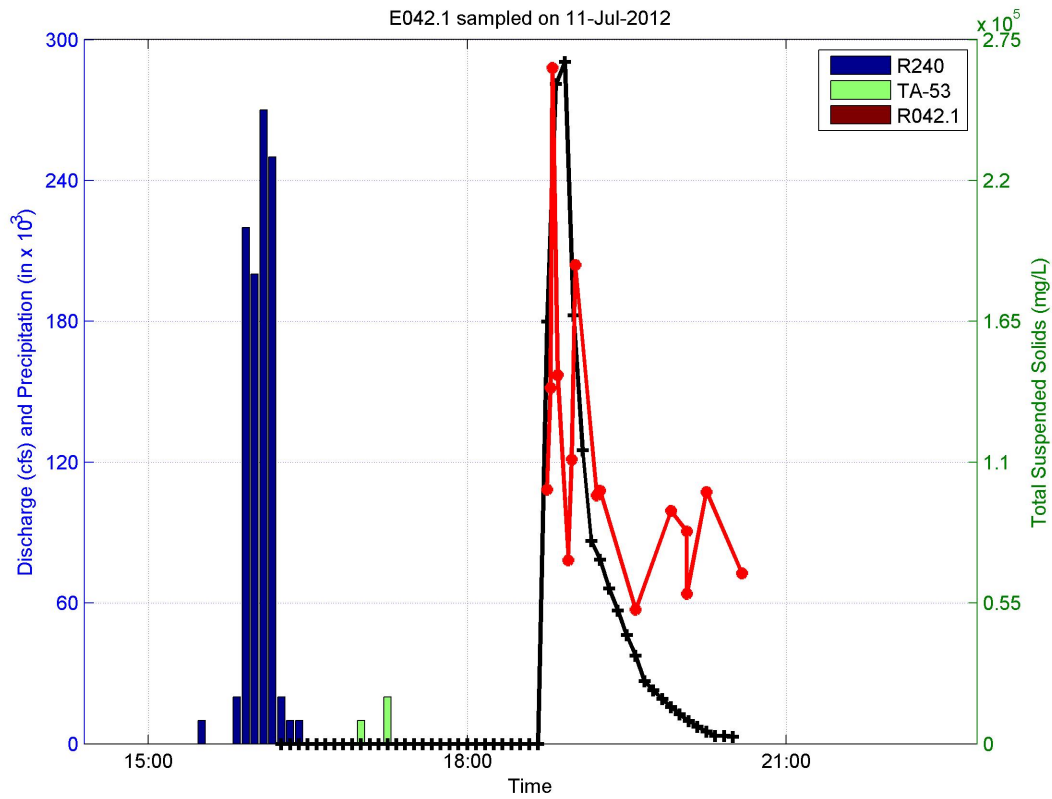
Hydrographs (+), hyetographs (assorted colors of stacked bars), and sedigraphs (●) for storm runoff events during which sampling was performed are displayed.

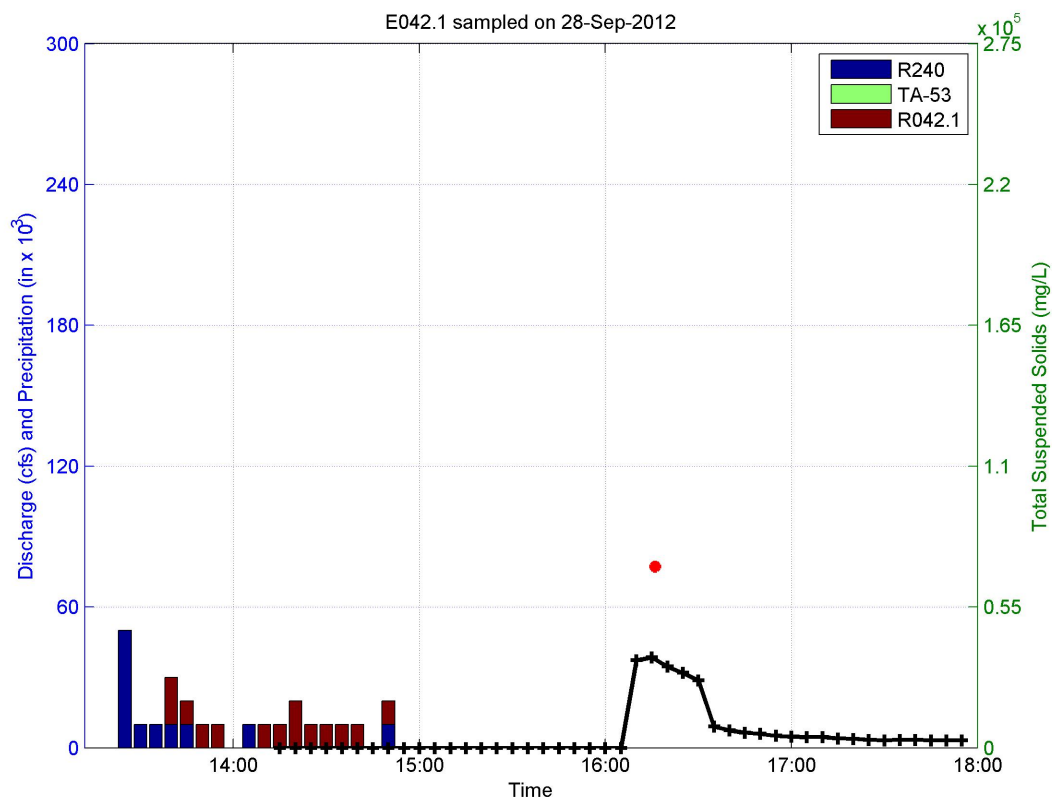
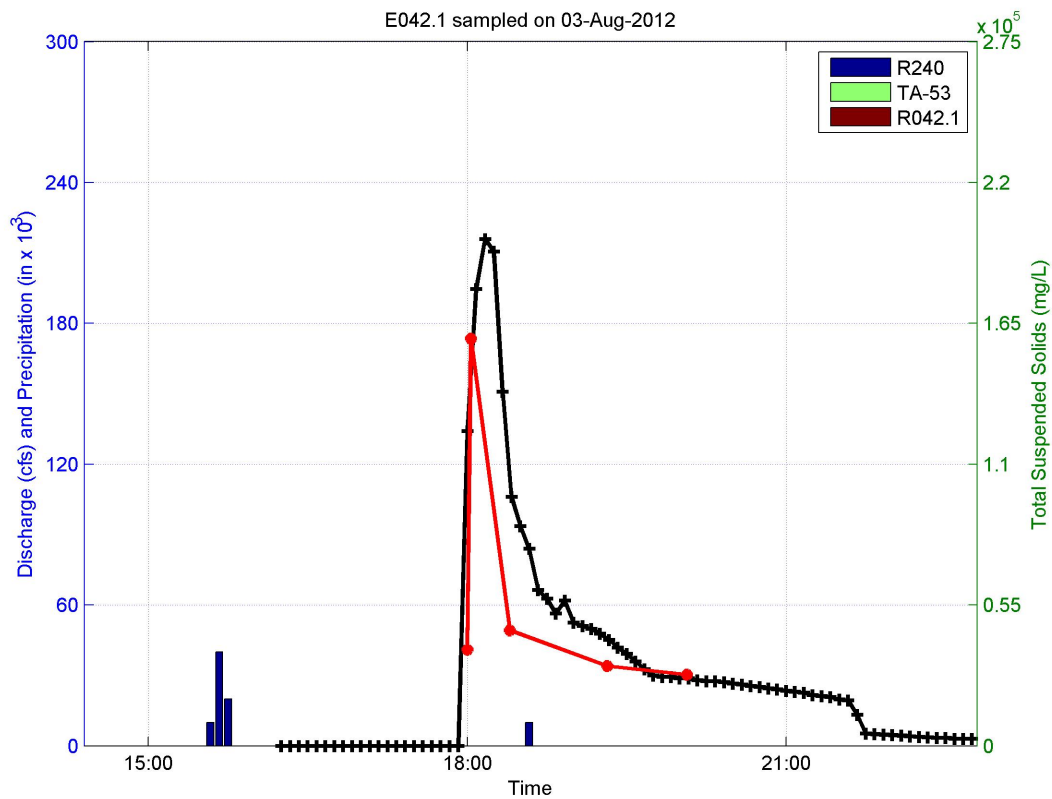


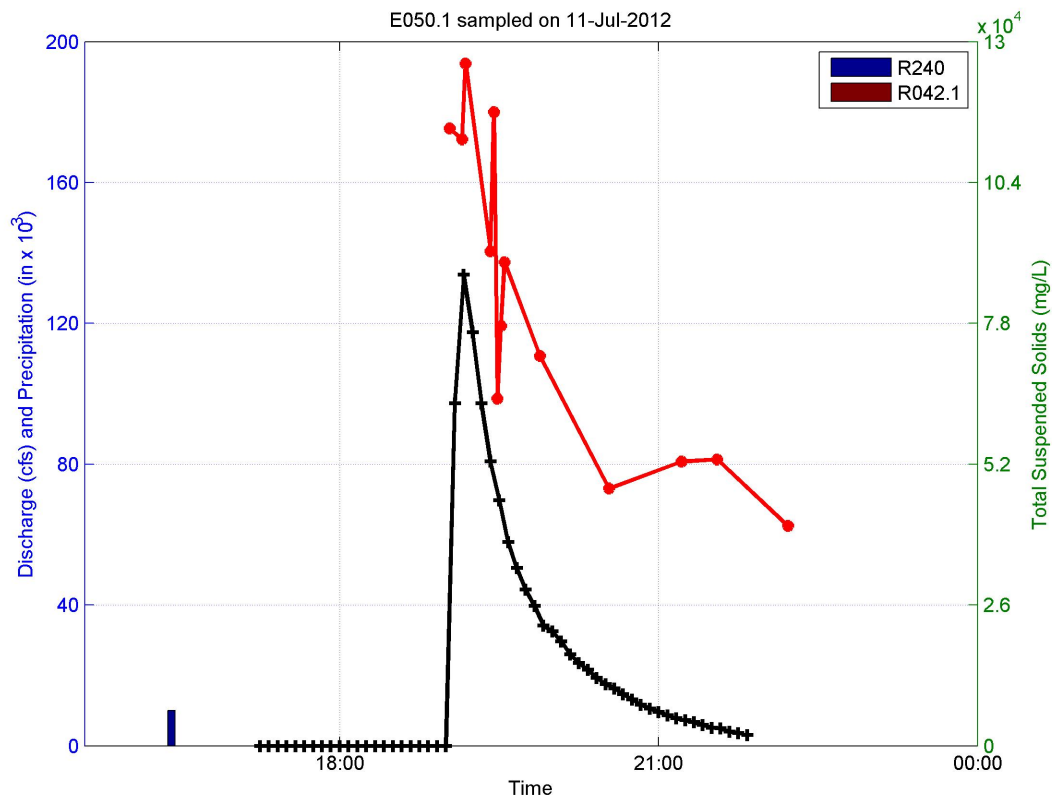
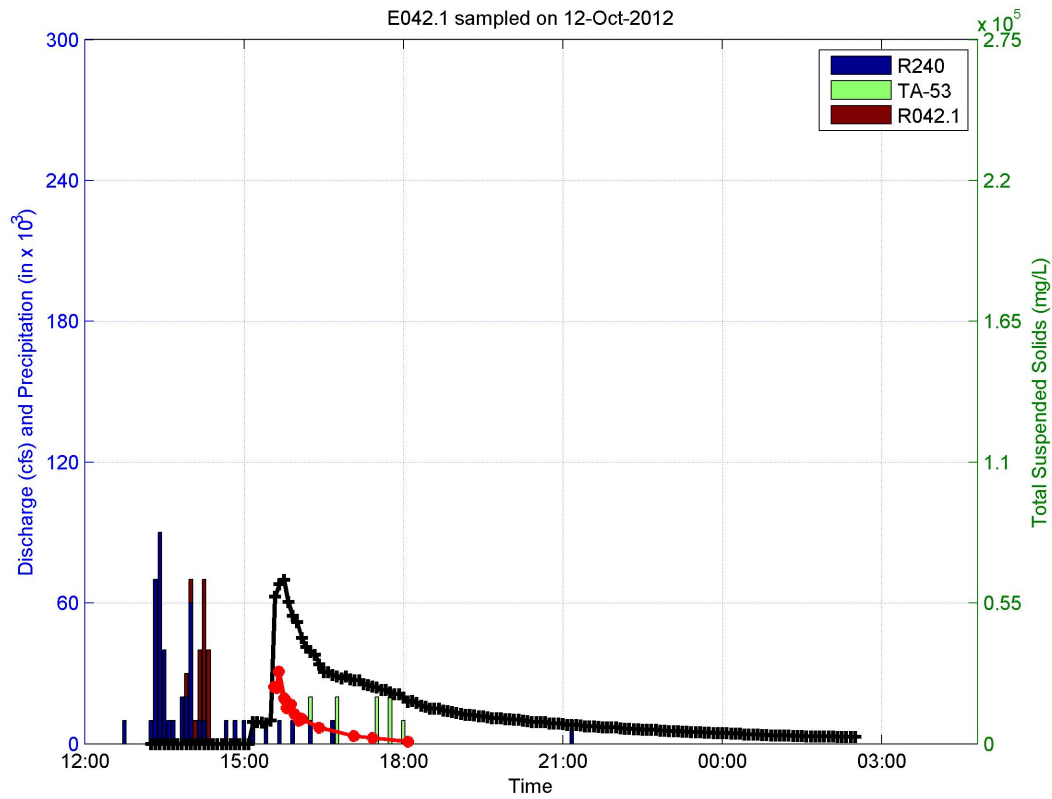


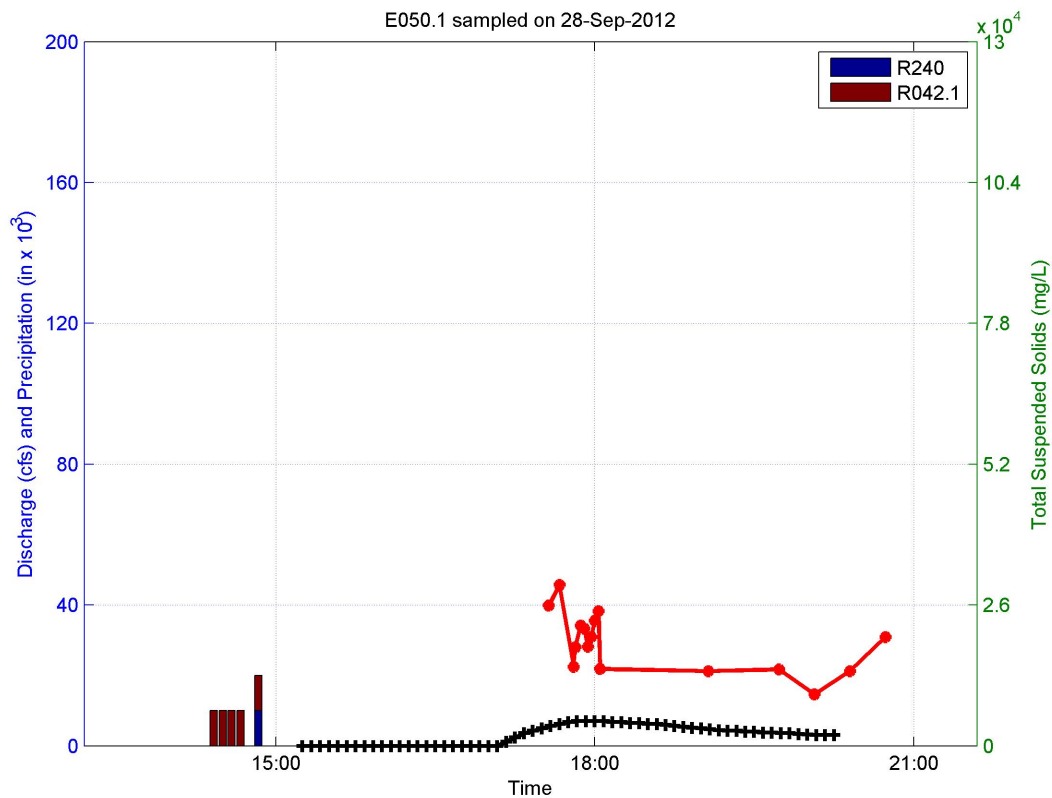
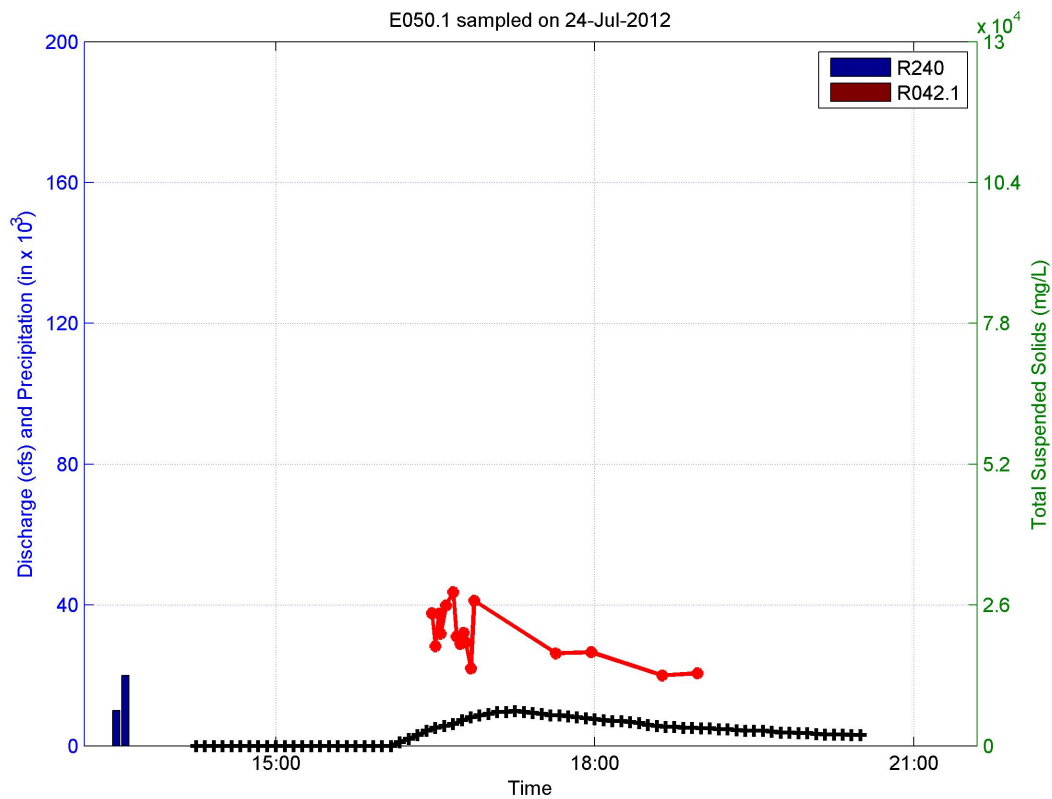


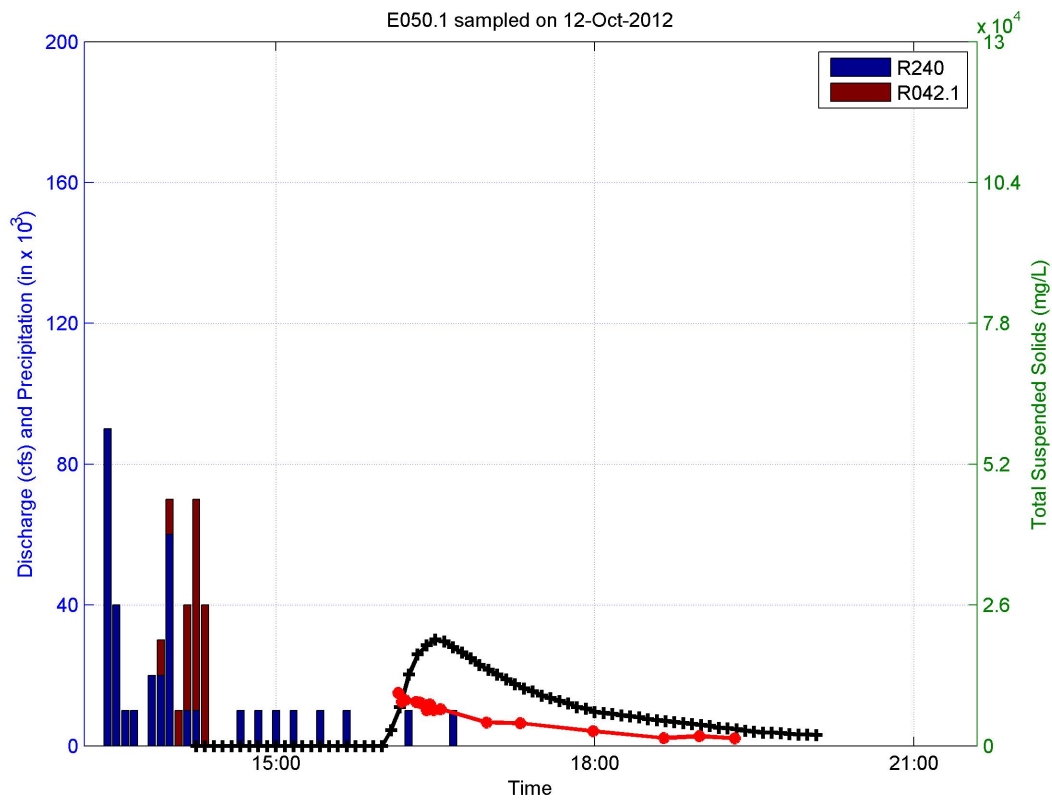
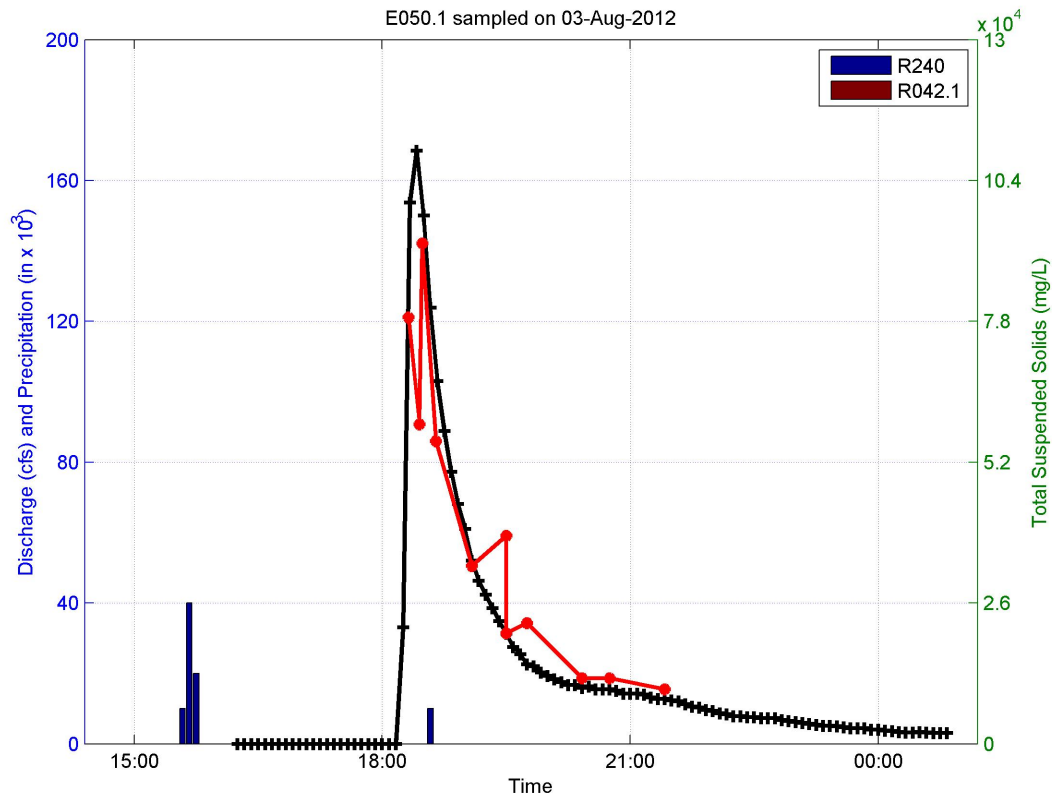


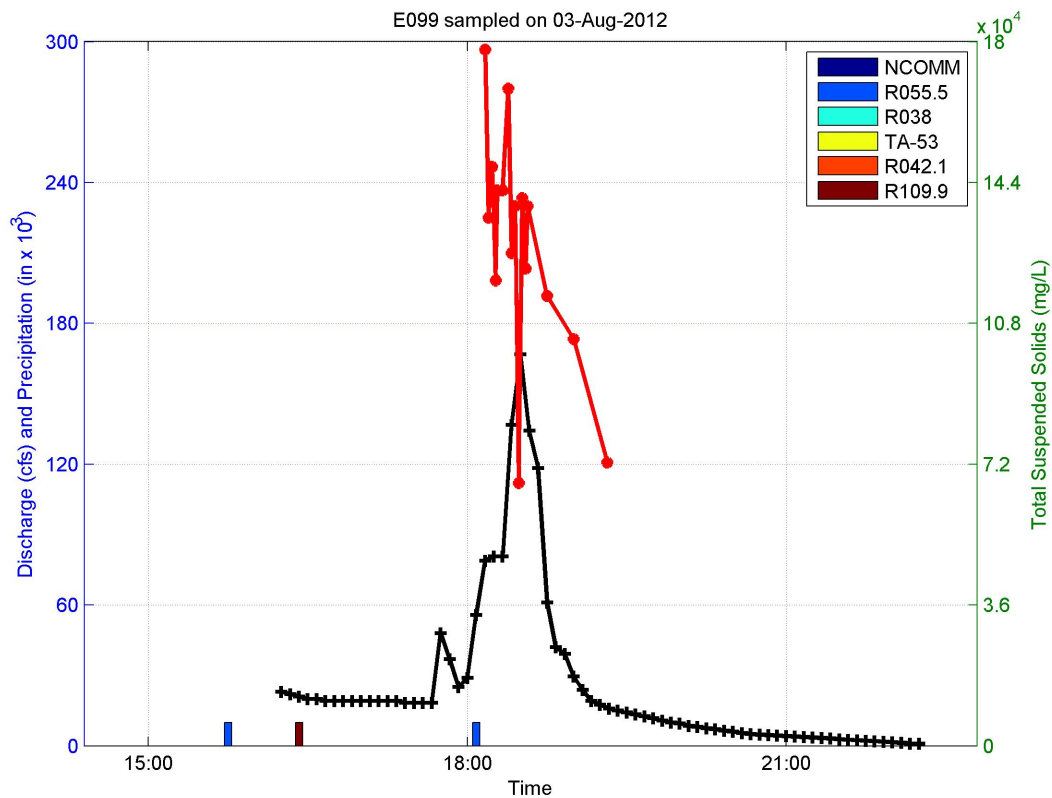
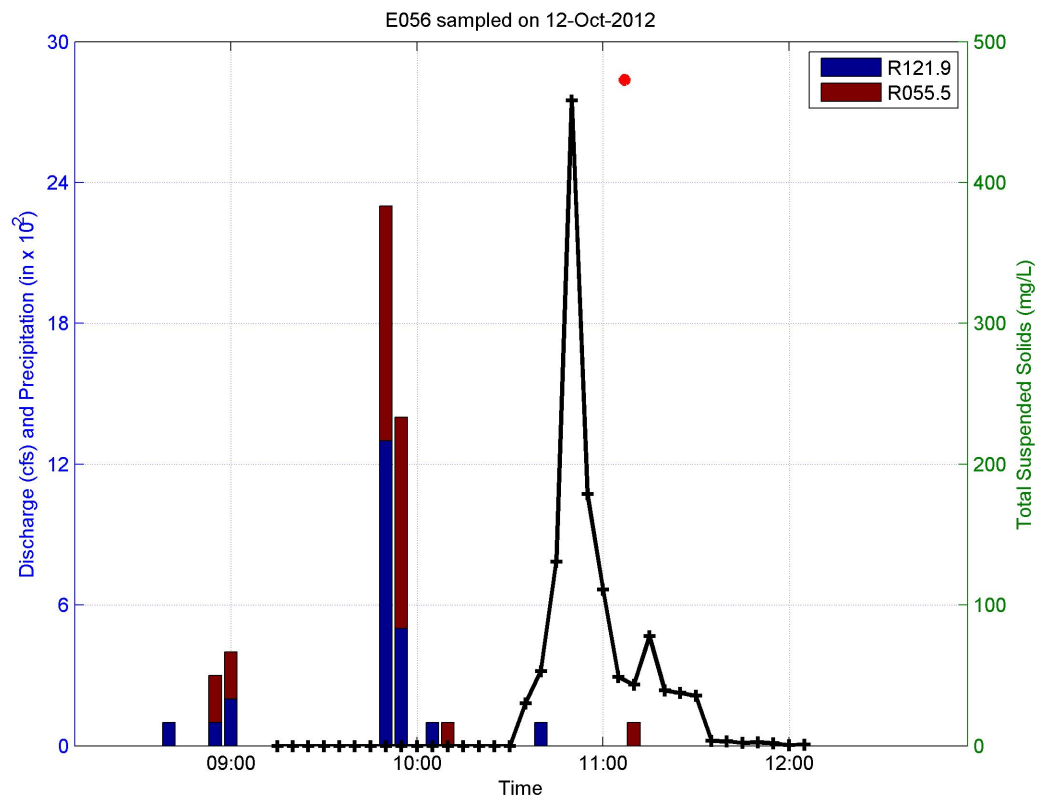


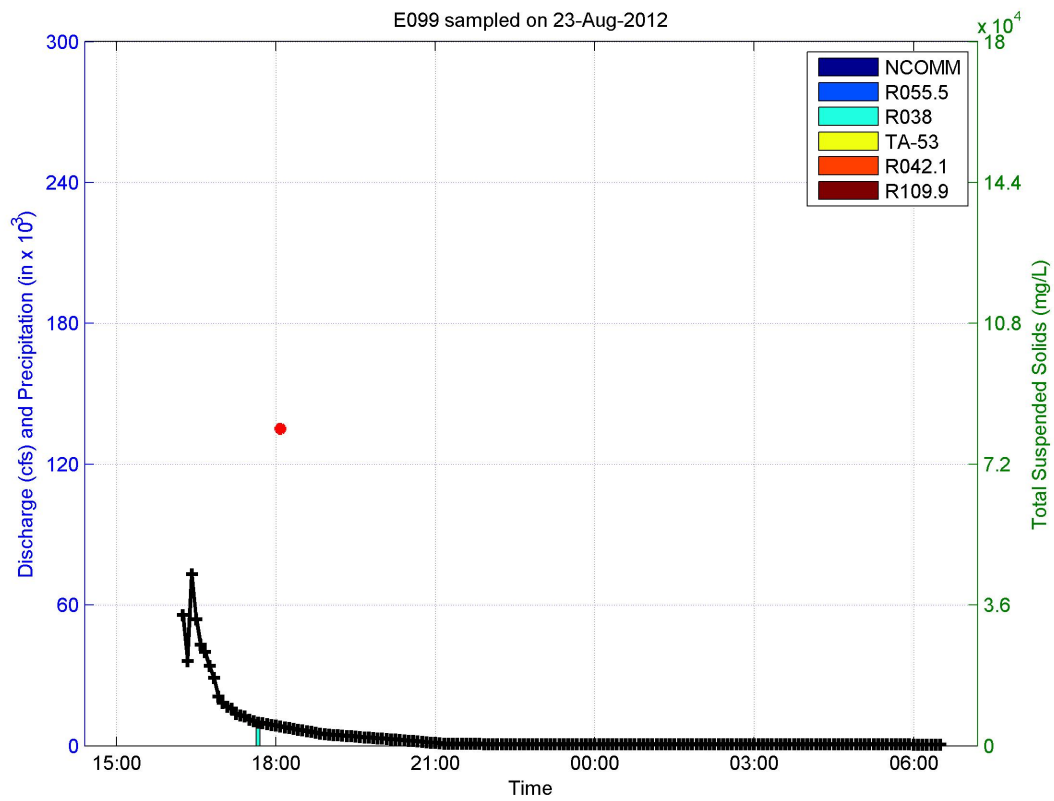
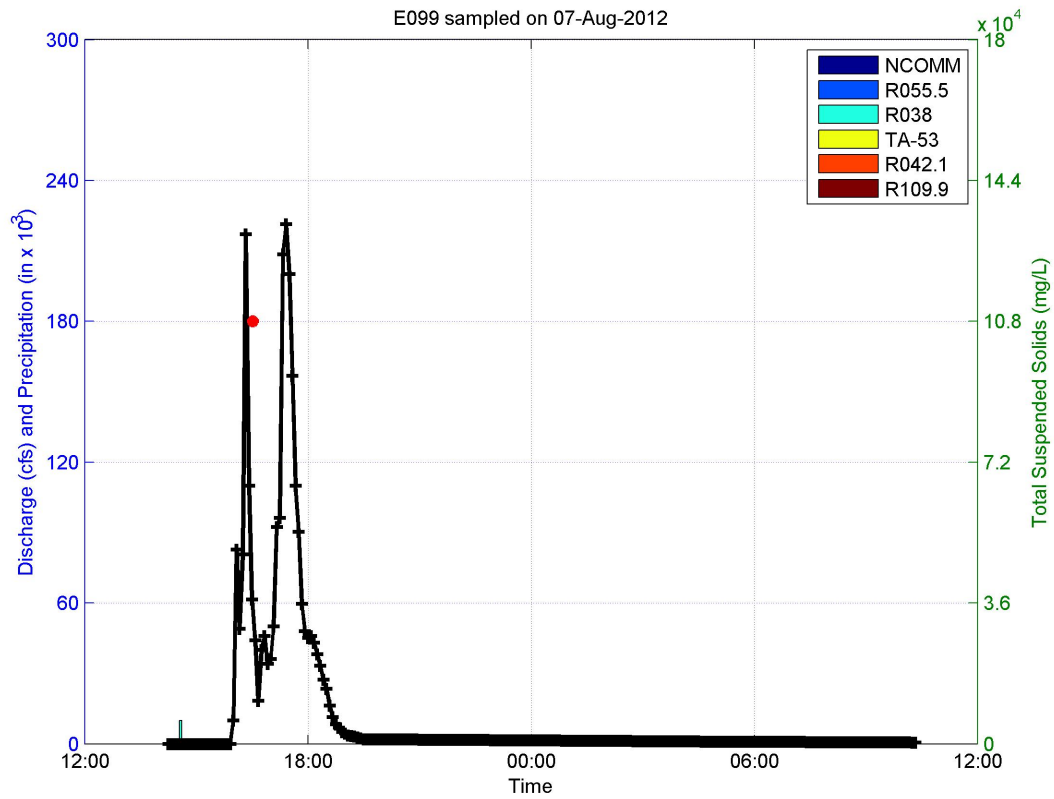


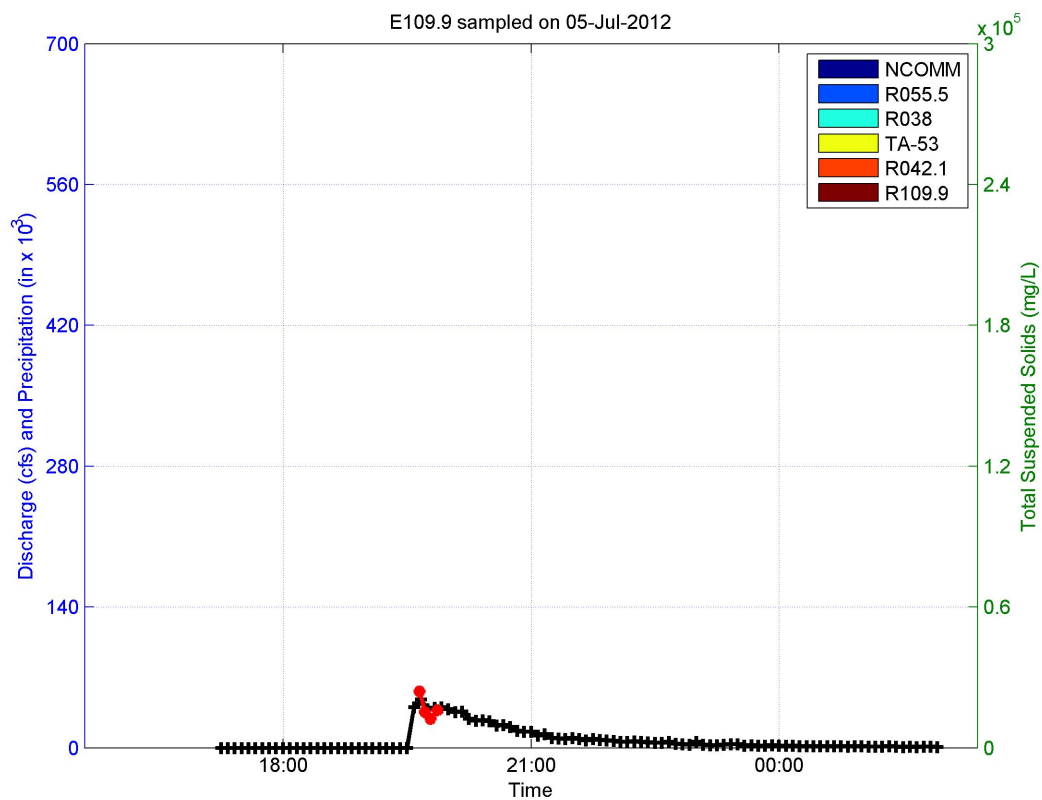
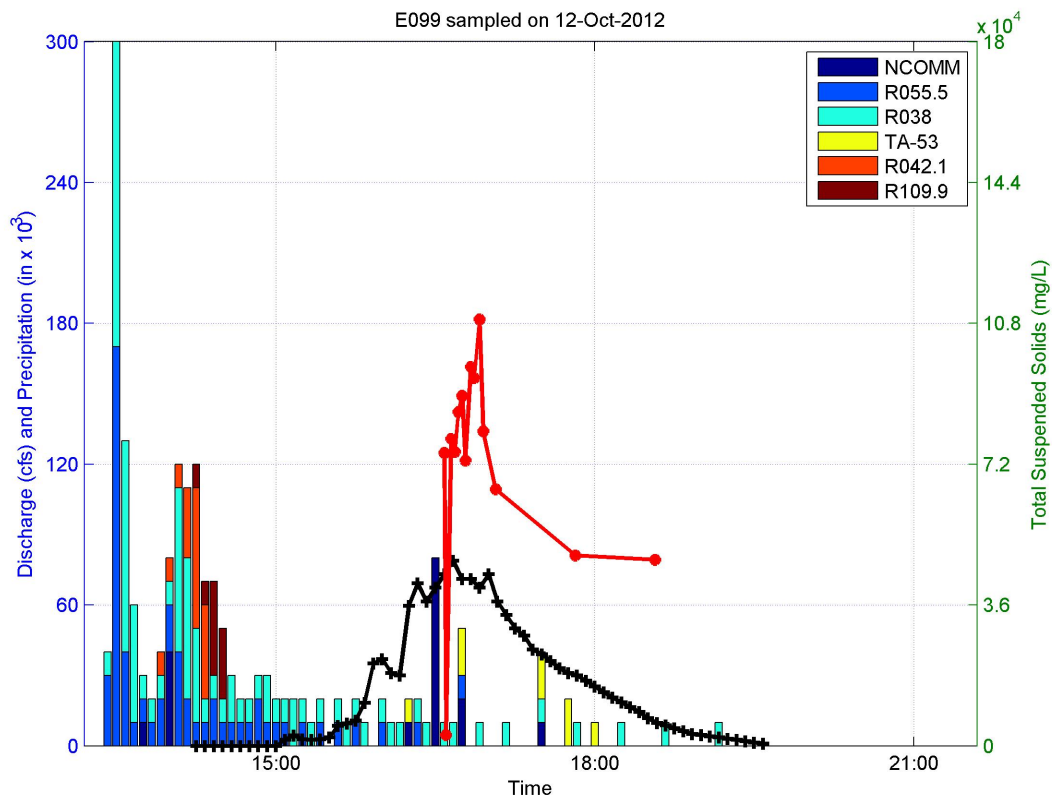


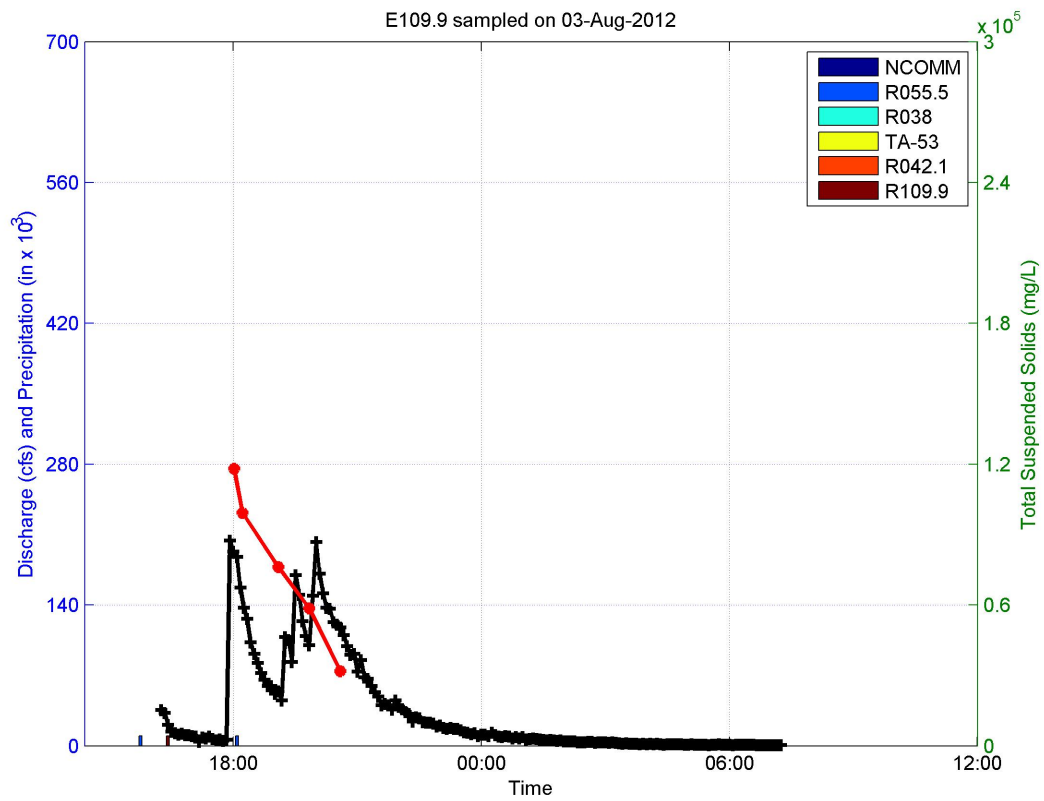
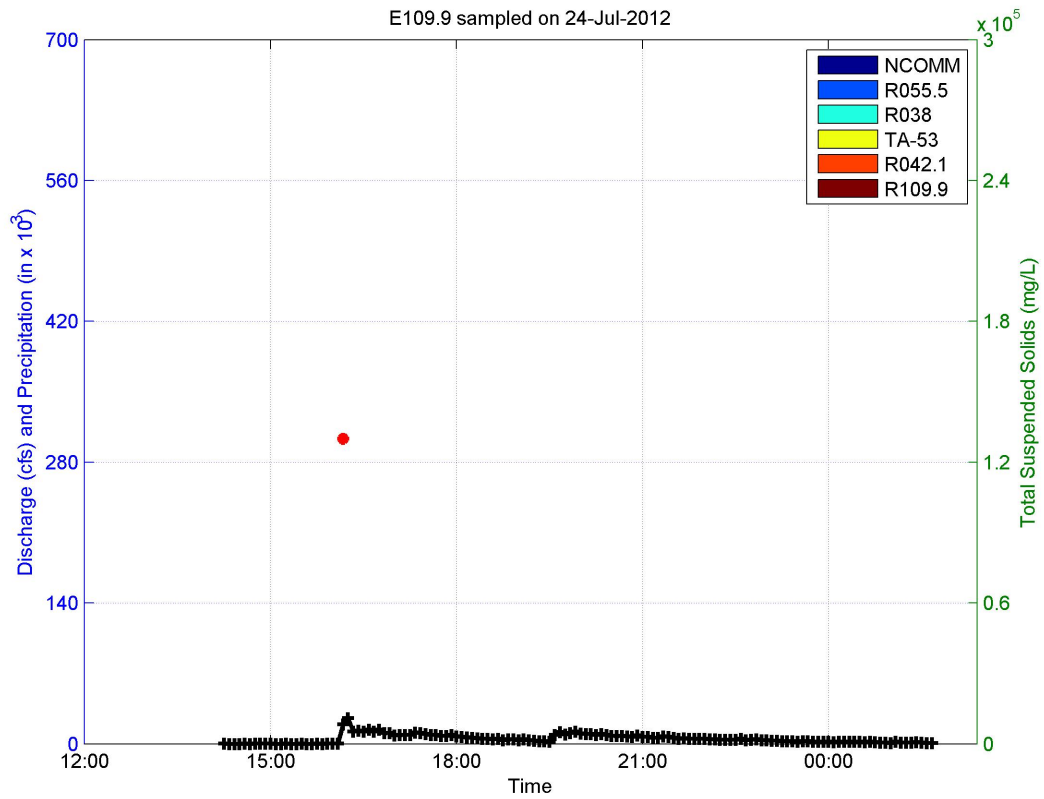


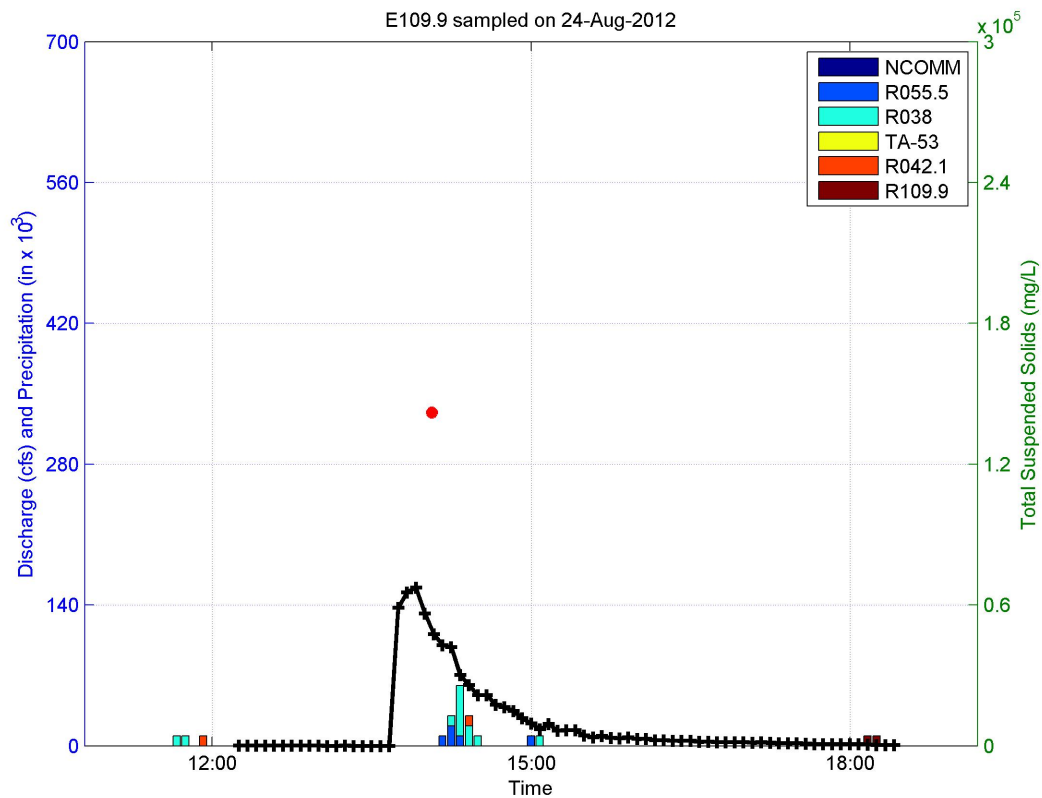
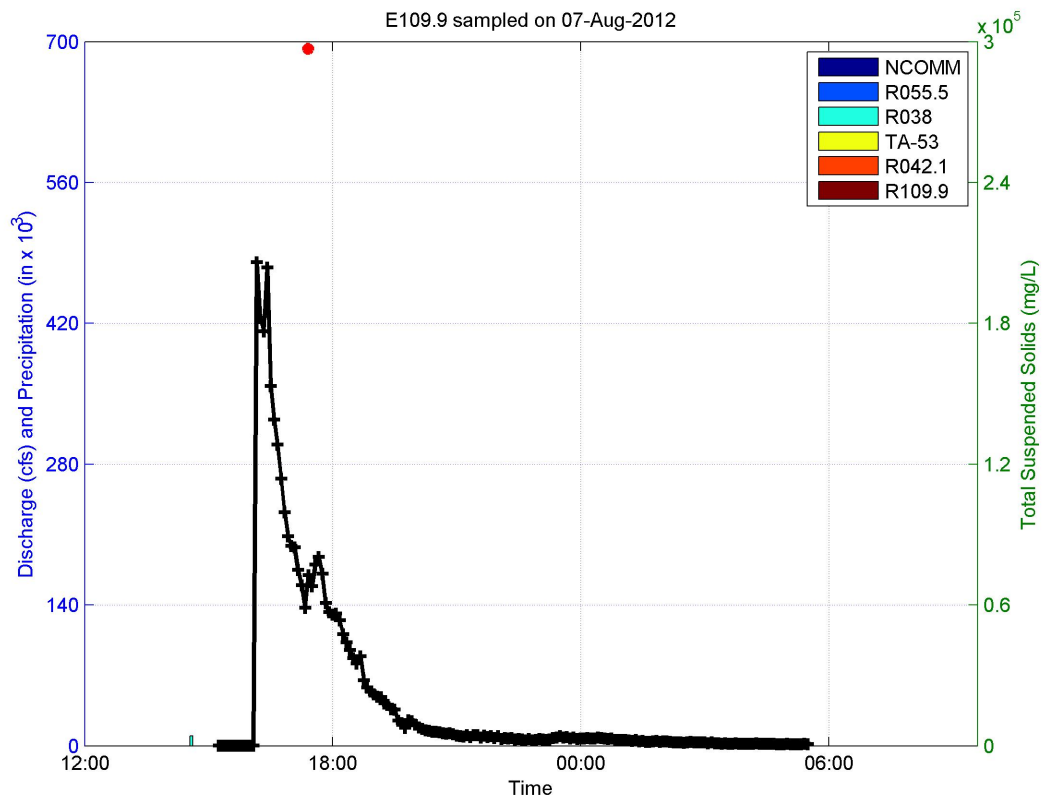












Appendix C

*Analytical Results, Analytical Reports, and 5-Minute Discharge
Results (on CD included with this document)*

