Annual Progress Report for 2015

Monitoring the Effectiveness and Validating Response to the Road Related Mitigation Practices Implemented on the Pikes Peak Highway

April 4, 2016

West Fork Beaver Creek, Pikes Peak, Colorado. Photo by Hannah Karlsson, METI Inc.

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Executive Summary

Monitoring the Effectiveness and Validating Response to the Road Related Mitigation Practices Implemented on the Pikes Peak Highway

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This is the thirteenth report documenting the annual monitoring efforts on the Pikes Peak Highway as part of the Settlement Agreement between the Sierra Club and the United States Department of Agriculture, Forest Service in Sierra Club v. Veneman, Civil Action No. 98-M-662 (D. Colo.), (U.S. Department of Justice 2002). The original monitoring plan and subsequent amendments call for effectiveness monitoring, designed to determine how well the mitigation practices implemented contribute to meeting their objectives; and validation monitoring, designed to determine how the mitigation practices affect the riparian, wetland, and aquatic systems within the area of influence of the Pikes Peak Highway (USDA Forest Service 2002 and 2003).

Effectiveness monitoring for the Pikes Peak Highway is focused on the 14-mile-long, 300-foot-wide highway corridor (150-feet each side of the highway centerline), starting at mile marker seven and continuing to the summit. The only resurfacing treatment used on the highway for mitigation purposes was asphalt paving which was completed in 2011. In 2015, no new structures were constructed for mitigation, but 646 tons of gravel was used to repair highway shoulders (personal communication with Dave Jordan, City of Colorado Springs, Skilled Maintenance Supervisor).

In addition to the roadside repair work, several other non-related activities did occur that have the potential to alter monitored responses. The U.S. Forest Service, Crystal Creek Fuels Reduction Project completed tree remediation on one linear mile within the highway corridor in Basin 1 (Lower North Fork of Crystal Creek Watershed) during the 2014 field season. In the winter of 2014/2015, additional work was completed. Treatment included forest thinning and mastication; creating a three to six-inch layer of woody debris on the forest floor. Several monitoring sites were disturbed as a result of these activities and others are at risk of future impact. The U.S. Forest Service, South Catamount Creek Fuels Reduction Project in Basin 2 (North Fork of Crystal and Ski Creek Watersheds) is in its initial planning stages and is scheduled for tree remediation in 2016. This treatment is planned to be accomplished by hand work, and will likely consist of tree felling, and subsequent lop and scattering of slash. The disturbance associated with the vegetation treatments of the fuels reduction projects potentially compromises several additional monitoring sites and may affect the integrity as well as the ability to obtain future measurements at these sites.

Work in 2015 completed by the Rocky Mountain Field Institute (RMFI) focused primarily above timberline around sediment ponds 258RW and 260RW. Native seeds were planted and erosion control matting installed on hill slopes exceeding a 20 percent gradient along highway drainages. RMFI used Mile High Corps and community volunteers to complete the 2015 projects. Restoration activities such as these are often environmentally positive, but can be at cross-purpose if they compromise the long-term monitoring sites assessing the impacts of the highway treatments.

Prior to the 2015 field season, three new HOBO Data Logging Rain Gauges (RG3) were purchased to replace the RG2 HOBO Data Logging Rain Gauges. The maximum rainfall intensity that the RG2 electronic rain gauge smart sensor can accurately measure is one inch of rain per hour. The RG3 electronic rain gauge smart sensor can accurately measure intensities up to five inches of rain per hour (Onset Computer Corp.). This should decrease any disparity in measurement between the electronic and standard rain gauges, during intense storm events. In addition to the electronic rain gauges, standard non-recording rain gauges (All-Weather) were installed at each monitoring site as described in the 2010 Annual Report.

Due to freezing temperatures and heavy snowfall early in the season, the electronic rain gauge tipping mechanisms froze and the standard rain gauges cracked. As a result, no usable data was obtained until June 1. Total seasonal precipitation (June 1 – September 30, 2015) varied between the three sites with the mid-elevation rain gauge receiving the most precipitation.

Silt fences were not exposed to high runoff and erosion activities in 2015. The field crew completed periodic site visits to 56 sites. The upper fence at cut slope site 059CS in Basin 7 (Glen Cove, Ski, and North Fork of Crystal Creek Watersheds) was removed in 2012 after highway construction limited access and relocated large boulders preventing fence material from being reliably fastened. The upper fences at five fill slope sites (048FS, 052FS, 055FS, 083FS, and 086FS) in Basin 7 were damaged during highway construction in 2011. As a result, the upper fences were removed from the sampling in 2012 and not replaced, and the lower fences continue to be monitored. In addition, silt fences were removed from fill slope site 196FS and conveyance channel 245CC was established in 2009. Silt fences from 13 cut slope, 28 fill slope, and 15 rock weir sites were monitored in 2015. In addition, one of the cut slope and one of the fill slope silt fences were breached during the 2015 field season. All silt fence sites were visited periodically, sediment volume measured, and silt fences evaluated for repair or replacement.

Four of the original 20 drainage ditches selected for monitoring were surveyed in 2015. Sixteen of the original 20 drainage ditches have been paved or lined with shotcrete since monitoring began. This eliminates the need for further monitoring unless visual inspection provides evidence of failure, in which case cross sections will be re-established and surveys completed to document change. The four remaining drainage ditches located in Basins 1 and 2 are lined with erosion control fabric and will continue to be surveyed annually.

One-hundred and seven of 117 conveyance channels were surveyed in 2015. In addition, eight conveyance channels (108CC, 112CC, 115CC, 116CC, 117CC, 119CC, 209CC, and 220CC) were documented using photographic and observation monitoring. These sites were not surveyed due to the exposure of large boulders and the general instability of the slope following past rock weir failure. Three conveyance channels (113CC, 114CC and 118CC) which were previously monitored through observation and photographs only, were surveyed. In addition, conveyance channel 106CC was re-established as a new site (as pins were covered due to instability of slope) and also surveyed.

Thirty-two sediment traps were monitored in 2015, including 20 rock weirs, seven sediment ponds, and five cutoff walls with riprap aprons below. Seventeen sites were surveyed at least twice to monitor their effectiveness in trapping sediment from winter and summer runoff. The rock weirs were surveyed and sediment volume was measured in the silt fences located down slope of the rock weirs (15 rock weirs have associated silt fences). Seven of the 20 rock weir sites overtopped during all rain events throughout the 2015 field season. Rock weir 252RW was filled with sediment and overtopped during all rain events throughout the field season. Overtopping implies the structure was not able to detain the discharge, allowing sediment to deposit in the pond, and both discharge and sediment flowed over the wall of the pond and onto the slope below as concentrated rather than diffused flow.

Heavy snowfall in the spring of 2015 above timberline affected sediment traps 236RW, 237RW, 239RW, and 241RW. Snow and ice blocks formed in the contributing drainage ditches causing rills and head cuts to form around these sites. An ice block above sediment trap 238RW diverted water and sediment away from the cut-off wall and down the side of the highway to the fill slope below.

The primary focus of the validation monitoring is to address the condition of the riparian wetland and aquatic systems along the Pikes Peak Highway. Surveys were completed on all stream reaches (Boehmer, Glen Cove, North Catamount, North Fork of Crystal, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks) except East Fork of Beaver Creek because a thunder storm interrupted the initial attempt and the crew was unable to return to the site. In the past, stream channel monitoring included planview surveys, profile surveys, cross section surveys, thalweg surveys, bankfull surveys, bank erosion surveys, vegetation surveys, pebble counts, and grab samples. In 2015, stream channel monitoring included only cross section surveys, thalweg surveys, vegetation surveys, pebble counts, and grab samples.

Stream pebble counts were completed on Glen Cove, North Catamount, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks. A pebble count was not completed on North Fork Crystal Creek as the stream bed is dry, inactive, and vegetation is encroaching into the channel. Pebble counts were also not completed on Boehmer and East Fork Beaver Creek because of thunder storms. Sediment grab samples were collected from bars on all streams surveyed in 2015 except East Fork Beaver Creek due to thunder storms and North Fork Crystal Creek; as mentioned above. Comparing the distribution of material captured in traps near the highway to sediment deposits (bars) in the streams may be useful in validating response to highway mitigation practices.

Numerous grab samples were collected from the cut slope and fill slope silt fences, the rock weirs and their associated silt fences, and from the stream bars throughout the 2015 field season. A subset of these was selected to be analyzed in the laboratory for particle size distribution. The balance of samples will be analyzed only if the variability in the particle size distribution of the subset of samples chosen for initial analysis warrants additional analysis. Laboratory analyses for the 2015 field season have been completed on the grab samples and a summary of particle size distributions and graphs are presented in this report. Comparing the distribution of material captured in traps near the highway to sediment deposits (bars) in the streams will validate response to highway mitigation practices.

Included with the full report is a data USB containing all survey data (field and post processing) plus digital photographs (recommended viewing) for all sites for the 2015 field season. The annual reports and data may also be accessed from:

http://www.fs.fed.us/emc/rig/pikespeak/index.shtml

INTRODUCTION

The proposed actions presented in the Pikes Peak Highway Drainage, Erosion and Sediment Control Plan Environmental Assessment (Hydrosphere Resource Consultants 1999) were designed to achieve the following goals:

- Stabilize road surface materials, cut slopes, and fill slopes
- Reduce runoff velocities and dissipate erosive energy
- Collect runoff in armored ditches and conveyance channels
- Reduce erosion and sediment deposition in drainage channels
- Retain sediment in traps and ponds to reduce downstream sedimentation

In May 2001, a monitoring plan was approved as part of the Settlement Agreement between the Sierra Club and the United States Department of Agriculture, Forest Service in Sierra Club v. Venneman, Civil Action No. 98-M-662 (D. Colo.), (U.S. Department of Justice 2002). The monitoring plan outlines appropriate procedures for monitoring and documenting the effectiveness of mitigation practices in achieving the above desired goals (USDA Forest Service 2002). The monitoring effort, which includes implementation monitoring, effectiveness monitoring, and validation monitoring, began in 2003 and ends in 2017.

Implementation monitoring verifies that mitigation practices are properly implemented. Staffs from both the city of Colorado Springs and the U.S. Forest Service are responsible for this aspect of the monitoring program. Because all parties assume that mitigation practices will be properly implemented, successes or failures in design or implementation will be addressed in the annual monitoring reports only to the extent that they impact subsequent monitoring.

Effectiveness monitoring is intended to document whether or not the properly implemented mitigation practice is effective in achieving the desired goal(s) or purpose(s) for that practice. Effectiveness monitoring for the Pikes Peak Highway is focused on the 14-mile-long, 300-foot-wide highway corridor (150-feet each side of the highway centerline), starting at mile marker seven and continuing to the summit, and is intended to document how effective the mitigation practices are in reducing erosion and sedimentation from features such as the road surface, cut and fill slopes, drainage ditches and conveyance channels. Precipitation is also monitored to provide an index to the amount and erosive energy of rainfall events. Effectiveness monitoring is the cornerstone of the monitoring effort described in this report.

An equally critical component in the monitoring program is validation monitoring, which is intended to document the degree to which the properly implemented and effective mitigation practices ultimately influence the resource of concern. In this report, validation monitoring addresses the condition of the riparian, wetland, and aquatic systems adjacent to the Pikes Peak Highway and attempts to provide data to validate that discharge management and reductions in sedimentation from the highway do in fact result in improvements in the channel and riparian environment below.

Subsequent changes in the proposed action plan for road mitigation (Burke 2002) required amendment of the approved monitoring plan (USDA Forest Service 2003). Initially, a variety of highway surface stabilization practices were proposed for road mitigation. Those were reduced to a single surfacing procedure, asphalt paving, eliminating the need for a monitoring design that incorporated multiple surface treatments. Rock weirs to detain the water and sediment exiting the highway corridor from all events up to the magnitude of the design storm have been constructed in selected locations. By design, sediment should settle out in the rock weir, where it can be measured directly, while water percolates through a porous berm. The addition of rock weirs eliminated the need to sample sediment concentrations in pond inflow and outflow as well as measure material trapped in the pond as originally stated in the monitoring plan. Additional revisions in the mitigation design concentrate road drainage from very long segments or reaches (as long as two miles) of both pavement and ditch line into fewer diversion points and conveyance channels, reducing the number of diversions off the highway and the number of proposed sampling sites.

The entire highway has been paved with asphalt, rather than surfaced using a variety of treatments, which should significantly reduce or eliminate the potential for continued surface erosion to occur from the road surface. Erosion rates from the gravel portion of the highway were monitored as described in the approved monitoring plan, but since paving of the entire highway was completed in 2011, it is assumed that erosion from the road surface has been reduced to zero. As noted above, sediment pond design has been altered but monitoring will still focus on quantifying total sediment exported in the discharge water and the effectiveness of the mitigation practices in reducing that export. This report includes a brief description of the current monitoring protocol for each metric of concern and documents any changes in the monitoring protocol that may have occurred since the previous annual report.

The U.S. Forest Service oversees monitoring of the streams draining the basins below the highway to validate whether or not discharge management and reductions in sedimentation from the highway result in improvements in the channel and riparian environment. A suite of tributaries in the Pikes Peak Watershed have been identified as either impacted or non-impacted by the presence and maintenance of the Pikes Peak Highway. North Catamount, South Catamount, Glen Cove, Oil, and Boehmer Creeks represent previously non-impacted streams. Ski, Severy, East Fork of Beaver, North Fork of Crystal, and West Fork of Beaver Creeks are all considered stream systems impacted by the highway. Depending on the magnitude of the reduction in the amount of sediment delivered to the stream system and changes in discharge amount and energy, it may be possible to document changes in channel morphology and riparian condition that occur as a consequence of highway management.

OBJECTIVE

The objective of this report is to document the data collected and progress made in the effectiveness and validation monitoring of the mitigation practices implemented on the Pikes Peak Highway during the 2015 field season. Each annual report beginning in 2007 follows a consistent format that provides a description of the protocol used to monitor each metric of concern as defined by the monitoring plan or its amendment, and a summary of the data collected for that particular year. It should be realized that, by design, not all metrics or monitoring locations will be sampled every year. As a result, some reports will contain site data and observations not presented in other reports. A full data set from all years is available in the data archive. It should also be noted that it was not the intent of the settlement agreement to include analysis of the data beyond a quality assurance and quality control assessment of the monitoring effort. Therefore the annual report will state the intended purpose for collecting the data and present the data in a format useful for subsequent analysis.

Site Location and Identification

A 15-year study requires that monitoring sites be uniquely identified and periodically relocated. Each precipitation gauge, cut slope and fill slope, road reach, drainage ditch and conveyance channel, rock weir and sediment pond, and stream channel reach monitored as part of this study has been uniquely identified and located. Each site is marked as a waypoint in a geographic information system (GIS) platform with attributes for latitude, longitude, and elevation, as well as a unique code, to distinguish it in the field. The coding convention used for the effectiveness monitoring sites is a five-character alpha-numeric code comprised of a three-digit feature number followed by a two-letter feature identifier (e.g., for site 001FS where 001 is the feature number and FS identifies the feature, a fill slope). The validation monitoring sites also use a five-character coding convention in which four letters identify the stream name and the last digit identifies the stream reach (e.g., OILC1 = Oil Creek, Reach 1).

Every feature being monitored has at least three benchmarks or control points used to locate the feature and obtain repeated, spatially similar, three-dimensional surveys, as appropriate. The benchmarks or control points are monumented by 2.5-foot lengths of 0.5-inch rebar pounded into the ground and topped with plastic yellow caps. Aluminum nursery tags wired to the rebar identify the individual benchmarks or control points (e.g., CP01 = Control Point 1). Every feature surveyed has at least three points with which to register the survey, although some features in close proximity may share control points.

In 2015, no new monitoring sites were established. Site names, locations, and feature descriptions can be found in Appendix A. Note that Appendix A provides a complete list of all waypoints established since the project began in 2003; not all of the sites listed were sampled during the 2015 monitoring season.   A USGS topographic map that documents the location of each monitoring site is presented in Appendix B.

OTHER ACTIVITIES

The highway corridor is managed for multiple use and some of these activities have the potential to compromise long established study sites as well as the outcome of the monitoring study. Even activities that would normally be considered beneficial could potentially alter the response currently being monitored at the site. Some of the activities that have the greatest potential for impacting existing monitoring sites, and the data obtained, are described below. The intent is to document the occurrence of an activity without passing judgement on the consequences to the monitoring study.

Fuels Reduction Projects

The U.S. Forest Service, South Catamount Creek Fuels Reduction Project in Basin 2 (North Fork of Crystal and Ski Creek Watersheds) is in its initial stages and is scheduled for tree remediation in 2016. This treatment is planned to be accomplished by hand work, and will most likely consist of tree felling, and subsequent lop and scattering of slash. Rock weirs 152RW and 153RW and their associated conveyance channels are located in the area proposed for treatment. The apron above rock weir 153RW is primarily bare, highly erosive Pikes Peak granite that could be aggravated if disturbed, or stabilized if covered with lopped and scattered slash (Figure 1). The latter would normally be considered beneficial, but the response to either disturbance or stabilization would potentially alter the response currently being monitored at this site.

Figure 1. Rock weir 153RW showing bare apron above rock weir that could be aggravated if disturbed or stabilized, Pikes Peak 2015.

During the 2015 field season, the field crew flagged a buffer around the Pikes Peak monitoring sites in the South Catamount Creek fuels reduction area and met with Damien Zona, U.S. Forest Service, Pikes Peak Ranger District, Silvaculturist. Damien completed a GPS survey of the perimeter of the buffer zone and indicated that this information would be provided to the contractor completing the fuels reduction project. A list of the rock weir and conveyance channel cross sections that could potentially be compromised by the silvicultural activities and associated disturbances are listed in Table 1. The designation directly impacted implies disturbance may occur on or near the monitoring site, while the designation potentially impacted refers to sites not located in the disturbance area but close enough that they may be compromised.

The U.S. Forest Service, Crystal Creek Fuels Reduction Project completed tree remediation on one linear mile within the highway corridor in Basin 1 (Lower North Fork of Crystal Creek Watershed) during the 2014 field season. The silvicultural practices implemented included a combination of partial tree removal and clearcuttings as well as slash and understory removal. In addition to the clear cut units, clear-cut breaks, or swaths, were also created. The breaks parallel the highway and cross monitoring sites as most of the conveyance channels and rock weirs are perpendicular to the highway. The disturbance associated with the vegetation treatments potentially compromise the integrity of some monitoring sites and may compromise the ability to obtain valid measurements at some of those sites in the future (Table 1).

Table 1. Directly impacted and potentially impacted monitoring sites from the South Catamount Creek and Crystal Creek Fuels Reduction Projects, Pikes Peak 2015.

U. S. Forest Service Fuels Reduction Projects		
Project	**Directly Impacted**	**Potentially Impacted**
South Catamount Creek 2016	153RW, 012CC, 013CC, 228CC	182DD
	152RW, 225CC	195DD
Crystal Creek 2014	002RW, 218CC	001FS
	003RW, 219CC	011CS, 010DD
	006RW, 220CC, 005DD	177FS
	009RA, 223CC	
	004CC	
Crystal Creek 2015	006RW, 220CC, 005DD	
	007FS, 175CC	
	008RW, 221CC, 222CC	
	009RA, 223CC	

In the winter of 2014/2015, additional work was completed on the Crystal Creek Fuels Reduction Project. Treatment included forest thinning and mastication; creating a three to six-inch layer of woody debris. This additional work impacted four previously impacted sites and five new sites. Figure 2 shows a comparison of conveyance channel 221CC in 2014 and 2015 before and after additional work was completed. A list of the rock weir and conveyance channel cross sections potentially compromised by the silvicultural activities and associated disturbances can be found in Table 1.

Pikes Peak International Hill Climb

Rock weirs in the start of Basin 1 (002RW, 003RW, 006RW, and 202RW) had been impacted in previous years by the parking, camping, and spectator areas for the Pikes Peak International Hill Climb. That impact extended to nearby survey cross sections. In 2015, prior to the Hill Climb, the field crew flagged these monitoring sites and race officials fenced-off these sites resulting in minimal impact to the sites.

Rocky Mountain Field Institute

Work in 2015 completed by the Rocky Mountain Field Institute (RMFI) focused primarily above timberline around sediment ponds 258RW and 260RW. Native seeds were planted and erosion control matting installed on hill slopes exceeding a 20 percent gradient along highway drainages (Figure 3). RMFI used Mile High Corps and community volunteers to complete the 2015 projects. Restoration activities such as these are often environmentally positive, but can be at

Figure 2. Clear cut break below rock weir 009RA encompassing cross sections of conveyance channel 223CC that was forested prior to 2014 (above) and after additional treatment 2015 (below), Pikes Peak 2015.

cross-purpose if they compromise the long-term monitoring sites assessing the impacts of the highway treatments.

The stream channel stabilization completed by RMFI on Severy Creek in 2014 included; installation of eight contour logs, construction of a log and rock retaining wall to reinforce the stream bank, and sediment removal (.5-cubic yards) to encourage water flow to the wetland. In 2015, RMFI continued revegetation and stabilization of the Severy Creek wetland. This work was completed between monitoring sites Severy Creek reach 1 and 2. The field crew visited the stream channel stabilization site in 2015 and determined there was no visible impact to the monitoring reaches.

Figure 3. RMFI planted native seeds and installed erosion control fabric on the hill slope along the highway drainage flowing into sediment pond 258RW.

EFFECTIVENESS MONITORING

The road mitigation practices implemented by the City of Colorado Springs are intended to control erosion and manage the erosive energy of surface water discharge from the Pikes Peak Highway. Effectiveness monitoring consists of documenting the impact that various mitigation practices have on the erosion and sedimentation processes that occur within the road corridor. Erosion rates and sediment volumes are primarily indexed using a combination of survey techniques and sediment traps (silt fences, rock weirs and sediment ponds). Grab samples of sediment and water are analyzed to document particle size distributions of deposited material and sediment concentration in discharge water leaving the site. Precipitation is also monitored to provide an index to the amount and erosive energy of rainfall events.

The following sections describe the metrics being monitored and the data collected in order to document the effectiveness of mitigation. The standard protocol for identifying and numbering the various sample sites is presented up front, followed by a description of the monitoring sites and metrics.

Precipitation

Three tipping bucket rain gauges (Onset Computer Corp.) equipped with event data loggers (HOBO) were installed at the beginning of the field season to index precipitation over the elevational range of the monitored portion of the highway. Although precipitation is not a response variable, it is a significant causal variable in evaluating the effectiveness of mitigation. Rain gauge 075RG is located just uphill from the Halfway Picnic Area near mile marker 10 at an elevation of 10,109-feet. This is at the upper end of Basin 2, in the subalpine zone. Rain gauge 076RG is located near the Elk Park Trailhead (No. 652) at the boundary between the subalpine and the alpine zones at 11,810-feet elevation. Rain gauge 077RG is located near the Devil's Playground and well into the alpine area at 13,069-feet elevation. Rain gauges installed for this study operate from early May, or as soon as the field season starts, until late September or early October when the field season ends. Data loggers record a date-time stamp for each tip of the rain gauge bucket (1 tip = 0.01 inches) from which volume, duration, and intensity (or rate) of each rainfall event can be determined.

In 2015, the three tipping bucket rain gauges and standard rain gauges were installed by May 5, but due to freezing temperatures and heavy snowfall, the electronic rain gauge tipping mechanisms froze and the standard rain gauges cracked (Figure 4). As a result, no usable data was obtained until June 1. The standard, non-recording rain gauges (All-Weather) are installed at each site as described in the 2010 Annual Report. The standard rain gauges provide a second index of precipitation amount for the sampling interval to avoid loss of data should a tipping bucket rain gauge fail.

Figure 4. Electronic rain gauge 076RG 1.5-feet above snowline and standard rain gauge 076RG post buried in large snow drift, Pikes Peak, May 2015.

Total seasonal precipitation (June1 – September 30, 2015) for the three monitoring sites for both the electronic and standard rain gauges is listed in Table 2. Data from electronic rain gauge 075RG was corrupt from August 24 through September 8, 2015. The data file was sent to Onset Technical Support (Onset), but the data could not be retrieved. Precipitation in the standard rain gauge measured .40-inches for that period. Electronic rain gauge 076RG developed a corrupt logger on June 1 and the rain gauge was replaced on June 22, 2015. The logger was sent to Onset but the data could not be retrieved. Precipitation in the standard rain gauge measured 2.54-inches for the period. When appropriate, total precipitation was adjusted for the rain gauges to account for missing data (Table 2).

Table 2. Location, measured and adjusted precipitation accumulation, and dates of operation for electronic and standard rain gauges, Pikes Peak 2015.

Gauge ID	Latitude (hddd˚mm.mmm)	Longitude (hddd˚mm.mmm)	Elevation (ft)	Total Precipitation Electronic (in)		Total Precipitation Standard (in)		Dates of Operation 2014
				Measured	Adjusted	Measured	Adjusted	
075RG	N38 53.797	W105 03.890	10,109	8.66	9.06†	9.29	N/A	6/1 – 9/30
076RG	N38 52.582	W105 03.970	11,810	8.33	10.87†	10.56	N/A	6/1 – 9/30
077RG	N38 51.783	W105 03.999	13,069	8.36	N/A	8.59	N/A	6/1 – 9/30

† Indicates missing/adjusted data due to equipment malfunction and/or damage to the rain gauge.

Prior to the 2015 field season, three new HOBO Data Logging Rain Gauges (RG3) were purchased to replace the RG2 HOBO Data Logging Rain Gauges. The maximum rainfall intensity that the RG2 electronic rain gauge smart sensor can accurately measure is one inch of rain per hour. The RG3 electronic rain gauge smart sensor can accurately measure intensities up to five inches of rain per hour (Onset Computer Corp.). This should decrease the disparity in measurement between the electronic and standard rain gauges, especially during intense storm events.

In 2015, seasonal totals varied between the three sites with the mid-elevation rain gauge receiving the most precipitation (Figures 5). Precipitation by measurement date for the three standard rain gauges is presented in Figure 6. Daily and periodic precipitation, and daily average temperature is presented in Appendix C and the basic rain gauge data (date-time stamp) is presented on the data USB accompanying the report.

In addition to the three sites established as part of this study, a Natural Resources Conservation Service (NRCS) Snotel site located at Glen Cove, between rain gauges 075RG and 076RG at an elevation of 11,469-feet, has precipitation data available for the entire year. Data for the NRCS Snotel site can be accessed from:

http://www.wcc.nrcs.usda.gov/snotel/snotel.pl?sitenum=1057&state=co

Highway Surface Stabilization

Historically, thousands of cubic yards of gravel material had been added to the Pikes Peak Highway road surface annually as part of the continuing maintenance program. Most of this material has since migrated elsewhere; either washed down the ditch line during snowmelt or following rainfall events or cast over the side onto the fill slope and the hillside below during road grading procedures. This material has been perceived to be the primary source for the sediment deposited in the streams (Chavez et al. 1993). The primary emphasis in the road

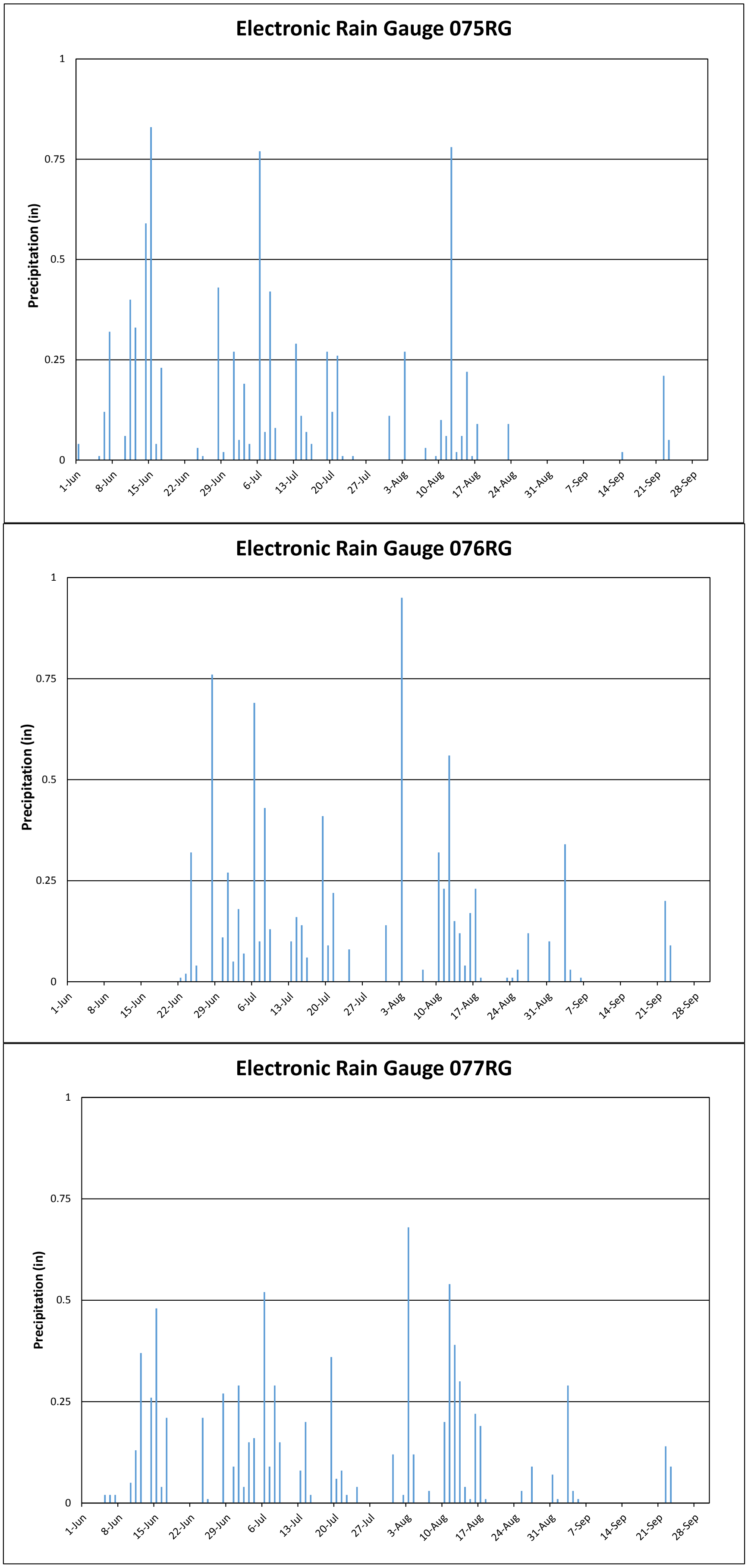

Figure 5. Daily precipitation for three electronic rain gauges, Pikes Peak 2015.

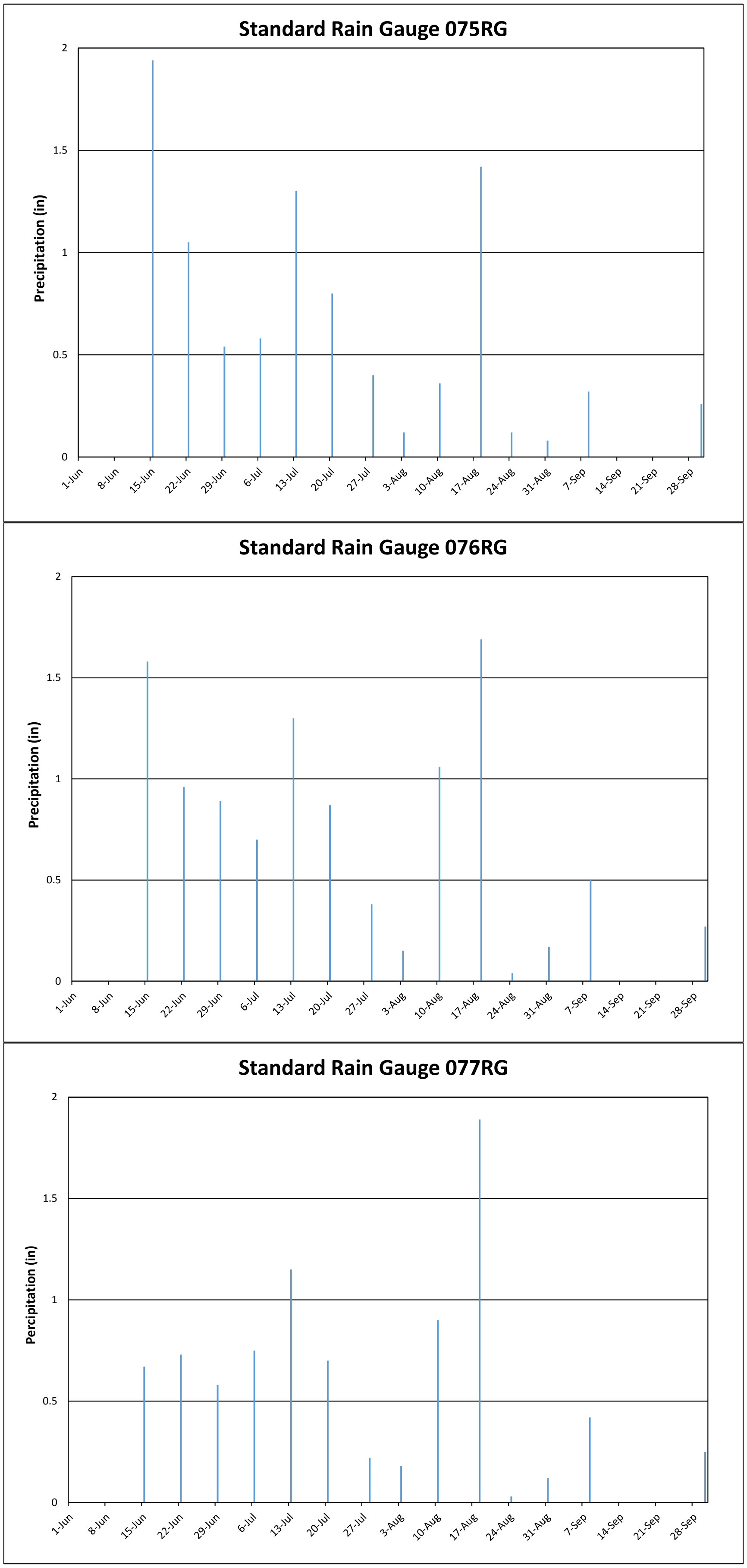

Figure 6. Precipitation by measurement date for the three standard rain gauges, Pikes Peak 2015.

mitigation practices was to reduce the volume of material available to be eroded (supply) and to manage the discharge water (energy) to reduce sediment transport. Initially a variety of alternate surfacing options were proposed.

As noted earlier, and as documented in amendments to the monitoring plan, the design of the monitoring protocol, appropriate for estimating road erosion, was significantly modified to reflect changes to the road bed stabilization practices implemented on the highway. The entire highway has been paved with asphalt, rather than surfaced using a variety of treatments, which should significantly reduce or eliminate the potential for continued surface erosion to occur from the road surface. Prior to 2011, erosion rates from the gravel portion of the highway were monitored as described in the approved monitoring plan, but since paving of the entire highway was completed in 2011, it is assumed that erosion from the paved road surface is zero and road surface surveys have been discontinued.

As a surrogate for estimating actual erosion rates, road surface elevation for selected road reaches prior to paving was monitored over time to document erosion rates, or changes in the volume of material stored on untreated road segments. Uniform road reaches were selected with survey cross sections permanently established at five intervals along each selected road reach (i.e., approximately one cross section per 20 meters of road). The road cross sections were periodically surveyed to provide the basis for estimating the degree of erosion or deposition occurring in the road reach they represent. Individual road cross sections were monumented using a 2.5-foot piece of rebar driven into the road surface at the upper edge of the fill slope. In addition, permanently monumented baseline elevation points (benchmarks) were established for each road reach and were used as references for each cross section. Monitoring consisted of surveying the surface elevation of the road cross sections, relative to the benchmark for the road reach. Either the average elevation of the cross section, or the survey transect, can be compared for different surveys to determine changes in the volume of material stored, or changes in surface configuration that may have occurred between measurements. Averaging the response for the five cross sections and multiplying that by the area of the road reach (estimated as average length times average width) yields an estimate of the change in the volume of material stored on the road reach during the interval between measurements.

Stabilizing Cut and Fill Slopes

Erosion from cut and fill slopes along the highway was thought to provide a continuous source of sediment to wetland, riparian, and aquatic systems. It is expected that highway mitigation practices will reduce sediment movement from these slopes in two ways. First, stabilizing the road bed through paving should also stabilize the angle of repose of adjacent cut and fill slopes, eliminating the constant adjustments that occur in the angle of repose of those slopes following changes to the plane of the road bed. Second, paving has eliminated the need for the continual addition of road base material, the primary source of material that had eroded onto fill slopes and hillsides. Effectiveness will be documented by comparing changes in the amount and timing of sediment trapped in silt fences at the base of the cut and fill slopes following paving.

A 30-foot silt fence placed at the base of the slope of interest is used to trap sediment. Periodic measurements of the volume of material trapped behind the fence (i.e., after spring snowmelt and again after each large rainfall event) provide an index of the amount of material being eroded from the slope above the fence. Each silt fence is routinely visited to ensure timely measurement and maintenance. Should the silt fence fill to the point of reduced efficiency or fail during the period between measurements, the fence is either repaired, replaced, cleaned-out, or relocated to a new monitoring site. Initially (2003 and 2004), the volume trapped was determined from surveys of the surface behind the fence before and after the sediment was removed. Since then, the volume of trapped sediment behind the silt fence has been estimated by removing the accumulated material and measuring the amount removed by placing it in graduated containers for a measure of total volume. A sub-sample of the material removed is collected for laboratory analysis to determine total weight per unit volume and particle size distribution.

On cut slopes, erosion is monitored using two silt fences per site: one is placed across the base of the cut slope just above the ditch line to capture the sediment coming off the cut slope (lower fence); a second is placed on the upper edge of the cut slope to intercept and trap the sediment delivered to the cut slope from the undisturbed hill slope above (upper fence). This partitioning allows separation of the contribution of the cut slope to the road or ditch line from that of the undisturbed hill slope above. The latter measurement also provides an index of natural erosion rates. The contributing area of the lower fence is represented by a rectangle above the fence that spans the width of the fence and extends to just below the upper fence at the toe of the undisturbed slope. The contributing area of the upper fence is more difficult to define and depends on the topographic features of the hill slope above. Contributing area for both lower and upper fences has been determined and measured for all cut slope monitoring sites. Currently, 22 cut slope silt fences have been installed at 13 sites. Initially, they were proportionally divided between the treated (paved) and untreated portions of the highway. The sampling design included cut slopes located in road segments that were treated at differing times, ensuring a wide range in the variability of conditions sampled both before and after highway mitigation. Paving of the entire highway was completed in 2011 resulting in all portions of the highway being treated.

Cut slope silt fences were not exposed to high runoff and erosion activity in 2015 reducing the need for cleaning. The upper fence at cut slope site 059CS (Basin 7: Glen Cove, Ski, and North Fork of Crystal Creek Watersheds) was damaged during highway construction in 2012. As a result, the upper fence from this site was removed from the sampling and not replaced, and the lower fence continues to be monitored. In addition, one of the 22 cut slope silt fences was breached during the 2015 field season. The condition of each silt fence was documented following each site visit. In the *SiteSummary.xls file* on the data USB site visit dates are annotated with the condition of the silt fence, any repairs or replacements that were completed to maintain the silt fence, and an indication if the fence was breached prior to the survey date. The sediment volume for each cut slope silt fence was recorded in the *SiteSummary.xls file* if there was sediment removed from the cut slope silt fence. It can be assumed that there was zero sediment removed on all other silt fence site visits. A summary of cut slope site visits, and sediment removed from cut slope silt fences for the 2015 monitoring season are presented in Appendix D. All cut slope data and photographs for the 2015 season are available on the accompanying data USB.

A similar design has been implemented for monitoring the effectiveness of mitigation practices intended to minimize erosion from fill slopes. The design includes the use of two silt fences per site: one is placed at the base of the fill slope to trap what originates from the fill slope (upper fence); a second is placed at the base of the hill slope on which the fill slope resides or at the boundary of the 150-foot corridor associated with the road right-of-way, whichever is the shorter distance (lower fence). The second lower fence is offset from the first fence and presumably not influenced by the upper fence. This design allows for trapping the eroded material in the upper fence as it leaves the fill slope as well as estimating the sediment being delivered off-site or down slope as indexed by the lower fence. Material trapped in the lower fence includes natural erosion from the slope below the fill slope as well as material contributed from the fill slope and transported downslope to the boundary of the corridor. In this way, not only will the on-site effectiveness of the mitigation practice as it effects fill slope erosion be evaluated, but an estimate of the amount of eroded material from the fill slope that is attenuated downslope will also be obtained. The contributing area of the upper fill slope fence spans the width of the fence and extends upslope to the edge of the road bed. The contributing area of the lower fence is defined by the width of the lower fence and the distance to the upper fence. However, like the fences above cut slopes, the actual contributing area of the lower fence is influenced by the topographic features of the hill slope. Contributing area for both the lower and upper fences has been determined and measured for all fill slope monitoring sites. Currently, 50 fill slope silt fences have been installed at 28 sites. Again, the sites were initially distributed between treated and untreated sections of the highway. Paving of the entire highway was completed in 2011 resulting in all sections of the highway being treated. Estimating the volume of material trapped behind the fill slope silt fences is accomplished in the same manner as that for the cut slope fences.

As with the cut slope silt fences, accumulation in the fill slope silt fences did not exhibit high runoff and erosion activity in 2015, reducing the need for cleaning. The upper fences at five fill slope sites (048FS, 052FS, 055FS, 083FS, and 086FS) in Basin 7 were damaged during highway construction in 2011. The upper fence at fill slope site 088FS (Basin 3: Severy and Ski Creek Watersheds) was damaged during highway construction in 2009. As a result, the upper fences from these six sites were removed from the sampling and not replaced, and the lower fences continue to be monitored. In addition, silt fences were removed from fill slope site 196FS and conveyance channel 245CC was established in 2009. In addition, one of the 50 fill slope silt fences was breached during the 2015 field season. Notes were taken in the field to document the condition of the silt fence during each site visit. In the *SiteSummary.xls file* on the data USB, site visit dates are annotated with the condition of the silt fence, any repairs or replacements that were completed to maintain the silt fence, and an indication if the fence was breached prior to the survey date. The sediment volume for the fill slope silt fences was recorded in the *SiteSummary.xls file* only if there was sediment removed from the fill slope silt fence. It can be assumed that there was zero sediment removed on all other silt fence site visits. A summary of fill slope site visits and sediment removed from fill slope silt fences for the 2015 monitoring season can be found in Appendix E. All fill slope data and photographs for 2015 are available on the accompanying data USB.

Numerous grab samples were collected from material trapped in the cut and fill slope silt fences throughout the 2015 field season. A subset of these was selected to be analyzed in the laboratory for particle size distribution. The balance of samples will be analyzed only if the variability in the particle size distribution of the subset of samples chosen for initial analysis warrants additional analysis. Laboratory analyses for the 2015 grab samples have been completed and a summary of particle size distributions and graphs are presented in Appendix F and on the accompanying data USB.

Initially, the monitoring plan anticipated taking measurements of the accumulation behind all silt fences two to three times per year. The actual number of measurements taken is dependent on many factors including; winter snowpack, soil moisture, number and size of rainfall events, and availability of crew members to clean-out silt fences while completing other tasks. Estimates of human induced erosion and sediment delivery (from cut slope, fill slope, and silt fences located down slope near the streamside or boundary of the 150-foot corridor), can be compared with estimates of "natural movement" estimated from what is trapped in the silt fencing placed above cut slopes for periods before and after mitigation to determine the effectiveness of the practice and other best management practices (BMPs) intended to reduce human induced erosion.

Using silt fences to monitor sediment transport has proven to be difficult where silt fences cross rock surfaces—frequent breaching and fence failure had occurred over the course of the study. Silt fences fail most frequently where fence material cannot be reliably fastened to rock surfaces, particularly at the base of cut slopes at higher elevations. As a corrective measure, the sampling protocol was revised for three cut slope monitoring sites (102CS, 123CS, and 141CS) that cross rock surfaces. The lower cut slope silt fences on each of these sites were replaced with two permanent survey cross sections (labeled A and B), one established at the vegetation line just below the upper fence and a second established 1/3 of the distance between the top of the cut slope and the road. The cross sections are the same length as the original fence and are monumented with rebar at each end. Monitoring consists of surveying the surface elevation, relative to the benchmark, of the cut slope cross section. The silt fence at the top of the cut slope has been maintained at all three sites. This procedural change is intended to provide a qualitative estimate of cut slope erosion in situations where a quantitative estimate is not feasible.

Cross section graphs for the three surveyed cut slope monitoring sites that correspond to the survey dates presented in Table 3 can be found in Appendix G. Photographs and survey data for all sites are available on the accompanying data USB.

Table 3. Management practices implemented below cut slope monitoring sites, and cut slope monitoring site survey dates, Pikes Peak 2015.

Site ID	Basin #	Watershed	Management Practice	Survey Dates	
102CS	6	WBVR	Asphalt Road, Shotcrete Ditch	6/30/2015	9/03/2015
123CS	6	FRENCH	Asphalt Road, Shotcrete Ditch	6/30/2015	9/03/2015
141CS	6	WBVR	Asphalt Road, Shotcrete Ditch	6/30/2015	9/03/2015

Armoring Drainage Channels

Drainage channels, which include both the drainage ditches along roads and the conveyance channels below culverts, were to be lined (armored) with riprap or concrete to control further erosion and deposition of sediment as mitigation progressed. However, all reaches except those meeting the criteria stated in the latest U.S. Forest Service Design Review (Burke 2002) are paved or lined with shotcrete, lined with erosion control fabric, or left untreated.

Effectiveness monitoring consists of monitoring the fabric-lined and unlined drainage ditches only, by establishing cross sections in the channels to be periodically surveyed, so that measured changes in cross sectional area could be used to determine if erosion or deposition was reduced or increased. Once drainage ditches were paved or lined with shotcrete, they were no longer surveyed. If visual inspection provides evidence of failure in the pavement or shotcrete, cross sections will be re-established and surveys completed to document change.

Conveyance channels are those features that drain water away from the road system to the streams below. For the most part, they are not physically treated or stabilized as part of the road mitigation effort, but road management practices may greatly alter the amount of discharge and sediment delivered to the conveyance channels. The monitoring technique is similar for both drainage ditches and conveyance channels, but the sample size differs.

Drainage Ditches

Most of the drainage ditches selected for monitoring were aligned with the road reaches previously selected to monitor changes in road surface. Additional drainage ditches were selected independently of the road reaches, as needed, to complete the desired road slope/contributing area/armoring material matrix defined in the monitoring plan. As with the road surface erosion transects, five cross sectional transects per segment of drainage channel (lined, not lined) were established (labeled A–E except for site 188DD, which has eight cross sections labeled A–H). For each cross section, a reference pin was located at the base of the cut slope on the inside of the ditch; a second pin was located on the edge of the road surface, if possible. Asphalt nails were used in the paved road surfaces to mark the end point if road conditions prohibited installation of rebar. The effectiveness of the lining methods in reducing erosion and deposition can be determined by obtaining cross section information at control sites for several years prior to, and then after, treatment. This information will be useful in the future as new drainage ditch segments are lined.

Four of the original 20 drainage ditches selected for monitoring had not been paved or lined with shotcrete and were surveyed in 2015. Sixteen of the original 20 drainage ditches had been paved or lined with shotcrete since monitoring began. The paving and shotcrete treatments eliminates the need for further monitoring unless visual inspection provides evidence of failure, in which case cross sections will be re-established and surveys completed to document change. The four remaining drainage ditches located in Basins 1 and 2 are lined with erosion control fabric and will continue to be surveyed annually. As noted earlier, drainage ditch 005DD may have been directly impacted and 010DD may be potentially impacted by the Crystal Creek Fuels Reduction Project, which may compromise future measurements at these site. For the upcoming South Catamount Creek Fuels Reduction Project, drainage ditches 182DD and 195DD have been documented to be potentially impacted by the planned harvest activity. Photographic and survey monitoring will be completed in 2016 field season to document any change resulting from the fuels reduction projects. Drainage ditch survey cross sections that correspond to the survey dates presented in Table 4 can be found in Appendix H. Drainage ditch survey data and photographs for 2015 are available on the accompanying data USB.

Table 4. Drainage ditches surveyed including description of road treatments above drainage ditches, treatments for drainage ditches, and drainage ditch survey dates, Pikes Peak 2015.

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Survey Date
005DD	1	SCAT	Asphalt	Erosion Control Fabric	8/25/2015
010DD	1	SCAT	Asphalt	Erosion Control Fabric	8/25/2015
182DD	2	SCAT	Asphalt	Erosion Control Fabric	7/16/2015
195DD	2	SCAT	Asphalt	Erosion Control Fabric	7/16/2015

Conveyance Channels

Monitoring the effectiveness of mitigation practices on conveyance channels also represents a critical component in the monitoring program. Many of these channels have eroded into gullies and have contributed to the sediment load of the wetland, riparian, and aquatic systems below. From mile marker seven to the summit, 115 conveyance channels were identified and surveyed during the first three years of monitoring. Two additional channels were identified and surveyed in 2009 and four additional channels were identified and surveyed in 2011. Two conveyance channel monitoring sites were eliminated during construction of sediment ponds in Basin 5 (Boehmer and East Fork of Beaver Creek Watersheds) and Basin 6 (East Fork and West Fork of Beaver Creek Watersheds). Conveyance channel 014CC was originally identified as a monitoring site, but was never surveyed. Conveyance channel 015CC located above sediment pond 199RW was lined with shotcrete in 2003 and is no longer surveyed. Conveyance channel 212CC was lined with rip rap in 2011. However, it continues to be monitored as the channel is exhibiting signs of failure. In 2012, two additional sites in Basin 7 (263CC and 265CC) were established in the channels below the new sediments ponds (262RW and 264RW).

It is not possible to survey all 117 conveyance channels every year. Instead, as many conveyance channels as possible are surveyed each year. Although, the entire highway has been paved, the fixed sub-sample of 13 conveyance channels that were initially selected to compare paved (7) and un-paved (6) road sections are surveyed annually, with the assumption that erosion, or changes in storage, from the paved segments will be zero. Conveyance channels located below the rock weirs are also surveyed annually. If the rock weirs are overtopped (as has been observed), changes in conveyance channel geometry may occur. Effectiveness of the rock weirs in mitigating sediment transport can be evaluated in part by comparing the erosion rate in the conveyance channels located or initiated below the rock weirs with erosion rates observed in other conveyance channels located in proximity to treated and untreated road segments. Every conveyance channel is surveyed using a series of three cross sections located within the 150-foot boundary of the highway corridor (labeled A–C except for site 053CC, which has four cross sections labeled A–D and site 232CC, which has five cross sections labeled A–E).

One-hundred and seven of 117 conveyance channels were surveyed in 2015 (Table 5). In addition, eight conveyance channels (108CC, 112CC, 115CC, 116CC, 117CC, 119CC, 209CC, and 220CC) were documented using photographic and observation monitoring. These sites were not surveyed due to the exposure of large boulders and the general instability of the slope following past rock weir failure. Three conveyance channels (113CC, 114CC and 118CC) which were previously monitored through observation and photographs only, were surveyed. In addition, conveyance channel 106CC was re-established as a new site (as pins were covered due to instability of slope) and also surveyed. As noted earlier, conveyance channels 004CC, 175CC, 218CC, 219CC, 220CC, 221CC, 222CC and 223CC may have been compromised by the Crystal Creek Fuels Reduction Project, which may affect the integrity of future measurements at these sites. Additionally, conveyance channels 012CC, 013CC, 225CC, and 228CC within the South Catamount Fuels Reduction Project are noted to be potentially impacted.

Table 5. Road and drainage ditch treatments associated with conveyance channels, treatments applied to conveyance channels, and conveyance channel survey dates, Pikes Peak 2015.

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
004CC	1	NCRY	Asphalt	Fabric	Culvert, Rip Rap	7/16/2015
012CC	2	SCAT	Asphalt	Fabric	Rock Weir	6/03/2015
013CC	2	SCAT	Asphalt	Fabric	Rock Weir	6/03/2015
016CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	7/20/2015
017CC	2	SCAT	Asphalt	Fabric	Culvert Removed	8/05/2015
018CC	2	NCRY	Asphalt	Shotcrete	Untreated	8/05/2015
019CC	2	SCAT	Asphalt	Fabric	Culvert Removed	8/19/2015
020CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	7/20/2015
021CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	7/21/2015
022CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	7/21/2015
023CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	7/21/2015
026CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	9/30/2015
028CC	2	NCRY	Asphalt	Shotcrete	Culvert Removed	8/03/2015
029CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	8/03/2015
030CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	8/03/2015
031CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	7/30/2015
032CC	2	SCAT	Asphalt	Shotcrete	Culvert Removed	7/20/2015
033CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Apron	7/30/2015
034CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	7/29/2015
035CC	7	SKIC	Asphalt	Shotcrete	Rip Rap	7/20/2015
036CC	7	NCRY	Asphalt	Shotcrete	Culvert	9/30/2015
037CC	7	NCRY	Asphalt	Shotcrete	Culvert, Rip Rap	6/29/2015
038CC	7	NCRY	Asphalt	Shotcrete	Culvert, Rip Rap	6/29/2015

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
040CC	1	NCRY	Asphalt, Asphalt Curb	Fabric	Straw Wattle	8/19/2015
053CC	7	SKIC	Asphalt	Shotcrete	Rip Rap	7/21/2015
054CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/21/2015
058CC	7	SKIC	Asphalt	Shotcrete	Culvert, Rip Rap	7/21/2015
063CC	7	SKIC	Asphalt	Shotcrete	Rock Weir	7/8/2015
064CC	7	SKIC	Asphalt	Shotcrete	Culvert, Rip Rap	7/7/2015
065CC	7	SKIC	Asphalt	Shotcrete	Culvert, Rip Rap	7/7/2015
066CC	7	SKIC	Asphalt	Shotcrete	Culvert, Rip Rap	7/72015
067CC	7	SKIC	Asphalt	Shotcrete	Culvert, Rip Rap	7/7/2015
068CC	7	SKIC	Asphalt	Shotcrete	Culvert Removed	7/8/2015
069CC	7	SKIC	Asphalt	Shotcrete	Culvert Removed	9/14/2015
070CC	7	SKIC	Asphalt	Shotcrete	Culvert Removed	9/14/2015
081CC	7	GLEN	Asphalt	Shotcrete	Pipe Back, Culvert Removed	7/72015
084CC	7	GLEN	Asphalt	Shotcrete	Culvert Removed	7/2/2015
089CC	3	SCAT	Asphalt	Shotcrete	Rock Weir	7/2/2015
091CC	3	SKIC	Asphalt	Shotcrete	Untreated	9/14/2015
094CC	3	SKIC	Asphalt	Shotcrete	Culvert Removed	9/14/2015
095CC	3	SKIC	Asphalt	Shotcrete	Culvert Removed	8/24/2015
096CC	3	SKIC	Asphalt	Shotcrete	Culvert Removed	9/14/2015
097CC	3	SKIC	Asphalt	Shotcrete	Culvert Removed	8/11/2015
099CC	3	SKIC/SCAT	Asphalt	Shotcrete	Cut-Off Wall, Rip Rap	7/6/2015
100CC	3	SVRY	Asphalt	Shotcrete	Culvert Removed	7/1/2015
104CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	7/2/2015
106CC	3	SVRY	Asphalt	Shotcrete	Culvert Removed	9/22/2015
108CC†	3	FRENCH	Asphalt	Shotcrete	Rock Weir	7/28/2015
109CC	3	SVRY/SCAT	Asphalt	Shotcrete	Culvert	9/22/2015
110CC	3	SVRY/SCAT	Asphalt	Shotcrete	Culvert	7/1/2015
111CC	3	SKIC/SCAT	Asphalt	Shotcrete	Cutoff Wall, Rip Rap	7/6/2015
112CC†	3	SCAT	Asphalt	Shotcrete	Culvert Removed	9/21/2015
113CC	3	SKIC	Asphalt	Shotcrete	Rock Weir	9/23/2015

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
114CC	4	FRENCH	Asphalt	Shotcrete	Rock Weir	9/24/2015
115CC†	4	SKIC/GLEN	Asphalt	Shotcrete	Culvert	9/21/2015
116CC†	4	SKIC/GLEN	Asphalt	Shotcrete	Culvert	9/21/2015
117CC†	4	SKIC/GLEN	Asphalt	Shotcrete	Culvert Removed	7/23/2015
118CC	4	SKIC/SCAT	Asphalt	Shotcrete	Cutoff Wall, Rip Rap	7/23/2015
119CC†	4	SKIC/SCAT	Asphalt	Shotcrete	Cutoff Wall, Rip Rap	7/20/2015
120CC	6	WBVR	Asphalt	Shotcrete	Sediment Pond	7/29/2015
121CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	8/14/2015
122CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	9/22/2015
125CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	6/30/2015
126CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	6/30/2015
127CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	6/30/2015
129CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	7/29/2015
130CC	6	FRENCH	Asphalt	Shotcrete	Pipe Back	7/30/2015
132CC	6	WBVR	Asphalt	Shotcrete	Culvert, Rip Rap	7/23/2015
133CC	6	EBVR	Asphalt	Shotcrete	Culvert, Rip Rap	7/22/2015
136CC	6	WBVR	Asphalt	Shotcrete	Untreated	7/30/2015
137CC	5	EBVR	Asphalt	Shotcrete	Untreated	8/14/2015
138CC	5	BHMR	Asphalt	Shotcrete	Untreated	7/22/2015
139CC	6	EBVR	Asphalt	Shotcrete	Rock Apron	7/2/2015
140CC	6	EBVR	Asphalt	Shotcrete	Untreated	7/22/2015
175CC	1	NCRY	Asphalt, Asphalt Curb	Untreated	Rock Apron	8/19/2015
184CC	2	SCAT	Asphalt	Shotcrete	Sediment Pond	6/23/2015
189CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Apron	7/30/2015
190CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Apron	7/30/2015
191CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Apron	7/30/2015
206CC	2	NCRY	Asphalt	Curb, Erosion Ctrl Fabric Ditch	Untreated	7/20/2015
207CC	6	WBVR	Asphalt	Shotcrete	Culvert Removed	7/29/2015
208CC	7	SKIC	Asphalt	Shotcrete	Untreated	7/21/2015
209CC†	7	SKIC	Asphalt	Shotcrete	Untreated	9/22/2015
210CC	2	SKIC	Asphalt	Shotcrete	Untreated	6/23/2015
211CC	2	SKIC	Asphalt	Shotcrete	Untreated	7/20/2015

Site ID	Basin #	Watershed	Road Treatment	Ditch Treatment	Channel Treatment	Survey Date
212CC	7	SKIC	Asphalt	Shotcrete	Culvert, Rip Rap	6/29/2015
213CC	6	FRENCH	Asphalt	Shotcrete	Untreated	7/14/2015
214CC	5	EBVR	Asphalt	Shotcrete	Untreated	8/14/2015
215CC	5	EBVR	Asphalt	Shotcrete	Untreated	8/24/2015
216CC	1	NCRY	Asphalt, Asphalt Curb	Asphalt	Rock Weir	9/9/2015
217CC	1	NCRY	Asphalt, Asphalt Curb	Asphalt	Rock Weir	9/9/2015
218CC	1	SCAT	Asphalt	Untreated	Rock Weir	6/16/2015
219CC	1	SCAT	Asphalt	Shotcrete	Rock Weir	6/16/2015
220CC†	1	SCAT	Asphalt	Fabric	Rock Weir	5/21/2015
221CC	1	NCRY	Asphalt	Shotcrete	Rock Weir	8/19/2015
222CC	1	NCRY	Asphalt	Shotcrete	Rock Weir	8/19/2015
223CC	1	SCAT	Asphalt	Fabric	Rock Weir	7/16/2015
224CC	2	NCRY	Asphalt	Asphalt	Rock Weir	6/4/2015
225CC	2	SCAT	Asphalt	Fabric	Rock Weir, Straw Wattles	6/1/2015
226CC	2	NCRY	Asphalt, Asphalt Curb	Fabric	Rock Weir	5/29/2015
227CC	2	NCRY	Asphalt, Asphalt Curb	Asphalt	Rock Weir	9/23/2015
228CC	2	SCAT	Asphalt	Fabric, Straw Wattles	Rock Weir	6/3/2015
229CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	6/15/2015
230CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	7/29/2015
231CC	2	NCRY	Asphalt	Shotcrete	Pipe Back, Rock Weir	7/29/2015
232CC	7	SCAT	Asphalt	Shotcrete	Untreated	9/17/2015
235CC	3	SVRY/SKIC	Asphalt	Shotcrete	Pipe Back, Rock Weir	7/6/2015
244CC	2	NCRY	Asphalt	Shotcrete	Untreated	8/5/2015
245CC	2	NCRY	Asphalt	Asphalt	Untreated	8/3/2015
246CC	5	EBVR	Asphalt	Shotcrete	Sediment Pond	7/22/2015
247CC	6	WBVR	Asphalt	Shotcrete	Sediment Pond	7/23/2015
251CC	7	NCRY	Asphalt	Shotcrete	Rock Weir	7/20/2015
253CC	7	SKIC	Asphalt,	Shotcrete	Rock Weir	7/22/2015
263CC	7	SKIC	Asphalt	Shotcrete	Sediment Pond	7/7/2015
265CC	7	SKIC	Asphalt	Shotcrete	Sediment Pond	6/23/2015
† Photographic and observation monitoring only.						

Cross sections for the conveyance channels listed in Table 5 are presented in Appendix I. At first glance, graphs of the conveyance channel cross sections presented in Appendix I may appear counter intuitive, as the low point in the cross section may be at the right or left end pin.

This presentation is not an error. Not all conveyance channels were formed as a result of natural drainage processes. Many were formed as the result of road related discharges and the flow path is across the slope rather than downslope, thus causing rills to form across the slope. The comparison of successive measurements provides the most useful information. Conveyance channel survey data and photographs for 2015 are available on the accompanying data USB.

Discharge Points

The mitigation practices implemented on the Pikes Peak Highway have five inherent goals, three of which relate to managing, or controlling, road related discharge. As a result, numerous modifications in the road side drainage network were made over the course of the paving process. Drainage ditches were lengthened and discharge points were altered, resulting in discharge water being diverted from one watershed to another. In the case of Severy Creek, for example, discharge into the watershed from the road prism has been virtually eliminated, reducing the erosive energy of flow in the conveyance channel and stream below as well as decreasing sediment supply. In contrast, discharge into South Catamount Creek, previously a "non-impacted" watershed has been increased. Increases or decreases in flow diverted off the road prism and into the conveyance channels draining to the stream channels can alter channel response and should be considered in any analysis of treatment effect. Table 6 lists the changes in the road drainage network and diversion points that have occurred during the course of the paving project. It should be noted that no attempt is made to quantify the amount of water diverted, only to document that water previously exiting at one point has been diverted to another point.

Sediment Traps (Sediment Ponds, Rock Weirs, and Cut-Off Walls)

The original mitigation plan called for building sediment ponds designed to trap sediment while allowing water to exit as a stream. Initially, the proposed monitoring consisted of periodic pond surveys to index sediment accumulation as well as measurement of the suspended sediment concentrations in discharge entering and exiting the pond. The combination of sediment accumulation in the pond plus the sediment exiting the pond in the outflow was intended to provide an estimate of total sediment transport. In accordance with the revised mitigation design, rock weirs presumably capable of detaining all the water and sediment discharged from the road segment for events up to the design storm have been constructed. The monitoring strategy assumes that the rock weirs detain all discharge long enough for the sediment to settle out, while the water percolates out of the rock weir through the porous berm. Measuring sediment accumulation in the rock weir presumably indexes total sediment movement. In the event the rock weir does not detain all the storm discharge delivered to it (actual discharge exceeds the design discharge or the rock weirs fail to function properly), silt fences have been installed on the downhill side of the rock weirs to trap sediment carried in surface discharge passing over or through the berm. A silt fence is preferred over grab samples of discharge because any overflow or through flow that occurs is most likely to be diffused and not concentrated. Also, using a silt fence to trap the sediment provides a measure of total transport. The measurement protocol for these silt fences is the same as that employed for the cut and fill slope silt fences.

Table 6. Changes in road drainage network and discharge points including year treated, treatments for drainage ditches, and reason for change, Pikes Peak 2015.

Site ID	Basin #	Change in Watershed	Year Treated	Ditch Treatment	Comment
234RW	3	SVRY>SKIC	2014	Shotcrete, Pipe Back	Rock Weir 234RW breached in 2011. In 2014, weir was rebuilt and a pipe back installed to divert discharge from 234RW (SVRY) to sediment pond 237RW (SKIC).
188DD	2	NCRY>SCAT	2013	Shotcrete, Pipe Back	Historically 188DD drained into 176RW, 178RW, 179RW, 180RW, 181RW NCRY. In 2013, ditch lined with shotcrete eliminated drainage into all weirs except 176RW. Pipe back diverted water to SCAT.
080DD	7	GLEN>SKIC	2011	Shotcrete, Pipe Back	Drainage ditches 080DD, 082DD, and 085DD combined into one continuous drainage ditch, lined with shotcrete in 2011. Watershed for 080DD, 082DD changed to SKIC. Watershed for 085DD did not change as it was always SKIC.
082DD	7	GLEN>SKIC	2011	Shotcrete, Pipe Back	
085DD	7	SKIC	2011	Shotcrete, Pipe Back	
109CC	3	SVRY>SKIC	2007	Shotcrete, Culvert	Discharge from conveyance channels 109CC and 110CC originally drained into 100CC (SVRY). The culvert for 100CC was plugged in 2007 diverting drainage from 109CC and 110CC into 238RW (SCAT).
110CC	3	SVRY>SKIC	2007	Shotcrete, Culvert	
236RW	3	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	Ski Creek diversion diverted all alpine runoff to Glen Cove Watershed in 2003.
238RW	3	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	
242RW	4	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	
243RW	4	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	
115CC	4	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	
116CC	4	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	
117CC	4	SKIC>GLEN	2003	Shotcrete, Cut-off wall, rip rap	

As with the road surface erosion transects, four sediment ponds (199RW, 237RW, 256RW, and 264RW) are surveyed using a series of cross sections (labeled A–C except for site 256RW, which has four cross sections labeled A–D and site 199RW, which has five cross sections labeled A–E) to estimate volumetric changes in sediment accumulation. Three sediment ponds (258RW, 260RW, and 262RW) are monitored by recording observations in the field notes and using photographic monitoring to document changes. In those few cases where there is a defined inflow and outflow to a pond, water samples to estimate trap efficiency can be grab sampled from the inlet and outlet of the ponds as originally planned. Surveys of the sediment traps should be completed after spring snowmelt and again after significant rainfall events, perhaps a total of four times per year. In addition, surveys taken before and after rock weir cleaning can be used to estimate the total volume or amount of material removed and this cumulative estimate can be used to verify appropriateness or adjust estimates based on the incremental surveys.

As noted above, any conveyance channels that appear to be present below the rock weirs are monitored. If the rock weirs overtop or exhibit concentrated thru-flow, any changes in the conveyance channel geometry that may result should be documented by the surveys. If the rock weirs are effective in reducing the erosive energy of the discharge, the reduction in erosion in the conveyance channels can be documented by comparing response in channels draining treated and untreated road segments.

In 2012, the highway crew removed five breached rock weirs (236RW, 238RW, 240RW, 242RW, and 243RW) in the switchbacks (Basins 3 and 4: Upper Ski and North French Creeks) and replaced them with cutoff walls with riprap aprons below (Figure 7). Photographic and observation monitoring are used to document changes at these sites along with three sediment ponds (258RW, 260RW, and 262RW). As noted earlier, rock weirs 002RW, 003RW, 006RW, 008RW, and 009RA, or their contributing area, may have been compromised by the Crystal Creek Fuels Reduction Projects. Additionally, rock weirs 152RW and 153RW within the South Catamount Fuels Reduction Project area have been identified as "at risk" if directly impacted by the proposed treatment.

Figure 7. Rock weir 243RW was removed and replaced with cutoff wall with riprap apron below, Pikes Peak 2012.

Thirty-two sediment traps were monitored in 2015, including 20 rock weirs, seven sediment ponds, and five cutoff walls with riprap aprons below. Seventeen sites were surveyed at least twice to monitor trapped sediment from winter and summer runoff. All 20 rock weirs were surveyed and sediment volume was measured in the silt fences located down slope of 15 rock weirs. Seven of the 20 rock weirs overtopped during all rain events throughout the field season (Figure 8).

Figure 8. Rock weir 252RW filled with sediment and overtopping during spring runoff, Pikes Peak June 16, 2015.

Heavy snowfall in the spring of 2015 above timberline affected sediment traps 236RW, 237RW, 239RW, and 241RW. Snow and ice blocks formed in the contributing drainage ditches causing rills and head cuts to form around these sites. An ice block above sediment trap 238RW diverted water and sediment away from the cut-off wall and down the side of the highway (Figure 9) to the fill slope below (Figure 10).

As noted earlier for silt fences on the cut and fill slopes, volume data estimated from surveys or cleaning from the breached rock weirs or sediment fences below rock weirs may under estimate total sediment production. Survey dates for the rock weirs and sediment ponds are presented in Table 7. A summary of rock weir silt fence site visits, and sediment accumulation in rock weir silt fences and the rock weirs for the 2015 monitoring season, as well as rock weir and sediment pond cross sections from 2015 are presented in Appendix J.

The average elevations for the rock weir surfaces were obtained by determining the average elevation of the survey points. The volumetric change between the two surveys was then estimated by multiplying the difference in the average geo-referenced elevations for the two surveys by the area of the rock weir (Appendix J). As noted earlier, the negative values imply a decrease in sediment accumulation between two surveys. Sediment trap data and photographs for 2015 are available on the accompanying data USB.

Grab samples of the sediment retained in both the rock weirs and silt fences below the weirs were collected each time the weirs were surveyed or the fences cleaned. As noted earlier, a subset of these grab samples was selected for analysis of particle size distribution. The balance of samples will be analyzed only if the variability in the particle size distribution of the subset of samples chosen for initial analysis warrants additional analysis. In addition, water samples to

Figure 9. Ice block above 238RW (top) diverted water away from the rock weir and down the side of the highway (bottom), Pikes Peak June 1, 2015.

Figure 10. Water and sediment diverted away from 238RW to the fill slope below, Pikes Peak June 1, 2015.

determine suspended sediment were collected from the inflow and outflow of the sediment ponds 199RW, 237RW, and 262RW. Laboratory analyses for the 2015 grab samples have been completed and a summary of particle size distributions and graphs are presented in Appendix K and on the accompanying data USB. Laboratory analyses on the suspended sediment samples for the 2015 field season are presented in Appendix L and on the accompanying data USB.

VALIDATION MONITORING

Validating the effect of road restoration practices on aquatic, wetland, and riparian conditions is more difficult than determining the effectiveness of mitigation practices in reducing erosion and sedimentation at specific locations on site or close to the highway. On-site response to the mitigation practices should be direct, dramatic, and occur in real time. Off-site response, such as in the stream channels, is likely to be more diffused, less dramatic, cumulative in nature, and subject to changes in condition elsewhere in the watershed, all of which make validation of response to road related mitigation complex. The watersheds of concern have been subject to road related impacts for more than 80 years. Any road-related degradation in the channel systems is the aggregate result of long-term, road-related discharge and sediment pulses. The interruption of those pulses as a result of road mitigation practices may be too subtle to be detectable in the near term, therefore creating a challenge in selecting the most appropriate indicator metric.

Table 7. Management practices implemented above sediment traps, and sediment trap survey dates, Pikes Peak 2015.

Site ID	Basin #	Watershed	Management Practice	Survey Dates	
002RW	1	SCAT	Untreated Ditch	6/16/2015	9/30/2015
003RW	1	SCAT	Shotcrete Ditch	6/16/2015	9/30/2015
006RW	1	SCAT	Fabric Ditch	6/16/2015	9/30/2015
008RW	1	NCRY	Shotcrete Ditch	5/28/2015	8/19/2015
009RA	1	SCAT	Fabric Ditch	5/28/2015	8/19/2015
152RW	2	SCAT	Fabric Ditch	6/1/2015	9/24/2015
153RW	2	SCAT	Fabric Ditch	6/3/2015	9/24/2015
161RW	2	NCRY	Asphalt Curb and Ditch	5/27/2015	9/23/2015
162RW	2	NCRY	Asphalt Ditch	5/27/2015	9/30/2015
176RW	2	NCRY	Shotcrete Ditch	6/15/2015	9/23/2015
199RW	2	SCAT	Shotcrete Ditch, Pipe Back	6/23/2015	9/24/2015
200RW	1	NCRY	Asphalt Curb and Ditch	6/17/2015	
201RW	2	NCRY	Asphalt Curb and Ditch	5/29/2015	
202RW	2	SCAT	Asphalt Ditch	5/27/2015	9/24/2015
233RW	3	SCAT	Shotcrete Ditch	7/2/2015	9/21/2015
234RW†	3	SVRY/SKIC	Shotcrete Ditch, Pipe Back	7/6/2015	
236RW∞	3	SKIC/SCAT	Shotcrete Ditch, Cutoff Wall, Rip Rap	6/1/2015	
237RW	3	SKIC	Shotcrete Ditch, Culvert Removed	7/6/2015	9/21/2015
238RW∞	3	SKIC/SCAT	Shotcrete Ditch, Cutoff Wall, Rip Rap	7/6/2015	
239RW	3	FRENCH	Shotcrete Ditch	7/28/2015	
240RW∞	3	SKIC	Shotcrete Ditch, Cutoff Wall, Rip Rap	7/6/2015	
241RW	4	FRENCH	Shotcrete Ditch	7/28/2015	
242RW∞	4	SKIC/SCAT	Shotcrete Ditch, Cutoff Wall, Rip Rap	7/23/2015	
243RW∞	4	SKIC/SCAT	Shotcrete Ditch, Cutoff Wall, Rip Rap	7/20/2015	
250RW	7	NCRY	Shotcrete Ditch	6/17/2015	9/23/2015
252RW	7	SKIC	Shotcrete Ditch	6/16/2015	
254RW	7	SKIC	Shotcrete Ditch	6/16/2015	9/23/2015
256RW	6	WBVR	Shotcrete Ditch, Culvert	7/29/2015	
258RW†	6	WBVR	Shotcrete Ditch, Culvert	7/23/2015	
260RW†	5	EBVR	Shotcrete Ditch	7/22/2015	
262RW†	7	SKIC	Shotcrete Ditch	6/29/2015	
264RW	7	SKIC	Shotcrete Ditch	6/23/2015	9/23/2015

† Photographic and observation monitoring only due to instability of slope.
∞Rock weir removed in 2012 and replaced with cutoff wall and riprap apron below. Photographic and observation monitoring only.

The scale chosen for validation monitoring is that of the stream channel reach. Within each stream reach selected, channel morphology, bed and bank particle size distribution, bank erosion, and vegetation diversity is monitored and characterized. A suite of tributaries in the Pikes Peak Watershed were identified as either impacted or non-impacted by the presence of the Pikes Peak Highway (Chavez et al. 1993). North Catamount, South Catamount, Glen Cove, Oil, and Boehmer Creeks represent previously non-impacted streams. Ski, Severy, East Fork of Beaver, North Fork of Crystal, and West Fork of Beaver Creeks are all considered stream systems impacted by the highway. Study reaches have been selected in each of the 10 streams, and periodic monitoring will be conducted in each stream reach for the entire 15-year study period. Oil Creek has only one monitored stream reach because the upper portion of the stream is on private land and not accessible. Glen Cove Creek has only one stream reach because it is a small tributary of South Catamount Creek, which has three stream reaches. All other streams have two stream reaches. Because response can be expected to be gradual, it is not necessary that all streams be measured every year; however, annual measurement is completed if time permits.

The monitoring assumption is that stream channel adjustments that might occur in the impacted stream reaches following road mitigation practices will not occur on either the reference stream reaches (those not influenced by the highway) or in the impacted streams draining the portions of highway during that period prior to receiving mitigation. However, this does not imply that differences that may have existed at the start of the monitoring program between the five reference and the five impacted stream systems were the consequence of road-related impacts. Rather, any long-term trends in convergence or divergence in the comparison of conditions in the impacted and the control stream reaches following road mitigation will be evaluated as potential indicators of stream channel response to highway mitigation practices.

The techniques proposed by Harrelson et al. (1994) were used to establish the stream channel reference sites. Selected stream reaches are at least 100 meters in length and contain several meander lengths or riffle-pool-riffle complexes. In 2005, two additional reaches were established in response to the diversion wall built on Ski Creek to divert all alpine runoff away from Ski Creek and into Glen Cove Creek. Glen Cove Creek is a tributary to South Catamount Creek, and enters upstream from the two reference stream reaches on South Catamount Creek. The diversion on Ski Creek increased discharge into both Glen Cove and South Catamount Creeks and additional monitoring seemed warranted, since what were considered non-impacted streams are now being impacted.

Stream Channel Cross Sections

Five channel cross sections have been located and permanently referenced in each of the stream reaches, following the selection and installation criteria in Harrelson et al. (1994). The purpose for the cross sections is to document changes in channel cross sectional geometry that may occur over time. Five cross sections in a 100-meter stream reach should be adequate to provide an indication of change in channel cross section geometry, should it occur naturally or as the consequence of mitigation. In addition to the cross sections, longitudinal surveys of the channel thalweg through the stream reach are conducted to document surface water and thalweg slope and location (Harrelson et al. 1994). Over time, changes in geometry such as width to depth ratios in the cross sections, thalweg elevation and location in the floodplain, longitudinal profile, or channel gradient through the reach may reflect a response to road mitigation impacts on sediment supply or discharge energy when compared to responses in the control reaches. If possible, cross sections are surveyed each fall so that changes in channel geometry can be documented on an annual basis. Because it can be expected that channel responses to the road mitigation practices will not be as robust as other metrics, it is not critical that each stream be surveyed each year.

Surveys were completed on all stream reaches (Boehmer, Glen Cove, North Catamount, North Fork of Crystal, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks) except East Fork of Beaver Creek because a thunder storm interrupted the initial attempt and the crew was unable to return to the site. Stream channel cross sections from the 2015 monitoring season can be found in Appendix M. Stream channel cross section and thalweg survey data for 2015 are available on the accompanying data USB.

Bank Erosion

Bank erosion is being documented primarily through the channel cross section surveys. If the channel is actively down cutting or migrating laterally, the change is an index to bank erosion. Additional bed and bank features are also displayed in a map of the stream reach (Harrelson et al., 1994) and through the use of permanent photo points. In each stream reach, measuring and comparing the lengths of bank that are stable versus lengths of bank that are actively eroding also provides an index of the proportion of eroding banks. If the stream reach contains areas of significant bank erosion, bank pins will be installed to measure the lateral rate of erosion.

Installation of such pins is only warranted if erosion appears to be active and severe in certain locations within the stream reach or if the onset of bank erosion begins to occur during the monitoring period. Over the long-term, the five cross sections located within a 100-meter stream reach should index channel and bank stability by documenting changes in channel geometry and location. Secondary measures such as thalweg surveys and bank erosion monitoring should help document any further change.

In 2015, measurements specific to bank erosion consisted of channel cross section surveys, thalweg surveys, and photographic documentation. There were no visual indications that bank erosion was significant enough to warrant installation of bank pins to measure the lateral rate of erosion.

Particle Size Distribution

Assuming that road mitigation practices are effective in reducing discharge energy and sediment delivery to the channel system, and that no offsetting responses occur, the percentage of fine particles in the stream channel bed can be expected to decrease over time. A greater percentage of the stream bed is likely to be composed of larger particles as the fine particles are winnowed out and not replaced. This assumes that the resulting flow regime is adequate to carry the sediment supply, as a severe reduction in flow without a reduction in available sediment could cause aggradation. The composition of the sediment trapped behind silt fences, and deposited in rock weirs and in bars on the stream reaches is assessed through the collection of grab samples and analyzed in the laboratory for particle size distribution. Comparing the particle size distribution in material captured in traps near the highway with sediment deposits (bars) in the streams and pebble counts taken in the stream channel should validate response to highway mitigation practices.

Pebble Counts

Pebble counts in each stream reach are conducted during each survey using the Bevenger and King Pebble Count Procedure (Bevenger and King, 1995). The procedure calls for a zigzag sampling pattern that passes through the stream reach, crossing from bank to bank. Three-hundred particles are sampled in each survey and one survey per field season is completed in each of the stream reaches. To help support this aspect of the validation monitoring, the particle size distribution of the material caught in silt fences and in the rock weir sediment traps is available for comparison to the bed material in the streams.

Stream pebble counts were completed on Glen Cove, North Catamount, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks. A pebble count was not completed on North Fork Crystal Creek as the stream bed is dry, inactive, and vegetation is encroaching into the channel. Pebble counts were also not completed on Boehmer and East Fork Beaver Creeks because of thunder storms. A summary of the stream channel particle size distribution from the pebble counts is presented in Table 8. Stream pebble count particle size distribution graphs from the 2015 monitoring season can be found in Appendix N and on the accompanying data USB.

Table 8. Summary of particle size distribution of pebble counts in stream channels, Pikes Peak 2015.

Site Name	Site ID	Date	Particle Size Distribution (mm) - Pebble Counts 2015					
			D15	D35	D50	D84	D95	D100
Glen Cove Creek Reach 1	GLEN1	8/26/2015	1.000	5.102	10.173	26.056	170.010	510.0
North Catamount Creek Reach 1	NCAT1	9/9/2015	0.500	2.027	3.737	8.559	11.771	18.0
North Catamount Creek Reach 2	NCAT2	9/9/2015	1.438	3.530	5.472	11.336	19.085	24.0
Oil Creek Reach 1	OILC1	8/20/2015	0.177	4.257	15.398	51.827	107.708	200.0
Severy Creek Reach 1	SVRY1	9/1/2015	0.000	0.707	2.128	8.477	16.832	186.0
Severy Creek Reach 2	SVRY2	9/1/2015	0.953	12.589	25.858	90.597	139.619	310.0
Ski Creek Reach 1	SKIC1	8/20/2015	0.216	6.557	17.163	96.677	204.705	490.0
Ski Creek Reach 2	SKIC2	9/8/2015	0.616	8.811	20.615	110.851	192.000	490.0
South Catamount Creek Reach 1	SCAT1	8/4/2015	0.717	6.773	12.188	31.412	47.396	96.0
South Catamount Creek Reach 2	SCAT2	8/4/2015	1.117	3.398	5.743	16.662	39.192	123.0
South Catamount Creek Reach 3	SCAT3	8/26/2015	0.910	3.434	5.331	10.984	15.009	104.0
West Fork Beaver Creek Reach 1	WBVR1	9/16/2015	0.000	4.132	8.761	196.319	413.130	740.0
West Fork Beaver Creek Reach 2	WBVR2	9/16/2015	0.876	7.182	19.388	44.316	61.004	103.0

Grab Samples

Sediment grab samples were collected from bars on all streams surveyed in 2015 except East Fork Beaver Creek because of thunder storms and North Fork Crystal Creek; as mentioned above, this stream bed is dry, inactive, and vegetation is encroaching into the channel. Comparing the distribution of material captured in traps near the highway to sediment deposits (bars) in the streams may be useful in validating response to highway mitigation practices. Laboratory analyses for the 2015 grab samples have been completed and a summary of stream channel particle size distributions and graphs for 2015 are presented in Appendix O and on the accompanying data USB.

Vegetation

Vegetation photo points established at the top of the left and right banks (facing downstream) at each cross section have been monumented and are intended to document changes in vegetation type, density, and percent cover over time as riparian and wetland areas recover (Hall 2002). Vegetation is grouped into general categories of moss, grass, sedge, forb, or shrub to document vegetation presence. Percent cover is estimated for the top of bank area 1.5-feet on either side of the center line of the cross section. This monitoring is not intended to determine the degree of departure that current conditions might reflect relative to a reference value. Monitoring will document the evolution or transition that occurs as the disturbed streams respond to the effects of road mitigation and will allow for comparison of any trends to those that occur in the control stream reaches.

Vegetation photo points were completed for Boehmer, Glen Cove, North Catamount, North Fork of Crystal, Oil, Severy, Ski, South Catamount, and West Fork of Beaver Creeks. The riparian vegetation summary from the 2015 monitoring season is presented in Appendix P. Vegetation data and photographs from 2015 are available on the accompanying data USB.

SUMMARY

The 2015 monitoring season, even though it got off to a slow start due to heavy snowfall and freezing temperatures, was very successful with regard to the number of sites visited, the amount of data collected, and the quality of the data. A total of 205 sites were monitored during the 2015 field season, many of which were visited more than once.

Heavy snowfall in the spring above timberline affected several sediment traps. Snow and ice blocks formed in the contributing drainage ditches causing rills and head cuts to form around the sediment traps. For the most part, the summer was somewhat uneventful. Rainfall events were not particularly large, but overtopping of the rock weirs was somewhat frequent. This was more a reflection of under design than storm size.

As noted, several monitoring sites were compromised by the fuels reduction treatments. There are two years left in the monitoring project. Now that the entire highway has been paved, all monitoring sites are exposed to, and reflect, the post treatment conditions.

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Acknowledgements

Many thanks to the U.S. Forest Service Pikes Peak Ranger District and Rocky Mountain Research Station for all their logistical, technical, laboratory, and related assistance. Thanks to the City of Colorado Springs, the Pikes Peak Highway Crew, and Highway Project Managers who shared their time and invaluable knowledge.

Thanks also to the City of Colorado Springs, the Public Works Department of Cripple Creek, and the Tezak Family for allowing access to closed and/or private watersheds for the validation monitoring.

Thanks to volunteer Page Saulsbury from the University of Colorado, Colorado Springs for her hard work during two big stream survey days.

Special thanks to METI Inc., the U.S. Forest Service, EMC Resource Information Group, and Jeff Hovermale, U.S. Forest Service, Pikes Peak Ranger District for a successful thirteenth year.

We are especially grateful for the open communication between Jeff Hovermale, U.S. Forest Service, Pikes Peak Ranger District, Jack Glavan and Dave Jordan, City of Colorado Springs, Pikes Peak Highway Department, and Josh VonLoh and Hannah Karlsson, METI Inc., Pikes Peak Monitoring Project Field Crew.

Thanks also to Josh VonLoh for nine years of dedicated service. His commitment and hard work on the Pikes Peak Monitoring Project are much appreciated. We wish him the best in his future endeavors. He will be missed!

Appendix A

Site Locations for

Effectiveness and Validation Monitoring

2015

Site Locations for Effectiveness and Validation Monitoring, Pikes Peak 2015†

Site ID	Latitude (hddd°mm.mmm)	Longitude (hddd°mm.mmm)	Altitude (ft)	Feature Description
001FS	N38 55.211	W105 02.238	9410	Fill Slope
002RW	N38 55.224	W105 02.264	9410	Rock Weir
003RW	N38 55.200	W105 02.258	9416	Rock Weir
004CC	N38 55.132	W105 02.278	9431	Conveyance Channel
005DD	N38 55.087	W105 02.415	9447	Drainage Ditch
006RW	N38 55.109	W105 02.482	9415	Rock Weir
007FS	N38 55.094	W105 02.520	9414	Fill Slope
008RW	N38 55.075	W105 02.554	9417	Rock Weir
009RA	N38 55.046	W105 02.655	9443	Rock Apron
010DD	N38 54.907	W105 02.734	9457	Drainage Ditch
011CS	N38 54.909	W105 02.730	9459	Cut Slope
012CC	N38 54.748	W105 03.060	9528	Conveyance Channel
013CC	N38 54.730	W105 03.068	9525	Conveyance Channel
015CC	N38 54.603	W105 03.174	9547	Conveyance Channel
016CC	N38 54.602	W105 03.111	9525	Conveyance Channel
017CC	N38 54.510	W105 03.246	9565	Conveyance Channel
018CC	N38 54.472	W105 03.298	9576	Conveyance Channel
019CC	N38 54.457	W105 03.384	9599	Conveyance Channel
020CC	N38 54.345	W105 03.383	9637	Conveyance Channel
021CC	N38 54.299	W105 03.461	9668	Conveyance Channel
022CC	N38 54.288	W105 03.552	9692	Conveyance Channel
023CC	N38 54.272	W105 03.583	9701	Conveyance Channel
024CC	N38 54.289	W105 03.638	9715	Conveyance Channel
025CC	N38 54.258	W105 03.697	9744	Conveyance Channel
026CC	N38 54.232	W105 03.643	9752	Conveyance Channel
027CC	N38 54.183	W105 03.652	9771	Conveyance Channel
028CC	N38 54.149	W105 03.714	9818	Conveyance Channel
029CC	N38 54.145	W105 03.816	9856	Conveyance Channel
030CC	N38 54.134	W105 03.828	9855	Conveyance Channel
031CC	N38 54.130	W105 03.829	9861	Conveyance Channel
032CC	N38 54.159	W105 03.836	9858	Conveyance Channel
033CC	N38 54.106	W105 03.854	9886	Conveyance Channel
034CC	N38 54.037	W105 03.896	9940	Conveyance Channel
035CC	N38 53.909	W105 04.000	10060	Conveyance Channel
036CC	N38 53.866	W105 03.875	10126	Conveyance Channel
037CC	N38 53.821	W105 03.855	10217	Conveyance Channel
038CC	N38 53.759	W105 03.787	10254	Conveyance Channel
039FS	N38 54.910	W105 02.812	9455	Fill Slope
040CC	N38 54.914	W105 02.789	9464	Conveyance Channel
041CP	N38 53.807	W105 03.893	10072	Road Survey Control Point
042DD	N38 53.719	W105 03.746	10161	Drainage Ditch
043FS	N38 53.726	W105 03.764	10180	Fill Slope
044RX	N38 53.726	W105 03.763	10183	Road Cross Section
045CS	N38 53.657	W105 03.868	10266	Cut Slope

Site ID	Latitude (hddd°mm.mmm)	Longitude (hddd°mm.mmm)	Altitude (ft)	Feature Description
046DD	N38 53.658	W105 03.868	10268	Drainage Ditch
047RX	N38 53.658	W105 03.868	10268	Road Cross Section
048FS	N38 53.651	W105 03.880	10275	Fill Slope
049CS	N38 53.592	W105 04.020	10406	Cut Slope
050RX	N38 53.593	W105 04.020	10404	Road Cross Section
051DD	N38 53.593	W105 04.021	10397	Drainage Ditch
052FS	N38 53.593	W105 04.021	10401	Fill Slope
053CC	N38 53.560	W105 04.127	10478	Conveyance Channel
054CC	N38 53.579	W105 04.148	10448	Conveyance Channel
055FS	N38 53.612	W105 04.095	10445	Fill Slope
056RX	N38 53.614	W105 04.096	10442	Road Cross Section
057DD	N38 53.613	W105 04.095	10445	Drainage Ditch
058CC	N38 53.513	W105 04.057	10512	Conveyance Channel
059CS	N38 53.353	W105 04.222	10697	Cut Slope
060RX	N38 53.354	W105 04.219	10691	Road Cross Section
061DD	N38 53.221	W105 04.381	10808	Drainage Ditch
062RX	N38 53.216	W105 04.381	10805	Road Cross Section
063CC	N38 53.223	W105 04.394	10803	Conveyance Channel
064CC	N38 53.448	W105 04.155	10634	Conveyance Channel
065CC	N38 53.382	W105 04.192	10679	Conveyance Channel
066CC	N38 53.336	W105 04.243	10701	Conveyance Channel
067CC	N38 53.297	W105 04.299	10736	Conveyance Channel
068CC	N38 53.251	W105 04.305	10841	Conveyance Channel
069CC	N38 53.019	W105 04.287	10989	Conveyance Channel
070CC	N38 52.956	W105 04.276	11028	Conveyance Channel
071DD	N38 52.972	W105 04.285	11017	Drainage Ditch
072RX	N38 52.972	W105 04.285	11015	Road Cross Section
073ST	N38 52.879	W105 04.311	11062	Sediment Trap
074FS	N38 52.927	W105 04.272	11053	Fill Slope
075RG	N38 53.797	W105 03.890	10109	Precipitation Gauge
076RG	N38 52.582	W105 03.970	11810	Precipitation Gauge
077RG	N38 51.783	W105 03.999	13069	Precipitation Gauge
078CS	N38 53.331	W105 04.275	10478	Cut Slope
079FS	N38 52.882	W105 04.382	11254	Fill Slope
080DD	N38 52.865	W105 04.391	11256	Drainage Ditch
081CC	N38 52.943	W105 04.415	11194	Conveyance Channel
082DD	N38 52.787	W105 04.376	11284	Drainage Ditch
083FS	N38 52.777	W105 04.362	11288	Fill Slope
084CC	N38 52.796	W105 04.471	11360	Conveyance Channel
085DD	N38 52.786	W105 04.410	11313	Drainage Ditch
086FS	N38 52.602	W105 04.390	11447	Fill Slope
087CS	N38 52.435	W105 04.432	11542	Cut Slope
088FS	N38 52.388	W105 04.549	11590	Fill Slope
089CC	N38 52.391	W105 04.555	11580	Conveyance Channel
090CS	N38 52.366	W105 04.540	11604	Cut Slope
091CC	N38 52.402	W105 04.414	11643	Conveyance Channel

Site ID	Latitude (hddd°mm.mmm)	Longitude (hddd°mm.mmm)	Altitude (ft)	Feature Description
092DD	N38 52.432	W105 04.204	11781	Drainage Ditch
093FS	N38 52.399	W105 04.401	11642	Fill Slope
094CC	N38 52.540	W105 04.069	11873	Conveyance Channel
095CC	N38 52.452	W105 04.205	11787	Conveyance Channel
096CC	N38 52.379	W105 04.217	11746	Conveyance Channel
097CC	N38 52.381	W105 04.310	11678	Conveyance Channel
098FS	N38 52.265	W105 03.995	12242	Fill Slope
099CC	N38 52.131	W105 04.046	12319	Conveyance Channel
100CC	N38 52.133	W105 03.936	12353	Conveyance Channel
101FS	N38 52.097	W105 03.875	12390	Fill Slope
102CS	N38 51.641	W105 04.063	12963	Cut Slope
103FS	N38 51.491	W105 04.021	12950	Fill Slope
104CC	N38 51.444	W105 03.894	12923	Conveyance Channel
105FS	N38 51.062	W105 03.694	13083	Fill Slope
106CC	N38 52.082	W105 03.858	12251	Conveyance Channel
107DD	N38 52.044	W105 03.824	12312	Drainage Ditch
108CC	N38 51.994	W105 03.769	12362	Conveyance Channel
109CC	N38 52.027	W105 03.825	12393	Conveyance Channel
110CC	N38 52.062	W105 03.914	12448	Conveyance Channel
111CC	N38 52.051	W105 03.992	12511	Conveyance Channel
112CC	N38 52.049	W105 03.933	12531	Conveyance Channel
113CC	N38 52.002	W105 03.873	12577	Conveyance Channel
114CC	N38 51.956	W105 03.840	12601	Conveyance Channel
115CC	N38 51.977	W105 03.995	12692	Conveyance Channel
116CC	N38 51.940	W105 04.080	12736	Conveyance Channel
117CC	N38 51.925	W105 04.141	12777	Conveyance Channel
118CC	N38 51.912	W105 04.177	12797	Conveyance Channel
119CC	N38 51.914	W105 04.032	12850	Conveyance Channel
120CC	N38 51.823	W105 04.090	12876	Conveyance Channel
121CC	N38 51.439	W105 03.804	12877	Conveyance Channel
122CC	N38 51.347	W105 03.789	12920	Conveyance Channel
123CS	N38 51.361	W105 03.782	12920	Cut Slope
124FS	N38 51.362	W105 03.788	12931	Fill Slope
125CC	N38 51.238	W105 03.806	12986	Conveyance Channel
126CC	N38 51.158	W105 03.789	13031	Conveyance Channel
127CC	N38 51.032	W105 03.697	13064	Conveyance Channel
128FS	N38 50.930	W105 03.732	13072	Fill Slope
129CC	N38 50.897	W105 03.662	13068	Conveyance Channel
130CC	N38 50.900	W105 03.177	13183	Conveyance Channel
131CC	N38 50.940	W105 03.382	13088	Conveyance Channel
132CC	N38 50.840	W105 03.274	13217	Conveyance Channel
133CC	N38 50.768	W105 03.213	13282	Conveyance Channel
134CC	N38 50.671	W105 03.035	13401	Conveyance Channel
135CC	N38 50.285	W105 02.872	13677	Conveyance Channel
136CC	N38 50.299	W105 02.931	13624	Conveyance Channel
137CC	N38 50.260	W105 02.755	13733	Conveyance Channel

Site ID	Latitude (hddd°mm.mmm)	Longitude (hddd°mm.mmm)	Altitude (ft)	Feature Description
138CC	N38 50.221	W105 02.605	13805	Conveyance Channel
139CC	N38 50.774	W105 03.110	13370	Conveyance Channel
140CC	N38 50.730	W105 03.195	13327	Conveyance Channel
141CS	N38 51.043	W105 03.690	13103	Cut Slope
152RW	N38 54.912	W105 02.837	9444	Rock Weir
153RW	N38 54.741	W105 03.066	9457	Rock Weir
154RX	N38 52.040	W105 03.817	12112	Road Cross Section
155DD	N38 51.245	W105 03.803	12917	Drainage Ditch
156RX	N38 51.244	W105 03.799	12922	Road Cross Section
157DD	N38 51.074	W105 03.684	13100	Drainage Ditch
158RX	N38 51.074	W105 03.683	13099	Road Cross Section
159DD	N38 51.610	W105 04.072	13091	Drainage Ditch
160RX	N38 51.611	W105 04.072	13066	Road Cross Section
161RW	N38 54.720	W105 03.055	9516	Rock Weir
162RW	N38 54.887	W105 02.854	9518	Rock Weir
163RA	N38 54.665	W105 03.115	9528	Rock Weir
175CC	N38 55.104	W105 02.532	9437	Conveyance Channel
176RW	N38 54.146	W105 03.795	9838	Rock Weir
177FS	N38 55.302	W105 02.224	9323	Fill Slope
178RW	N38 54.142	W105 03.821	9839	Rock Weir
179RW	N38 54.127	W105 03.852	9851	Rock Weir
180RW	N38 54.055	W105 03.903	9906	Rock Weir
181RW	N38 54.025	W105 03.918	9919	Rock Weir
182DD	N38 54.895	W105 02.860	9430	Drainage Ditch
183FS	N38 54.675	W105 03.109	9453	Fill Slope
184CC	N38 54.708	W105 03.363	9308	Conveyance Channel
185CS	N38 54.536	W105 03.246	9532	Cut Slope
186FS	N38 54.524	W105 03.242	9538	Fill Slope
187FS	N38 54.281	W105 03.658	9711	Fill Slope
188DD	N38 54.075	W105 03.892	9894	Drainage Ditch
189CC	N38 54.073	W105 03.886	9887	Conveyance Channel
190CC	N38 54.095	W105 03.869	9871	Conveyance Channel
191CC	N38 54.117	W105 03.854	9855	Conveyance Channel
192CS	N38 54.183	W105 03.677	9786	Cut Slope
193FS	N38 54.821	W105 02.983	9507	Fill Slope
194FS	N38 54.811	W105 03.004	9506	Fill Slope
195DD	N38 54.827	W105 02.983	9505	Drainage Ditch
196FS	N38 54.872	W105 02.900	9497	Fill Slope
197CS	N38 54.364	W105 03.383	9640	Cut Slope
198FS	N38 54.497	W105 03.254	9560	Fill Slope
199RW	N38 54.688	W105 03.389	9326	Sediment Pond
200RW	N38 55.261	W105 02.246	9418	Rock Weir
201RW	N38 54.805	W105 03.021	9522	Rock Weir
202RW	N38 54.619	W105 03.132	9450	Rock Weir
203FS	N38 54.603	W105 03.139	9517	Fill Slope
204FS	N38 54.273	W105 03.572	9707	Fill Slope

Site ID	Latitude (hddd°mm.mmm)	Longitude (hddd°mm.mmm)	Altitude (ft)	Feature Description
205DD	N38 54.022	W105 03.927	9983	Drainage Ditch
206CC	N38 54.689	W105 03.097	9506	Conveyance Channel
207CC	N38 51.664	W105 04.062	12962	Conveyance Channel
208CC	N38 52.754	W105 04.445	11172	Conveyance Channel
209CC	N38 52.647	W105 04.411	11365	Conveyance Channel
210CC	N38 54.059	W105 03.916	9849	Conveyance Channel
211CC	N38 54.130	W105 03.844	9853	Conveyance Channel
212CC	N38 53.149	W105 04.311	10893	Conveyance Channel
213CC	N38 50.964	W105 03.391	13046	Conveyance Channel
214CC	N38 50.234	W105 02.661	13198	Conveyance Channel
215CC	N38 50.356	W105 02.792	13375	Conveyance Channel
216CC	N38 55.263	W105 02.236	9289	Conveyance Channel
217CC	N38 55.255	W105 02.232	9284	Conveyance Channel
218CC	N38 55.226	W105 02.268	9359	Conveyance Channel
219CC	N38 55.202	W105 02.262	9371	Conveyance Channel
220CC	N38 55.108	W105 02.482	9411	Conveyance Channel
221CC	N38 55.107	W105 02.482	9305	Conveyance Channel
222CC	N38 55.070	W105 02.554	9319	Conveyance Channel
223CC	N38 55.048	W105 02.657	9394	Conveyance Channel
224CC	N38 54.878	W105 02.852	9493	Conveyance Channel
225CC	N38 54.917	W105 02.840	9441	Conveyance Channel
226CC	N38 54.796	W105 03.010	9431	Conveyance Channel
227CC	N38 54.706	W105 03.053	9480	Conveyance Channel
228CC	N38 54.746	W105 03.078	9431	Conveyance Channel
229CC	N38 54.140	W105 03.788	9774	Conveyance Channel
230CC	N38 54.028	W105 03.912	9902	Conveyance Channel
231CC	N38 54.050	W105 03.908	9910	Conveyance Channel
232CC	N38 52.583	W105 04.557	11399	Conveyance Channel
233RW	N38 52.383	W105 04.560	11074	Rock Weir
234RW	N38 52.502	W105 03.924	11915	Rock Weir
235CC	N38 52.504	W105 03.920	11928	Conveyance Channel
236RW	N38 52.185	W105 04.066	12177	Rock Weir
237RW	N38 52.398	W105 04.393	11219	Sediment Pond
238RW	N38 52.131	W105 04.048	12340	Rock Weir
239RW	N38 52.008	W105 03.774	12517	Rock Weir
240RW	N38 52.048	W105 03.990	12644	Rock Weir
241RW	N38 51.976	W105 03.834	12686	Rock Weir
242RW	N38 51.903	W105 04.176	12851	Rock Weir
243RW	N38 51.919	W105 04.043	12900	Rock Weir
244CC	N38 54.487	W105 03.232	9569	Conveyance Channel
245CC	N38 54.872	W105 02.900	9497	Conveyance Channel
246CC	N38 50.709	W105 03.090	13423	Conveyance Channel
247CC	N38 50.709	W105 03.499	13080	Conveyance Channel
250RW	N38 53.724	W105 03.710	10232	Rock Weir
251CC	N38 53.723	W105 03.712	10229	Conveyance Channel
252RW	N38 53.456	W105 03.998	10598	Rock Weir

Site ID	Latitude (hddd°mm.mmm)	Longitude (hddd°mm.mmm)	Altitude (ft)	Feature Description
253CC	N38 53.462	W105 03.998	10582	Conveyance Channel
254RW	N38 53.226	W105 04.396	10836	Rock Weir
256RW	N38 51.832	W105 04.112	12923	Sediment Pond
258RW	N38 50.938	W105 03.394	13091	Sediment Pond
260RW	N38 50.682	W105 03.043	13415	Sediment Pond
262RW	N38 52.890	W105 04.297	11086	Sediment Pond
263CC	N38 52.919	W105 04.258	11056	Conveyance Channel
264RW	N38 53.201	W105 04.228	10864	Sediment Pond
265CC	N38 53.209	W105 04.206	10843	Conveyance Channel
BHMR1	N38 48.951	W105 03.040	11885	Boehmer Creek 1
BHMR2	N38 49.061	W105 03.027	11995	Boehmer Creek 2
EBVR1	N38 49.832	W105 03.612	12156	East Fork Beaver Creek 1
EBVR2	N38 49.907	W105 03.598	12190	East Fork Beaver Creek 2
GLEN1	N38 54.457	W105 04.690	9519	Glen Cove Creek 1
NCAT1	N38 54.746	W105 05.994	9415	North Catamount Creek 1
NCAT2	N38 54.402	W105 06.106	9519	North Catamount Creek 2
NCRY1∞	N38 54.418	W105 03.199	9453	North Fork Crystal Creek 1 & 2
OILC1	N38 48.449	W105 06.511	10505	Oil Creek 1
SCAT1	N38 55.035	W105 04.112	9368	South Catamount Creek 1
SCAT2	N38 54.974	W105 04.181	9345	South Catamount Creek 2
SCAT3	N38 54.316	W105 04.899	9412	South Catamount Creek 3
SKIC1	N38 54.975	W105 04.078	9418	Ski Creek 1
SKIC2	N38 53.767	W105 03.987	10035	Ski Creek 2
SVRY1	N38 52.467	W105 03.039	10732	Severy Creek 1
SVRY2	N38 52.472	W105 03.339	10926	Severy Creek 2
WBVR1	N38 48.181	W105 05.710	10726	West Fork Beaver Creek 1
WBVR2	N38 48.349	W105 05.591	10698	West Fork Beaver Creek 2

† Not all sites were sampled during the 2015 field season.
∞ North Fork Crystal Creek Reach 2 (NCRY2) is located 200ft upstream from NCRY1.

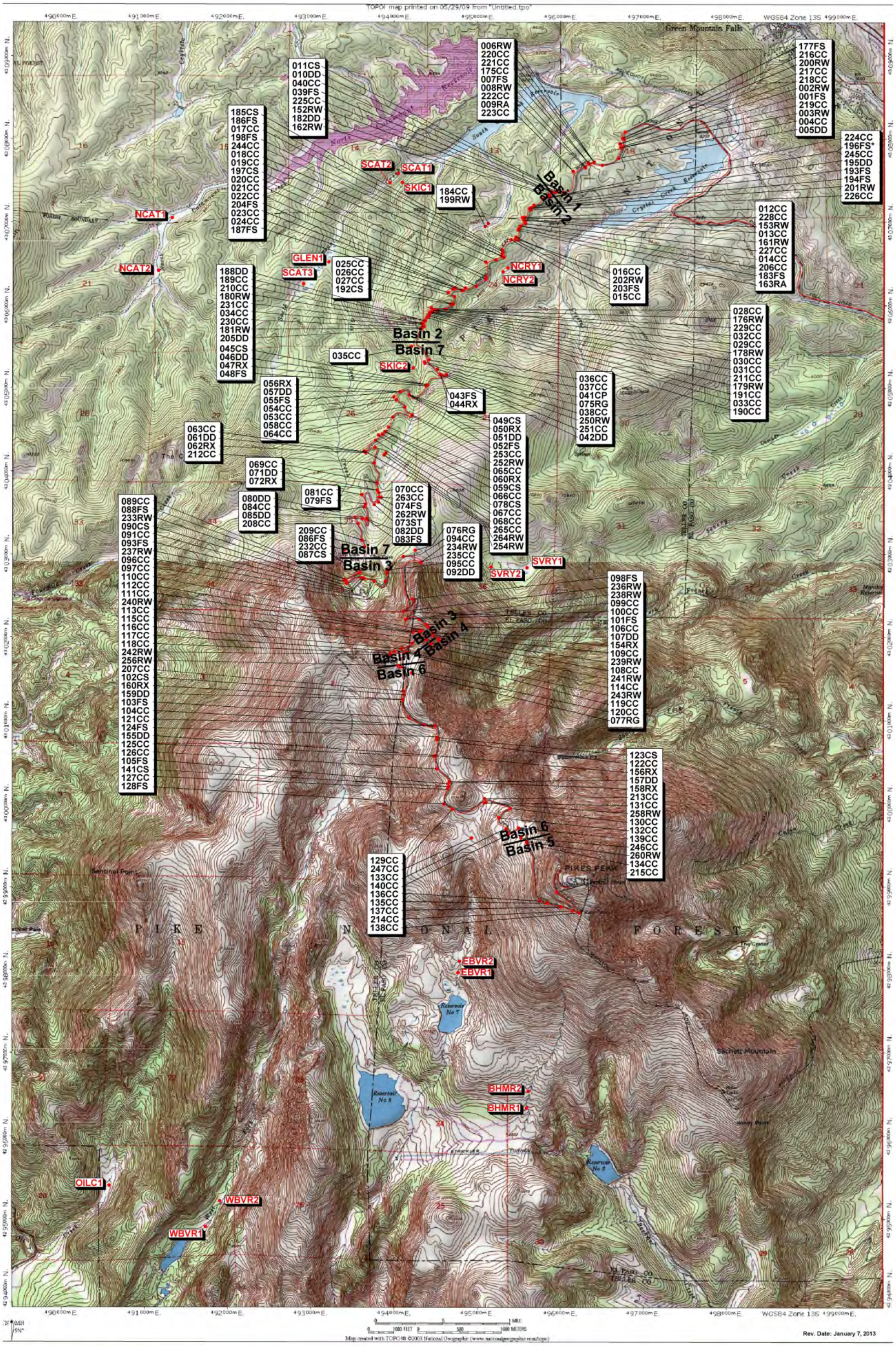
Appendix B

USGS Topographic Map

Site Locations for

Effectiveness and Validation Monitoring

2015



Rev. Date: January 7, 2013

Appendix C

Daily Precipitation,

Periodic Precipitation

and

Daily Average Temperature

2015

Daily Precipitation for Electronic Rain Gauges, Pikes Peak 2015

Date	075RG (Elevation 10,109') Precipitation (in)	076RG (Elevation 11,810') Precipitation (in)	077RG (Elevation 13,069') Precipitation (in)
6/1/2015	0.04	Missing†	0
6/2/2015	0	Missing†	0
6/3/2015	0	Missing†	0
6/4/2015	0	Missing†	0
6/5/2015	0.01	Missing†	0.02
6/6/2015	0.12	Missing†	0.02
6/7/2015	0.32	Missing†	0.02
6/8/2015	0	Missing†	0
6/9/2015	0	Missing†	0
6/10/2015	0.06	Missing†	0.05
6/11/2015	0.4	Missing†	0.13
6/12/2015	0.33	Missing†	0.37
6/13/2015	0	Missing†	0
6/14/2015	0.59	Missing†	0.26
6/15/2015	0.83	Missing†	0.48
6/16/2015	0.04	Missing†	0.04
6/17/2015	0.23	Missing†	0.21
6/18/2015	0	Missing†	0
6/19/2015	0	Missing†	0
6/20/2015	0	Missing†	0
6/21/2015	0	Missing†	0
6/22/2015	0	Missing†	0
6/23/2015	0	0.01	0
6/24/2015	0.03	0.02	0.21
6/25/2015	0.01	0.32	0.01
6/26/2015	0	0.04	0
6/27/2015	0	0	0
6/28/2015	0.43	0	0.27
6/29/2015	0.02	0.76	0
6/30/2015	0	0	0.09
7/1/2015	0.27	0.11	0.29
7/2/2015	0.05	0.27	0.04
7/3/2015	0.19	0.05	0.15
7/4/2015	0.04	0.18	0.16
7/5/2015	0	0.07	0
7/6/2015	0.77	0	0.52
7/7/2015	0.07	0.69	0.09
7/8/2015	0.42	0.1	0.29
7/9/2015	0.08	0.43	0.15
7/10/2015	0	0.13	0
7/11/2015	0	0	0

Date	075RG (Elevation 10,109’) Precipitation (in)	076RG (Elevation 11,810’) Precipitation (in)	077RG (Elevation 13,069’) Precipitation (in)
7/12/2015	0	0	0
7/13/2015	0.29	0	0.08
7/14/2015	0.11	0.1	0.2
7/15/2015	0.07	0.16	0.02
7/16/2015	0.04	0.14	0
7/17/2015	0	0.06	0
7/18/2015	0	0	0
7/19/2015	0.27	0	0.36
7/20/2015	0.12	0.41	0.06
7/21/2015	0.26	0.09	0.08
7/22/2015	0.01	0.22	0.02
7/23/2015	0	0	0
7/24/2015	0.01	0	0.04
7/25/2015	0	0.08	0
7/26/2015	0	0	0
7/27/2015	0	0	0
7/28/2015	0	0	0
7/29/2015	0	0	0
7/30/2015	0	0	0
7/31/2015	0.11	0	0.12
8/1/2015	0	0.14	0
8/2/2015	0	0	0.02
8/3/2015	0.27	0	0.68
8/4/2015	0	0.95	0.12
8/5/2015	0	0	0
8/6/2015	0	0	0
8/7/2015	0.03	0	0.03
8/8/2015	0	0.03	0
8/9/2015	0.01	0	0
8/10/2015	0.1	0	0.2
8/11/2015	0.06	0.32	0.54
8/12/2015	0.78	0.23	0.39
8/13/2015	0.02	0.56	0.3
8/14/2015	0.06	0.15	0.04
8/15/2015	0.22	0.12	0.01
8/16/2015	0.01	0.04	0.22
8/17/2015	0.09	0.17	0.19
8/18/2015	0	0.23	0.01
8/19/2015	0	0.01	0
8/20/2015	0	0	0
8/21/2015	0	0	0
8/22/2015	0	0	0
8/23/2015	0.09	0	0

Date	075RG (Elevation 10,109') Precipitation (in)	076RG (Elevation 11,810') Precipitation (in)	077RG (Elevation 13,069') Precipitation (in)
8/24/2015	Missing†	0.01	0
8/25/2015	Missing†	0.01	0.03
8/26/2015	Missing†	0.03	0
8/27/2015	Missing†	0	0.09
8/28/2015	Missing†	0.12	0
8/29/2015	Missing†	0	0
8/30/2015	Missing†	0	0
8/31/2015	Missing†	0	0.07
9/1/2015	Missing†	0.1	0.01
9/2/2015	Missing†	0	0
9/3/2015	Missing†	0	0.29
9/4/2015	Missing†	0.34	0.03
9/5/2015	Missing†	0.03	0.01
9/6/2015	Missing†	0	0
9/7/2015	Missing†	0.01	0
9/8/2015	Missing†	0	0
9/9/2015	0	0	0
9/10/2015	0	0	0
9/11/2015	0	0	0
9/12/2015	0	0	0
9/13/2015	0	0	0
9/14/2015	0.02	0	0
9/15/2015	0	0	0
9/16/2015	0	0	0
9/17/2015	0	0	0
9/18/2015	0	0	0
9/19/2015	0	0	0
9/20/2015	0	0	0
9/21/2015	0	0	0
9/22/2015	0.21	0	0.14
9/23/2015	0.05	0.2	0.09
9/24/2015	0	0.09	0
9/25/2015	0	0	0
9/26/2015	0	0	0
9/27/2015	0	0	0
9/28/2015	0	0	0
9/29/2015	0	0	0
9/30/2015	0	0	0
Total	**8.66**	**8.33**	**8.36**
† Indicates missing data due to equipment malfunction and/or damage to the rain gauge.			

Periodic Precipitation for Standard Rain Gauges, Pikes Peak 2015†

Date	075RG (Elevation 10,109') Precipitation (in)	076RG (Elevation 11,810') Precipitation (in)	077RG (Elevation 13,069') Precipitation (in)
6/15/15	1.94	1.58	0.67
6/22/15	1.05	0.96	0.73
6/29/15	0.54	0.89	0.58
7/6/15	0.58	0.70	0.75
7/13/15	1.30	1.30	1.15
7/20/15	0.80	0.87	0.70
7/28/15	0.40	0.38	0.22
8/3/15	0.12	0.15	0.18
8/10/15	0.36	1.06	0.90
8/18/15	1.42	1.69	1.89
8/24/15	0.12	0.04	0.03
8/31/15	0.08	0.17	0.12
9/8/15	0.32	0.50	0.42
09/14/15	0.00	0.00	0.00
09/21/15	0.00	0.00	0.00
9/30/15	0.26	0.27	0.25
Total	**9.29**	**10.56**	**8.59**

† Periodic precipitation for standard rain gauges June 1 through September 30, 2015.

Daily Average Temperature for Electronic Rain Gauges, Pikes Peak 2015

Date	075RG (Elevation 10,109') Temperature (°F)	076RG (Elevation 11,810') Temperature (°F)	077RG (Elevation 13,069') Temperature (°F)
6/1/2015	53.61	Missing†	Missing†
6/2/2015	58.22	Missing†	Missing†
6/3/2015	55.46	Missing†	Missing†
6/4/2015	59.74	Missing†	46.03
6/5/2015	51.99	Missing†	38.19
6/6/2015	50.89	Missing†	35.52
6/7/2015	47.78	Missing†	34.85
6/8/2015	50.58	Missing†	41.78
6/9/2015	56.73	Missing†	45.84
6/10/2015	53.93	Missing†	40.28
6/11/2015	49.93	Missing†	37.98
6/12/2015	47.14	Missing†	38.49
6/13/2015	51.45	Missing†	39.57
6/14/2015	48.26	Missing†	36.61
6/15/2015	48.08	Missing†	40.57
6/16/2015	54.60	Missing†	40.46
6/17/2015	57.00	Missing†	43.95
6/18/2015	57.99	Missing†	46.20
6/19/2015	64.14	Missing†	48.61
6/20/2015	66.15	Missing†	51.08
6/21/2015	68.67	Missing†	51.75
6/22/2015	64.65	Missing†	51.10
6/23/2015	65.21	55.72	48.61
6/24/2015	61.86	53.35	47.55
6/25/2015	61.52	52.89	46.78
6/26/2015	58.86	49.43	46.79
6/27/2015	59.81	52.27	46.86
6/28/2015	58.29	50.70	45.93
6/29/2015	56.16	51.14	45.52
6/30/2015	Missing†	55.48	49.00
7/1/2015	Missing†	50.77	46.68
7/2/2015	Missing†	48.48	45.01
7/3/2015	Missing†	49.43	45.57
7/4/2015	Missing†	51.65	46.80
7/5/2015	Missing†	53.71	49.83
7/6/2015	53.27	45.97	41.44
7/7/2015	49.69	45.33	39.49
7/8/2015	47.74	41.55	37.17
7/9/2015	52.22	45.14	39.91
7/10/2015	54.22	45.81	40.69
7/11/2015	58.34	50.08	44.51

Date	075RG (Elevation 10,109') Temperature (°F)	076RG (Elevation 11,810') Temperature (°F)	077RG (Elevation 13,069') Temperature (°F)
7/12/2015	60.87	52.30	45.89
7/13/2015	56.30	49.15	44.28
7/14/2015	53.72	47.19	41.61
7/15/2015	54.84	48.39	43.54
7/16/2015	57.07	49.05	44.20
7/17/2015	59.87	51.64	45.71
7/18/2015	60.60	52.87	45.77
7/19/2015	55.14	48.21	43.70
7/20/2015	51.75	44.99	40.67
7/21/2015	54.20	48.02	41.42
7/22/2015	57.13	49.52	43.99
7/23/2015	63.05	54.45	48.89
7/24/2015	59.03	51.04	46.70
7/25/2015	62.30	53.90	47.63
7/26/2015	63.50	55.45	49.27
7/27/2015	64.28	54.81	48.34
7/28/2015	63.39	55.42	47.39
7/29/2015	54.73	50.68	46.61
7/30/2015	58.31	50.46	45.93
7/31/2015	55.16	48.67	45.02
8/1/2015	62.11	54.06	47.32
8/2/2015	60.01	51.68	46.86
8/3/2015	54.06	47.97	43.61
8/4/2015	59.72	49.51	44.56
8/5/2015	64.96	55.67	50.14
8/6/2015	65.10	54.75	49.66
8/7/2015	64.24	54.98	49.47
8/8/2015	60.36	51.02	45.89
8/9/2015	59.22	50.94	46.39
8/10/2015	54.62	48.41	44.21
8/11/2015	55.09	48.67	44.08
8/12/2015	59.13	51.87	46.58
8/13/2015	60.53	52.42	48.70
8/14/2015	57.10	50.60	47.14
8/15/2015	63.15	56.88	51.08
8/16/2015	58.96	51.91	46.98
8/17/2015	58.50	50.23	45.00
8/18/2015	51.25	45.14	40.09
8/19/2015	46.74	41.60	35.18
8/20/2015	57.76	48.33	43.31
8/21/2015	60.71	51.06	45.49
8/22/2015	59.85	52.73	47.19
8/23/2015	54.83	51.04	44.48

Date	075RG (Elevation 10,109’) Temperature (°F)	076RG (Elevation 11,810’) Temperature (°F)	077RG (Elevation 13,069’) Temperature (°F)
8/24/2015	48.90	50.05	47.59
8/25/2015	Missing†	51.72	45.57
8/26/2015	Missing†	53.63	46.09
8/27/2015	Missing†	47.75	42.26
8/28/2015	Missing†	46.20	41.01
8/29/2015	Missing†	50.04	44.58
8/30/2015	Missing†	55.12	50.01
8/31/2015	Missing†	48.81	44.15
9/1/2015	Missing†	49.81	44.11
9/2/2015	Missing†	51.46	45.92
9/3/2015	Missing†	46.30	41.84
9/4/2015	Missing†	49.24	43.00
9/5/2015	Missing†	46.66	40.20
9/6/2015	Missing†	49.17	42.39
9/7/2015	64.45	47.62	41.19
9/8/2015	58.52	47.49	42.66
9/9/2015	56.77	48.93	43.11
9/10/2015	50.58	47.47	44.51
9/11/2015	56.14	45.76	41.07
9/12/2015	59.50	48.42	44.00
9/13/2015	58.26	49.50	44.68
9/14/2015	54.76	50.82	44.46
9/15/2015	56.76	46.77	40.30
9/16/2015	57.31	47.24	40.40
9/17/2015	46.86	48.02	40.41
9/18/2015	47.66	41.35	36.71
9/19/2015	54.45	42.01	36.71
9/20/2015	59.61	45.65	41.11
9/21/2015	52.59	52.45	47.51
9/22/2015	50.03	47.25	43.55
9/23/2015	51.12	43.55	38.36
9/24/2015	52.07	44.57	41.02
9/25/2015	54.69	45.25	41.25
9/26/2015	57.58	46.91	44.46
9/27/2015	55.45	49.55	47.38
9/28/2015	49.99	47.62	42.74
9/29/2015	48.41	44.77	38.86
9/30/2015	53.61	41.65	37.74

† Indicates missing data due to equipment malfunction and/or damage to the rain gauge.

Appendix D

Cut Slope

Site Visit Dates

and

Sediment Accumulation

2015

Site Visit Dates of Cut Slope Silt Fences, Pikes Peak 2015

Site ID	Cut Slope Site Visit Dates 2015									
	5/12	5/20	6/2	6/22	6/30	7/13	7/28	8/10	8/24	9/3	9/17
011CS	X	X	X	X	O	X	X	O	X		O
045CS		O	X	X	X	X	X	X	X		O
049CS		O	X	X	X	X	X	X	X		X
059CS		X	O	X	X	X	X	X	X		X
078CS		X	X	X	X	O	X	X	X		X
087CS		X	X	O	X	X	X	O	X		O
090CS		X	X	X	X	X	X	X	X		X
102CS		X	X	X	X	X	X	X	X	X	X
123CS		X	X	X	O	X	X	X	X	X	X
141CS		X	X	X	O	X	X	X	X	X	X
185CS		O	X	X	X	O	X	X	X		X
192CS		O	X	X	O	O	X	O	O		X
197CS		O	X	X	X	O	X	O	X		O

X Site visit, fence not cleaned-out.
O Site visit, fence cleaned-out.

Sediment Accumulation in Cut Slope Silt Fences, Pikes Peak 2015

Site ID	Location	Date	Volume (ft^3)	Grab Sample
045CS	Lower Fence	5/20/15	0.07	Yes
049CS	Lower Fence	5/20/15	0.27	Yes
185CS	Lower Fence	5/20/15	0.13	Yes
192CS	Lower Fence	5/20/15	1.20	Yes
192CS	Upper Fence	5/20/15	0.07	Yes
197CS†	Lower Fence	5/20/15	0.94	Yes
197CS†	Upper Fence	5/20/15	0.07	Yes
059CS	Lower Fence	6/2/15	0.13	Yes
087CS	Lower Fence	6/22/15	0.20	Yes
087CS	Upper Fence	6/22/15	0.07	Yes
011CS†	Lower Fence	6/30/15	0.27	Yes
123CS†	Upper Fence	6/30/15	0.13	Yes
141CS†	Upper Fence	6/30/15	0.13	Yes
192CS	Lower Fence	6/30/15	0.67	Yes
078CS	Lower Fence	7/13/15	0.10	Yes
078CS	Upper Fence	7/13/15	0.07	Yes
185CS†	Lower Fence	7/13/15	0.07	Yes
192CS†	Lower Fence	7/13/15	0.33	Yes
197CS	Lower Fence	7/13/15	0.74	Yes
197CS	Upper Fence	7/13/15	0.07	Yes
011CS	Lower Fence	8/10/15	0.07	Yes
087CS†	Lower Fence	8/10/15	0.27	Yes
192CS	Lower Fence	8/10/15	0.40	Yes
197CS†	Lower Fence	8/10/15	0.20	Yes
192CS	Lower Fence	8/24/15	1.60	Yes
011CS	Lower Fence	9/17/15	0.07	Yes
045CS†	Lower Fence	9/17/15	0.07	Yes
087CS	Lower Fence	9/17/15	0.07	Yes
197CS	Upper Fence	9/17/15	0.07	Yes

† Grab samples selected for lab analyses

Appendix E

Fill Slope

Site Visit Dates

and

Sediment Accumulation

2015

Site Visit Dates of Fill Slope Silt Fences, Pikes Peak 2015

Site ID	Fill Slope Site Visit Dates 2015												
	5/7	5/20	5/21	6/2	6/22	6/30	7/1	7/13	7/14	7/28	8/10	8/24	9/17
001FS		X		X	X	X			O	X	X	O	O
007FS	X	X	X	X	X	X			X	X	X	X	X
039FS		O		X	X	X		X		X	X	X	O
043FS		X		O	O	X		X		O	X	O	X
048FS		X		X	X	X		X		X	X	X	X
052FS		X		X	X	X		O		X	X	X	X
055FS		X		X	O	X		X		X	X	X	X
074FS		X		X	O	X		O		O	O	O	X
079FS		X		X	O	X		X		O	X	X	X
083FS		X		X	O	X		X		O	X	O	O
086FS		X		X	X	X		X		X	X	X	O
088FS		X		X	O	X		X		X	X	X	O
093FS		X		X	O	X		X		O	O	O	X
098FS		X		X	X	X		X		X	O	O	O
101FS		X		X	X	X	X	X		X	X	O	O
103FS		X		X	X	O		X		X	X	X	X
105FS		X		X	X	O		X		X	X	X	X
124FS		X		X	X	X		X		X	X	X	X
128FS		X		X	X	X		X		X	X	X	X
177FS		O		X	X	X		X		X	O	X	X
183FS		X		O	X	X		X		X	O	O	O
186FS		O		X	X	X			O	X	X	O	O
187FS		X		O	X	X			O	X	X	O	X
193FS		O		X	X	X			O	X	O	X	X
194FS		O		X	X	X			X	X	X	X	X
198FS		O		X	X	X			X	X	X	X	X
203FS		O		X	O	X			O	X	O	O	X
204FS		O		X	X	X		O		X	X	O	X

X Site visit, fence not cleaned-out.
O Site visit, fence cleaned-out.

Sediment Accumulation in Fill Slope Silt Fences, Pikes Peak 2015

Site ID	Location	Date	Volume (ft^3)	Grab Sample
039FS†	Upper Fence	5/20/15	0.67	Yes
039FS†	Lower Fence	5/20/15	0.07	Yes
177FS	Upper Fence	5/20/15	0.13	Yes
186FS	Upper Fence	5/20/15	0.13	Yes
193FS†	Upper Fence	5/20/15	1.00	Yes
194FS	Upper Fence	5/20/15	0.40	Yes
198FS	Upper Fence	5/20/15	0.80	Yes
203FS†	Upper Fence	5/20/15	0.67	Yes
204FS	Upper Fence	5/20/15	0.53	Yes
204FS	Lower Fence	5/20/15	0.20	Yes
043FS	Upper Fence	6/2/16	0.67	Yes
183FS	Upper Fence	6/2/15	0.13	Yes
187FS†	Upper Fence	6/2/15	0.40	Yes
043FS	Upper Fence	6/22/15	0.20	Yes
055FS	Lower Fence	6/22/15	0.07	Yes
074FS	Upper Fence	6/22/15	0.07	Yes
074FS	Lower Fence	6/22/15	1.87	Yes
079FS†	Upper Fence	6/22/15	1.07	Yes
083FS	Lower Fence	6/22/15	1.87	Yes
088FS†	Lower Fence	6/22/15	0.07	Yes
093FS	Upper Fence	6/22/15	0.67	Yes
203FS	Upper Fence	6/22/15	0.27	Yes
103FS†	Upper Fence	6/30/15	0.27	Yes
105FS	Lower Fence	6/30/15	0.27	Yes
052FS†	Lower Fence	7/13/15	0.07	Yes
074FS†	Upper Fence	7/13/15	0.13	Yes
074FS	Lower Fence	7/13/15	0.27	Yes
204FS†	Upper Fence	7/13/15	0.53	Yes
001FS†	Upper Fence	7/14/15	0.40	Yes
186FS	Upper Fence	7/14/15	0.13	Yes
187FS	Upper Fence	7/14/15	0.13	Yes
193FS	Upper Fence	7/14/15	0.13	Yes
203FS	Upper Fence	7/14/15	0.13	Yes
043FS	Upper Fence	7/28/15	0.33	Yes
074FS	Lower Fence	7/28/15	0.07	Yes
079FS	Upper Fence	7/28/15	0.67	Yes
083FS	Lower Fence	7/28/15	0.40	Yes
093FS	Upper Fence	7/28/15	0.40	Yes
074FS	Lower Fence	8/10/15	0.13	Yes
093FS	Upper Fence	8/10/15	0.80	Yes
098FS	Upper Fence	8/10/15	0.53	Yes
177FS†	Upper Fence	8/10/15	0.13	Yes
183FS	Upper Fence	8/10/15	0.33	Yes
193FS	Upper Fence	8/10/15	0.07	Yes

203FS†	Upper Fence	8/10/15	0.13	Yes
001FS	Upper Fence	8/24/15	0.13	Yes
043FS	Upper Fence	8/24/15	0.13	Yes
074FS†	Upper Fence	8/24/15	0.07	Yes
074FS†	Lower Fence	8/24/15	0.27	Yes
093FS†	Upper Fence	8/24/15	1.07	Yes
098FS	Upper Fence	8/24/15	0.47	Yes
101FS	Upper Fence	8/24/15	0.07	Yes
183FS	Upper Fence	8/24/15	0.27	Yes
186FS	Upper Fence	8/24/15	0.07	Yes
187FS	Upper Fence	8/24/15	0.20	Yes
203FS	Upper Fence	8/24/15	0.10	Yes
204FS	Upper Fence	8/24/15	0.40	Yes
001FS	Upper Fence	9/17/15	0.13	Yes
039FS	Upper Fence	9/17/15	0.13	Yes
083FS	Lower Fence	9/17/15	0.07	Yes
086FS†	Lower Fence	9/17/15	0.13	Yes
093FS	Upper Fence	9/17/15	0.13	Yes
098FS	Upper Fence	9/17/15	0.27	Yes
101FS†	Upper Fence	9/17/15	0.07	Yes
183FS	Upper Fence	9/17/15	0.24	Yes
186FS	Upper Fence	9/17/15	0.07	Yes
† Grab samples selected for lab analyses				

Appendix F

Cut and Fill Slope

Particle Size Distribution Summary

and

Graphs

2015

Summary of Cut Slope Particle Size Distribution from Sieve Analysis of Grab Samples, Pikes Peak 2015

			Cut Slope Particle Size Distribution (mm) – Grab Samples 2015					
Site Name	ID	Date	D15	D35	D50	D84	D95	D100
Pikes Peak Highway - Cut Slope	011CS Lower Fence	6/30/2015	0.769	2.305	3.895	9.447	13.519	16.0
Pikes Peak Highway - Cut Slope	045CS Lower Fence	9/17/2015	7.188	13.191	17.117	24.517	27.517	29.0
Pikes Peak Highway - Cut Slope	087CS Lower Fence	8/10/2015	0.564	1.883	3.581	36.427	40.828	43.0
Pikes Peak Highway - Cut Slope	123CS Upper Fence	6/30/2015	2.441	4.047	5.155	9.553	12.120	22.0
Pikes Peak Highway - Cut Slope	141CS Upper Fence	6/30/2015	1.012	2.418	3.512	7.880	14.943	31.0
Pikes Peak Highway - Cut Slope	185CS Lower Fence	7/14/2015	0.968	2.937	5.346	13.022	18.252	26.0
Pikes Peak Highway - Cut Slope	192CS Lower Fence	7/13/2015	0.014	0.083	0.309	3.647	8.261	16.0
Pikes Peak Highway - Cut Slope	197CS Lower Fence	5/20/2015	0.629	1.668	2.819	6.834	10.539	17.0
Pikes Peak Highway - Cut Slope	197CS Upper Fence	5/20/2015	0.471	1.880	2.950	6.618	10.250	18.0
Pikes Peak Highway - Cut Slope	197CS Lower Fence	8/10/2015	0.149	1.089	2.192	7.729	14.921	21.0
Pikes Peak Highway - Cut Slope	197CS Upper Fence	8/10/2015	0.080	0.935	1.851	6.823	12.205	17.0

Summary of Fill Slope Particle Size Distribution from Sieve Analysis of Grab Samples, Pikes Peak 2015

			Fill Slope Particle Size Distribution (mm) – Grab Samples 2015					
Site Name	ID	Date	D15	D35	D50	D84	D95	D100
Pikes Peak Highway - Fill Slope	001FS Upper Fence	7/14/2015	0.096	0.818	1.413	3.938	7.038	12.0
Pikes Peak Highway - Fill Slope	039FS Lower Fence	5/20/2015	0.022	0.223	0.687	2.874	7.096	15.0
Pikes Peak Highway - Fill Slope	052FS Lower Fence	7/13/2015	0.034	0.534	1.063	4.248	7.453	11.0
Pikes Peak Highway - Fill Slope	074FS Upper Fence	7/13/2015	0.053	0.670	1.216	13.043	24.320	28.0
Pikes Peak Highway - Fill Slope	074FS Upper Fence	8/24/2015	0.781	2.955	15.009	49.402	54.508	57.0
Pikes Peak Highway - Fill Slope	074FS Lower Fence	8/24/2015	0.200	1.103	1.758	4.635	8.177	12.0
Pikes Peak Highway - Fill Slope	079FS Upper Fence	6/22/2015	0.688	2.499	4.911	16.757	23.644	29.0
Pikes Peak Highway - Fill Slope	086FS Lower Fence	9/17/2015	0.530	1.383	2.292	5.173	7.850	12.0
Pikes Peak Highway - Fill Slope	088FS Lower Fence	6/22/2015	0.793	1.689	2.754	7.497	23.747	26.0
Pikes Peak Highway - Fill Slope	093FS Upper Fence	8/24/2015	0.162	1.226	2.242	6.603	10.972	25.0
Pikes Peak Highway - Fill Slope	101FS Upper Fence	9/17/2015	0.561	1.371	2.355	5.174	8.171	21.0
Pikes Peak Highway - Fill Slope	103FS Upper Fence	6/30/2015	1.377	9.292	17.742	28.004	32.419	36.0
Pikes Peak Highway - Fill Slope	177FS Upper Fence	8/10/2015	0.660	1.983	3.646	13.358	33.240	45.0
Pikes Peak Highway - Fill Slope	187FS Upper Fence	6/2/2015	0.329	1.131	1.822	4.499	8.684	12.0
Pikes Peak Highway - Fill Slope	193FS Upper Fence	5/20/2015	0.118	1.025	1.691	5.083	9.040	19.0
Pikes Peak Highway - Fill Slope	203FS Upper Fence	5/20/2015	0.056	0.693	1.259	3.793	6.694	12.0
Pikes Peak Highway - Fill Slope	203FS Upper Fence	8/10/2015	0.106	0.802	1.293	3.608	6.739	20.0
Pikes Peak Highway - Fill Slope	204FS Upper Fence	7/13/2015	0.049	0.642	1.166	4.296	8.056	18.0

Sieve Analysis Worksheet

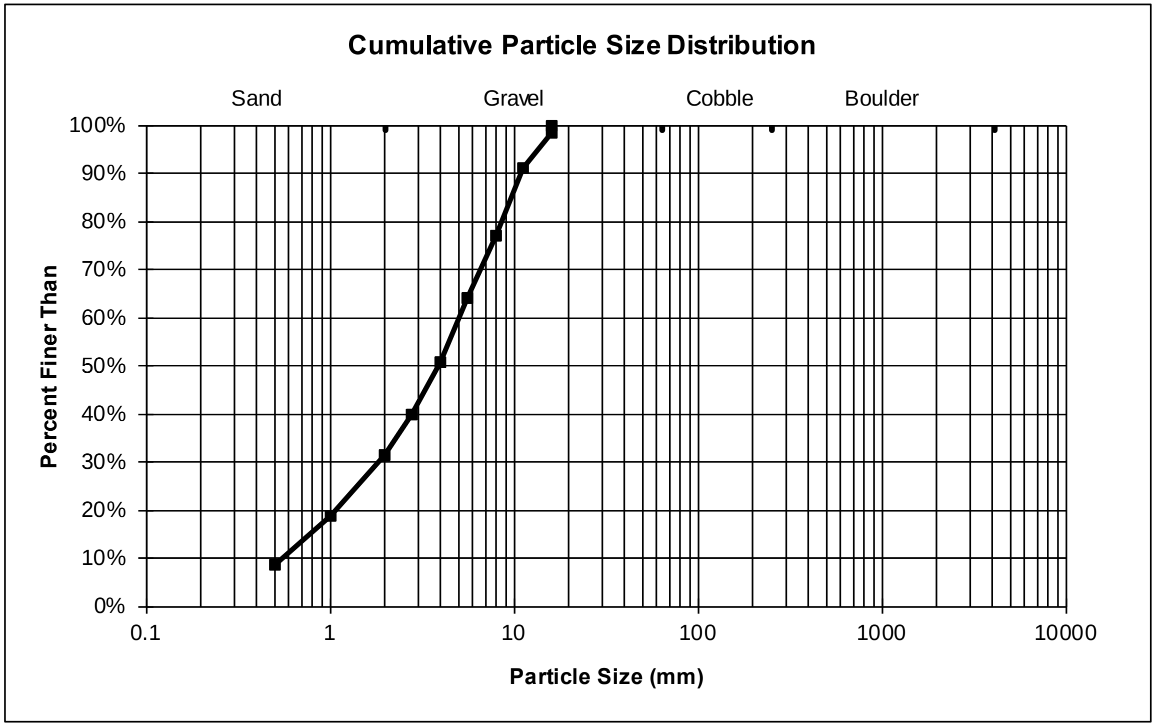
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	51.00	8.7%	
0.5	60.30	10.2%	8.7%
1.0	73.50	12.5%	18.9%
2.0	50.80	8.6%	31.4%
2.8	63.80	10.8%	40.0%
4.0	78.00	13.2%	50.8%
5.6	77.40	13.1%	64.0%
8.0	81.40	13.8%	77.2%
11.2	44.80	7.6%	91.0%
16.0	8.30	1.4%	98.6%
16.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	589.30		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **011CS Lower Fence**
DATE: 6/30/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.769	2.305	3.895	9.447	13.519	16.0



Sieve Analysis Worksheet

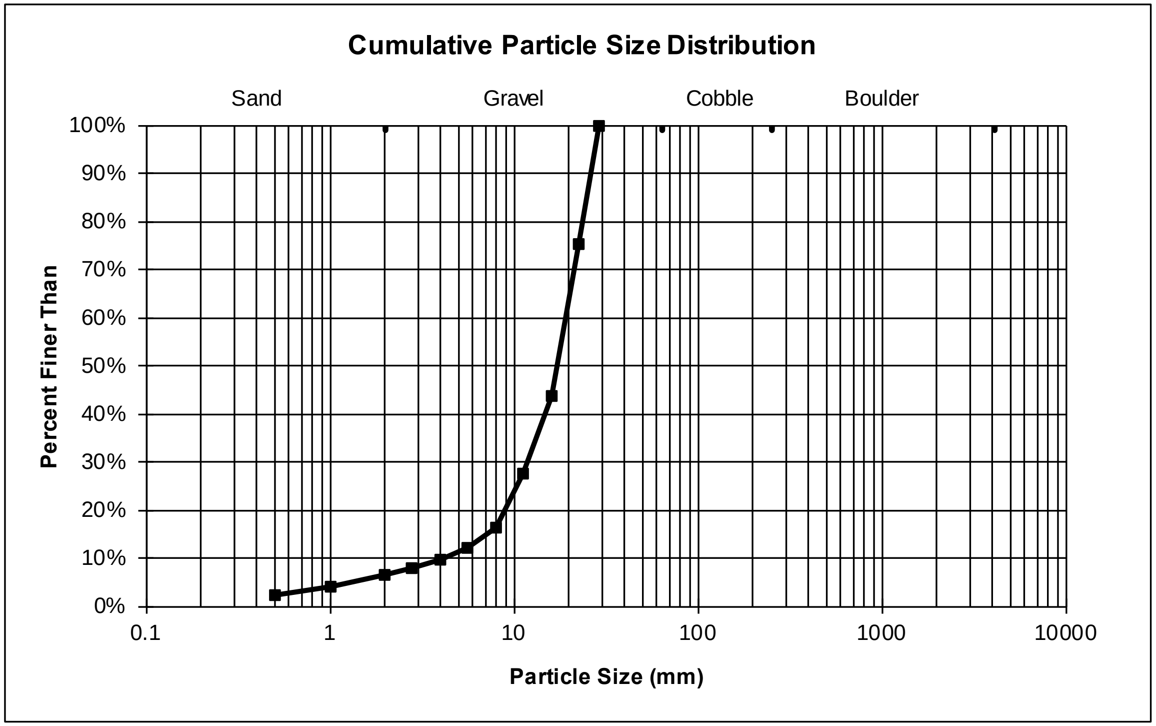
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	11.40	2.2%	
0.5	9.80	1.9%	2.2%
1.0	12.20	2.3%	4.1%
2.0	7.40	1.4%	6.4%
2.8	9.30	1.8%	7.8%
4.0	12.40	2.4%	9.6%
5.6	22.10	4.3%	12.0%
8.0	59.30	11.4%	16.3%
11.2	82.90	15.9%	27.7%
16.0	165.10	31.8%	43.6%
22.4	127.90	24.6%	75.4%
29.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	519.80		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **045CS Lower Fence**
DATE: 9/17/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	7.188	13.191	17.117	24.517	27.517	29.0



Sieve Analysis Worksheet

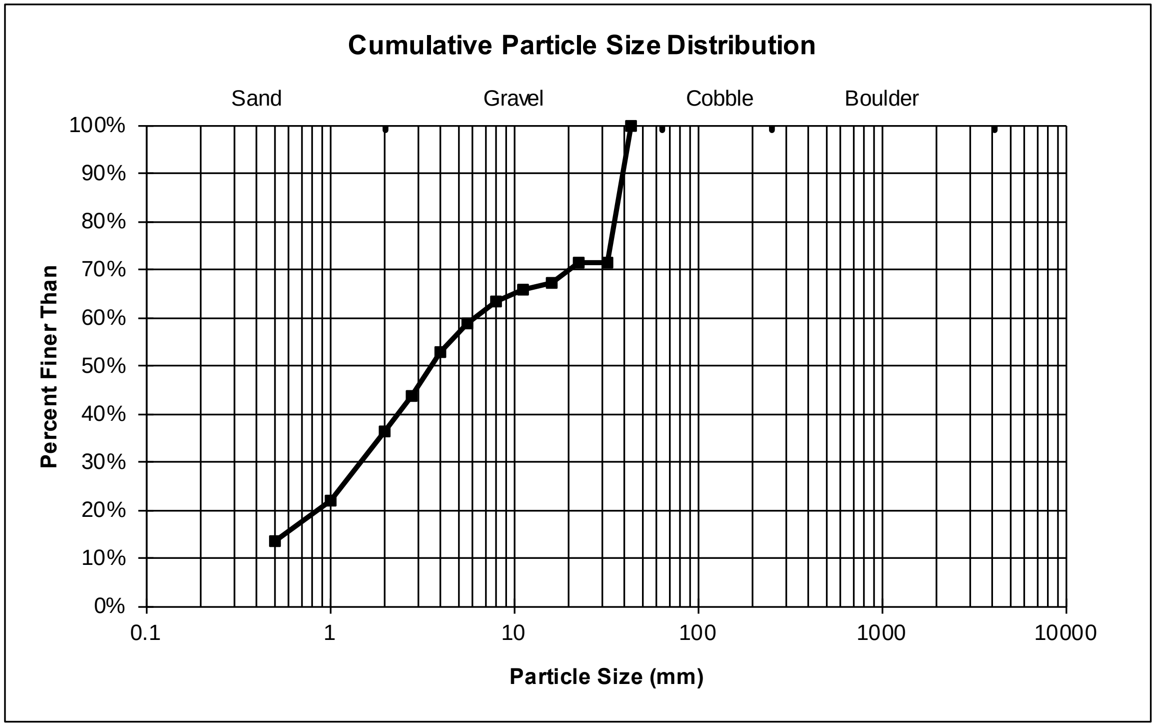
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	85.10	13.5%	
0.5	53.80	8.6%	13.5%
1.0	89.10	14.2%	22.1%
2.0	47.70	7.6%	36.2%
2.8	56.40	9.0%	43.8%
4.0	37.10	5.9%	52.8%
5.6	28.90	4.6%	58.7%
8.0	15.60	2.5%	63.3%
11.2	8.90	1.4%	65.8%
16.0	27.30	4.3%	67.2%
22.4	0.00	0.0%	71.5%
32.0	179.30	28.5%	71.5%
43.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	629.20		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **087CS Lower Fence**
DATE: 8/10/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.564	1.883	3.581	36.427	40.828	43.0



Sieve Analysis Worksheet

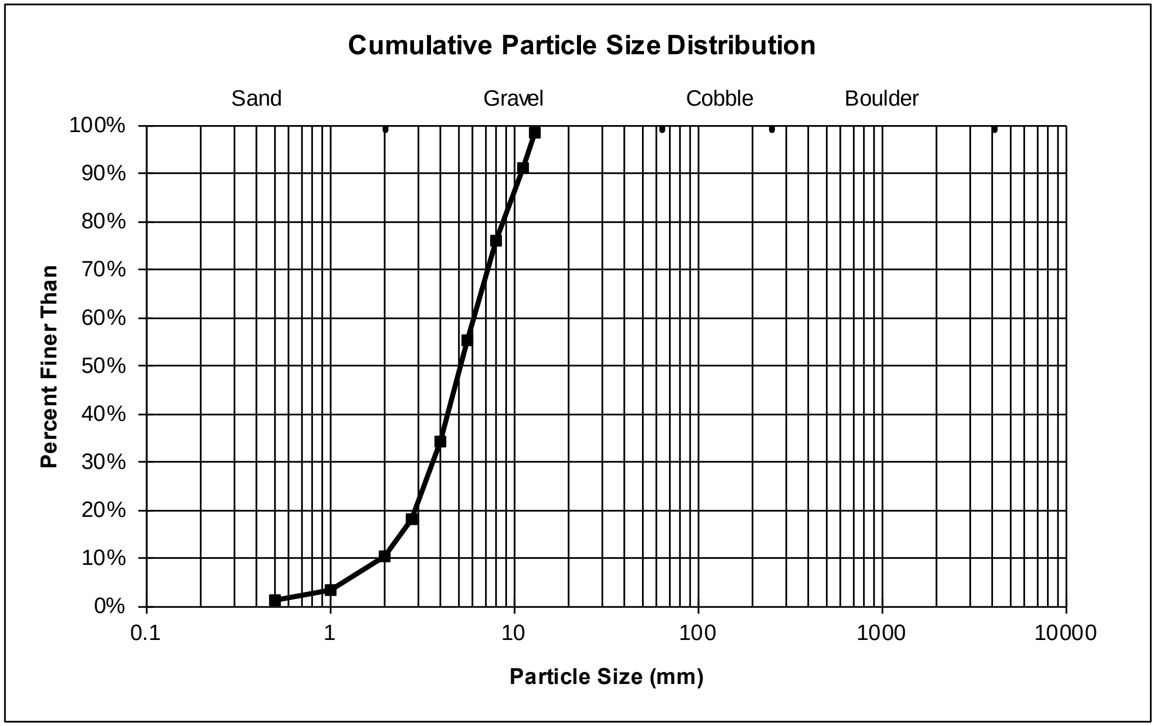
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	9.60	1.3%	
0.5	15.90	2.2%	1.3%
1.0	51.80	7.1%	3.5%
2.0	55.50	7.6%	10.5%
2.8	119.00	16.2%	18.1%
4.0	153.10	20.8%	34.3%
5.6	153.30	20.9%	55.1%
8.0	111.50	15.2%	76.0%
11.2	53.00	7.2%	91.2%
13.0	11.80		98.4%
22.0	*		-
32.0			100.0%
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	734.50		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **123CS - Upper Fence**
DATE: 6/30/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.441	4.047	5.155	9.553	12.120	22.0



Sieve Analysis Worksheet

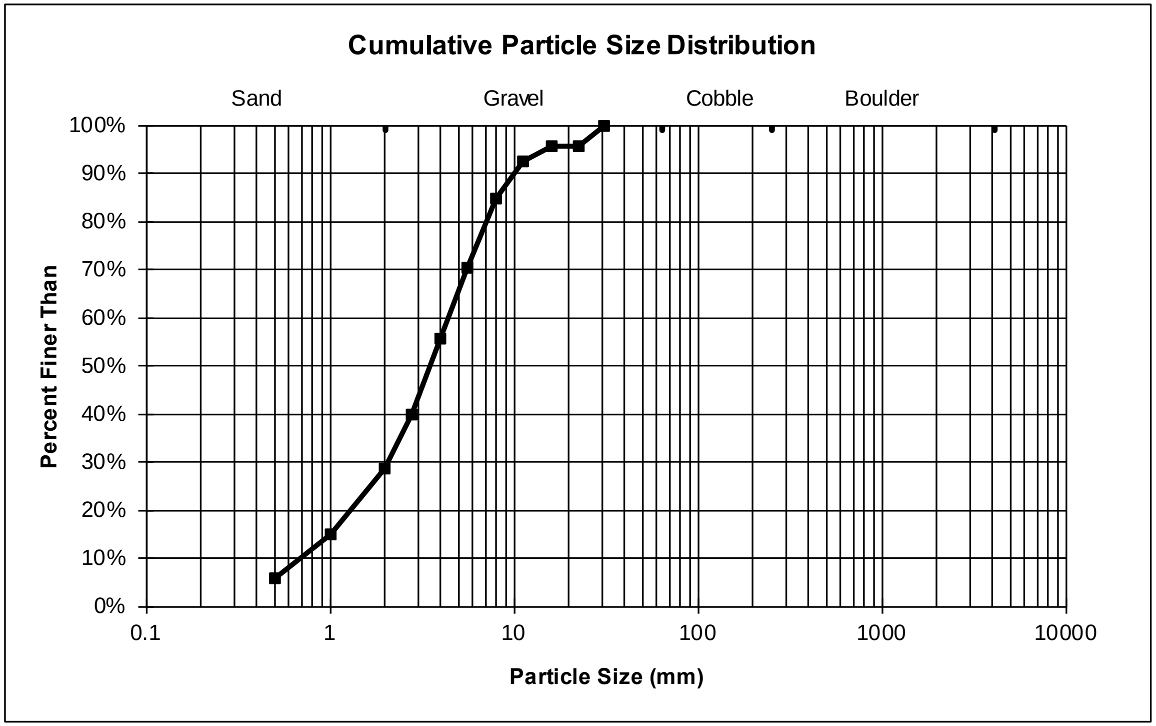
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	35.80	5.7%	
0.5	56.60	9.0%	5.7%
1.0	86.70	13.9%	14.8%
2.0	70.70	11.3%	28.6%
2.8	99.20	15.9%	39.9%
4.0	90.90	14.5%	55.8%
5.6	89.40	14.3%	70.3%
8.0	49.50	7.9%	84.6%
11.2	19.20	3.1%	92.5%
16.0	0.00	0.0%	95.6%
22.4	27.60	4.4%	95.6%
31.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	625.60		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **141CS Upper Fence**
DATE: 6/30/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.012	**2.418**	**3.512**	**7.880**	**14.943**	**31.0**



Sieve Analysis Worksheet

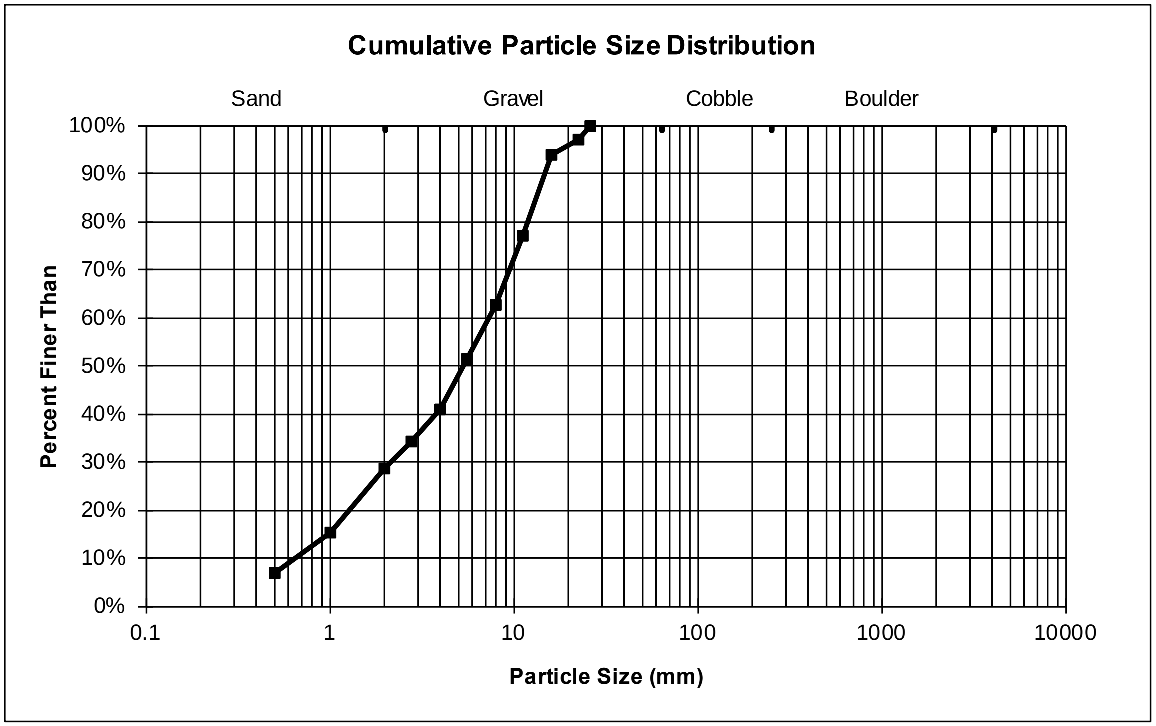
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	35.60	6.9%	
0.5	43.80	8.5%	6.9%
1.0	68.10	13.2%	15.4%
2.0	28.20	5.5%	28.6%
2.8	35.70	6.9%	34.1%
4.0	53.90	10.5%	41.0%
5.6	57.90	11.2%	51.4%
8.0	73.30	14.2%	62.7%
11.2	86.80	16.8%	76.9%
16.0	16.90	3.3%	93.7%
22.4	15.50	3.0%	97.0%
26.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	515.70		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **185CS Lower Fence**
DATE: 7/14/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.968	**2.937**	**5.346**	**13.022**	**18.252**	**26.0**



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	298.80	55.5%	
0.5	32.30	6.0%	55.5%
1.0	70.20	13.0%	61.5%
2.0	28.80	5.3%	74.5%
2.8	30.00	5.6%	79.9%
4.0	26.20	4.9%	85.4%
5.6	23.30	4.3%	90.3%
8.0	20.70	3.8%	94.6%
11.2	8.20	1.5%	98.5%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	538.50		

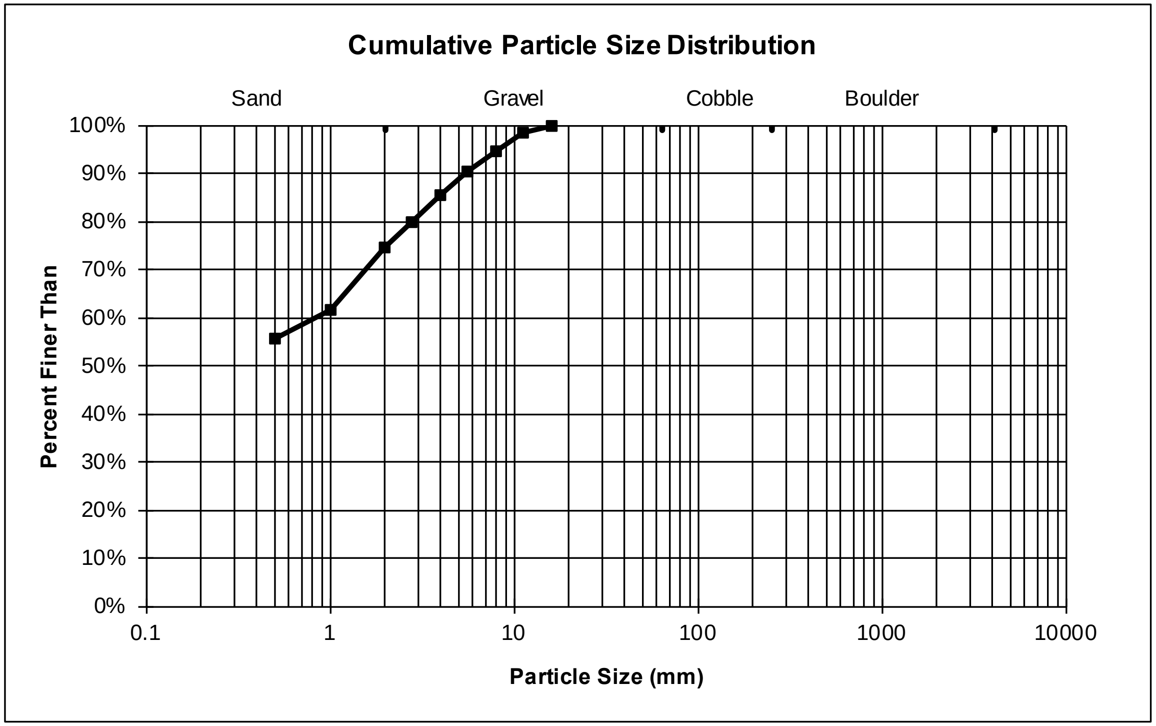
*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **192CS Lower Fence**
DATE: 7/13/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
0.014	0.083	0.309	3.647	8.261	16.0



Sieve Analysis Worksheet

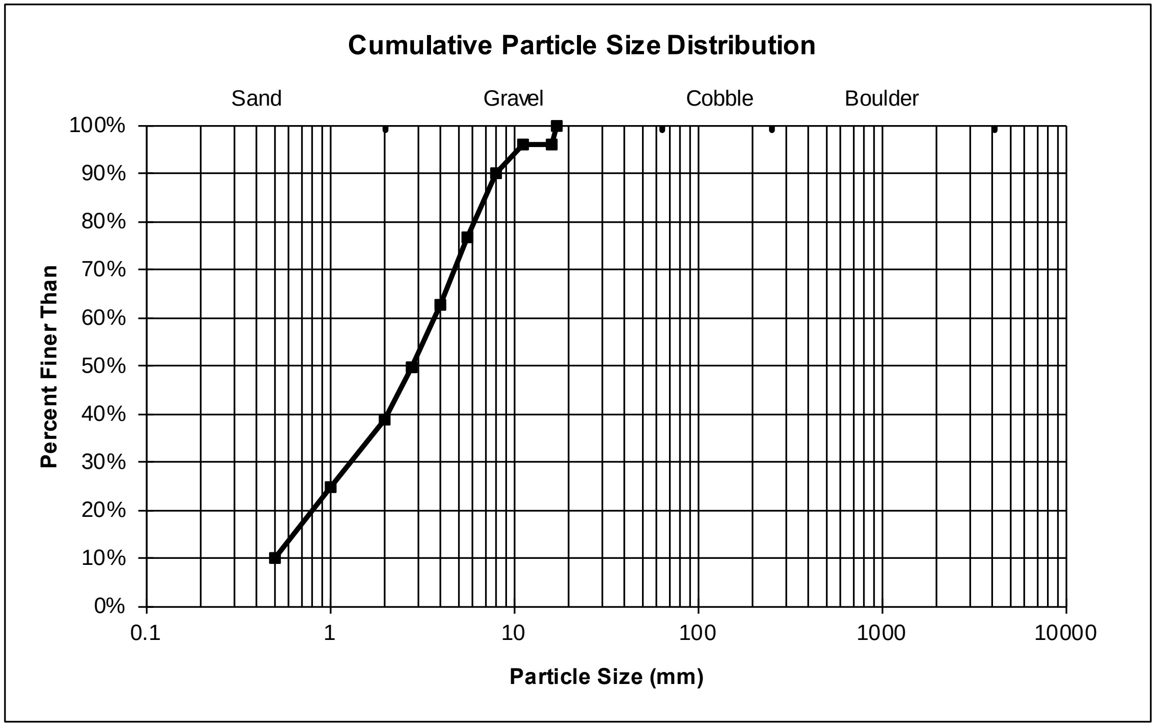
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	59.20	10.1%	
0.5	85.80	14.7%	10.1%
1.0	80.30	13.8%	24.8%
2.0	65.10	11.2%	38.6%
2.8	75.60	13.0%	49.8%
4.0	80.80	13.8%	62.7%
5.6	77.90	13.3%	76.5%
8.0	36.40	6.2%	89.9%
11.2	0.00	0.0%	96.1%
16.0	22.60	3.9%	96.1%
17.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	583.70		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **197CS Lower Fence**
DATE: 5/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.629	**1.668**	**2.819**	**6.834**	**10.539**	**17.0**



Sieve Analysis Worksheet

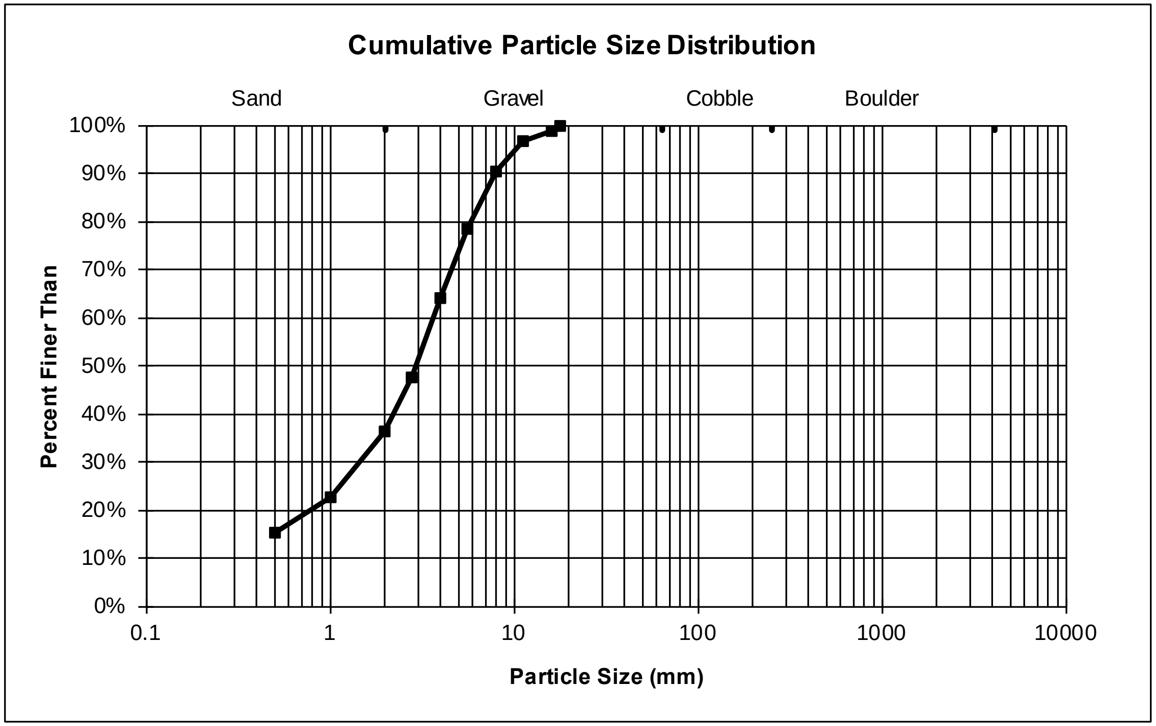
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	93.50	15.2%	
0.5	46.90	7.6%	15.2%
1.0	82.40	13.4%	22.8%
2.0	70.30	11.4%	36.2%
2.8	100.60	16.3%	47.6%
4.0	89.30	14.5%	64.0%
5.6	72.80	11.8%	78.5%
8.0	39.40	6.4%	90.3%
11.2	13.10	2.1%	96.7%
16.0	7.30	1.2%	98.8%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	615.60		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **197CS Upper Fence**
DATE: 5/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.471	1.880	2.950	6.618	10.250	18.0



Sieve Analysis Worksheet

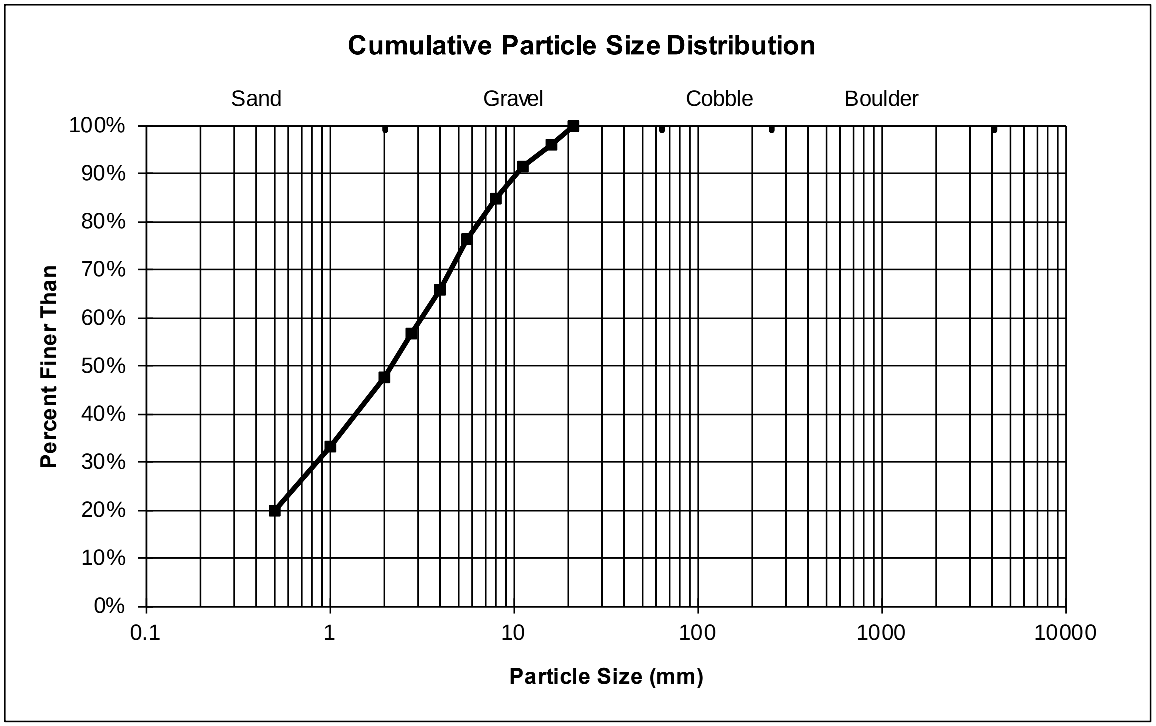
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	128.20	20.0%	
0.5	85.00	13.3%	20.0%
1.0	91.00	14.2%	33.3%
2.0	59.90	9.3%	47.4%
2.8	57.90	9.0%	56.8%
4.0	68.20	10.6%	65.8%
5.6	53.50	8.3%	76.5%
8.0	41.70	6.5%	84.8%
11.2	29.40	4.6%	91.3%
16.0	26.30	4.1%	95.9%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	641.10		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **197CS Lower Fence**
DATE: 8/10/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.149	1.089	2.192	7.729	14.921	21.0



Sieve Analysis Worksheet

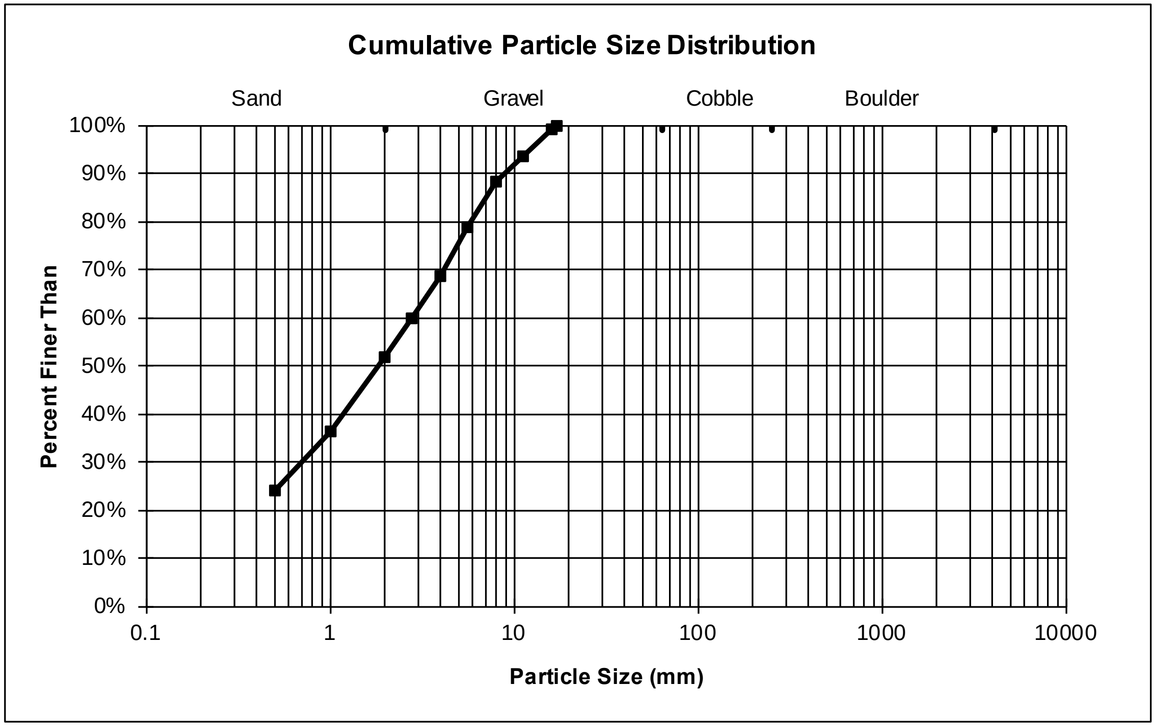
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	150.20	24.1%	
0.5	75.40	12.1%	24.1%
1.0	97.10	15.6%	36.2%
2.0	51.00	8.2%	51.7%
2.8	54.50	8.7%	59.9%
4.0	62.80	10.1%	68.7%
5.6	59.40	9.5%	78.7%
8.0	33.90	5.4%	88.2%
11.2	34.10	5.5%	93.7%
16.0	5.30	0.8%	99.2%
17.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	623.70		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Cut Slope
ID NUMBER: **197CS Upper Fence**
DATE: 8/10/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.080	0.935	1.851	6.823	12.205	17.0



Sieve Analysis Worksheet

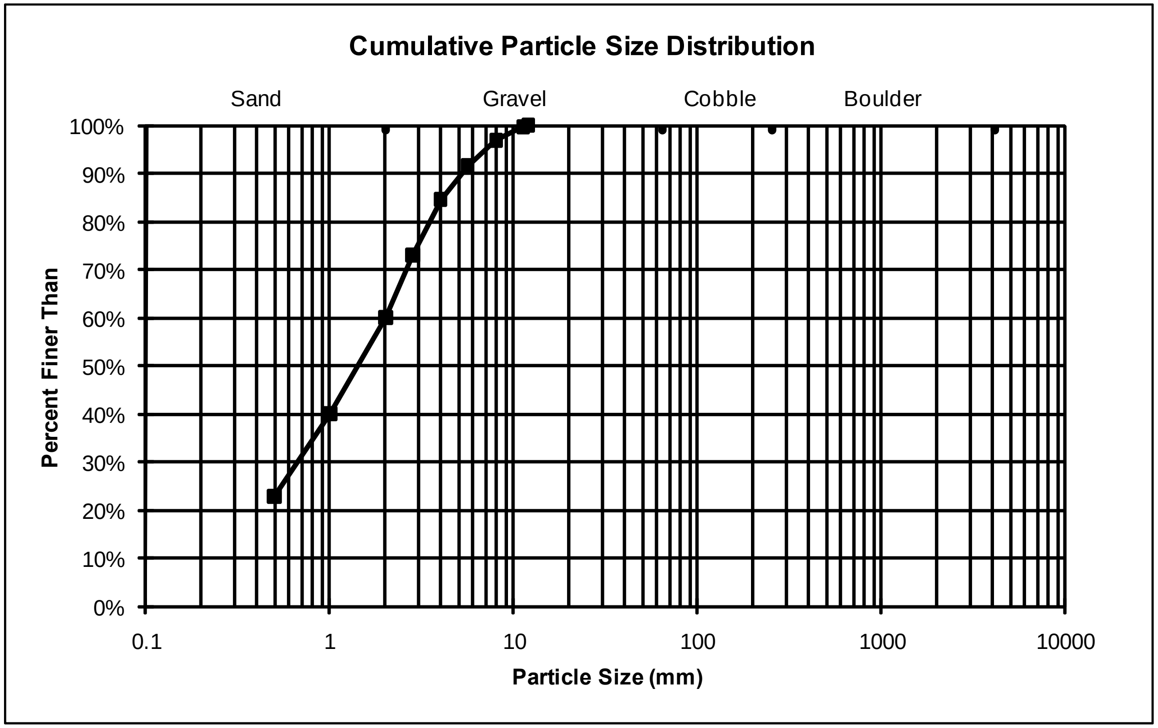
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	119.10	22.7%	
0.5	90.80	17.3%	22.7%
1.0	105.10	20.0%	40.0%
2.0	67.80	12.9%	60.0%
2.8	60.50	11.5%	73.0%
4.0	37.70	7.2%	84.5%
5.6	27.10	5.2%	91.7%
8.0	14.50	2.8%	96.9%
11.2	2.00	0.4%	99.6%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	524.60		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **001FS Upper Fence**
DATE: 7/14/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.096	0.818	1.413	3.938	7.038	12.0



Sieve Analysis Worksheet

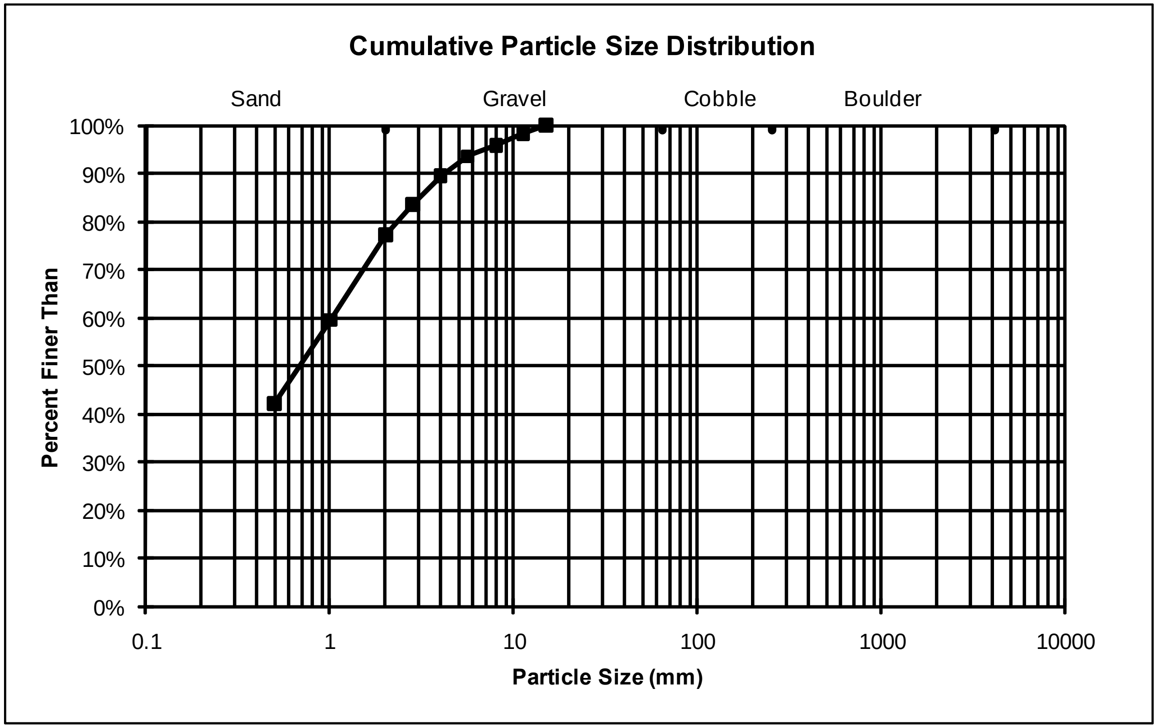
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	215.30	42.0%	
0.5	89.50	17.5%	42.0%
1.0	90.30	17.6%	59.5%
2.0	33.30	6.5%	77.1%
2.8	29.80	5.8%	83.6%
4.0	21.40	4.2%	89.4%
5.6	11.10	2.2%	93.6%
8.0	12.80	2.5%	95.7%
11.2	9.10	1.8%	98.2%
15.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	512.60		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **039FS Lower Fence**
DATE: 5/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.022	**0.223**	**0.687**	**2.874**	**7.096**	**15.0**



Sieve Analysis Worksheet

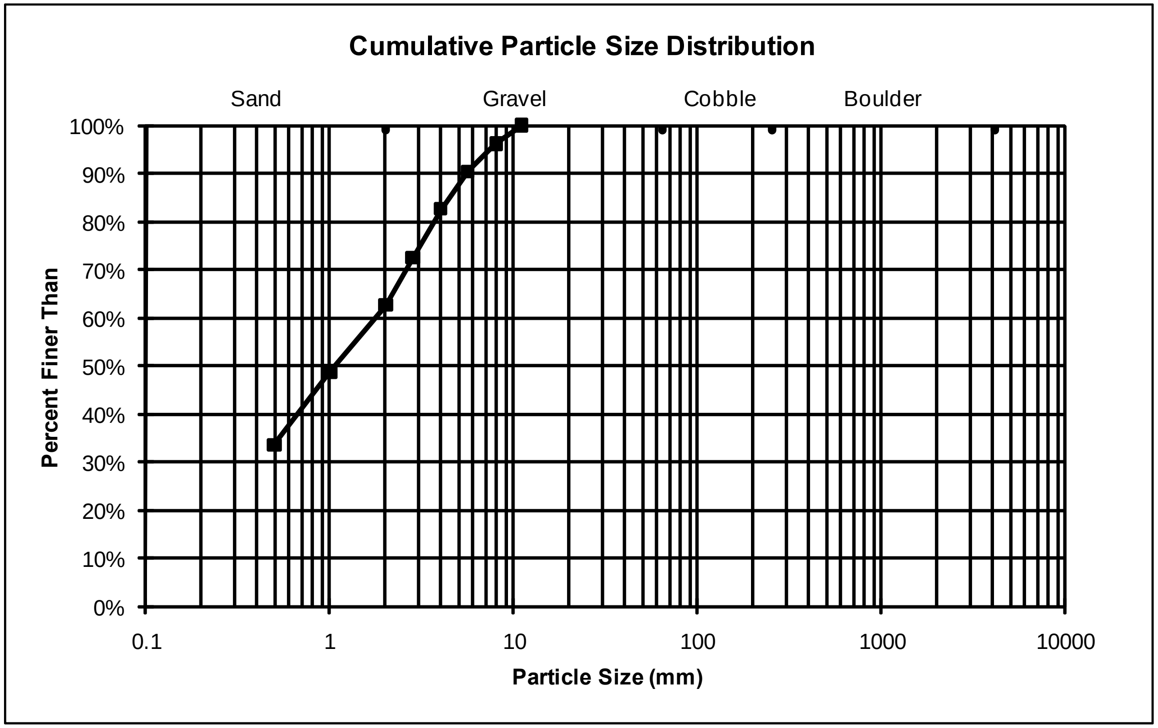
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	145.30	33.6%	
0.5	65.90	15.2%	33.6%
1.0	59.70	13.8%	48.8%
2.0	42.70	9.9%	62.6%
2.8	44.00	10.2%	72.4%
4.0	33.70	7.8%	82.6%
5.6	24.90	5.8%	90.4%
8.0	16.70	3.9%	96.1%
11.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	432.90		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **052FS Lower Fence**
DATE: 7/13/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.034	0.534	1.063	4.248	7.453	11.0



Sieve Analysis Worksheet

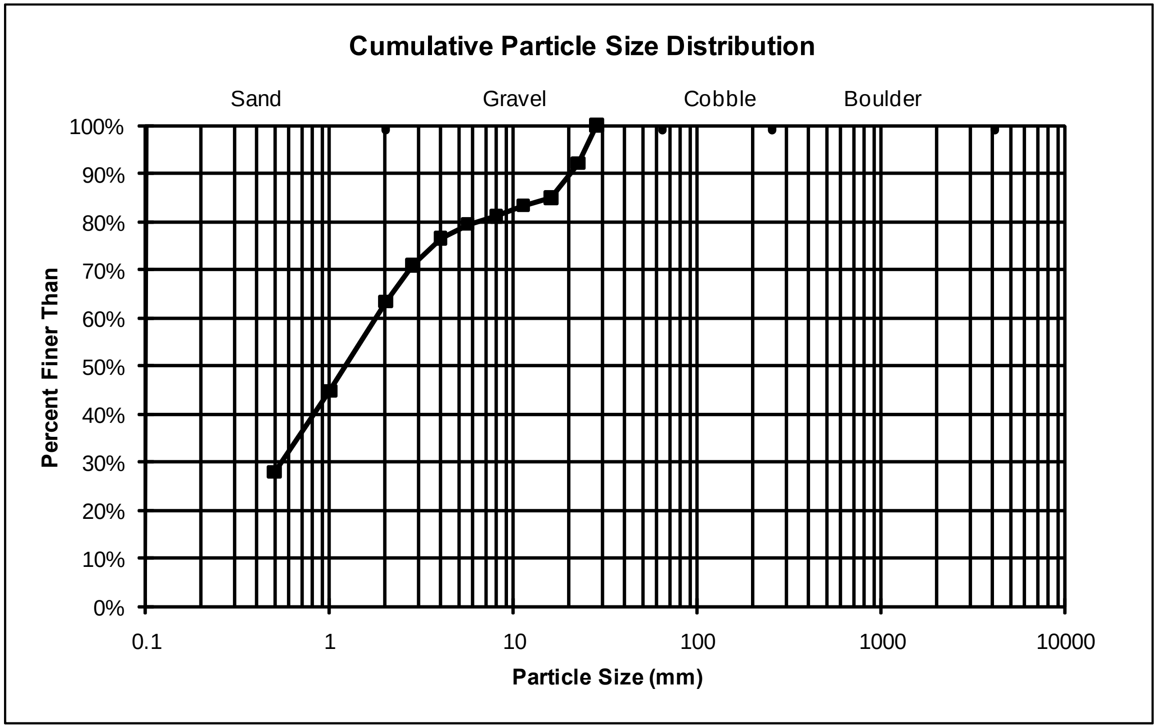
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	133.80	27.9%	
0.5	81.00	16.9%	27.9%
1.0	89.10	18.6%	44.8%
2.0	35.70	7.4%	63.3%
2.8	27.40	5.7%	70.8%
4.0	14.20	3.0%	76.5%
5.6	8.10	1.7%	79.4%
8.0	10.40	2.2%	81.1%
11.2	8.00	1.7%	83.3%
16.0	34.20	7.1%	85.0%
22.4	38.00	7.9%	92.1%
28.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	479.90		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **074FS Upper Fence**
DATE: 7/13/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.053	0.670	1.216	13.043	24.320	28.0



Sieve Analysis Worksheet

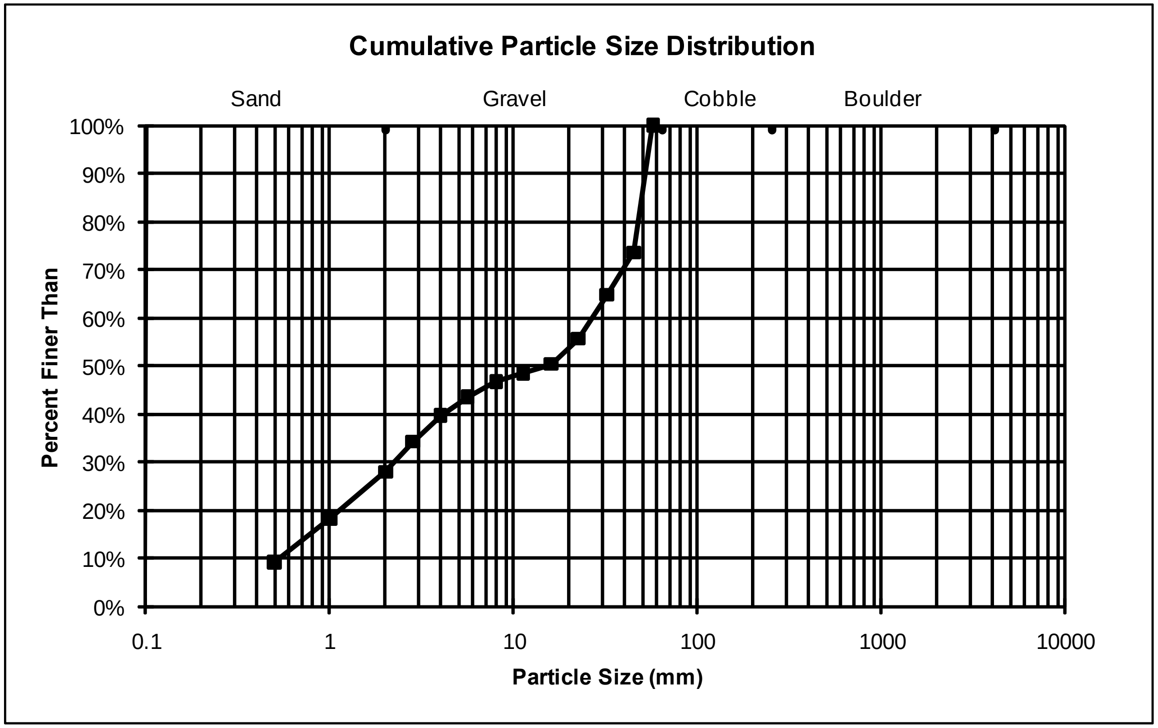
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	71.50	9.2%	
0.5	71.10	9.1%	9.2%
1.0	75.50	9.7%	18.2%
2.0	49.00	6.3%	27.9%
2.8	42.40	5.4%	34.2%
4.0	29.80	3.8%	39.6%
5.6	25.20	3.2%	43.4%
8.0	14.30	1.8%	46.6%
11.2	14.50	1.9%	48.5%
16.0	41.10	5.3%	50.3%
22.4	71.30	9.1%	55.6%
32.0	69.10	8.8%	64.7%
45.0	206.60	26.4%	73.6%
57.0	*		100.0%
90			-
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	781.40		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **074FS Upper Fence**
DATE: 8/24/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.781	2.955	15.009	49.402	54.508	57.0



Sieve Analysis Worksheet

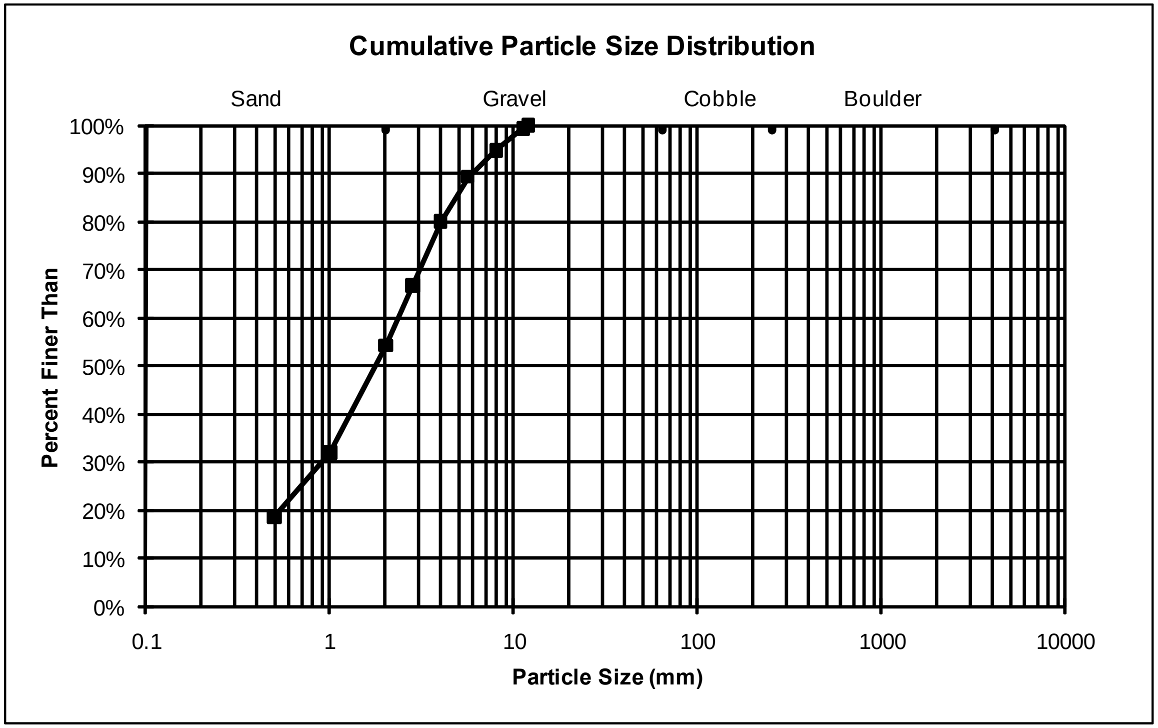
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	104.70	18.5%	
0.5	75.60	13.3%	18.5%
1.0	126.40	22.3%	31.8%
2.0	70.40	12.4%	54.2%
2.8	75.40	13.3%	66.6%
4.0	53.00	9.4%	79.9%
5.6	30.80	5.4%	89.3%
8.0	25.90	4.6%	94.7%
11.2	4.10	0.7%	99.3%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	566.30		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **074FS Lower Fence**
DATE: 8/24/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.200	**1.103**	**1.758**	**4.635**	**8.177**	**12.0**



Sieve Analysis Worksheet

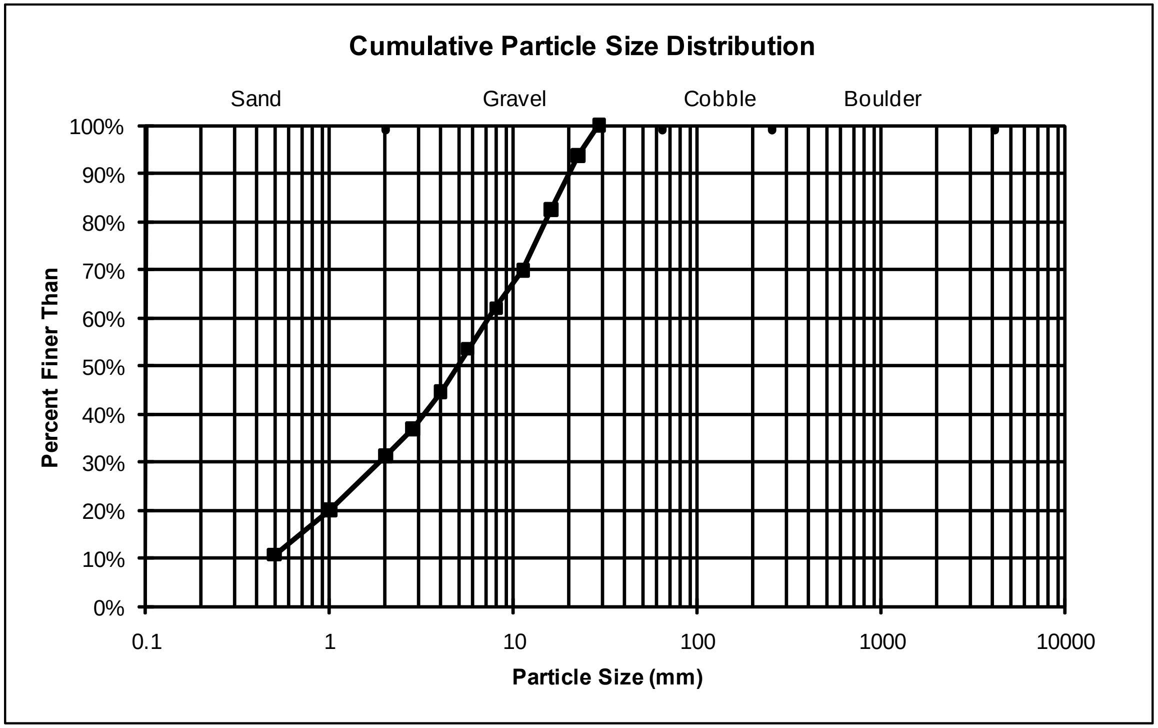
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	72.90	10.6%	
0.5	64.70	9.4%	10.6%
1.0	76.10	11.1%	20.1%
2.0	39.20	5.7%	31.2%
2.8	52.50	7.7%	36.9%
4.0	60.60	8.9%	44.6%
5.6	58.40	8.5%	53.5%
8.0	53.10	7.8%	62.0%
11.2	87.10	12.7%	69.7%
16.0	76.80	11.2%	82.5%
22.4	43.30	6.3%	93.7%
29.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	684.70		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **079FS Upper Fence**
DATE: 6/22/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.688	**2.499**	**4.911**	**16.757**	**23.644**	**29.0**



Sieve Analysis Worksheet

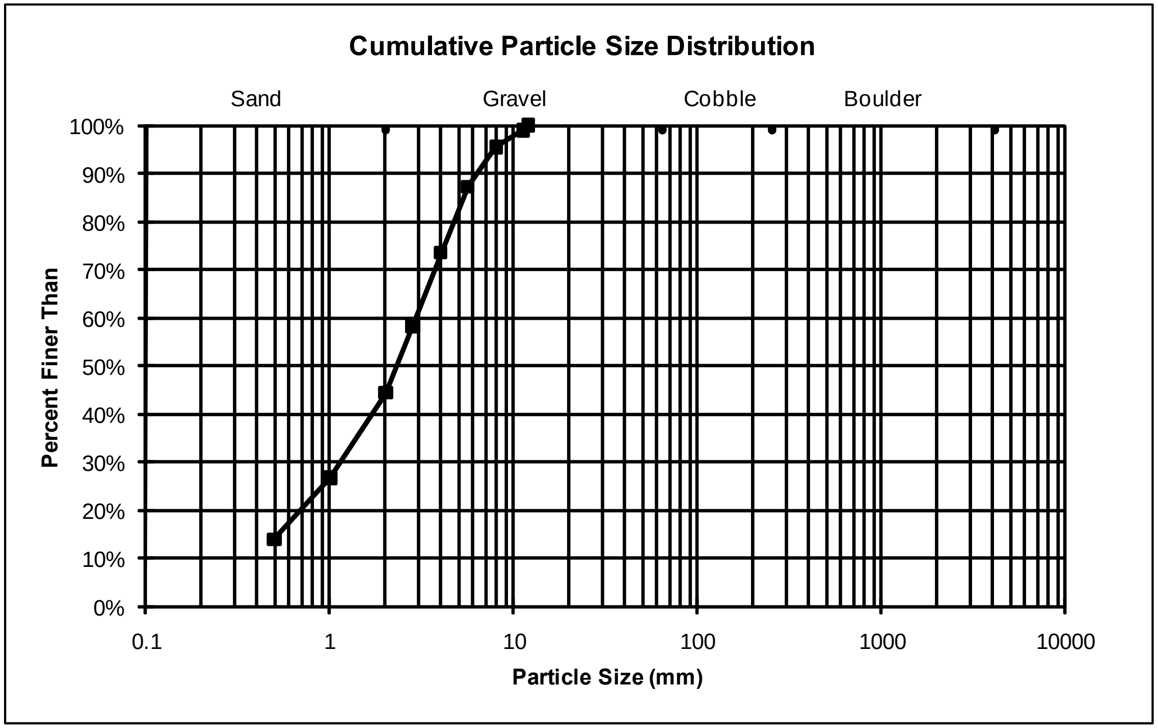
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	69.50	13.9%	
0.5	64.20	12.9%	13.9%
1.0	87.90	17.6%	26.8%
2.0	69.40	13.9%	44.4%
2.8	75.90	15.2%	58.3%
4.0	68.80	13.8%	73.5%
5.6	40.90	8.2%	87.2%
8.0	17.20	3.4%	95.4%
11.2	5.60	1.1%	98.9%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	499.40		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **086FS Lower Fence**
DATE: 9/17/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.530	**1.383**	**2.292**	**5.173**	**7.850**	**12.0**



Sieve Analysis Worksheet

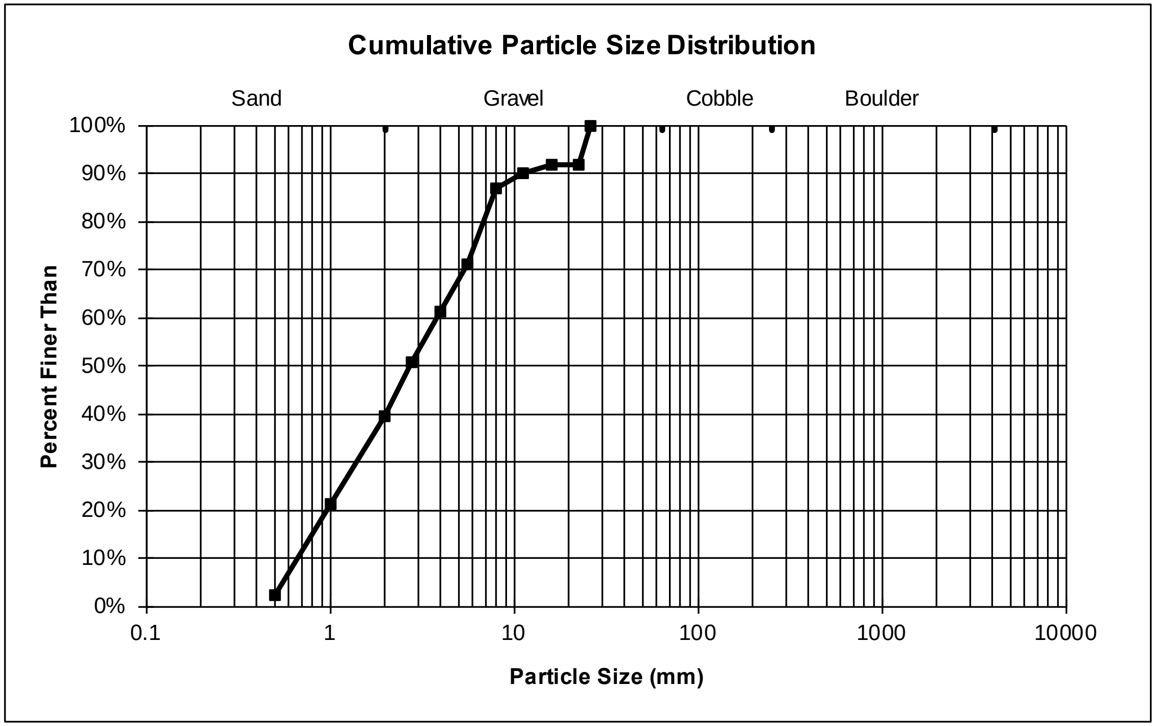
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	8.90	2.4%	
0.5	69.50	18.9%	2.4%
1.0	66.40	18.1%	21.3%
2.0	40.90	11.1%	39.4%
2.8	39.40	10.7%	50.5%
4.0	35.50	9.7%	61.3%
5.6	58.70	16.0%	70.9%
8.0	11.50	3.1%	86.9%
11.2	6.40	1.7%	90.0%
16.0	0.00	0.0%	91.8%
22.4	30.20	8.2%	91.8%
26.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	367.40		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **088FS Lower Fence**
DATE: 6/22/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.793	1.689	2.754	7.497	23.747	26.0



Sieve Analysis Worksheet

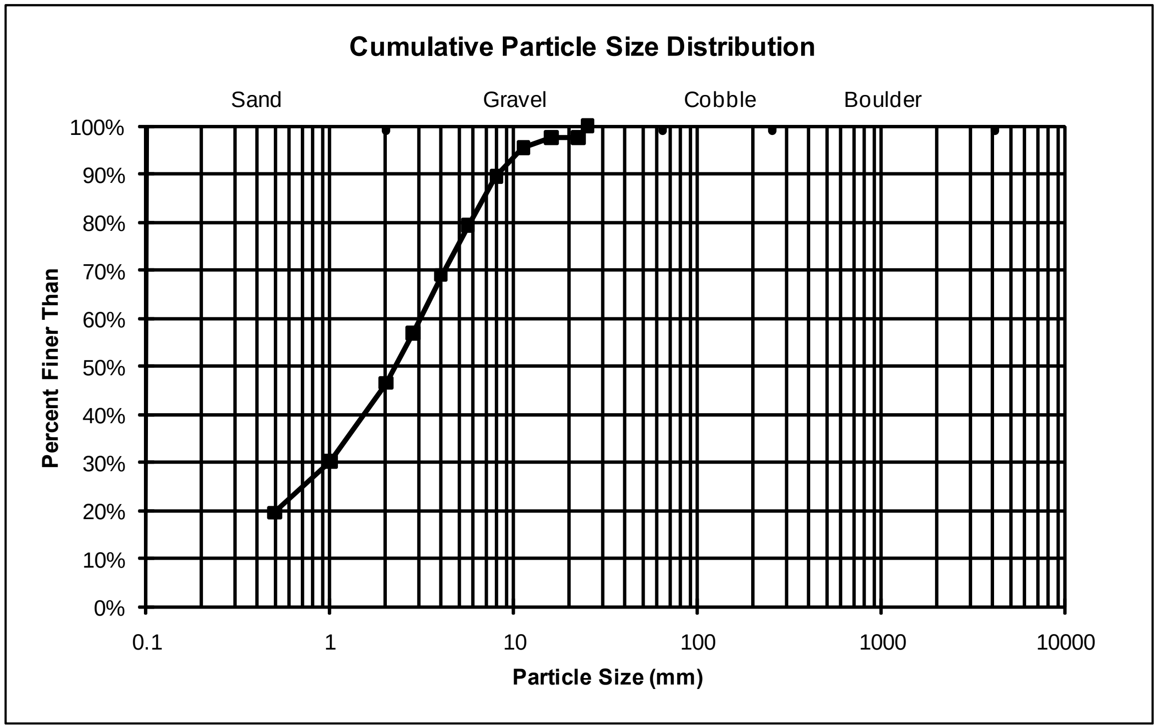
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	96.50	19.5%	
0.5	52.90	10.7%	19.5%
1.0	80.20	16.2%	30.2%
2.0	51.50	10.4%	46.5%
2.8	59.50	12.0%	56.9%
4.0	51.70	10.5%	68.9%
5.6	49.40	10.0%	79.4%
8.0	29.60	6.0%	89.4%
11.2	10.40	2.1%	95.4%
16.0	0.00	0.0%	97.5%
22.4	12.50	2.5%	97.5%
25.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	494.20		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **093FS Upper Fence**
DATE: 8/24/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.162	1.226	2.242	6.603	10.972	25.0



Sieve Analysis Worksheet

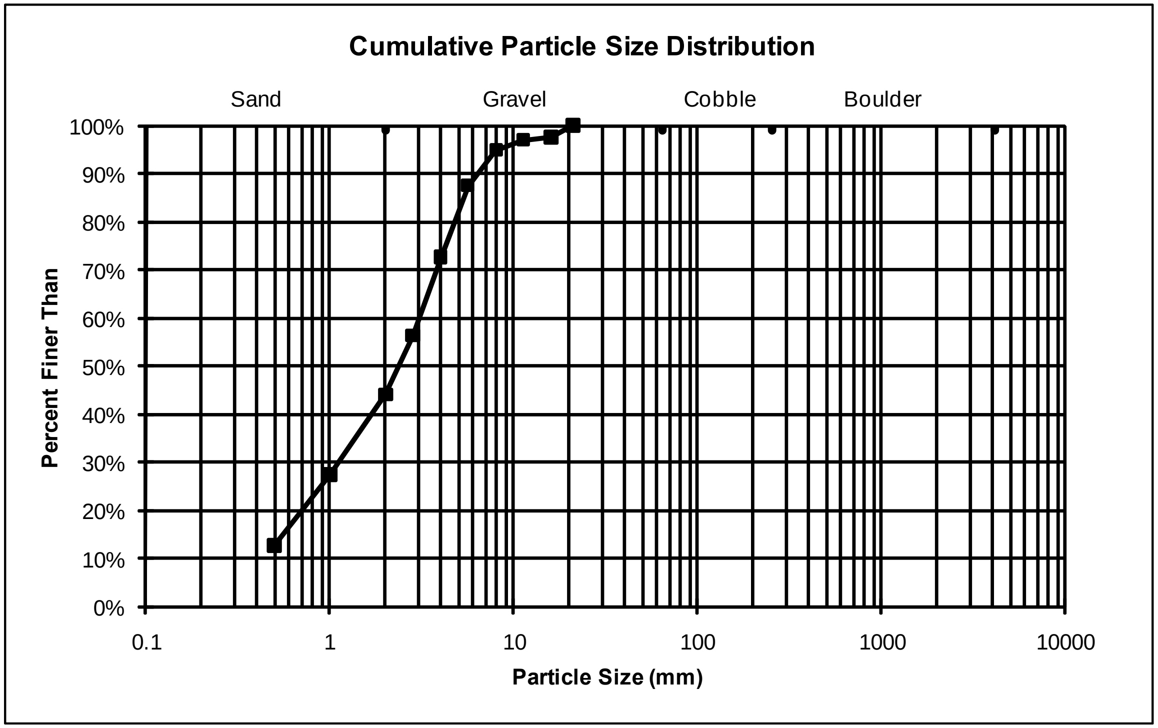
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	77.30	12.5%	
0.5	92.00	14.9%	12.5%
1.0	102.80	16.6%	27.4%
2.0	75.50	12.2%	44.1%
2.8	100.20	16.2%	56.3%
4.0	92.70	15.0%	72.5%
5.6	45.30	7.3%	87.5%
8.0	13.10	2.1%	94.9%
11.2	4.10	0.7%	97.0%
16.0	14.50	2.3%	97.7%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	617.50		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **101FS Upper Fence**
DATE: 9/17/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.561	**1.371**	**2.355**	**5.174**	**8.171**	**21.0**



Sieve Analysis Worksheet

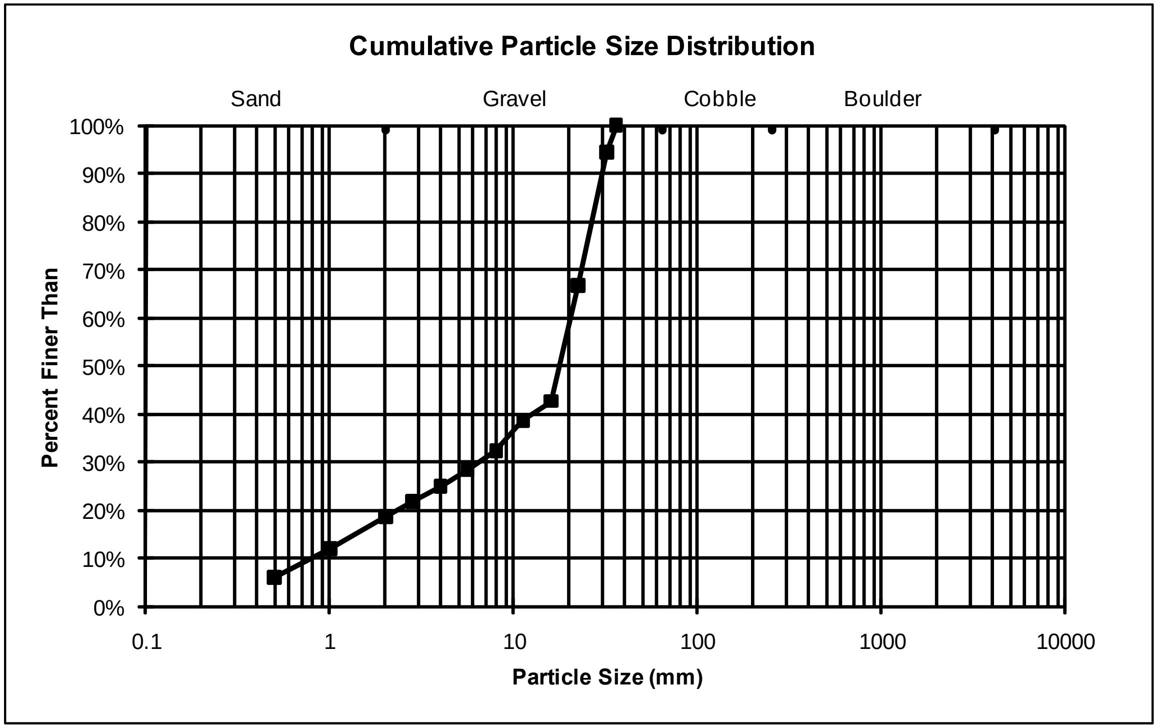
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	51.50	6.0%	
0.5	50.40	5.9%	6.0%
1.0	57.30	6.7%	11.9%
2.0	26.50	3.1%	18.6%
2.8	28.50	3.3%	21.7%
4.0	29.60	3.5%	25.0%
5.6	31.80	3.7%	28.5%
8.0	53.80	6.3%	32.2%
11.2	35.40	4.1%	38.5%
16.0	205.40	24.0%	42.6%
22.4	237.50	27.8%	66.6%
32.0	48.10	5.6%	94.4%
36.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	855.80		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **103FS Upper Fence**
DATE: 6/30/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.377	9.292	17.742	28.004	32.419	36.0



Sieve Analysis Worksheet

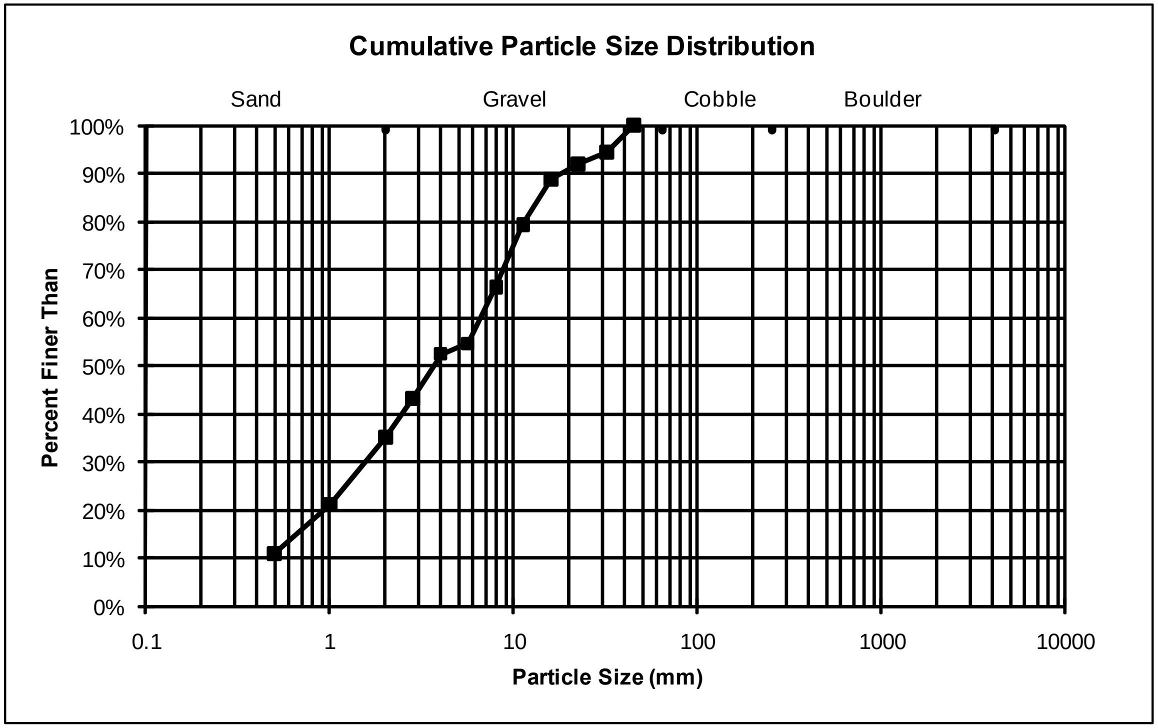
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	71.00	10.9%	
0.5	67.60	10.3%	10.9%
1.0	91.40	14.0%	21.2%
2.0	52.10	8.0%	35.2%
2.8	60.60	9.3%	43.1%
4.0	14.10	2.2%	52.4%
5.6	77.10	11.8%	54.6%
8.0	84.90	13.0%	66.4%
11.2	61.70	9.4%	79.3%
16.0	20.00	3.1%	88.8%
22.4	16.60	2.5%	91.8%
32.0	36.80	5.6%	94.4%
45.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	653.90		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **177FS Upper Fence**
DATE: 8/10/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.660	**1.983**	**3.646**	**13.358**	**33.240**	**45.0**



Sieve Analysis Worksheet

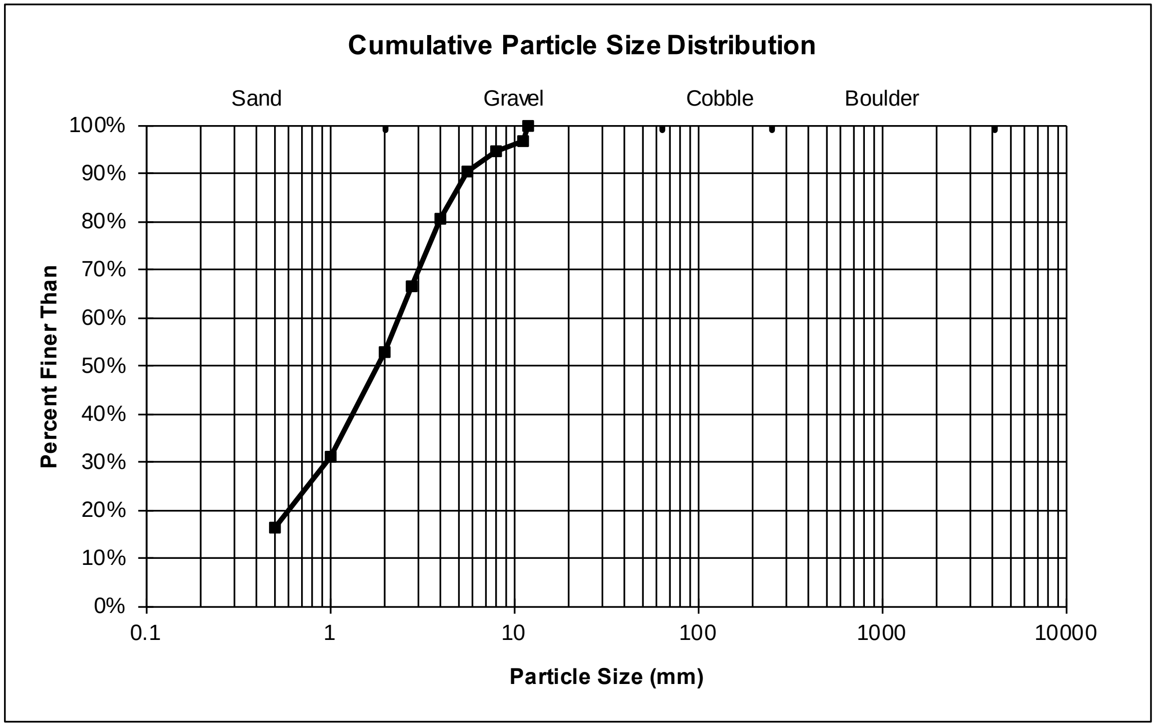
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	78.30	16.4%	
0.5	70.10	14.7%	16.4%
1.0	104.00	21.8%	31.1%
2.0	64.30	13.5%	52.9%
2.8	67.50	14.2%	66.4%
4.0	46.90	9.8%	80.6%
5.6	19.20	4.0%	90.4%
8.0	11.30	2.4%	94.4%
11.2	15.30	3.2%	96.8%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	476.90		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **187FS Upper Fence**
DATE: 6/2/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.329	1.131	1.822	4.499	8.684	12.0



Sieve Analysis Worksheet

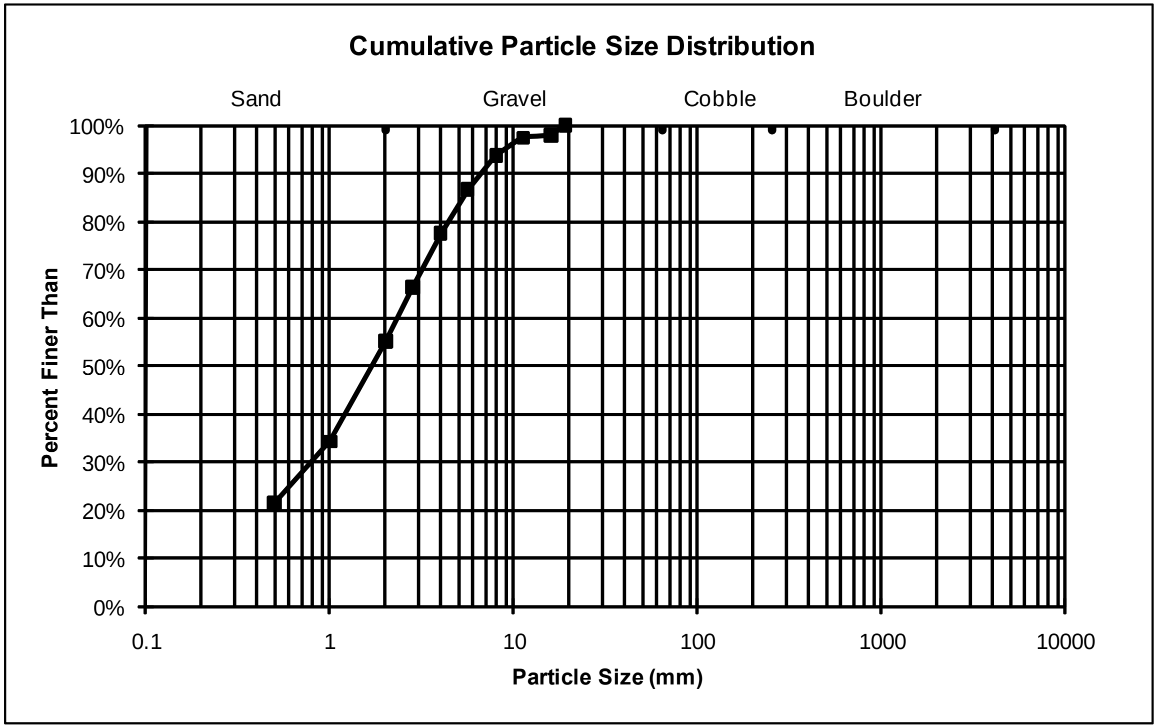
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	103.70	21.4%	
0.5	62.70	12.9%	21.4%
1.0	100.80	20.8%	34.3%
2.0	54.80	11.3%	55.0%
2.8	54.50	11.2%	66.3%
4.0	44.10	9.1%	77.5%
5.6	34.00	7.0%	86.6%
8.0	18.50	3.8%	93.6%
11.2	1.90	0.4%	97.4%
16.0	10.60	2.2%	97.8%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	485.60		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **193FS Upper Fence**
DATE: 5/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.118	1.025	1.691	5.083	9.040	19.0



Sieve Analysis Worksheet

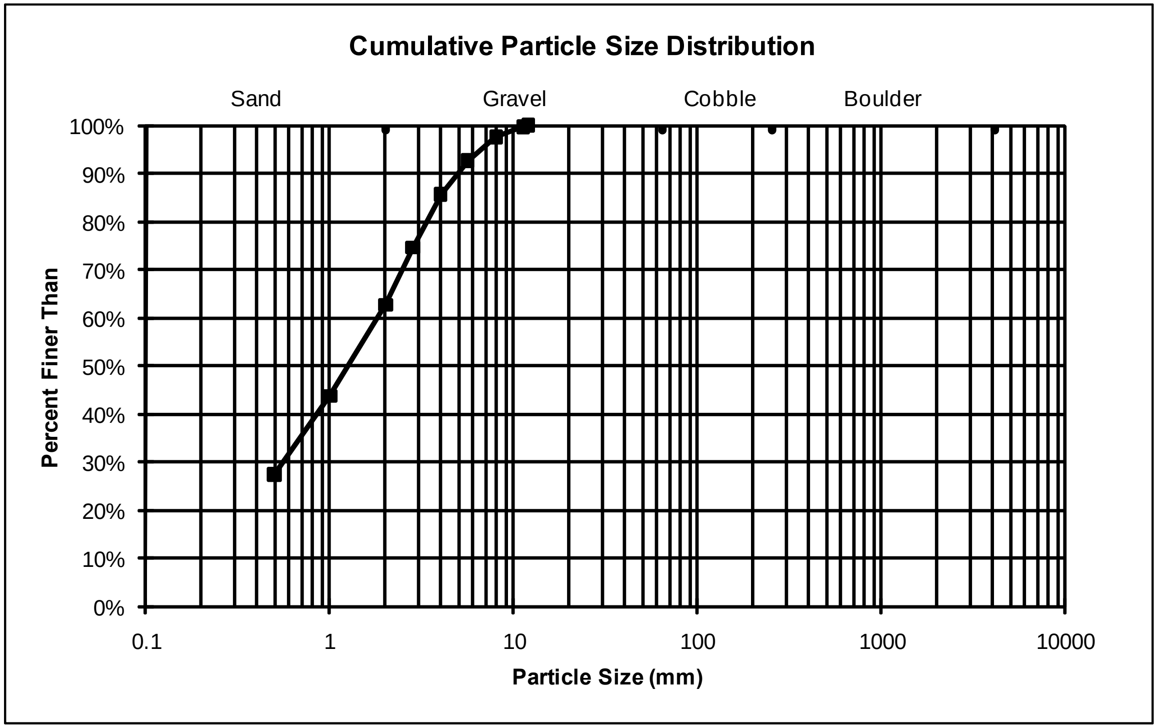
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	161.40	27.3%	
0.5	97.20	16.4%	27.3%
1.0	112.10	18.9%	43.7%
2.0	70.50	11.9%	62.6%
2.8	65.70	11.1%	74.6%
4.0	40.90	6.9%	85.7%
5.6	28.80	4.9%	92.6%
8.0	13.00	2.2%	97.4%
11.2	2.20	0.4%	99.6%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	591.80		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **203FS Upper Fence**
DATE: 5/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.056	0.693	1.259	3.793	6.694	12.0



Sieve Analysis Worksheet

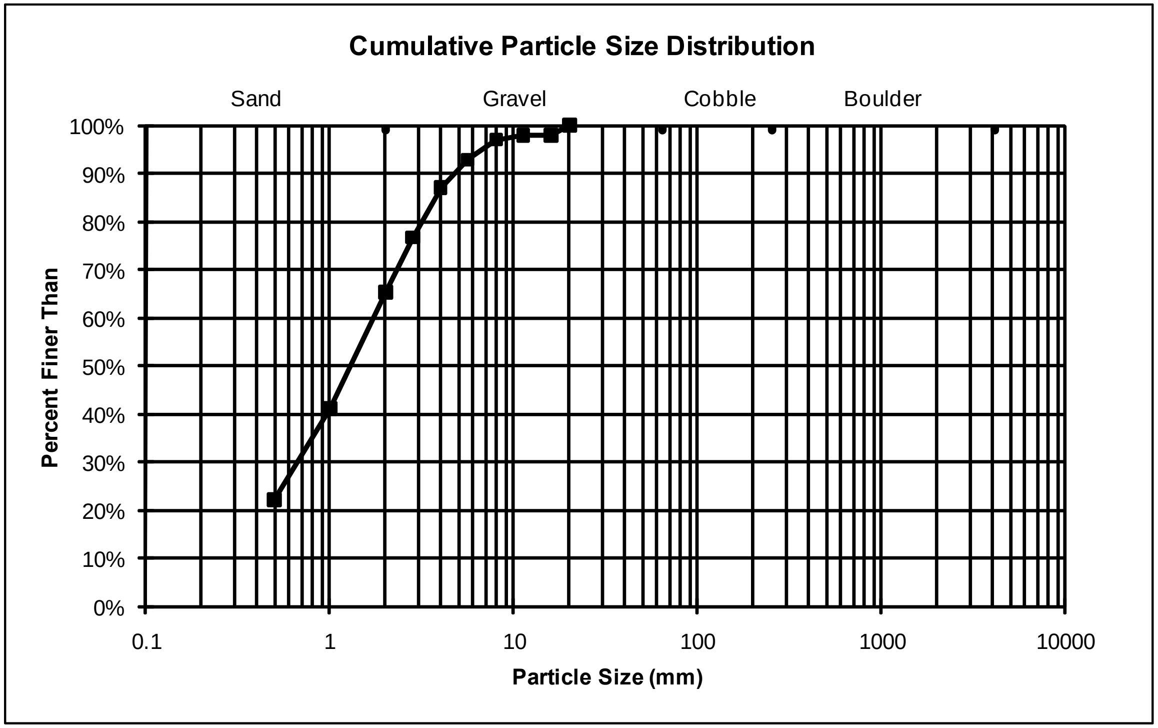
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	121.30	22.0%	
0.5	104.60	19.0%	22.0%
1.0	132.70	24.1%	41.1%
2.0	63.20	11.5%	65.2%
2.8	56.80	10.3%	76.7%
4.0	32.20	5.9%	87.0%
5.6	22.90	4.2%	92.8%
8.0	5.10	0.9%	97.0%
11.2	0.00	0.0%	97.9%
16.0	11.40	2.1%	97.9%
20.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	550.20		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **203FS Upper Fence**
DATE: 8/10/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.106	0.802	1.293	3.608	6.739	20.0



Sieve Analysis Worksheet

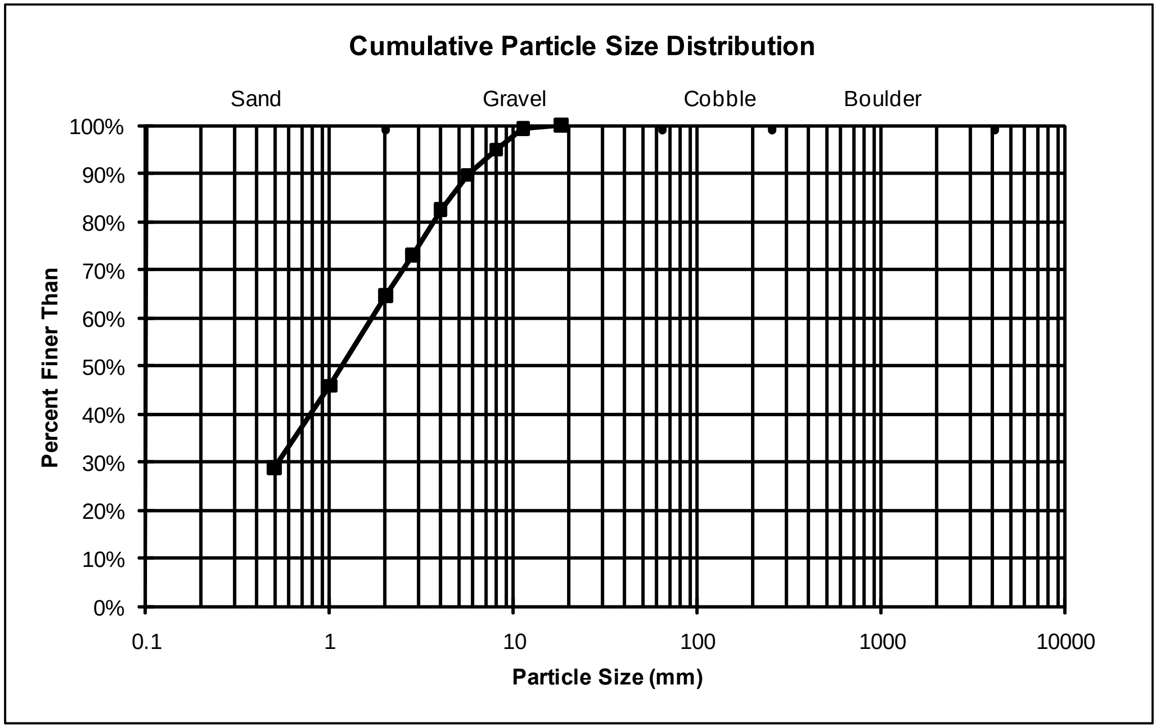
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	126.50	28.9%	
0.5	74.30	17.0%	28.9%
1.0	82.10	18.7%	45.8%
2.0	36.30	8.3%	64.6%
2.8	42.00	9.6%	72.9%
4.0	31.70	7.2%	82.5%
5.6	22.80	5.2%	89.7%
8.0	19.20	4.4%	94.9%
11.2	3.10	0.7%	99.3%
18.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	438.00		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Fill Slope
ID NUMBER: **204FS Upper Fence**
DATE: 7/13/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.049	0.642	1.166	4.296	8.056	18.0

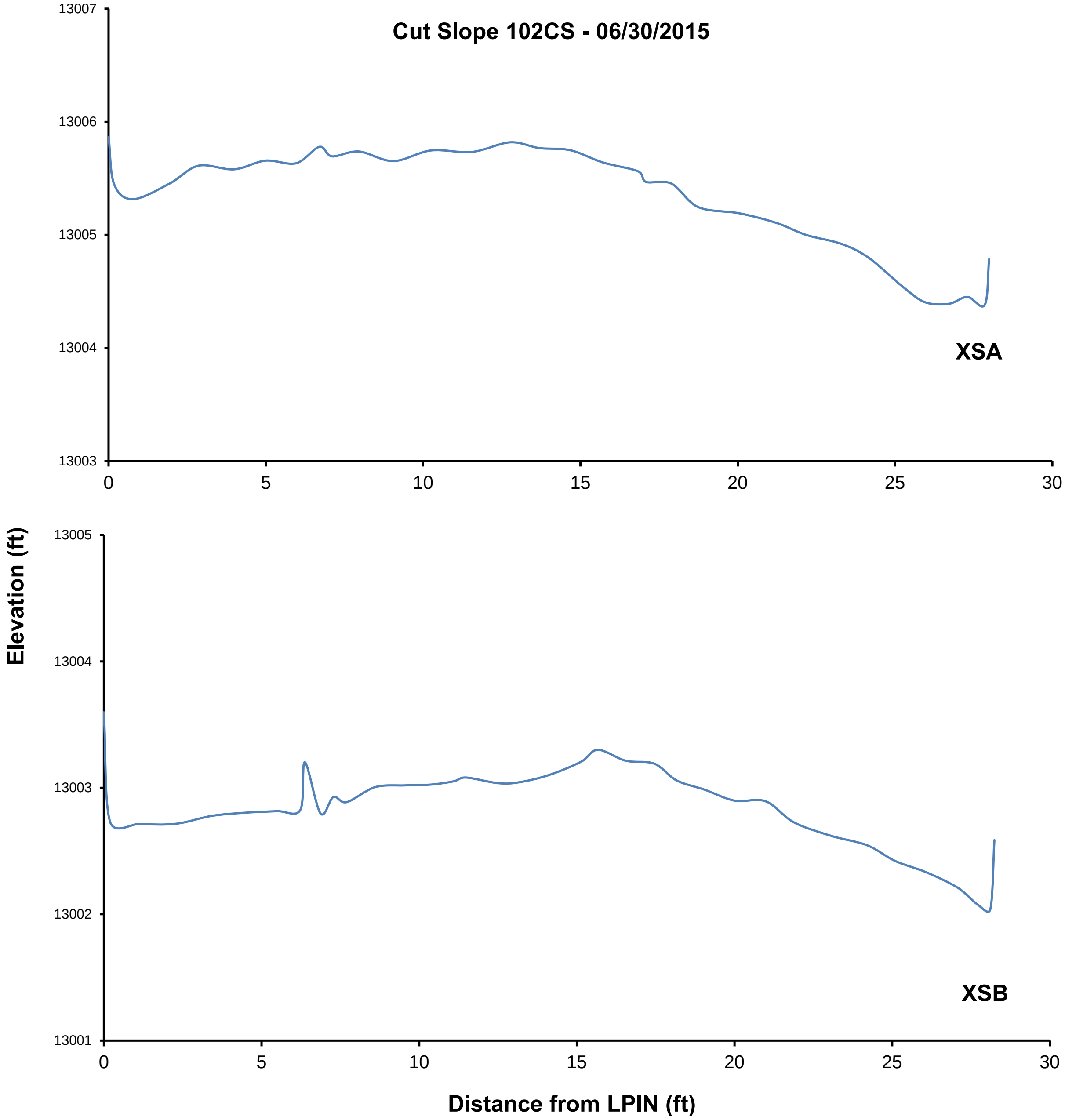


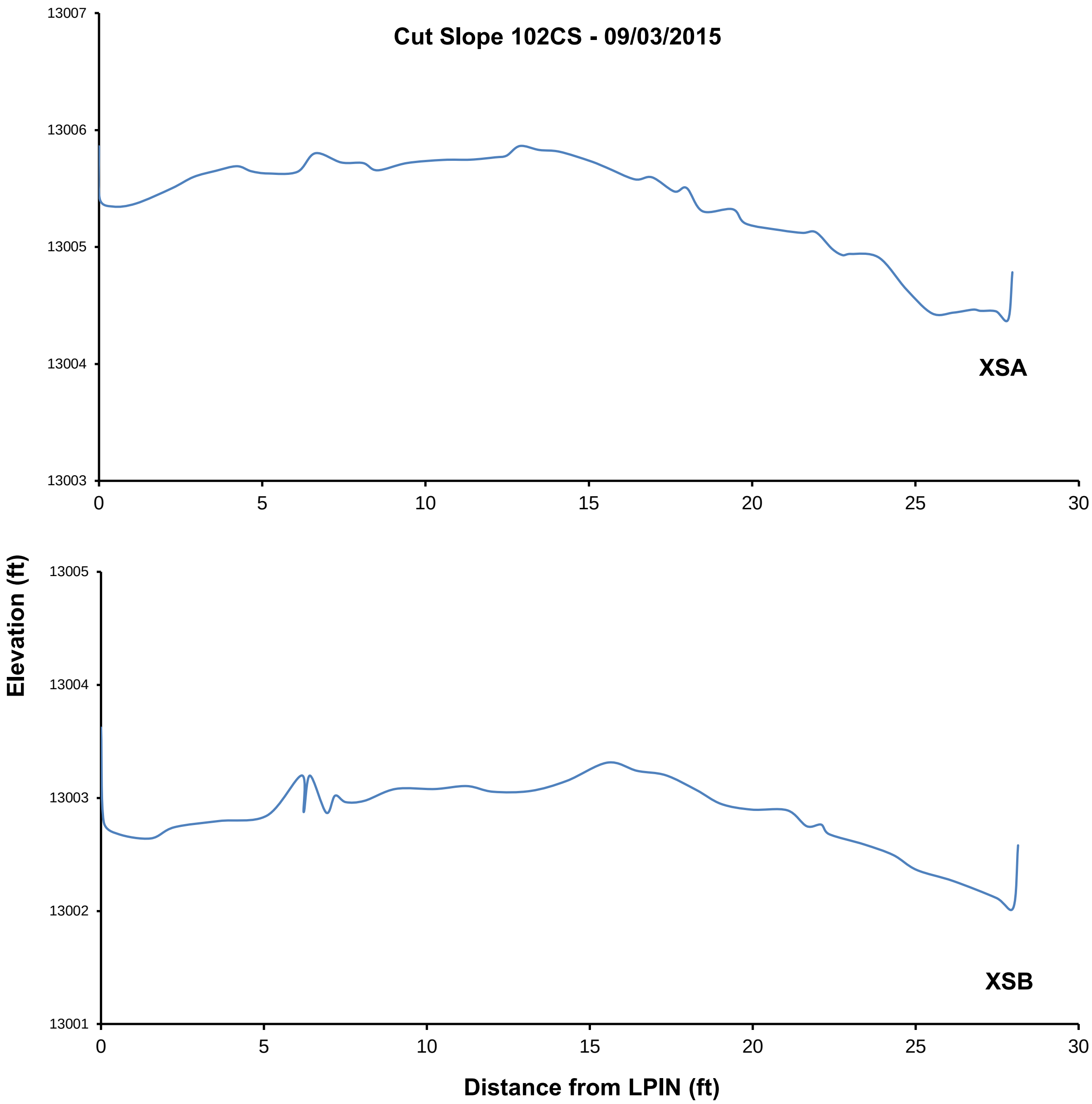
Appendix G

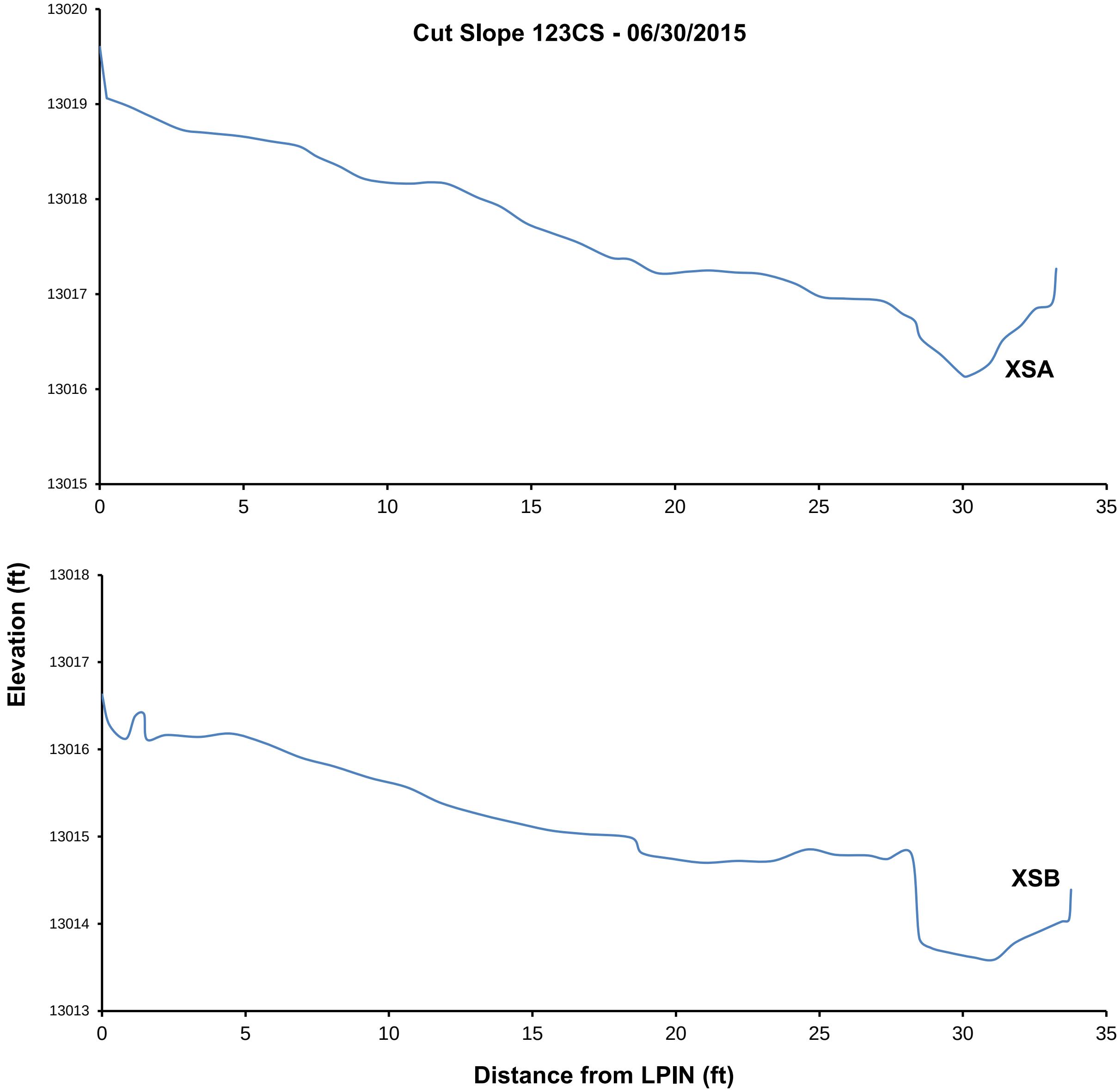
Cut Slope

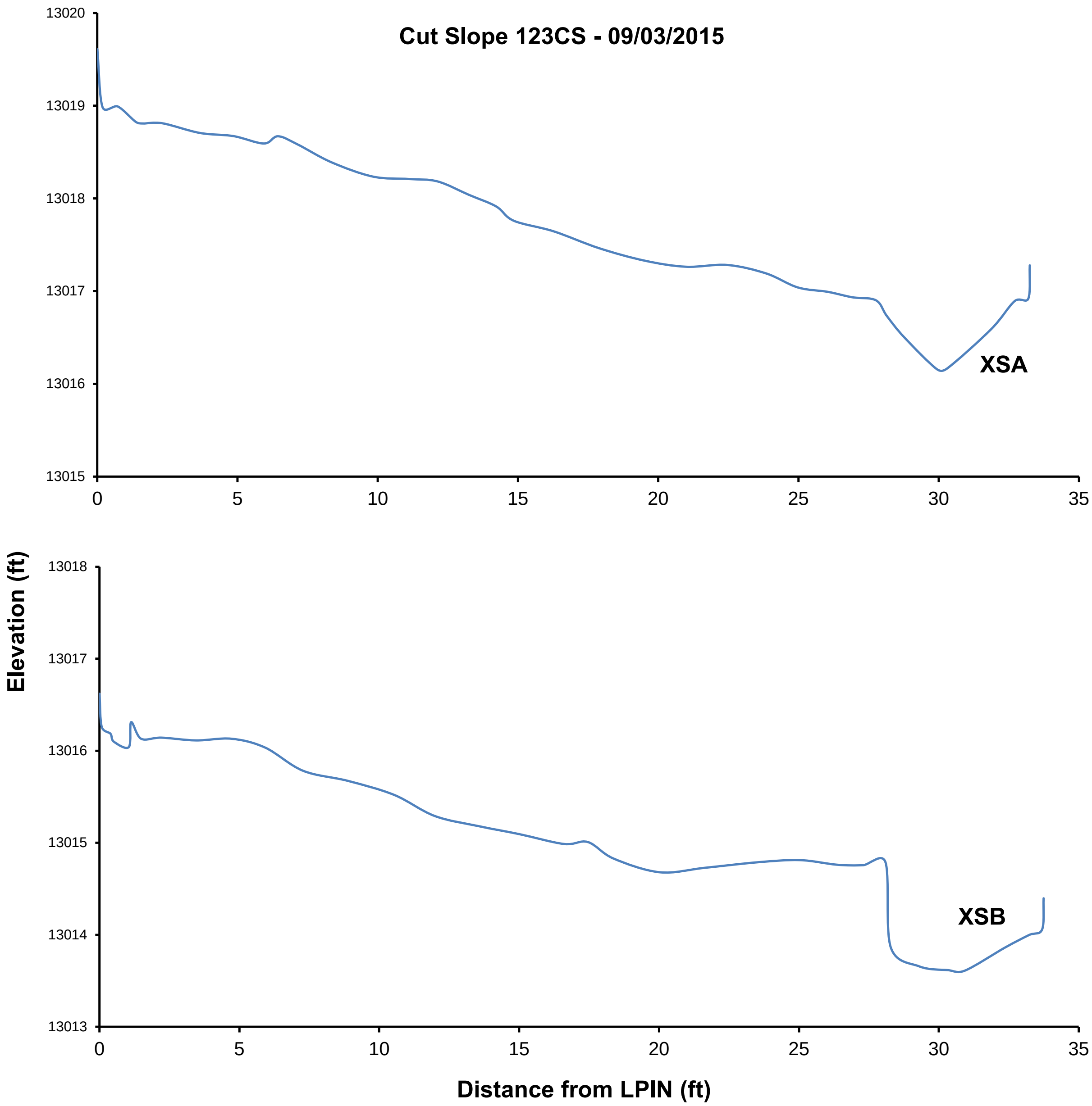
Cross Section Graphs

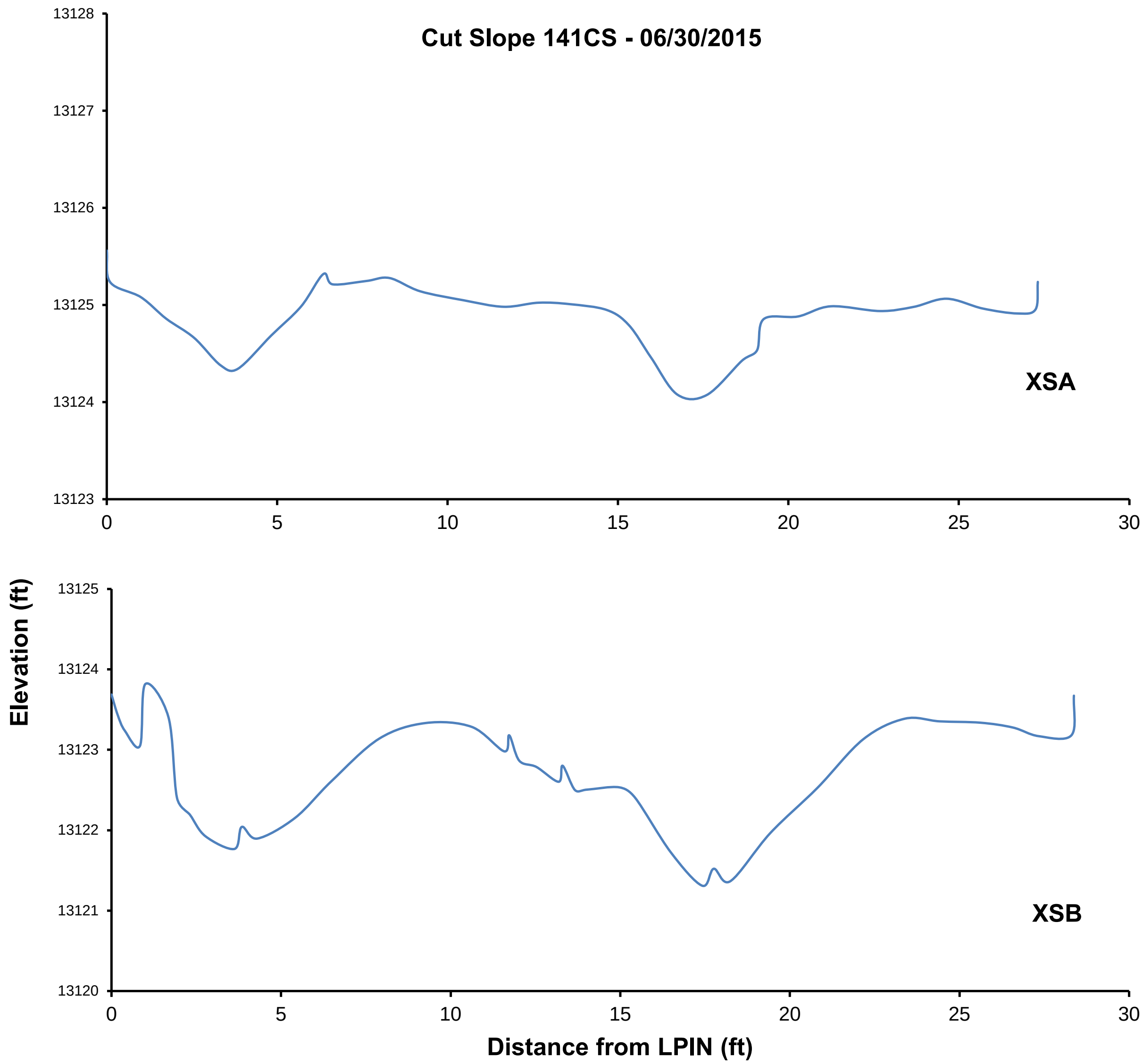
2015


Cut Slope 102CS - 06/30/2015
Elevation (ft)
13007
13006
13005
13004
13003
0
5
10
15
20
25
30
XSA
13005
13004
13003
13002
13001
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

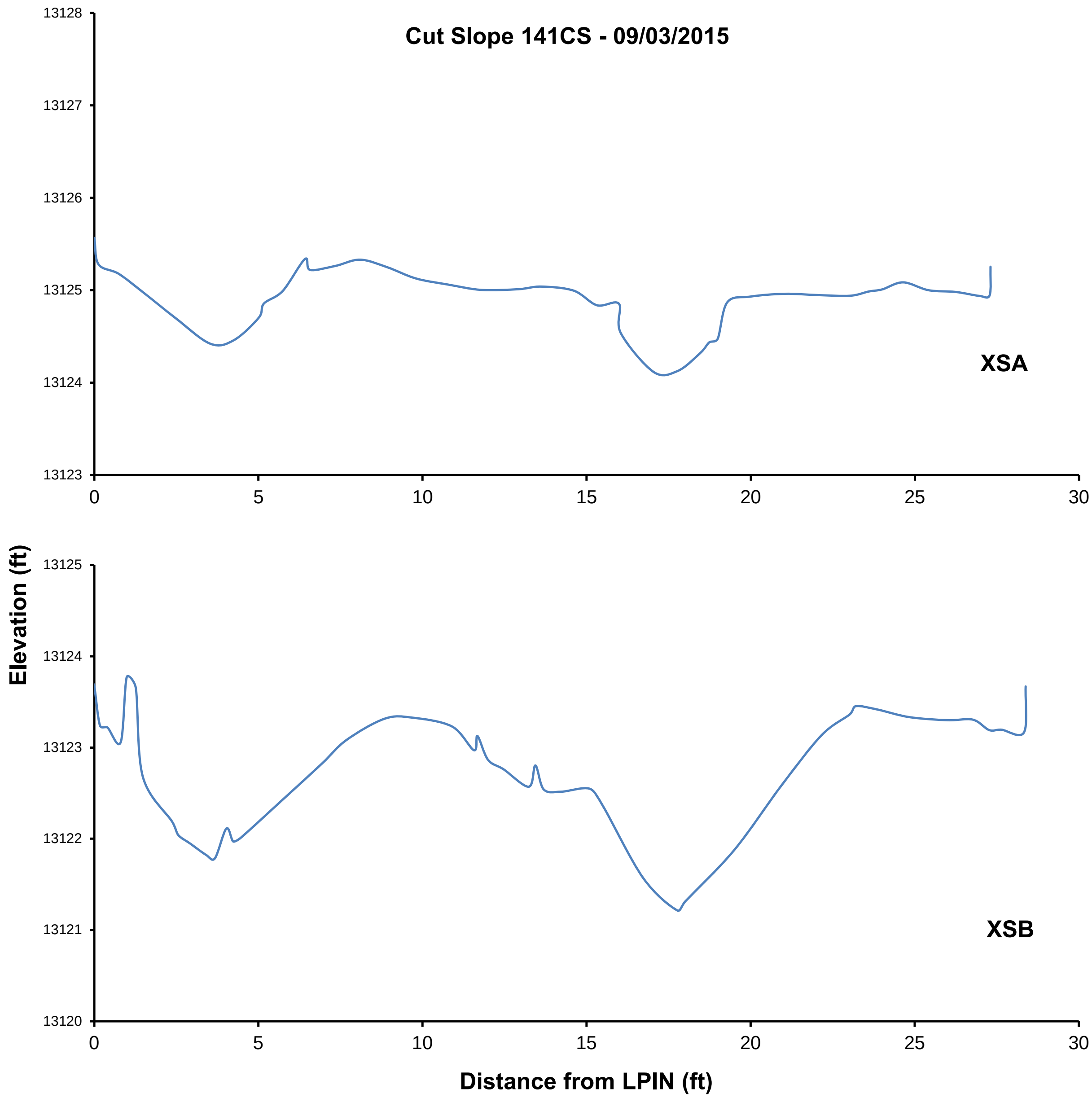

Cut Slope 102CS - 09/03/2015
13007
13006
13005
13004
13003
0
5
10
15
20
25
30
XSA
Elevation (ft)
13005
13004
13003
13002
13001
XSB
Distance from LPIN (ft)


Cut Slope 123CS - 06/30/2015
XSA
XSB
Elevation (ft)
Distance from LPIN (ft)
13020
13019
13018
13017
13016
13015
13014
13013
0
5
10
15
20
25
30
35


Cut Slope 123CS - 09/03/2015
13020
13019
13018
13017
13016
13015
0
5
10
15
20
25
30
35
XSA
Elevation (ft)
13018
13017
13016
13015
13014
13013
XSB
Distance from LPIN (ft)



Cut Slope 141CS - 06/30/2015
13128
13127
13126
13125
13124
13123
0
5
10
15
20
25
30
XSA
Elevation (ft)
13125
13124
13123
13122
13121
13120
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

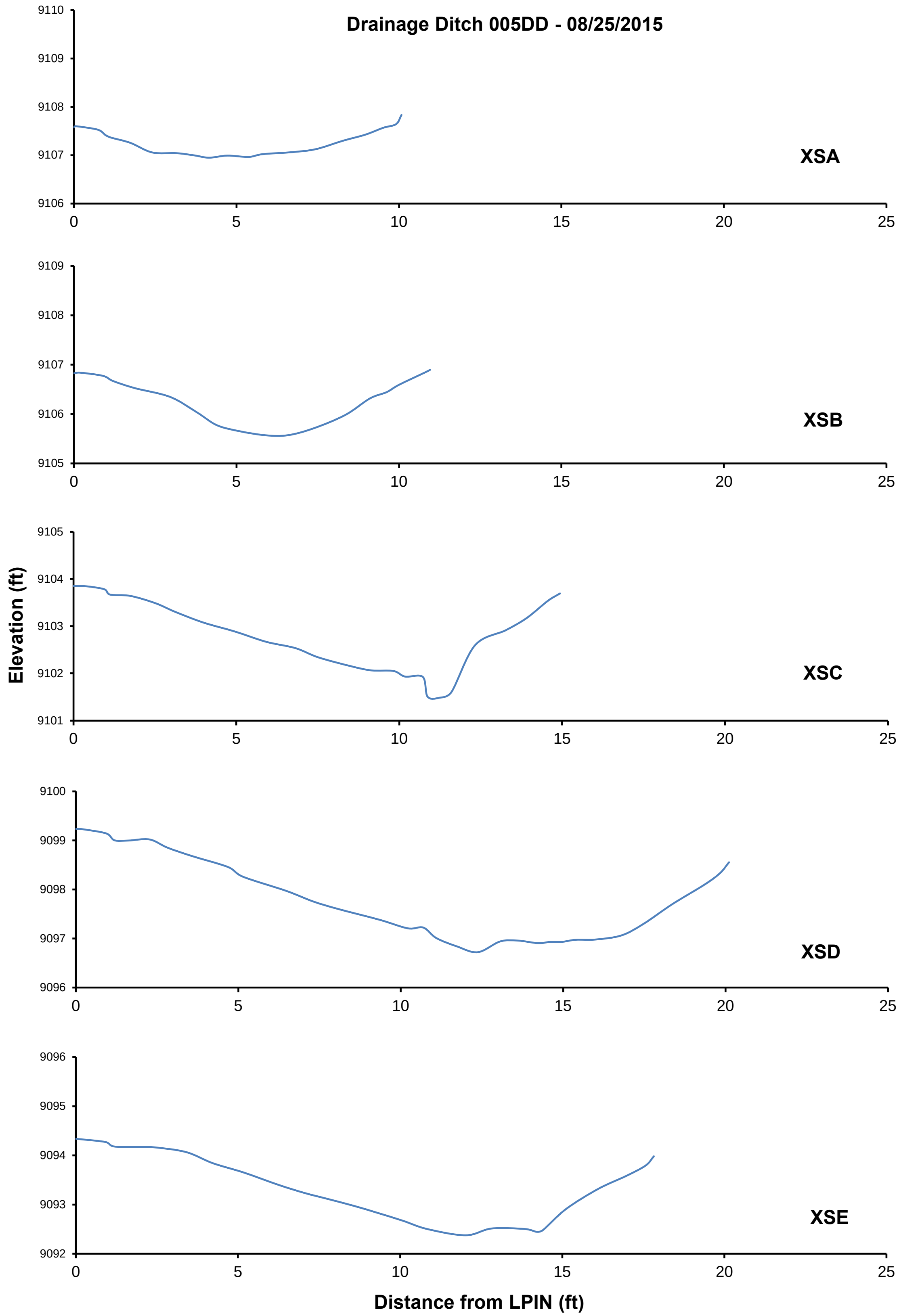

Cut Slope 141CS - 09/03/2015
13128
13127
13126
13125
13124
13123
0
5
10
15
20
25
30
XSA
Elevation (ft)
13125
13124
13123
13122
13121
13120
0
5
10
15
20
25
30
XSB
Distance from LPIN (ft)

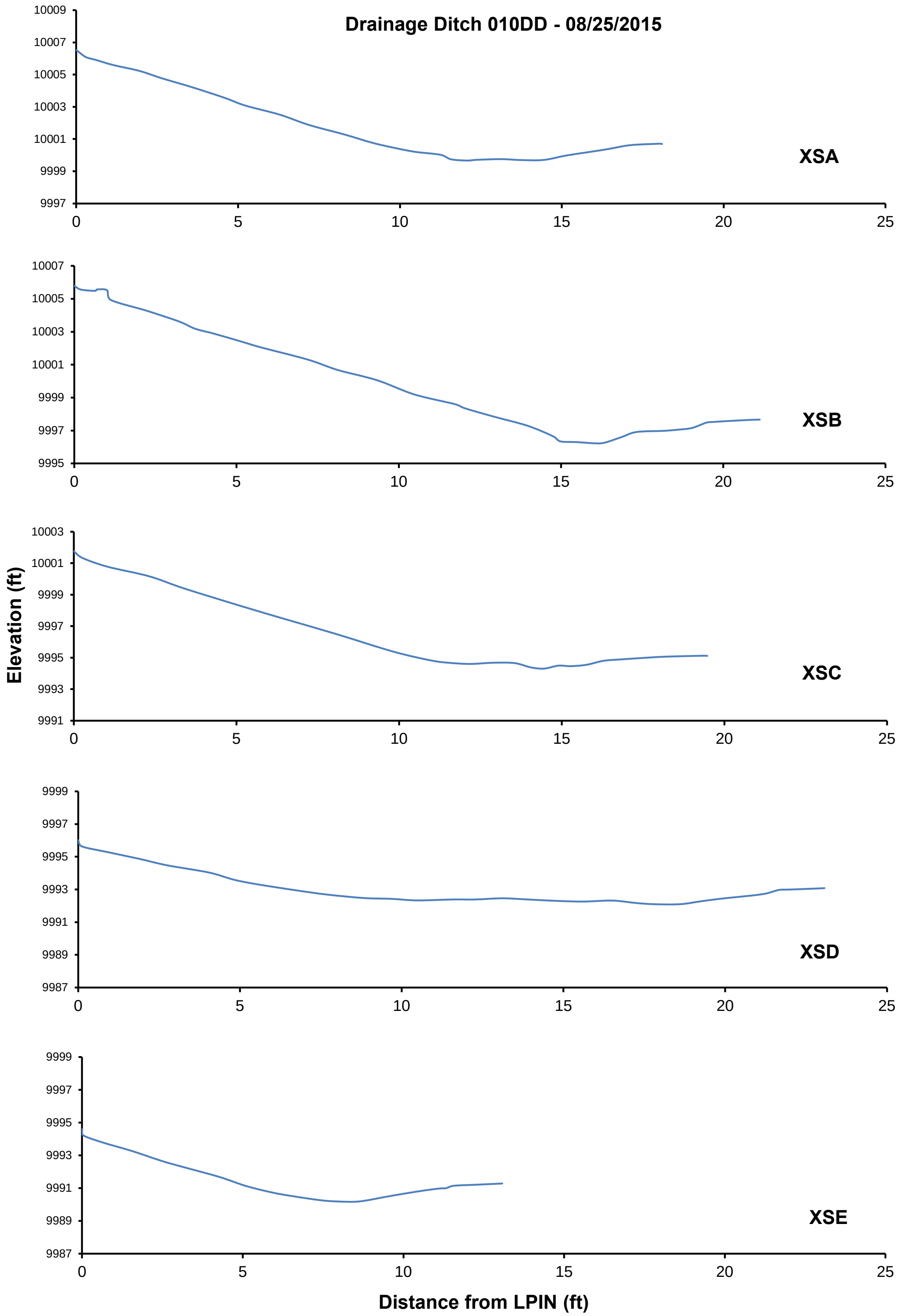
Appendix H

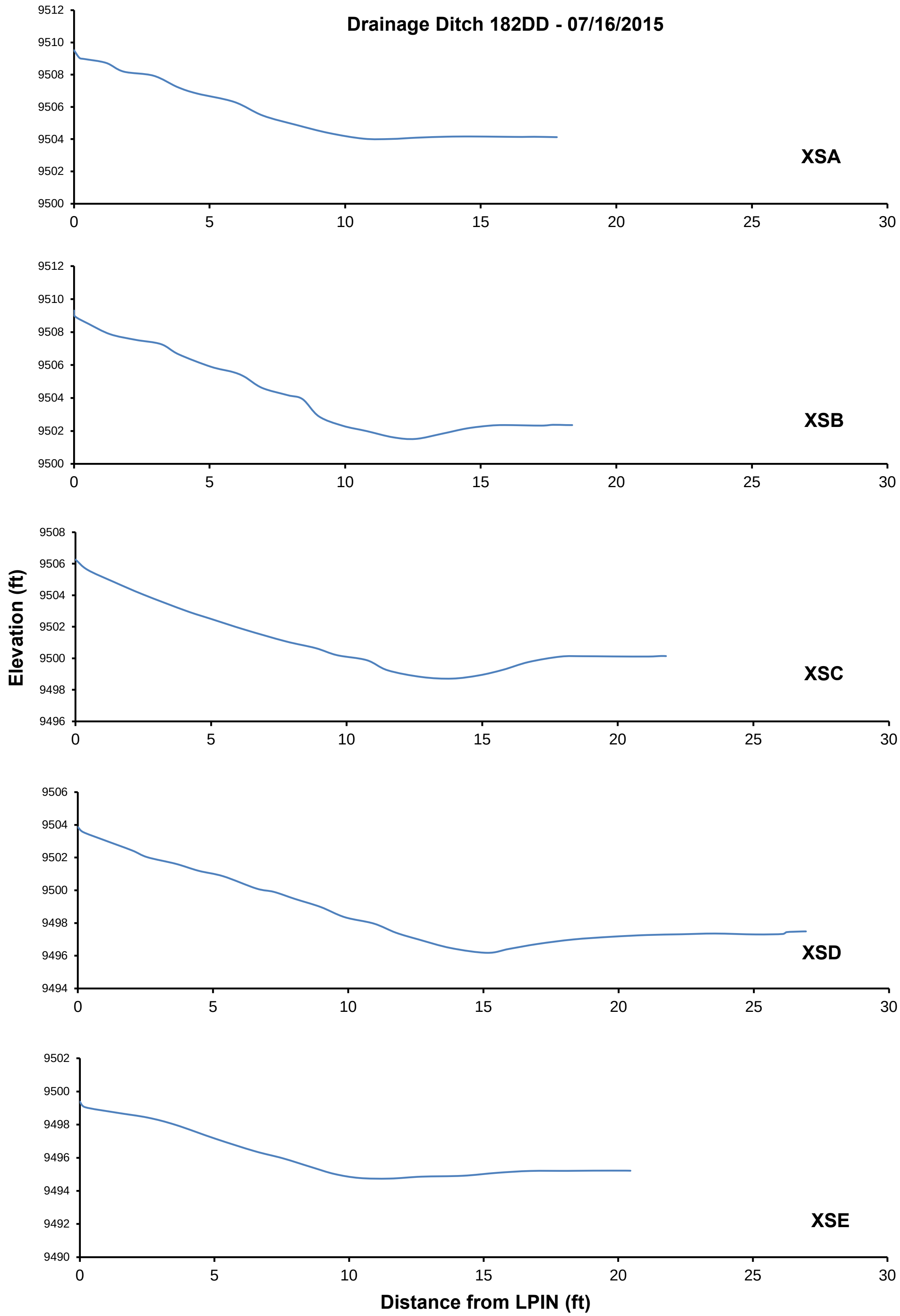
Drainage Ditch

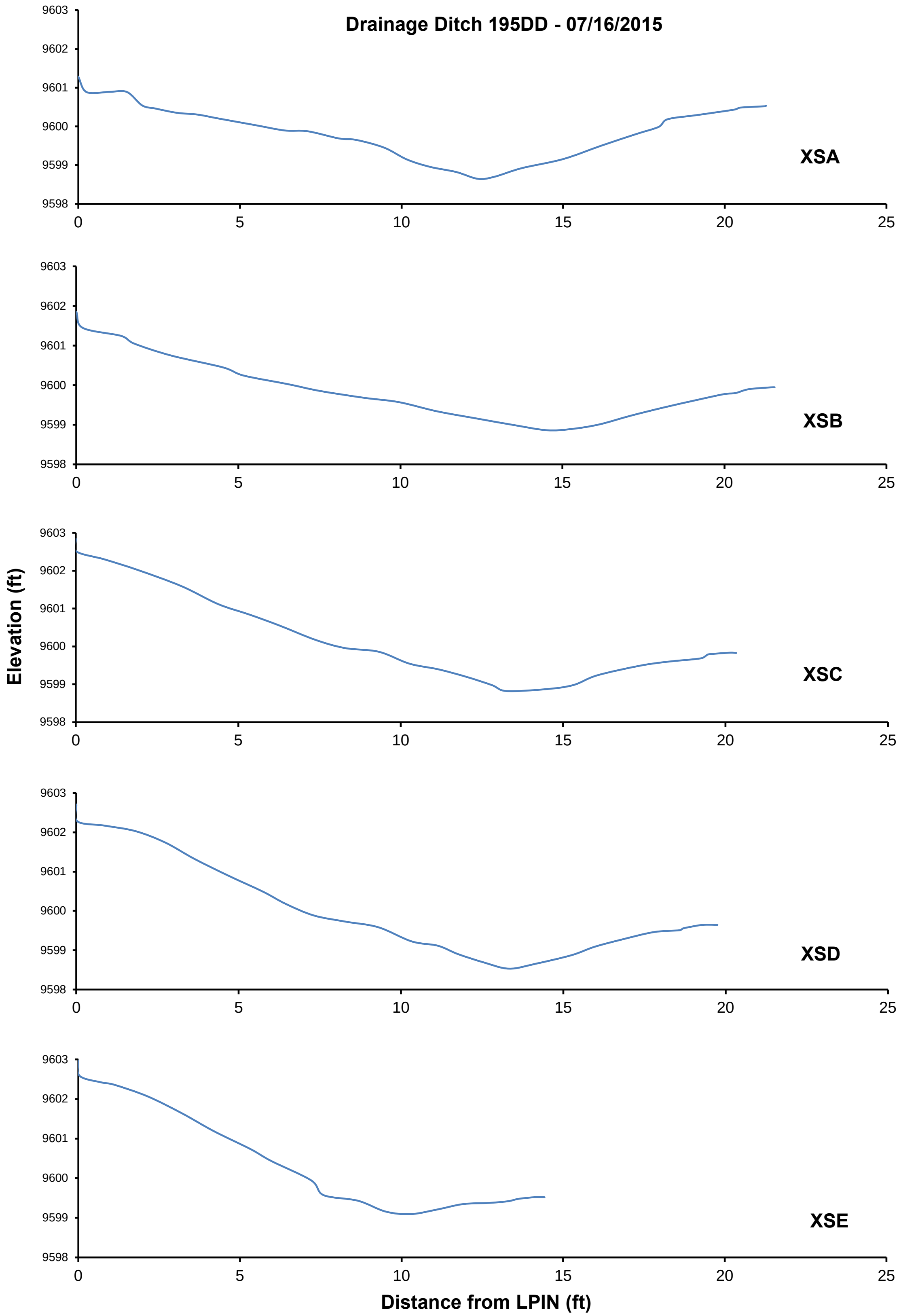
Cross Section Graphs

2015


Drainage Ditch 005DD - 08/25/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
9110
9109
9108
9107
9106
9105
9104
9103
9102
9101
9100
9099
9098
9097
9096
9095
9094
9093
9092
0
5
10
15
20
25


Drainage Ditch 010DD - 08/25/2015
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)


Drainage Ditch 182DD - 07/16/2015
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
9512
9510
9508
9506
9504
9502
9500
9498
9496
9494
9492
9490
0
5
10
15
20
25
30

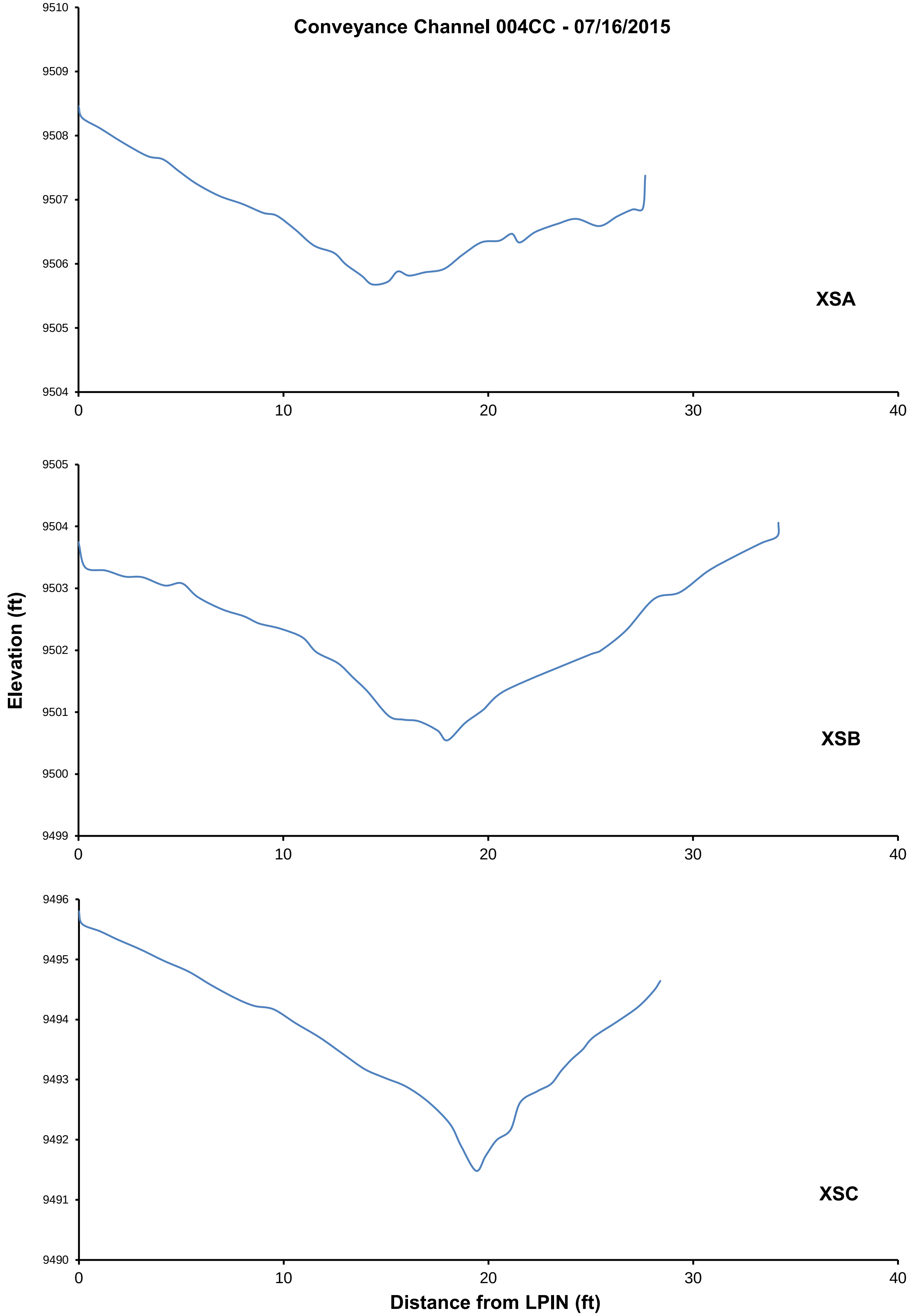

Drainage Ditch 195DD - 07/16/2015
Elevation (ft)
Distance from LPIN (ft)
9603
9602
9601
9600
9599
9598
0
5
10
15
20
25
XSA
XSB
XSC
XSD
XSE

Appendix I

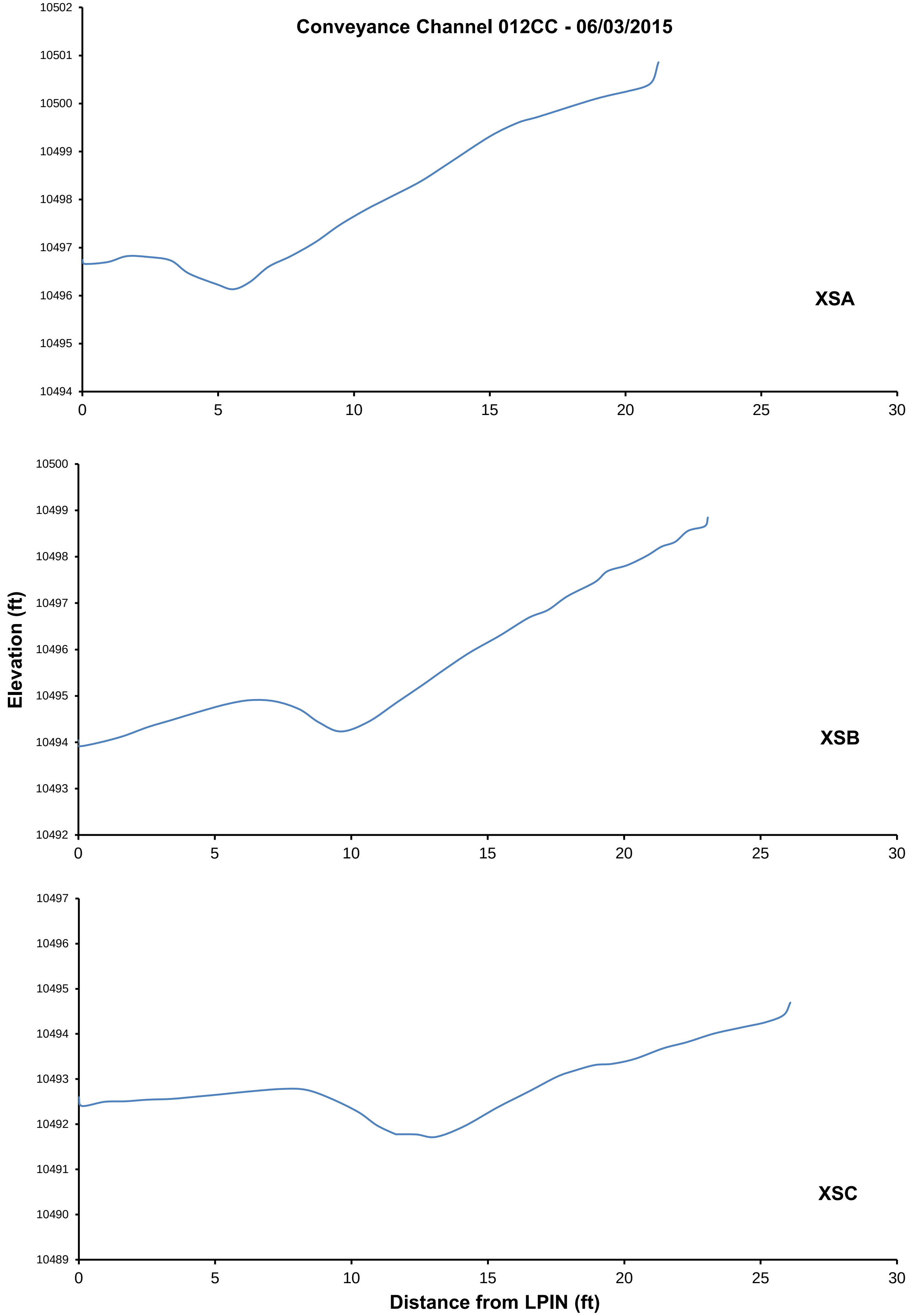
Conveyance Channel

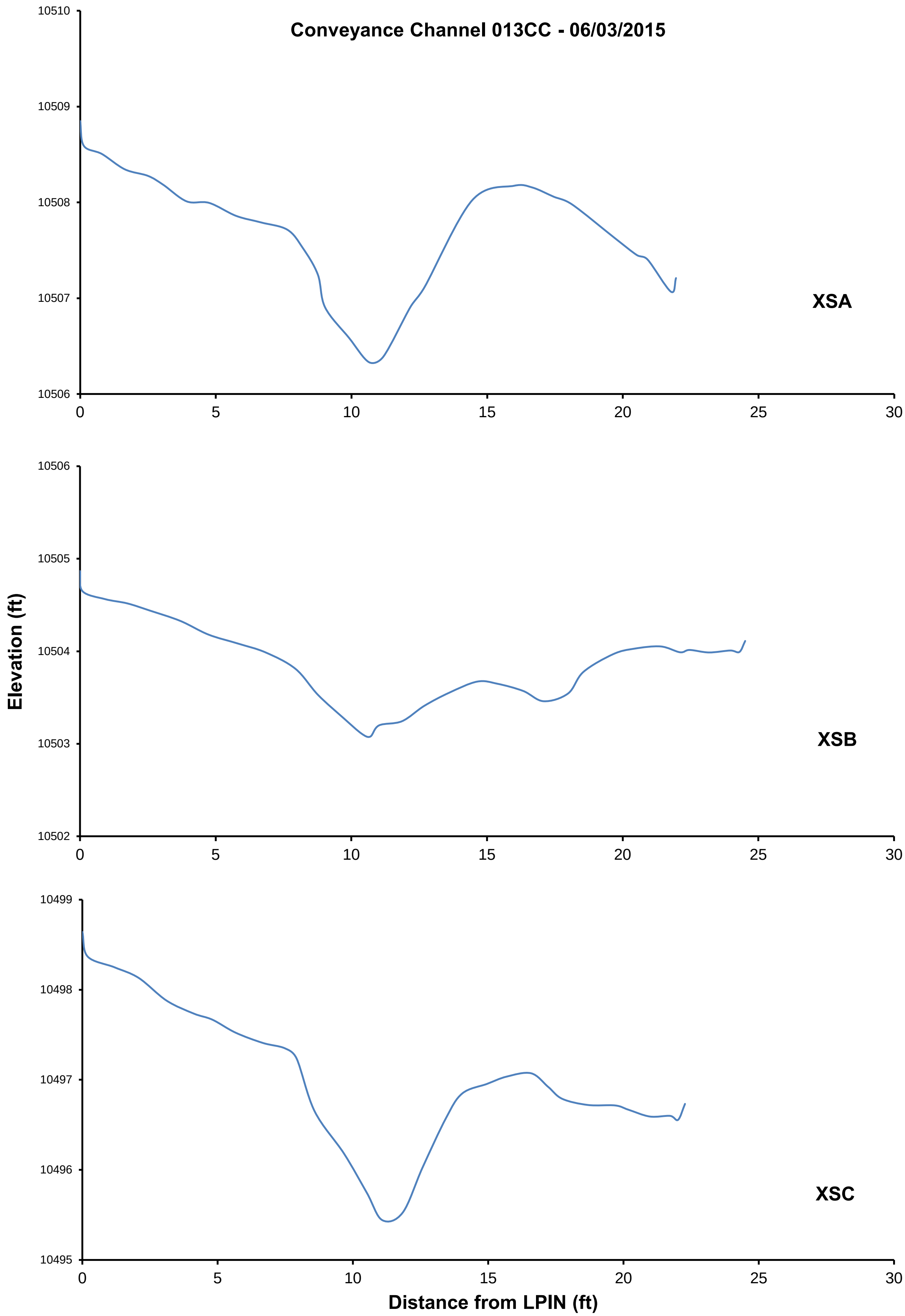
Cross Section Graphs

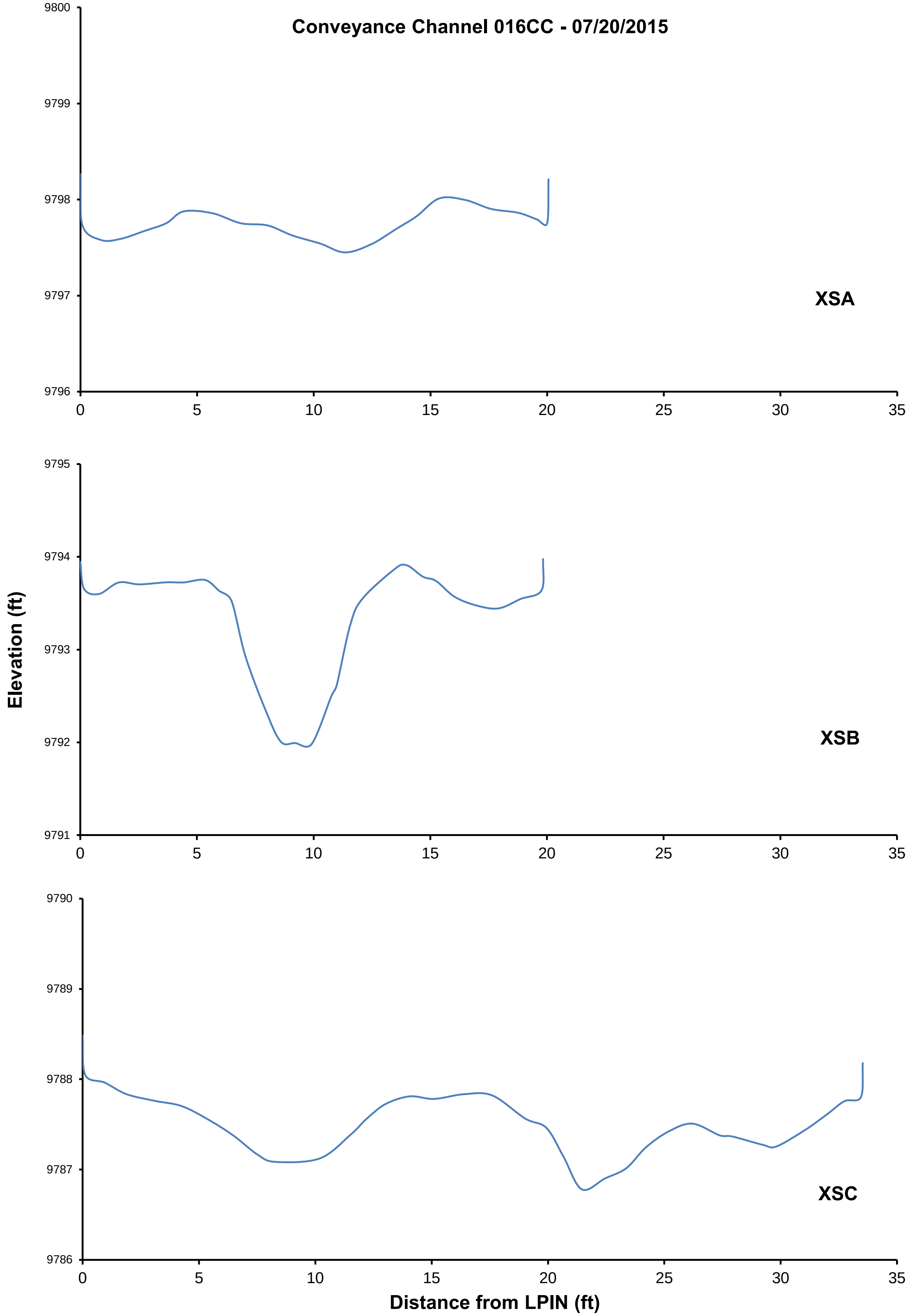
2015



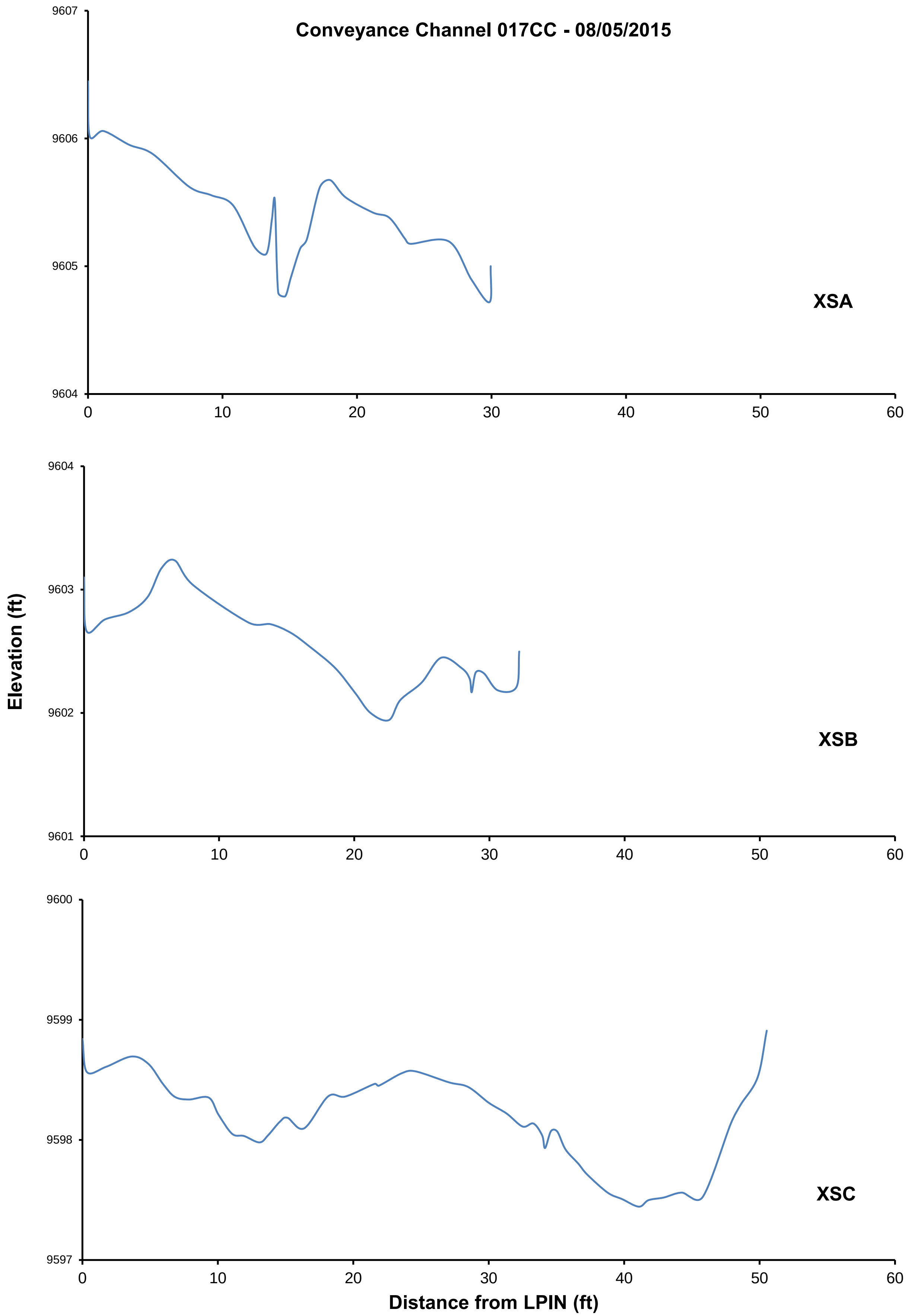
Conveyance Channel 004CC - 07/16/2015
9510
9509
9508
9507
9506
9505
9504
XSA
9505
9504
9503
9502
9501
9500
9499
XSB
9496
9495
9494
9493
9492
9491
9490
XSC
0
10
20
30
40
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 012CC - 06/03/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10502
10501
10500
10499
10498
10497
10496
10495
10494
10493
10492
10491
10490
10489
0
5
10
15
20
25
30

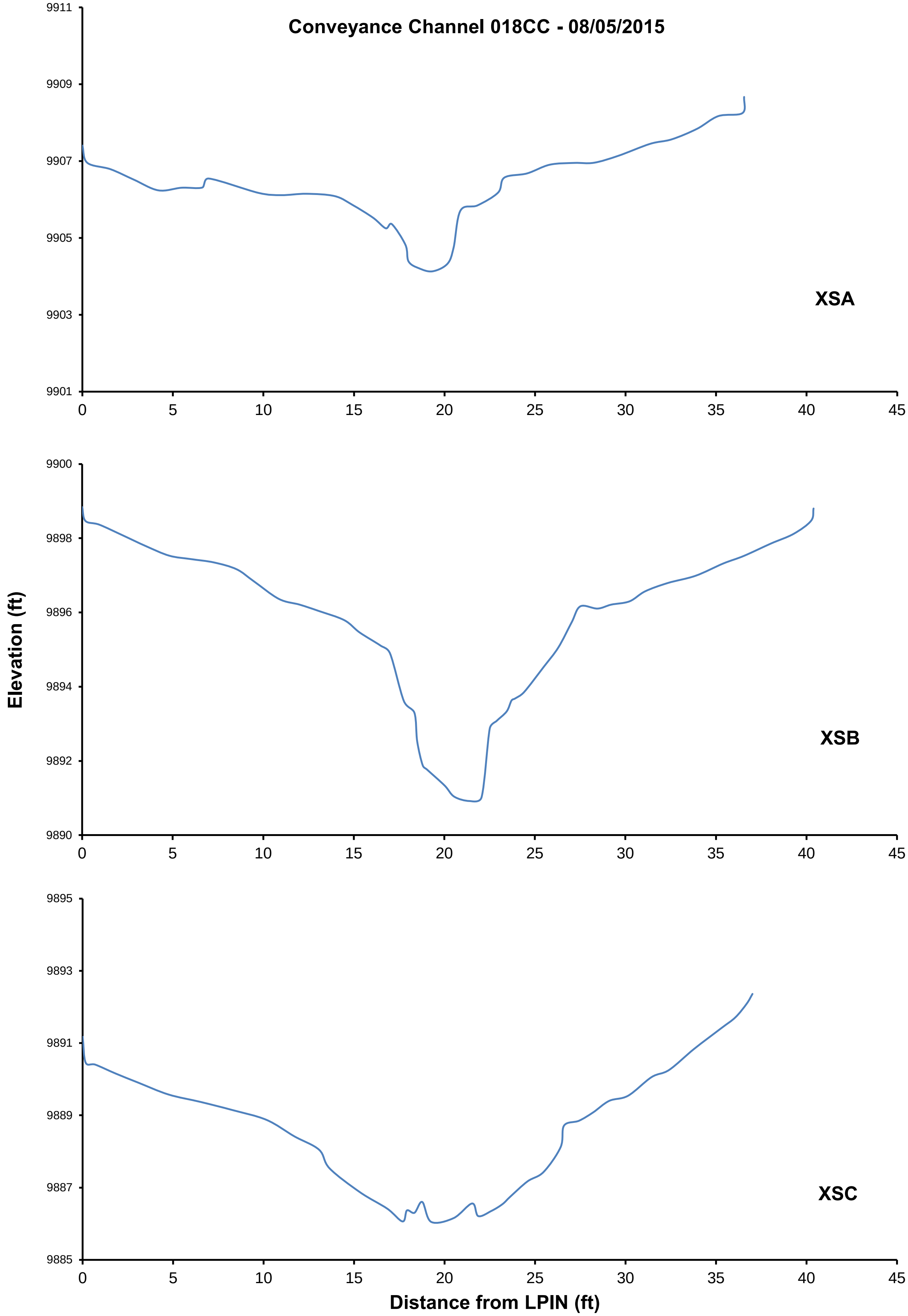

Conveyance Channel 013CC - 06/03/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10510
10509
10508
10507
10506
10505
10504
10503
10502
10499
10498
10497
10496
10495
0
5
10
15
20
25
30



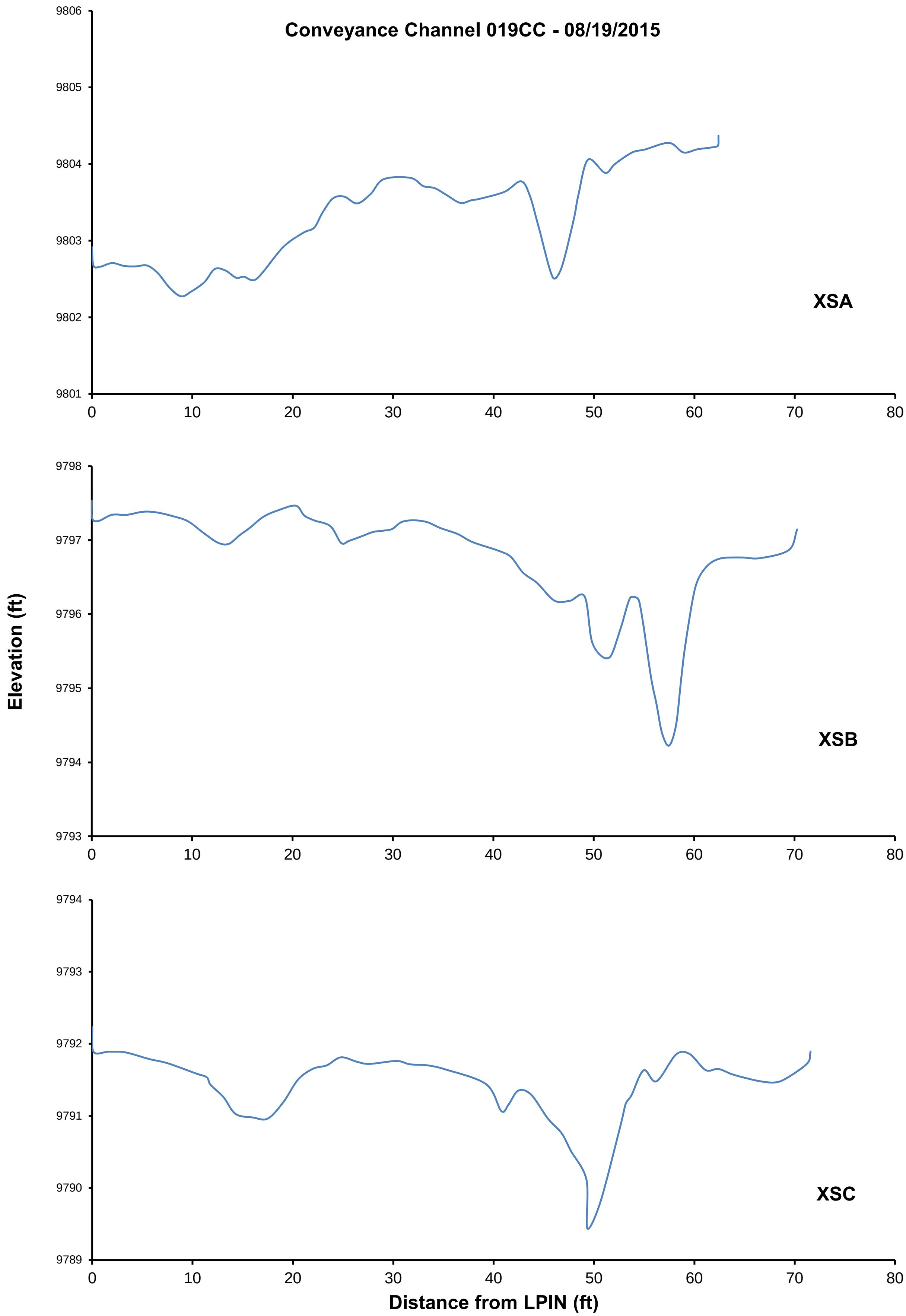
Conveyance Channel 016CC - 07/20/2015
Elevation (ft)
XSA
9800
9799
9798
9797
9796
0
5
10
15
20
25
30
35
XSB
9795
9794
9793
9792
9791
0
5
10
15
20
25
30
35
XSC
9790
9789
9788
9787
9786
0
5
10
15
20
25
30
35
Distance from LPIN (ft)

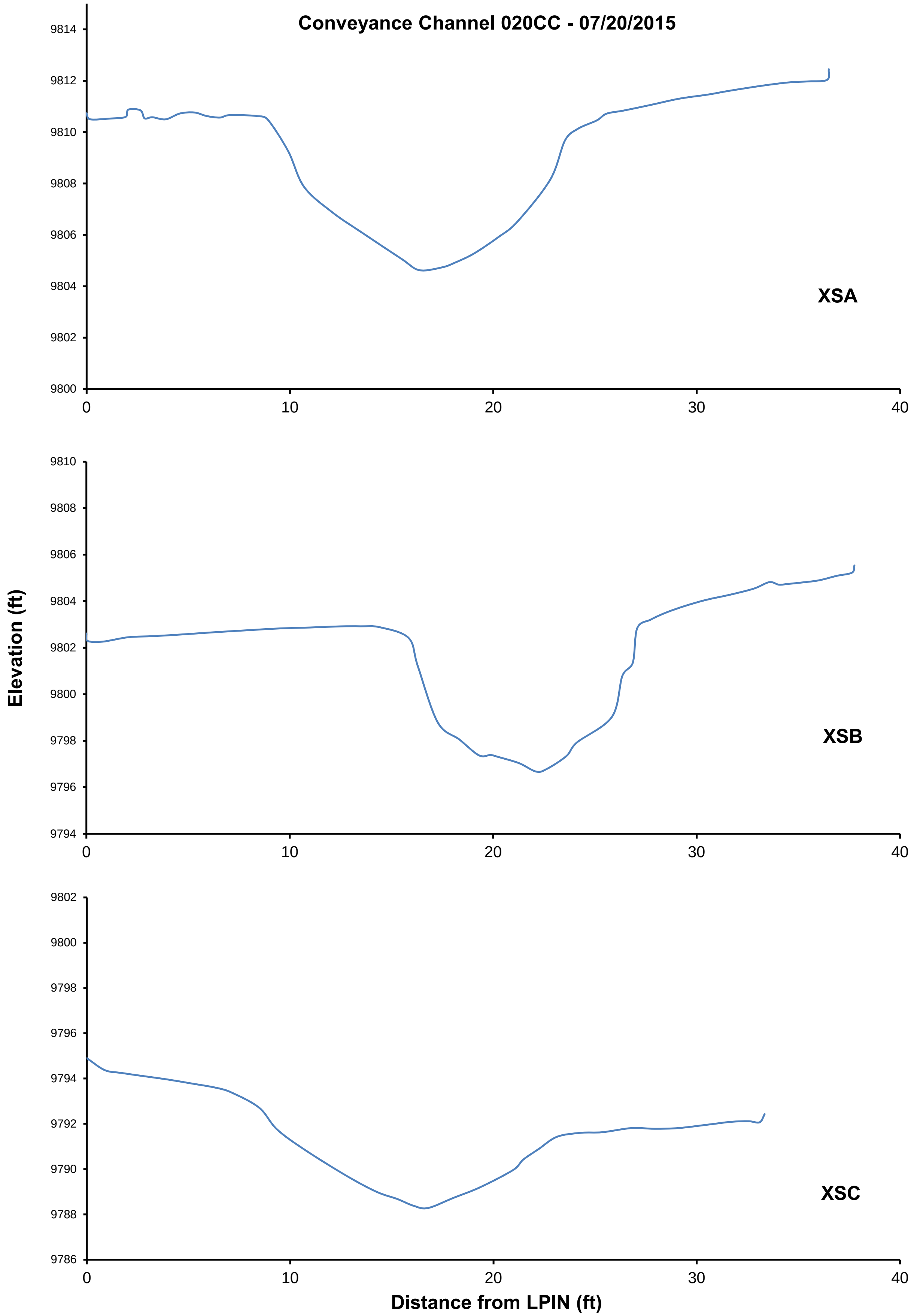


Conveyance Channel 017CC - 08/05/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9607
9606
9605
9604
9603
9602
9601
9600
9599
9598
9597
0
10
20
30
40
50
60

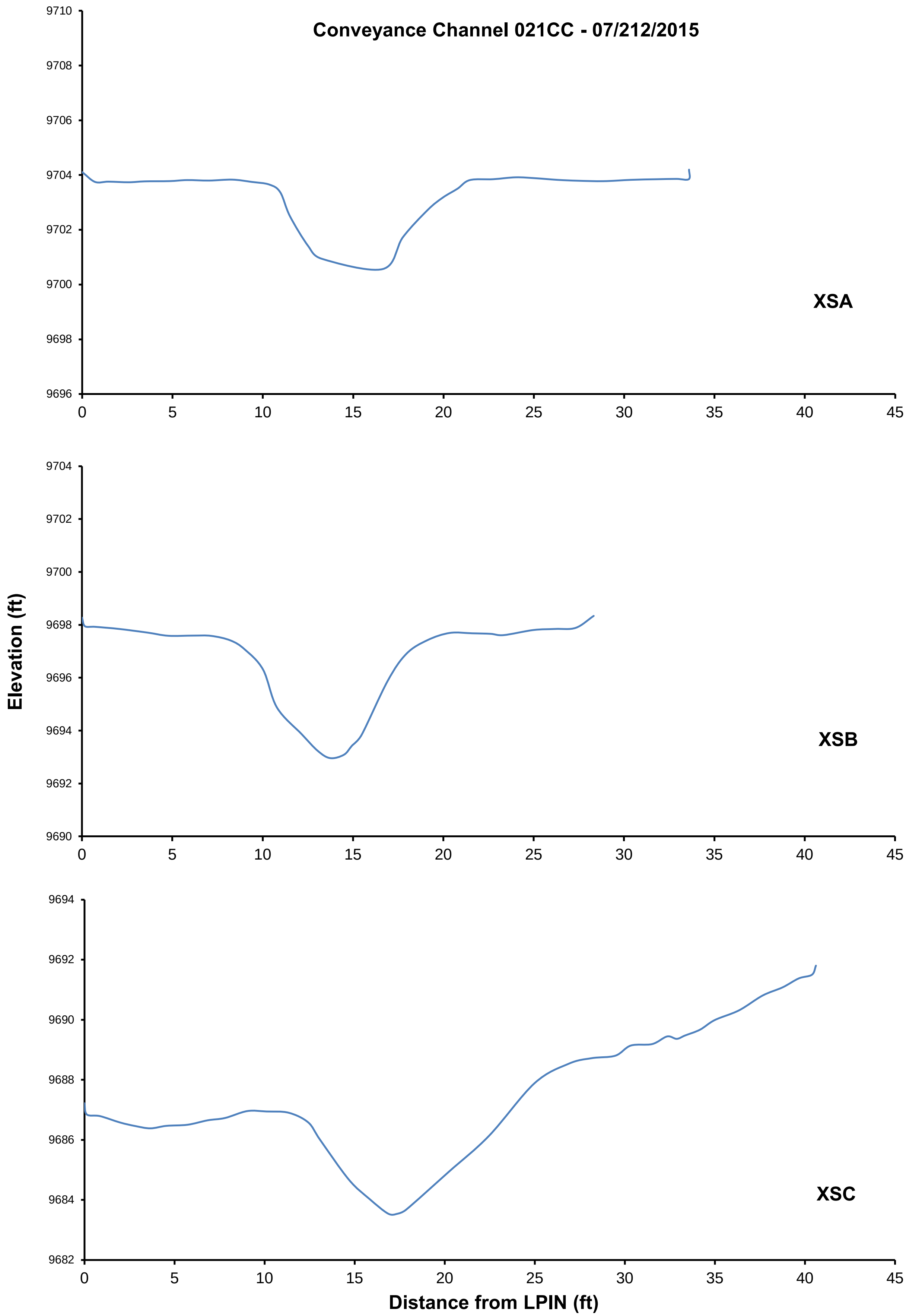


Conveyance Channel 018CC - 08/05/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9911
9909
9907
9905
9903
9901
9900
9898
9896
9894
9892
9890
9895
9893
9891
9889
9887
9885
0
5
10
15
20
25
30
35
40
45

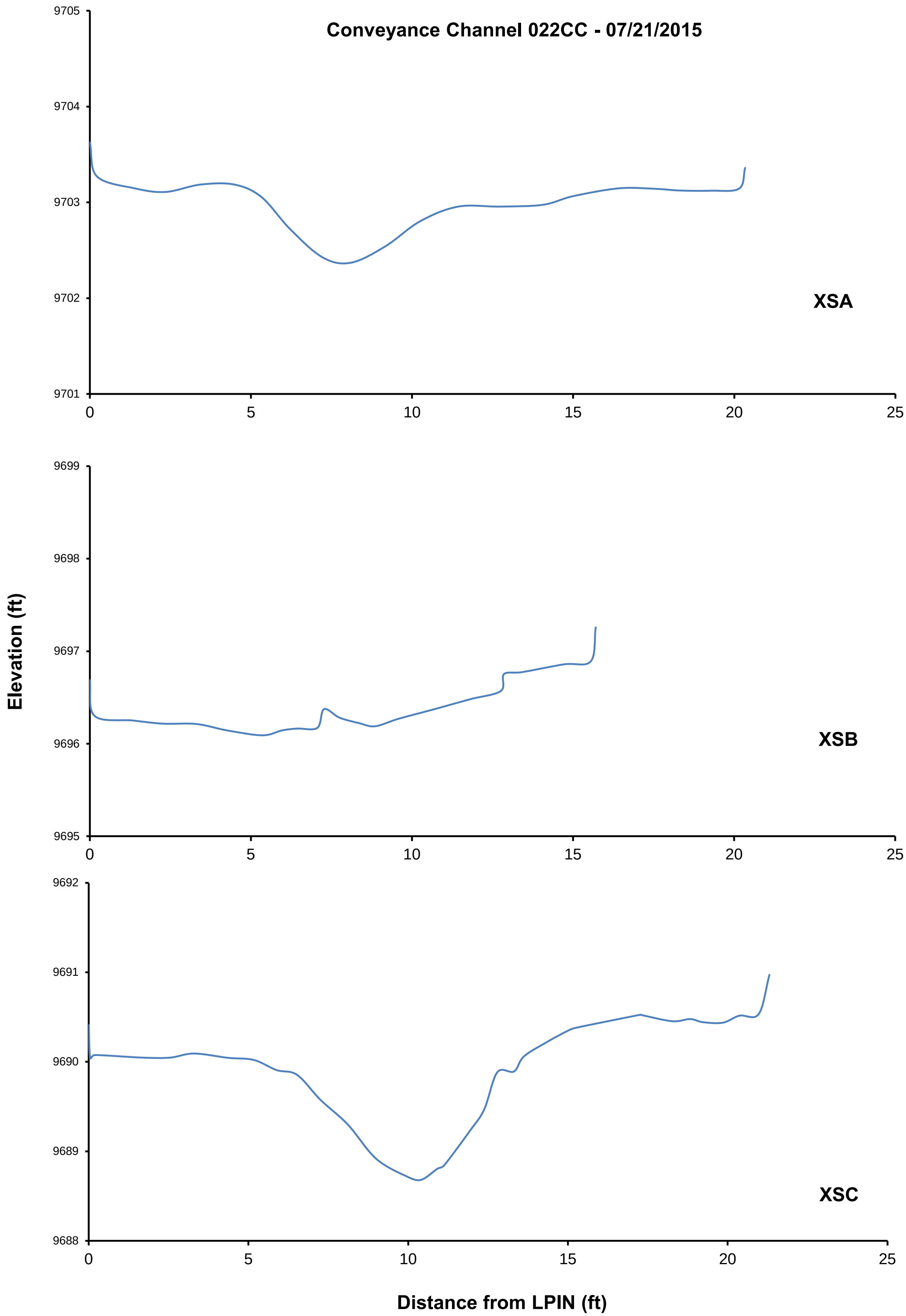

Conveyance Channel 019CC - 08/19/2015
9806
9805
9804
9803
9802
9801
XSA
9798
9797
9796
9795
9794
9793
XSB
9794
9793
9792
9791
9790
9789
XSC
0
10
20
30
40
50
60
70
80
Elevation (ft)
Distance from LPIN (ft)

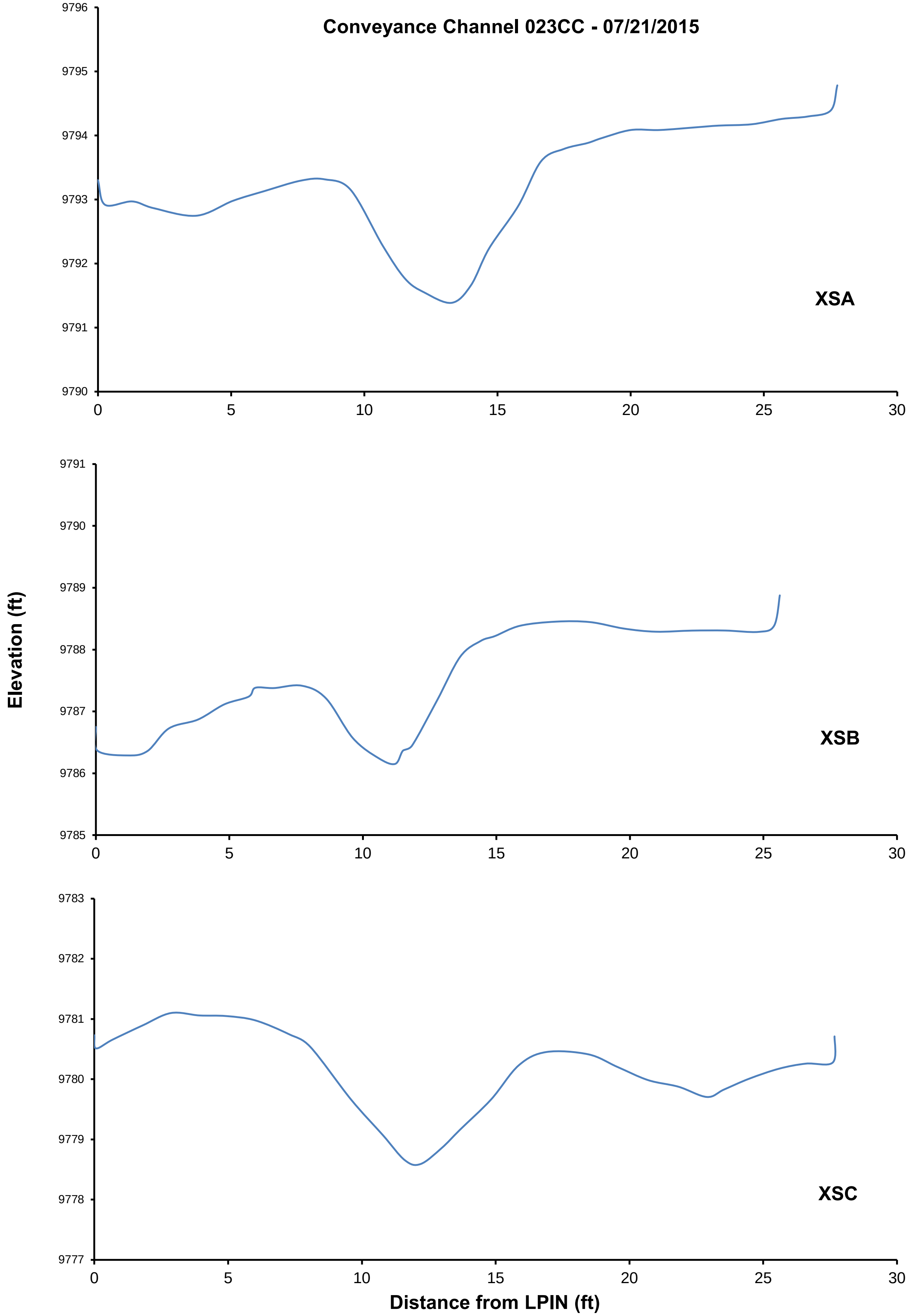


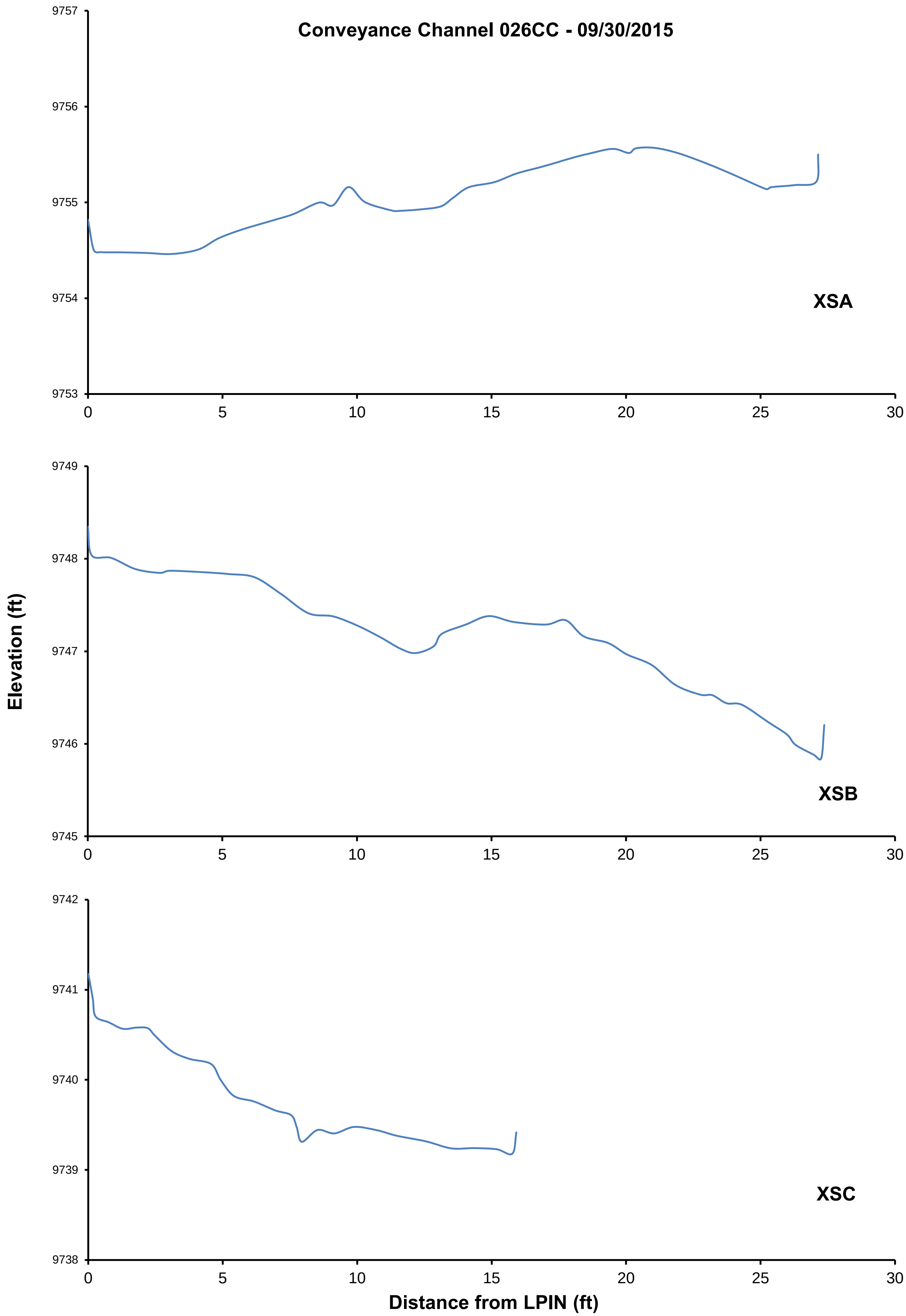
Conveyance Channel 020CC - 07/20/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9814
9812
9810
9808
9806
9804
9802
9800
9798
9796
9794
9792
9790
9788
9786
0
10
20
30
40



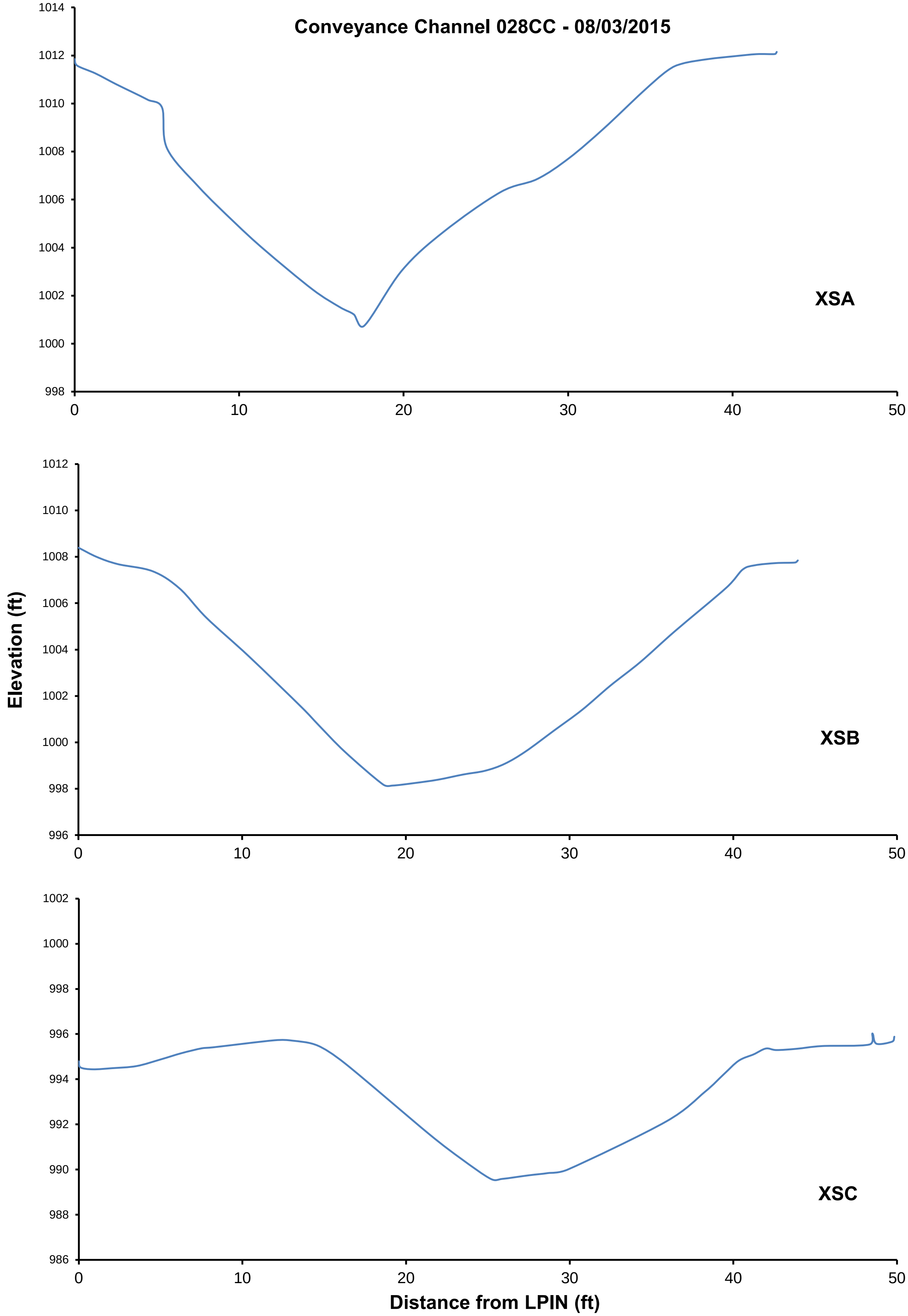
Conveyance Channel 021CC - 07/212/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9710
9708
9706
9704
9702
9700
9698
9696
9694
9692
9690
9688
9686
9684
9682
0
5
10
15
20
25
30
35
40
45

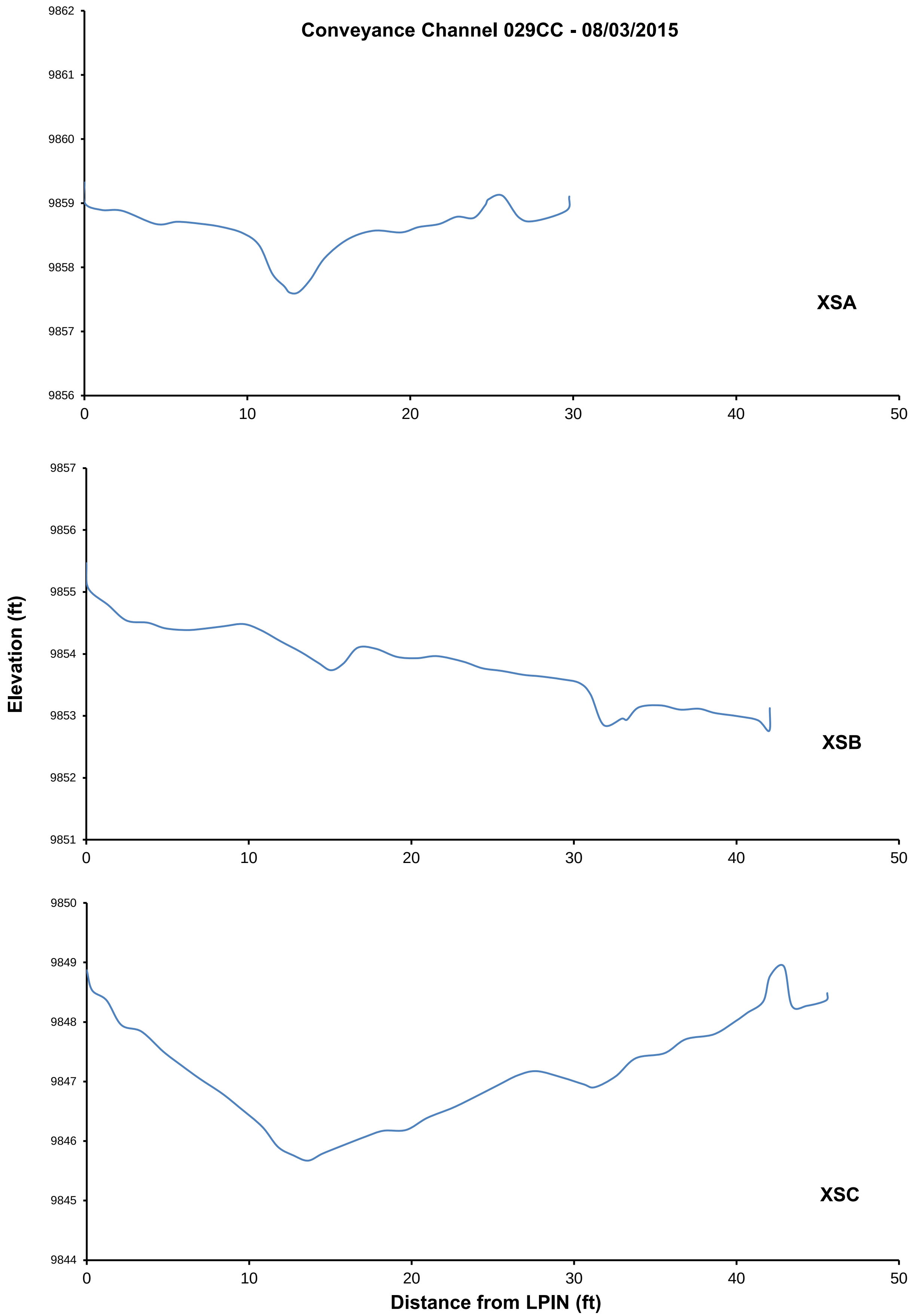

Conveyance Channel 022CC - 07/21/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9705
9704
9703
9702
9701
9699
9698
9697
9696
9695
9692
9691
9690
9689
9688
0
5
10
15
20
25

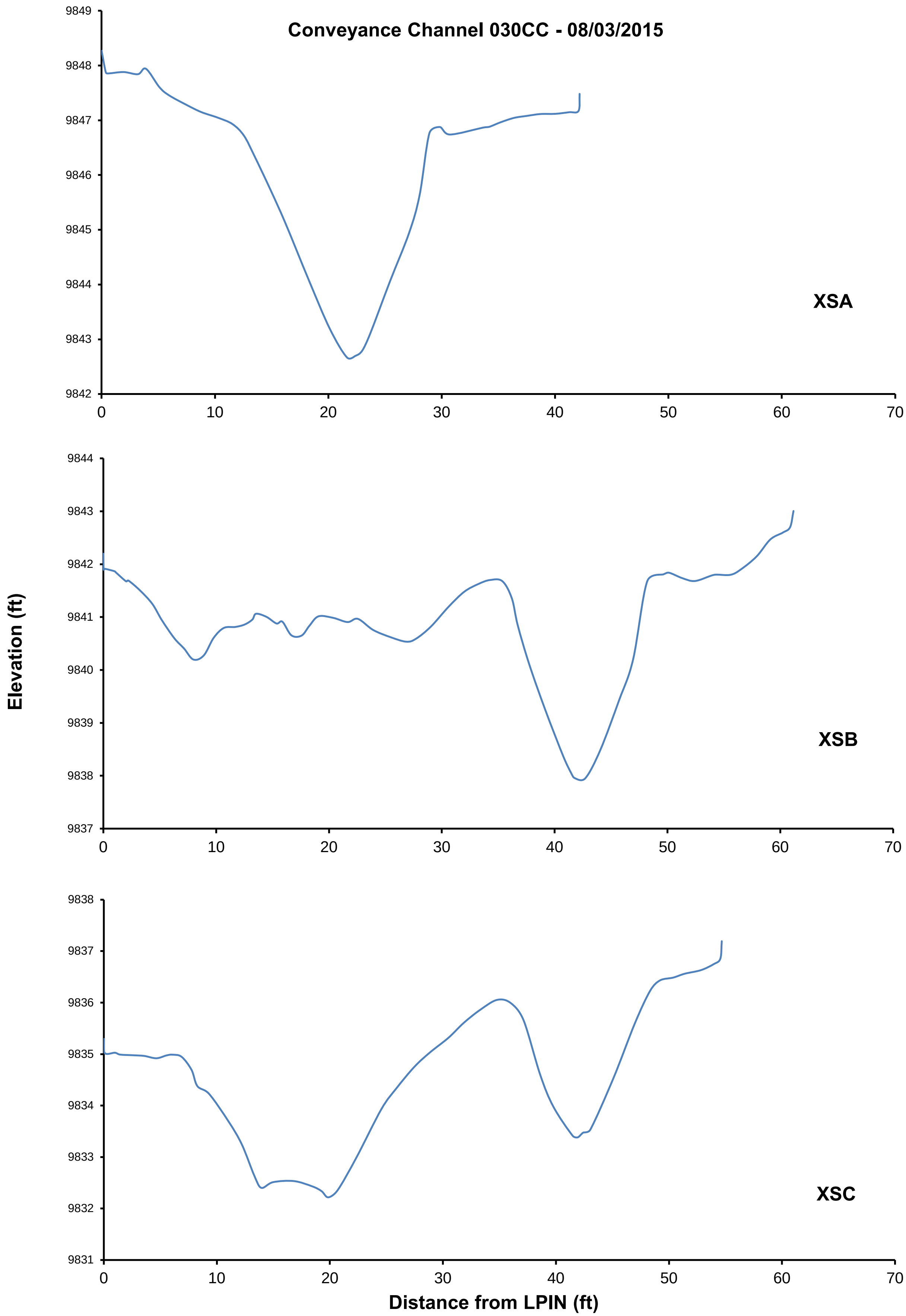

Conveyance Channel 023CC - 07/21/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9796
9795
9794
9793
9792
9791
9790
9789
9788
9787
9786
9785
9783
9782
9781
9780
9779
9778
9777
0
5
10
15
20
25
30

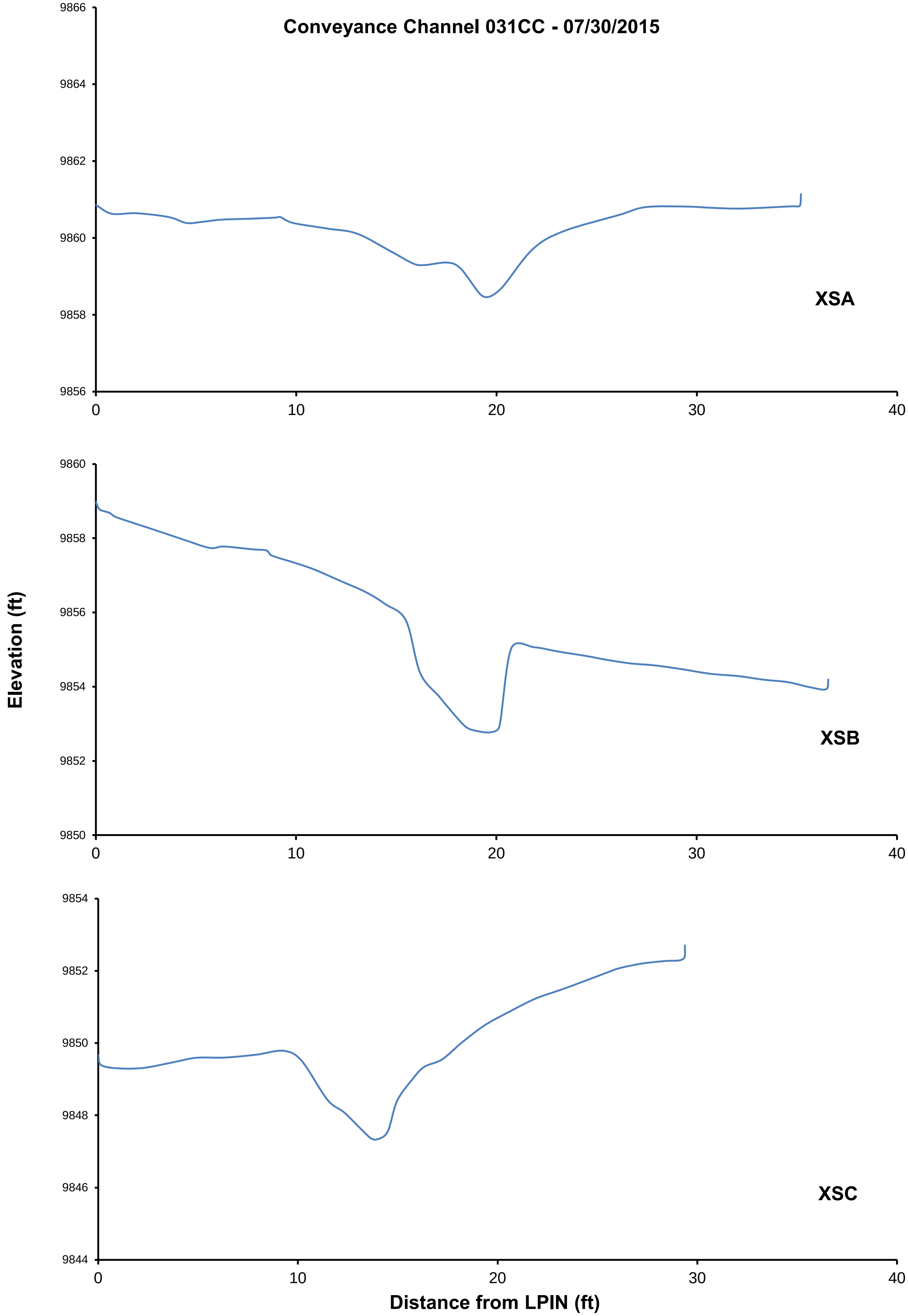


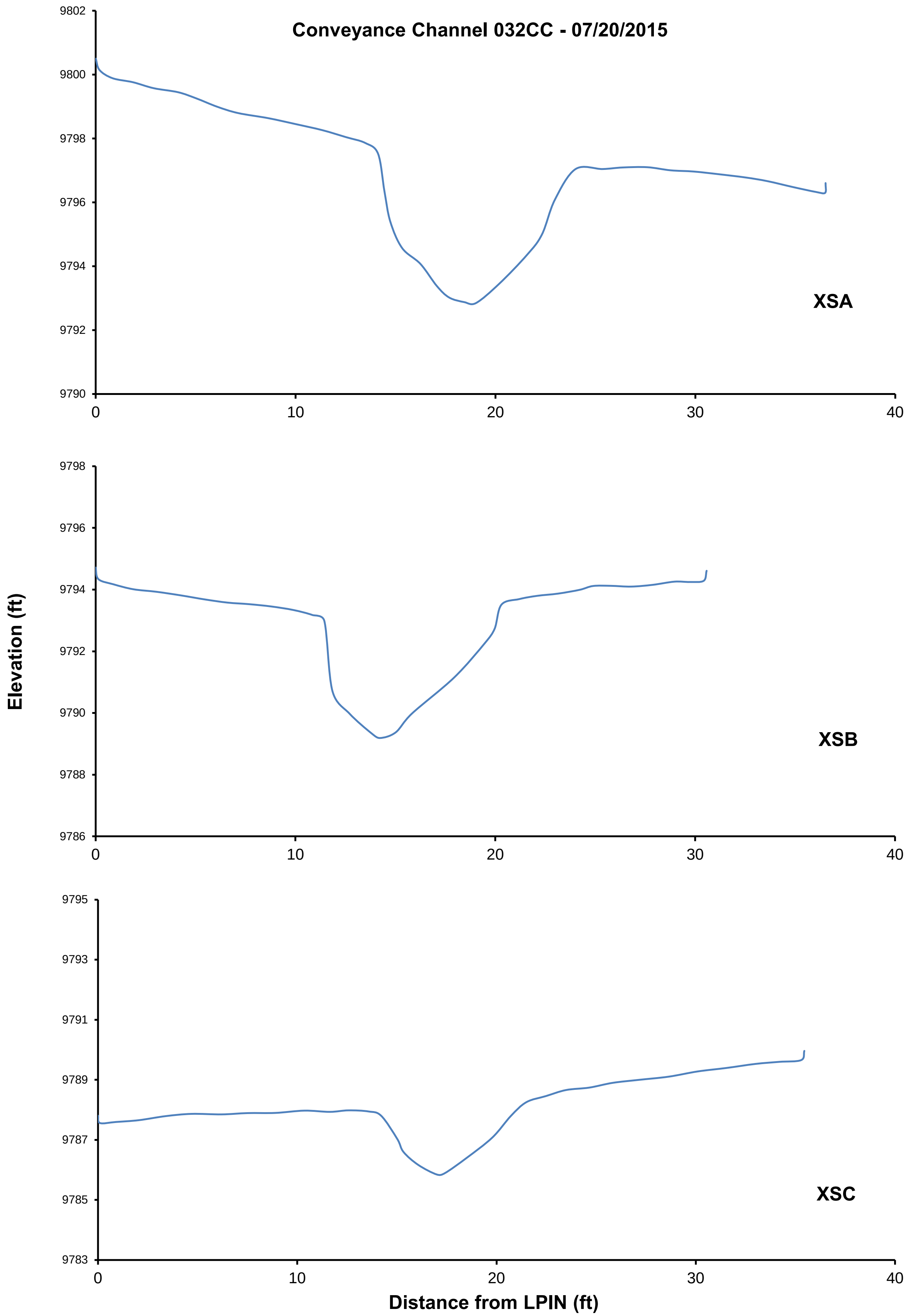
Conveyance Channel 026CC - 09/30/2015
Elevation (ft)
9757
9756
9755
9754
9753
XSA
9749
9748
9747
9746
9745
XSB
9742
9741
9740
9739
9738
XSC
0
5
10
15
20
25
30
Distance from LPIN (ft)


Conveyance Channel 028CC - 08/03/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
1014
1012
1010
1008
1006
1004
1002
1000
998
996
994
992
990
988
986
0
10
20
30
40
50

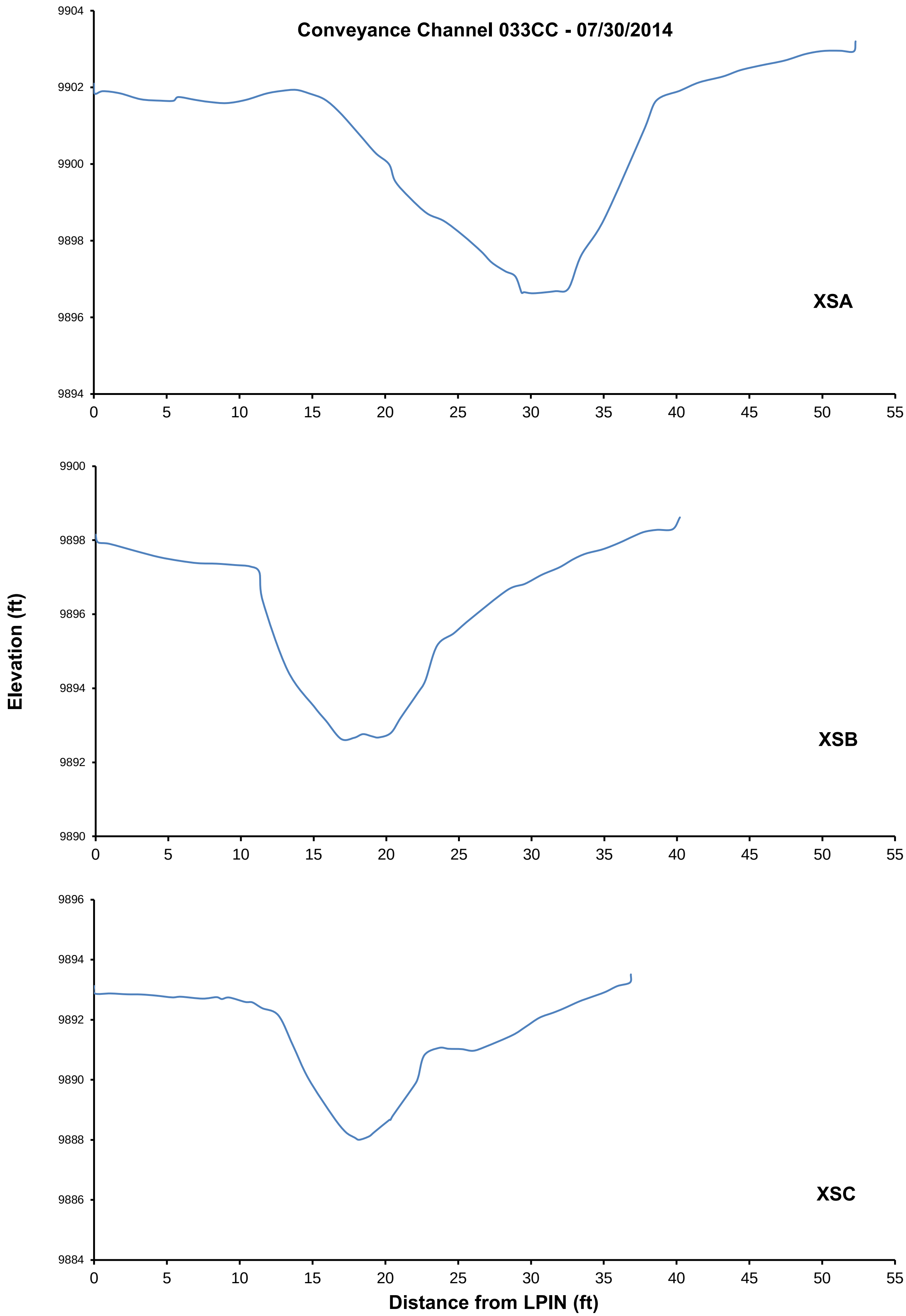

Conveyance Channel 029CC - 08/03/2015
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
9862
9861
9860
9859
9858
9857
9856
9855
9854
9853
9852
9851
9850
9849
9848
9847
9846
9845
9844
0
10
20
30
40
50


Conveyance Channel 030CC - 08/03/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9849
9848
9847
9846
9845
9844
9843
9842
9844
9843
9842
9841
9840
9839
9838
9837
9838
9837
9836
9835
9834
9833
9832
9831
0
10
20
30
40
50
60
70


Conveyance Channel 031CC - 07/30/2015
Elevation (ft)
9866
9864
9862
9860
9858
9856
0
10
20
30
40
XSA
9860
9858
9856
9854
9852
9850
0
10
20
30
40
XSB
9854
9852
9850
9848
9846
9844
0
10
20
30
40
XSC
Distance from LPIN (ft)



Conveyance Channel 032CC - 07/20/2015
Elevation (ft)
9802
9800
9798
9796
9794
9792
9790
0
10
20
30
40
XSA
9798
9796
9794
9792
9790
9788
9786
XSB
9795
9793
9791
9789
9787
9785
9783
XSC
Distance from LPIN (ft)


Conveyance Channel 033CC - 07/30/2014
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9904
9902
9900
9898
9896
9894
9892
9890
9888
9886
9884
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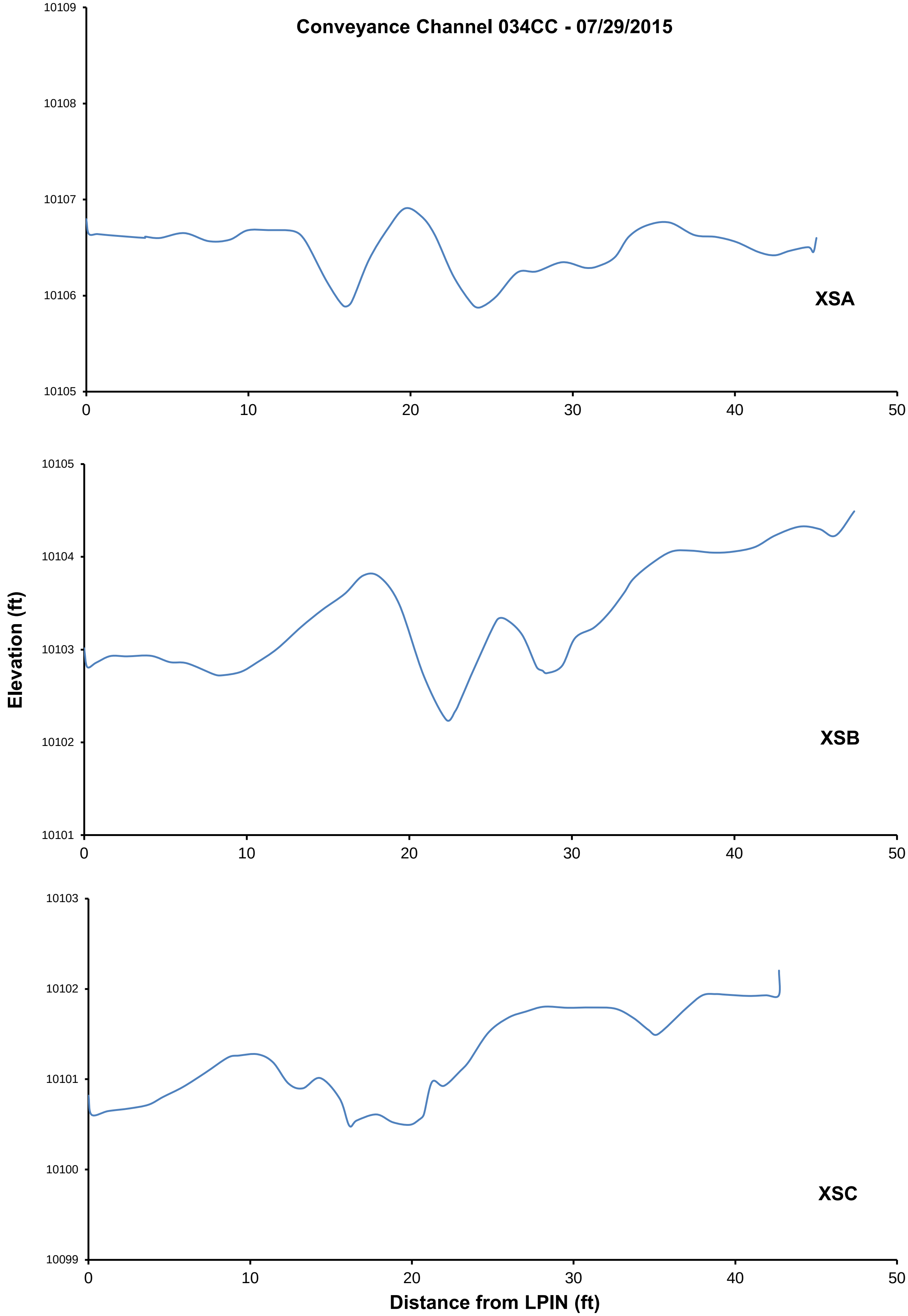
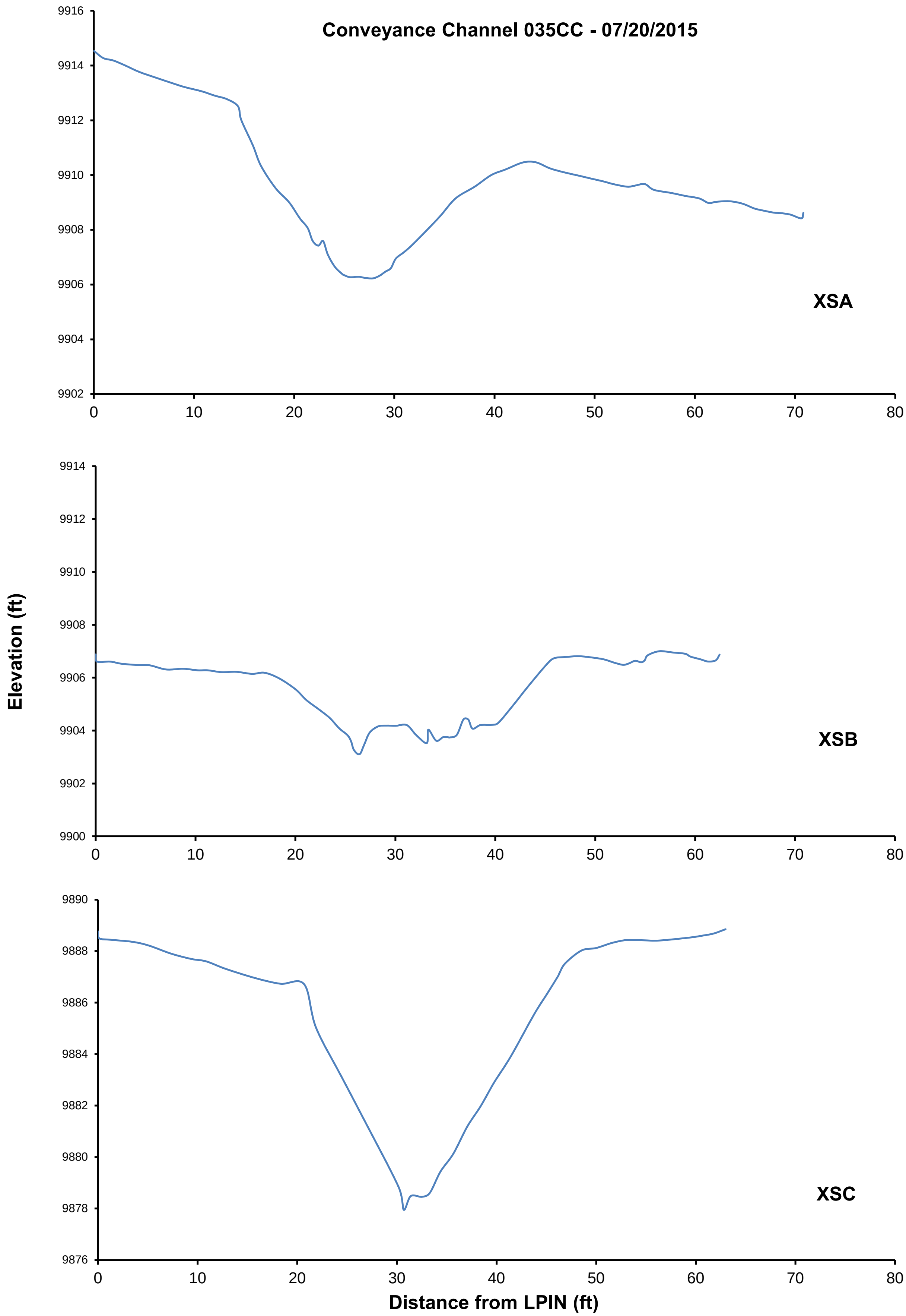
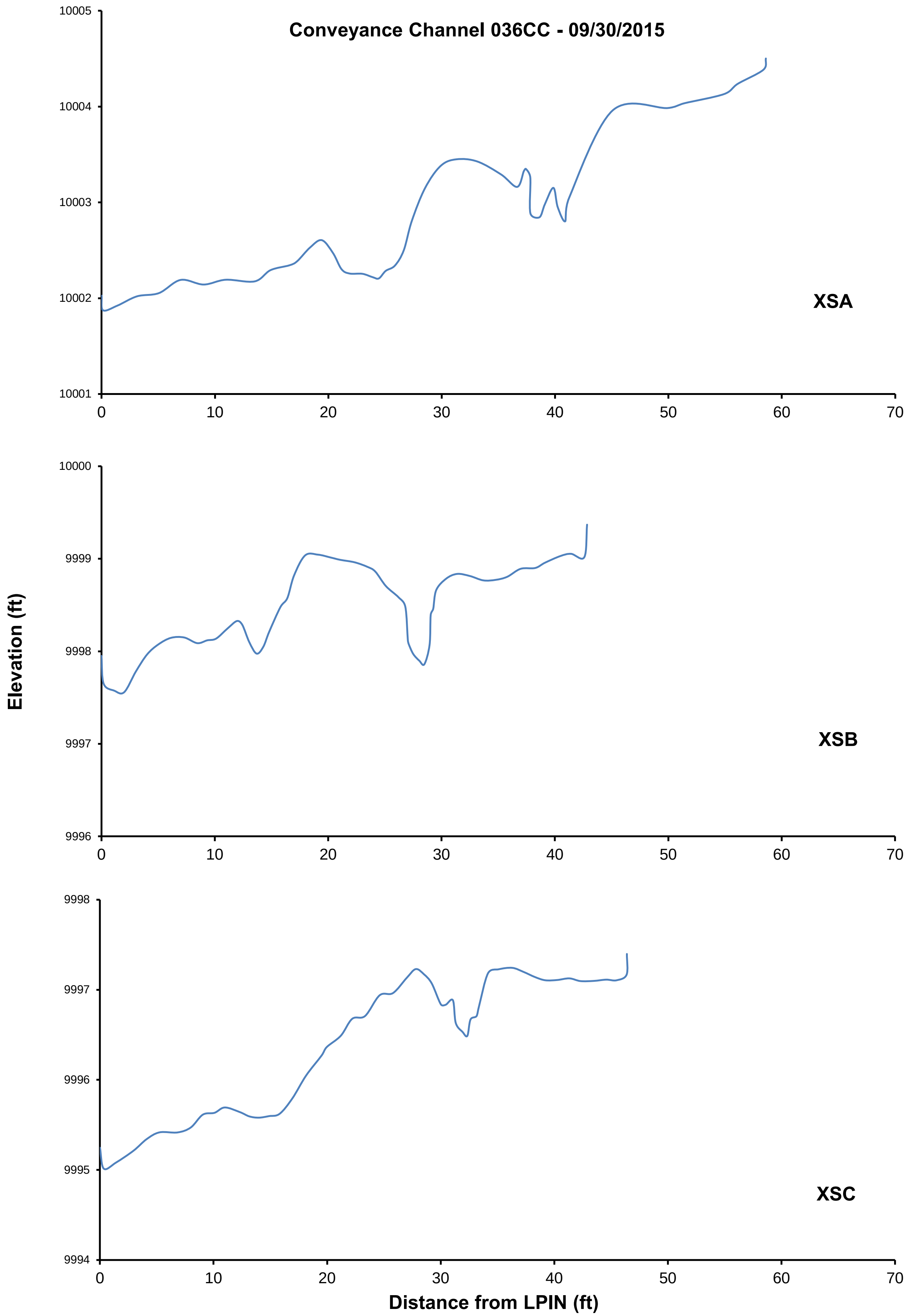
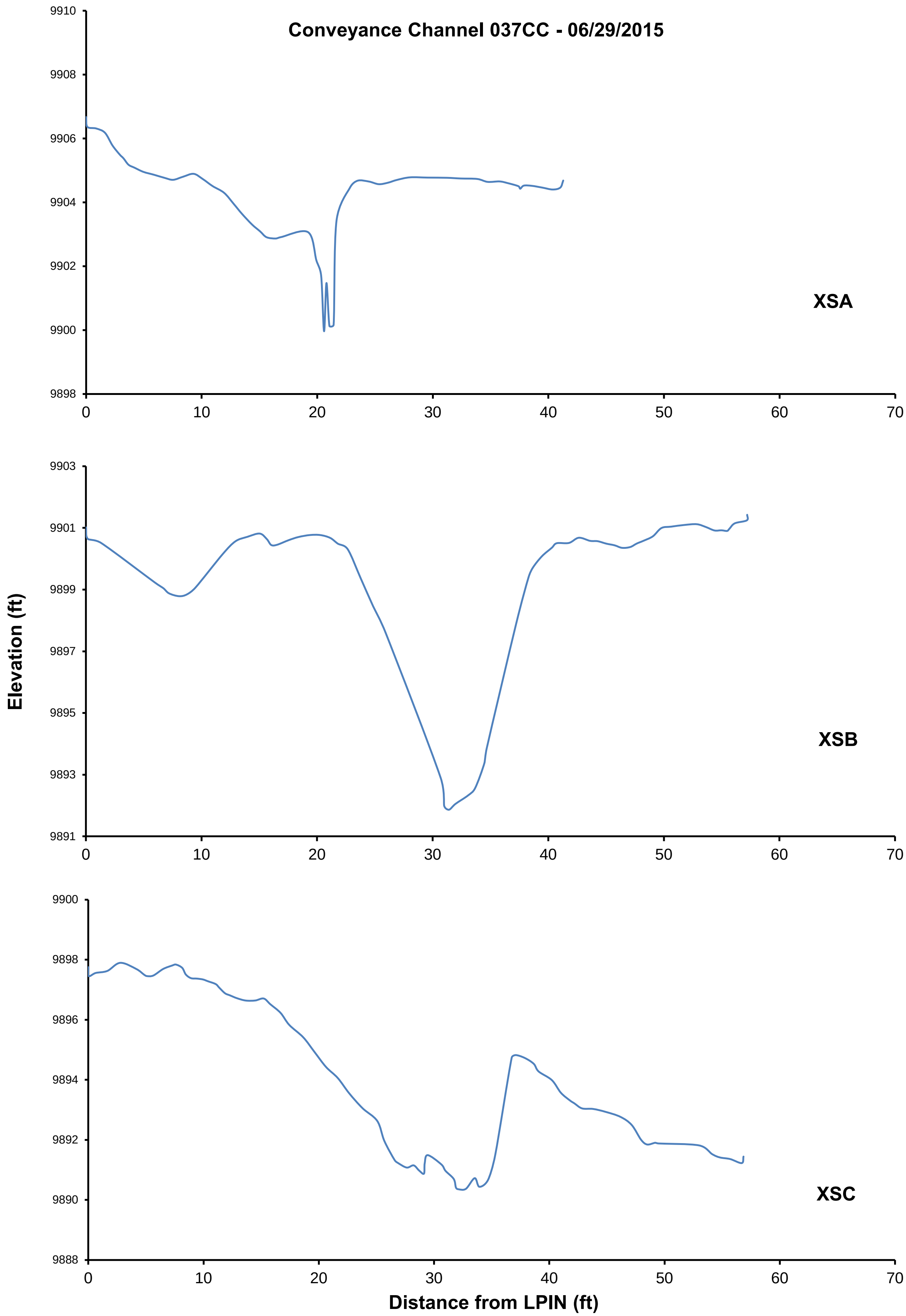
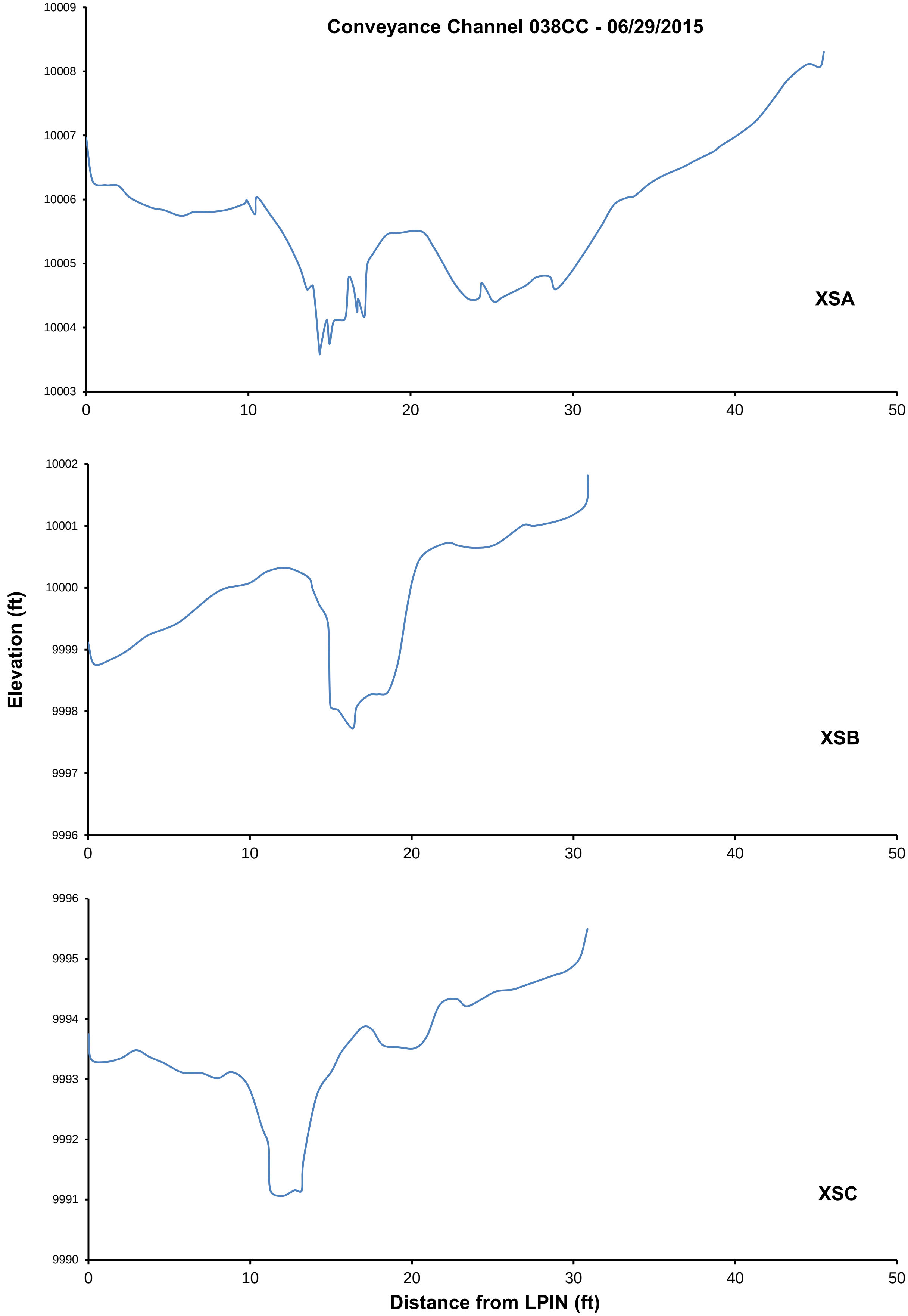
5
10
15
20
25
30
35
40
45
50
55

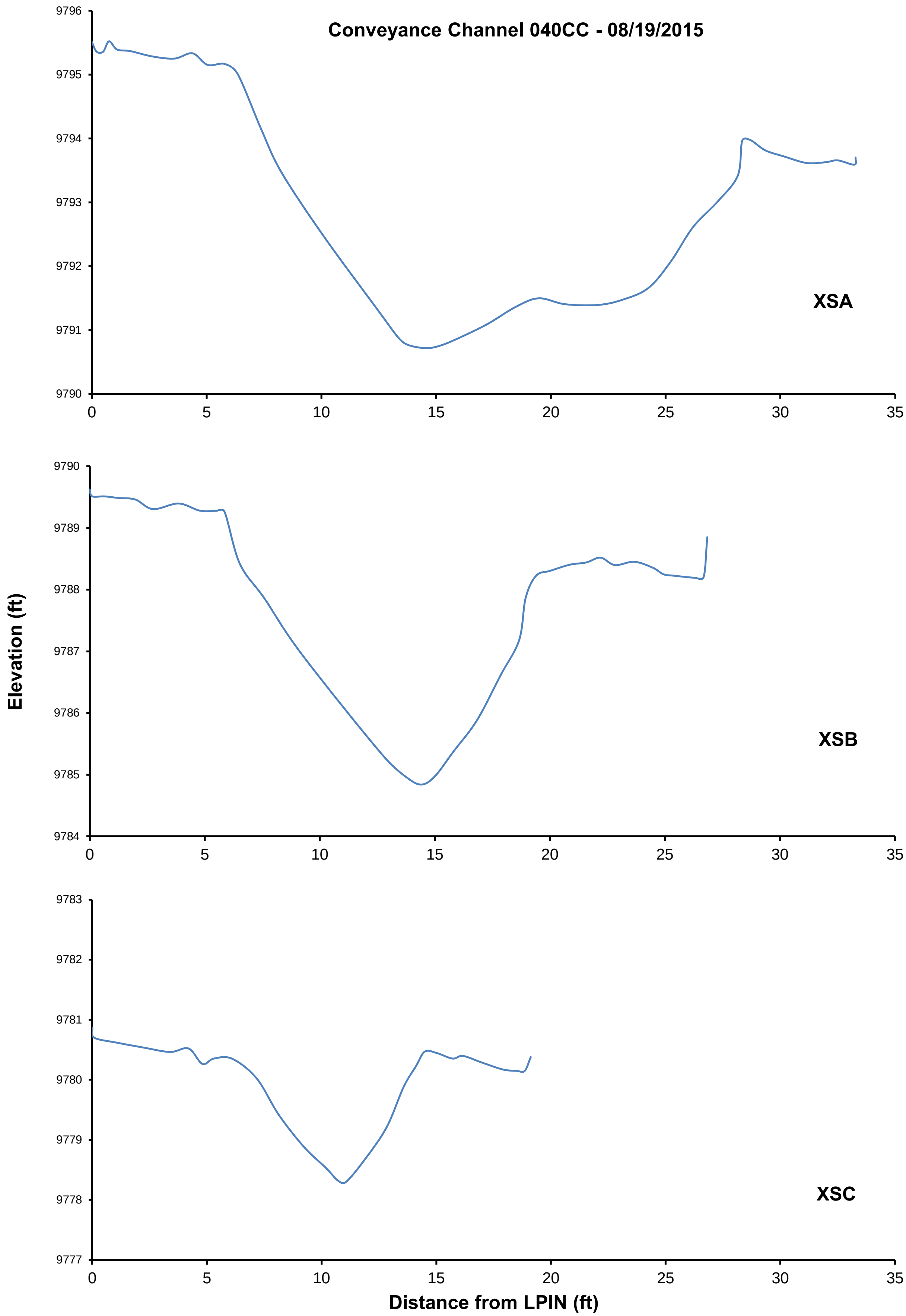

Conveyance Channel 034CC - 07/29/2015
10109
10108
10107
10106
10105
0
10
20
30
40
50
XSA
10105
10104
10103
10102
10101
XSB
Elevation (ft)
10103
10102
10101
10100
10099
XSC
Distance from LPIN (ft)

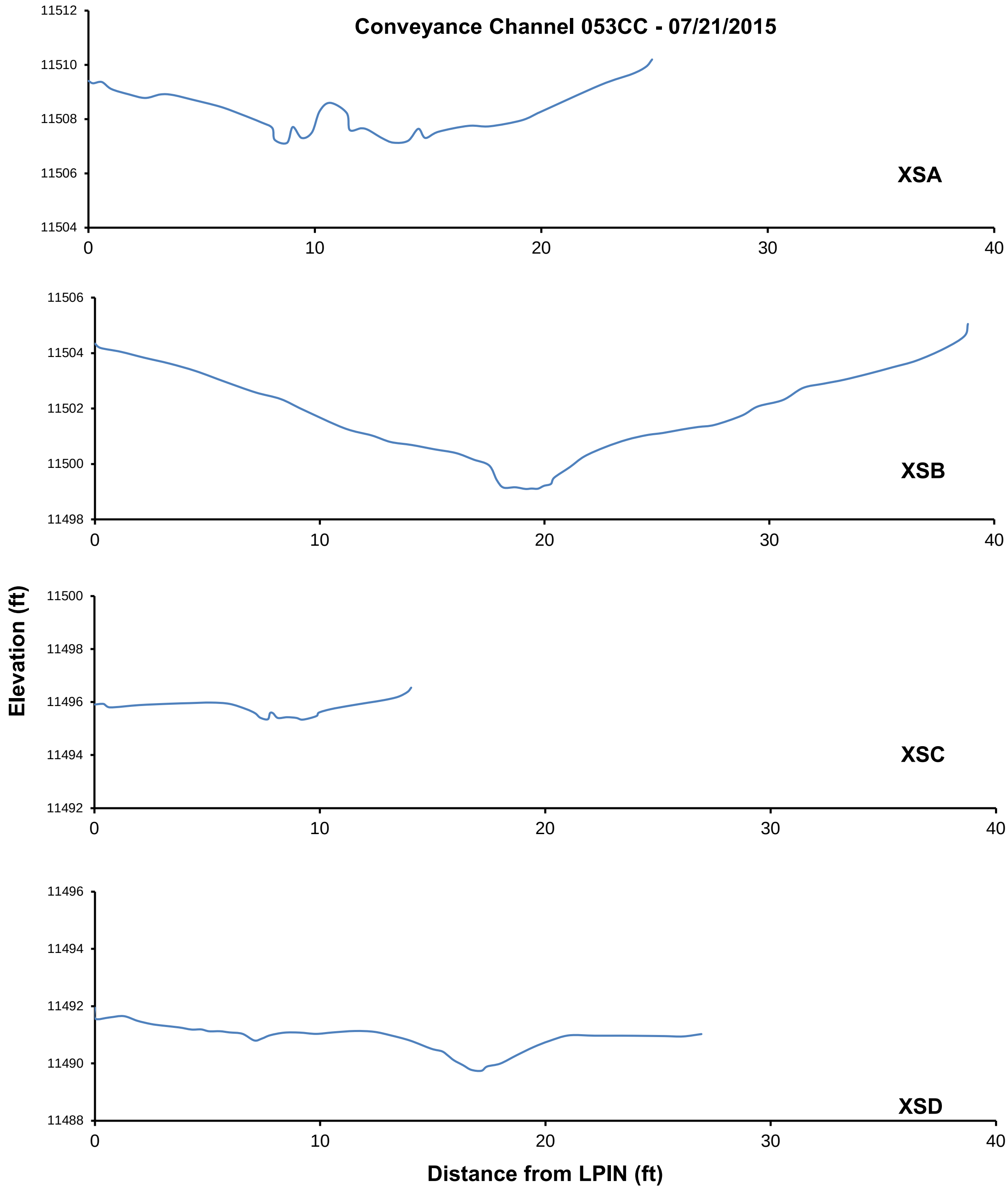

Conveyance Channel 035CC - 07/20/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9916
9914
9912
9910
9908
9906
9904
9902
9900
9890
9888
9886
9884
9882
9880
9878
9876
0
10
20
30
40
50
60
70
80

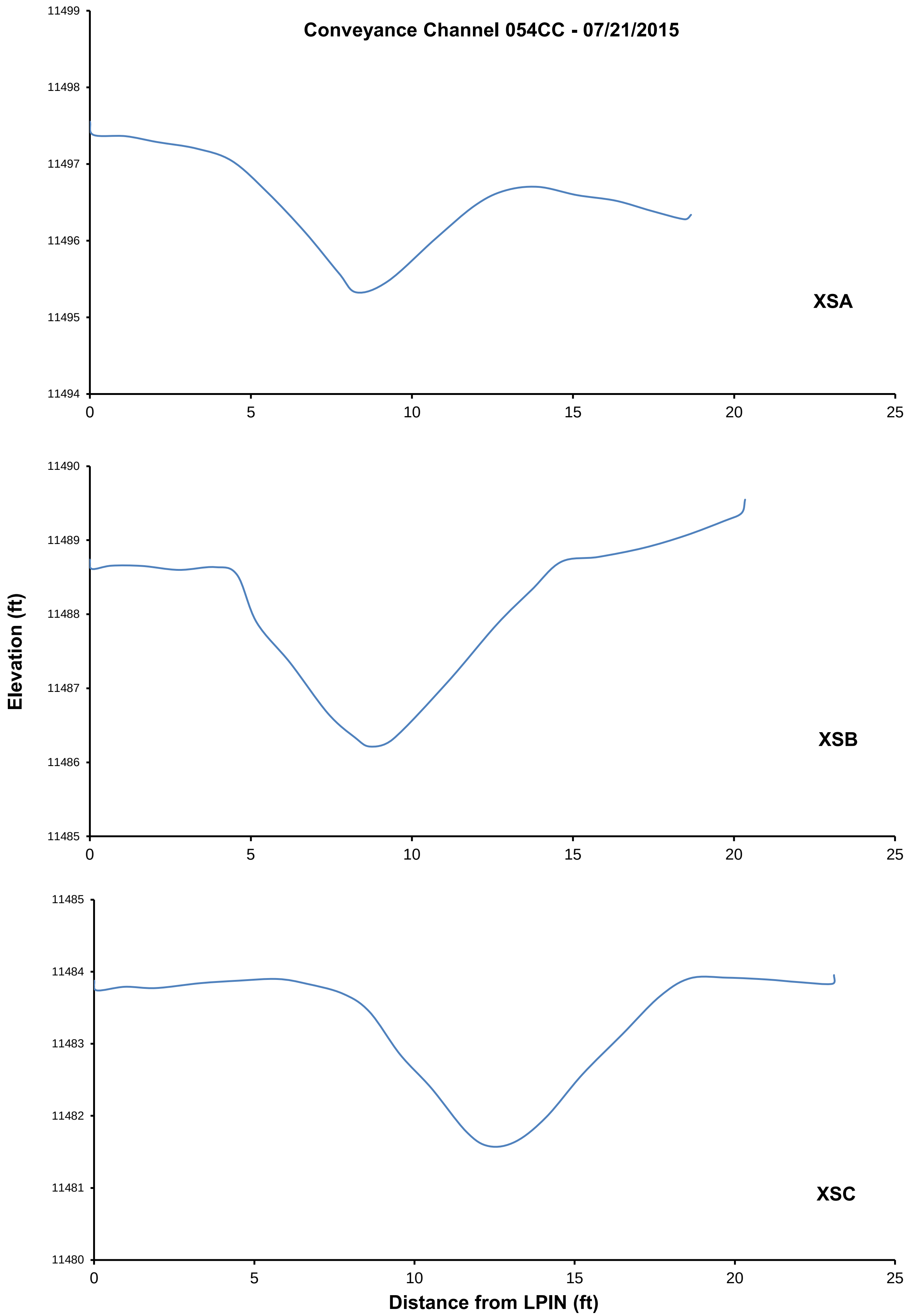

Conveyance Channel 036CC - 09/30/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10005
10004
10003
10002
10001
10000
9999
9998
9997
9996
9995
9994
0
10
20
30
40
50
60
70

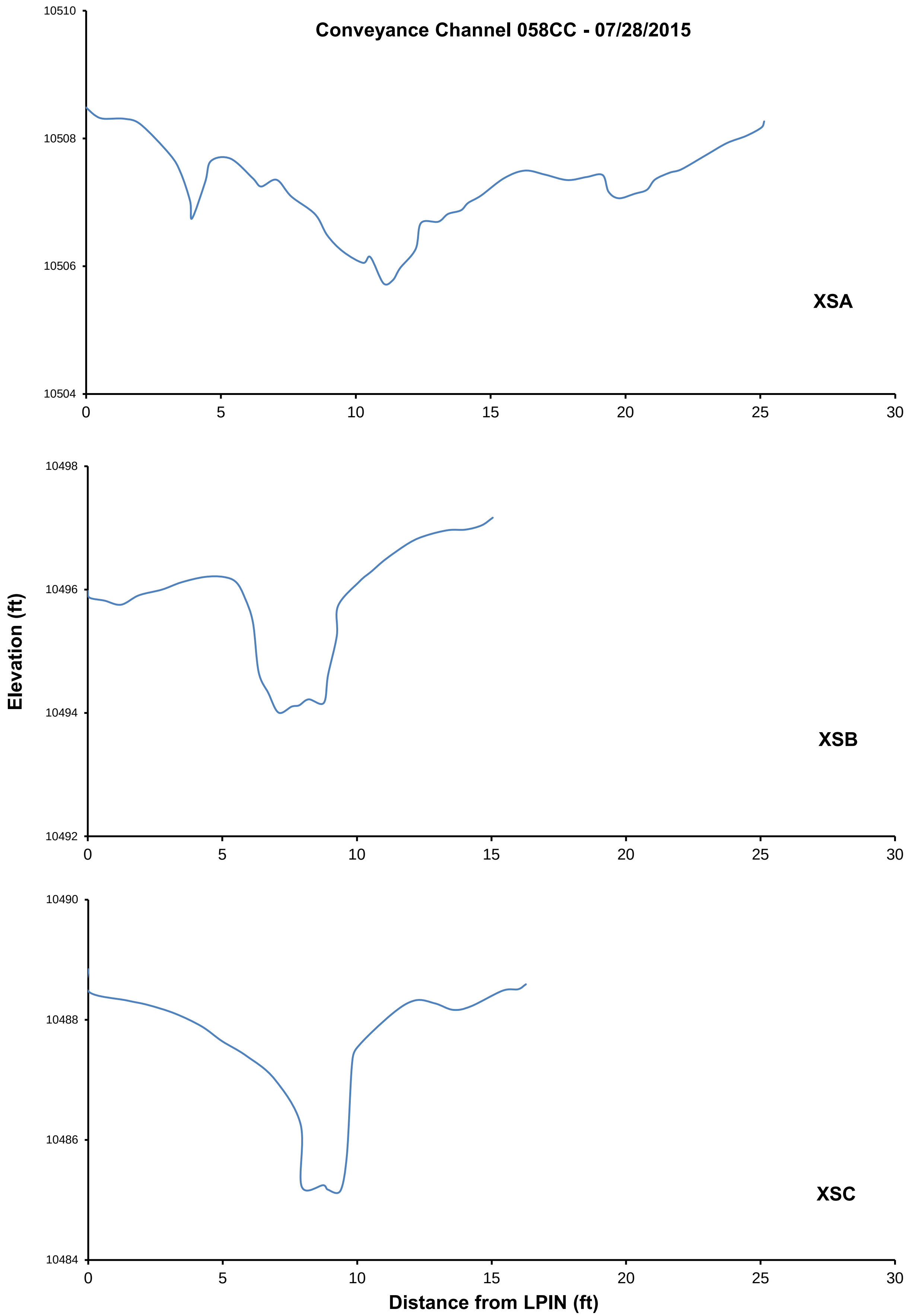

Conveyance Channel 037CC - 06/29/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9910
9908
9906
9904
9902
9900
9898
9903
9901
9899
9897
9895
9893
9891
9900
9898
9896
9894
9892
9890
9888
0
10
20
30
40
50
60
70


Conveyance Channel 038CC - 06/29/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10009
10008
10007
10006
10005
10004
10003
10002
10001
10000
9999
9998
9997
9996
9995
9994
9993
9992
9991
9990
0
10
20
30
40
50

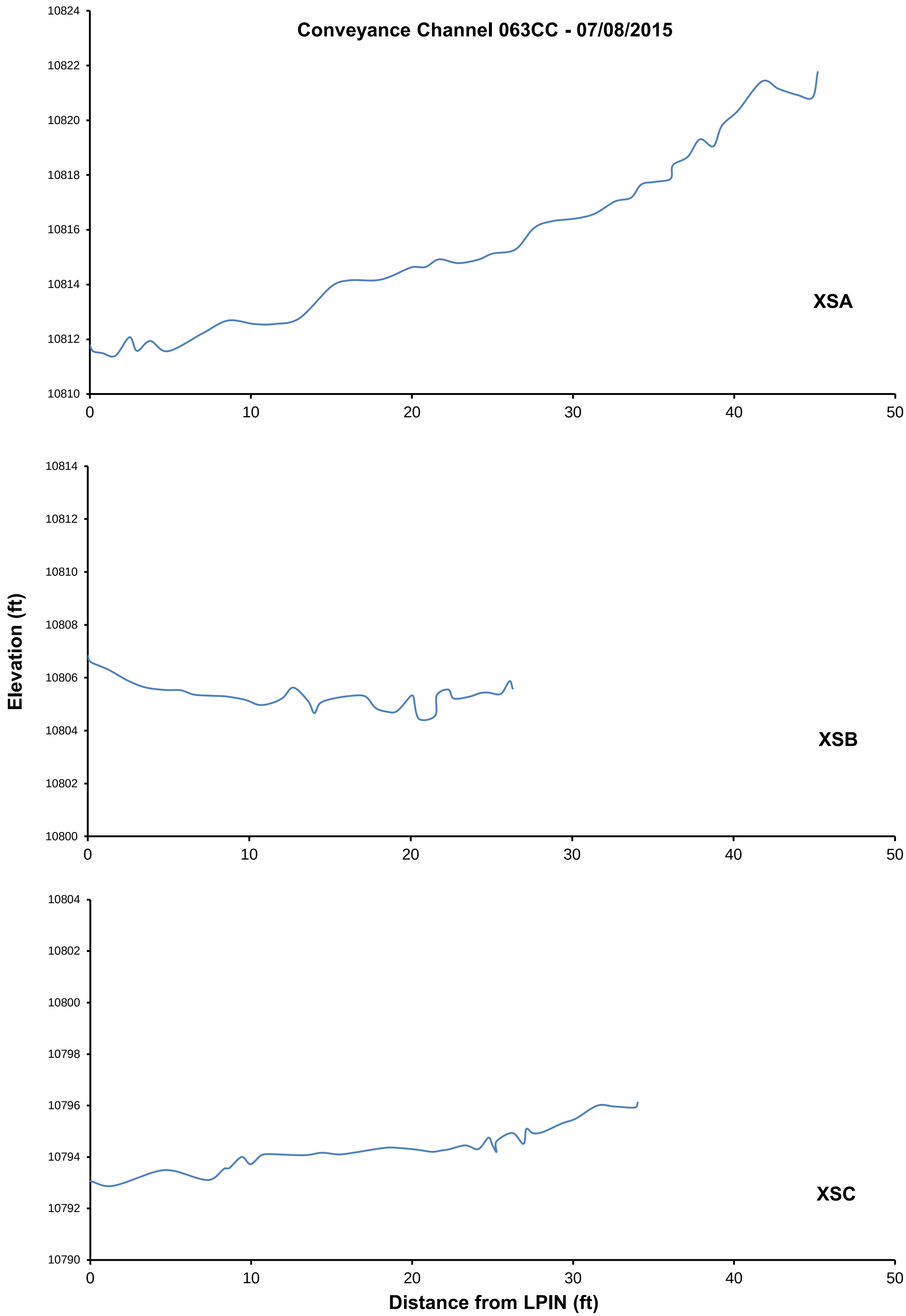

Conveyance Channel 040CC - 08/19/2015
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
9796
9795
9794
9793
9792
9791
9790
9789
9788
9787
9786
9785
9784
9783
9782
9781
9780
9779
9778
9777
0
5
10
15
20
25
30
35

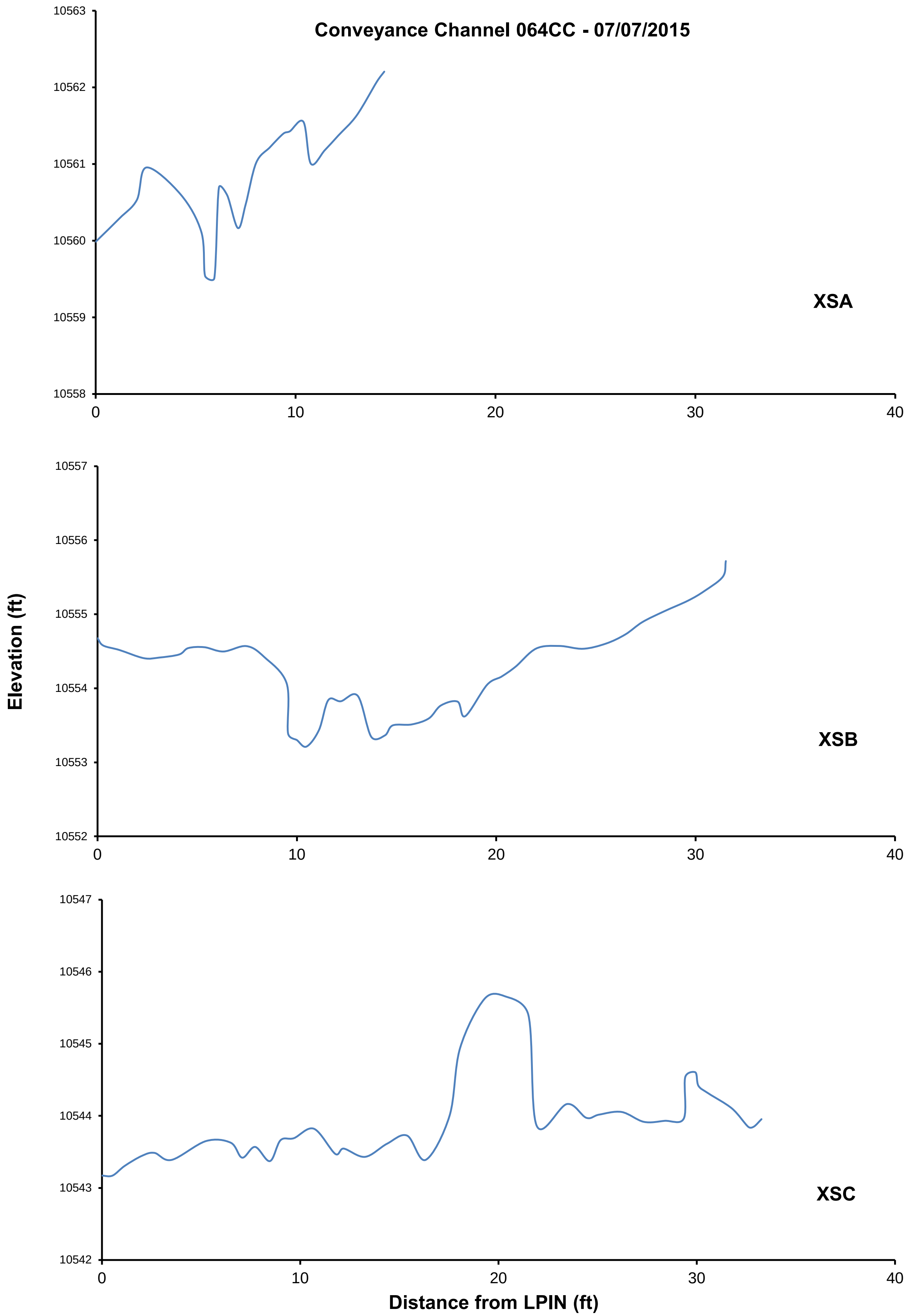

Conveyance Channel 053CC - 07/21/2015
XSA
XSB
XSC
XSD
Elevation (ft)
Distance from LPIN (ft)
11512
11510
11508
11506
11504
11502
11500
11498
11496
11494
11492
11490
11488
0
10
20
30
40

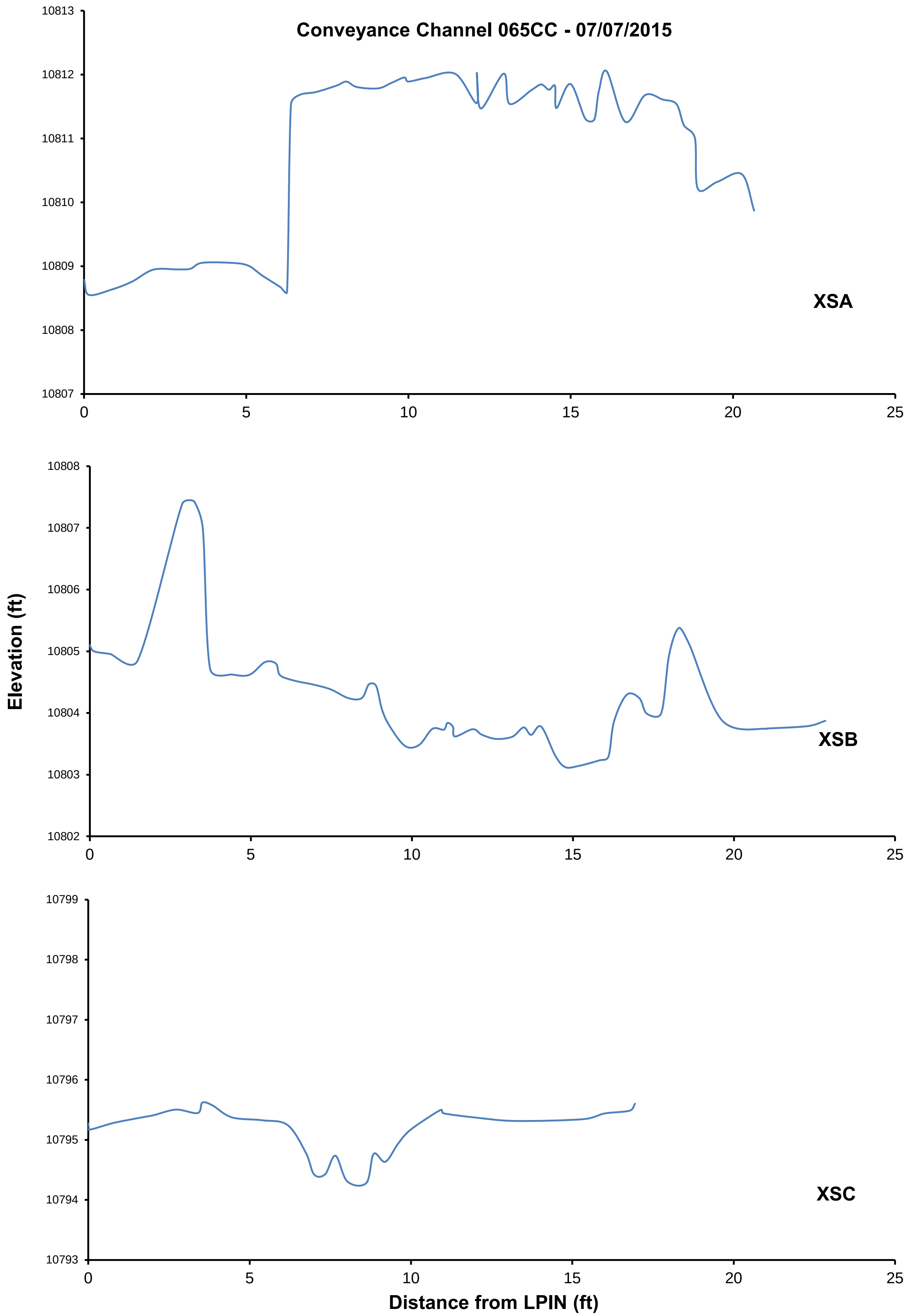

Conveyance Channel 054CC - 07/21/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11499
11498
11497
11496
11495
11494
11490
11489
11488
11487
11486
11485
11484
11483
11482
11481
11480
0
5
10
15
20
25

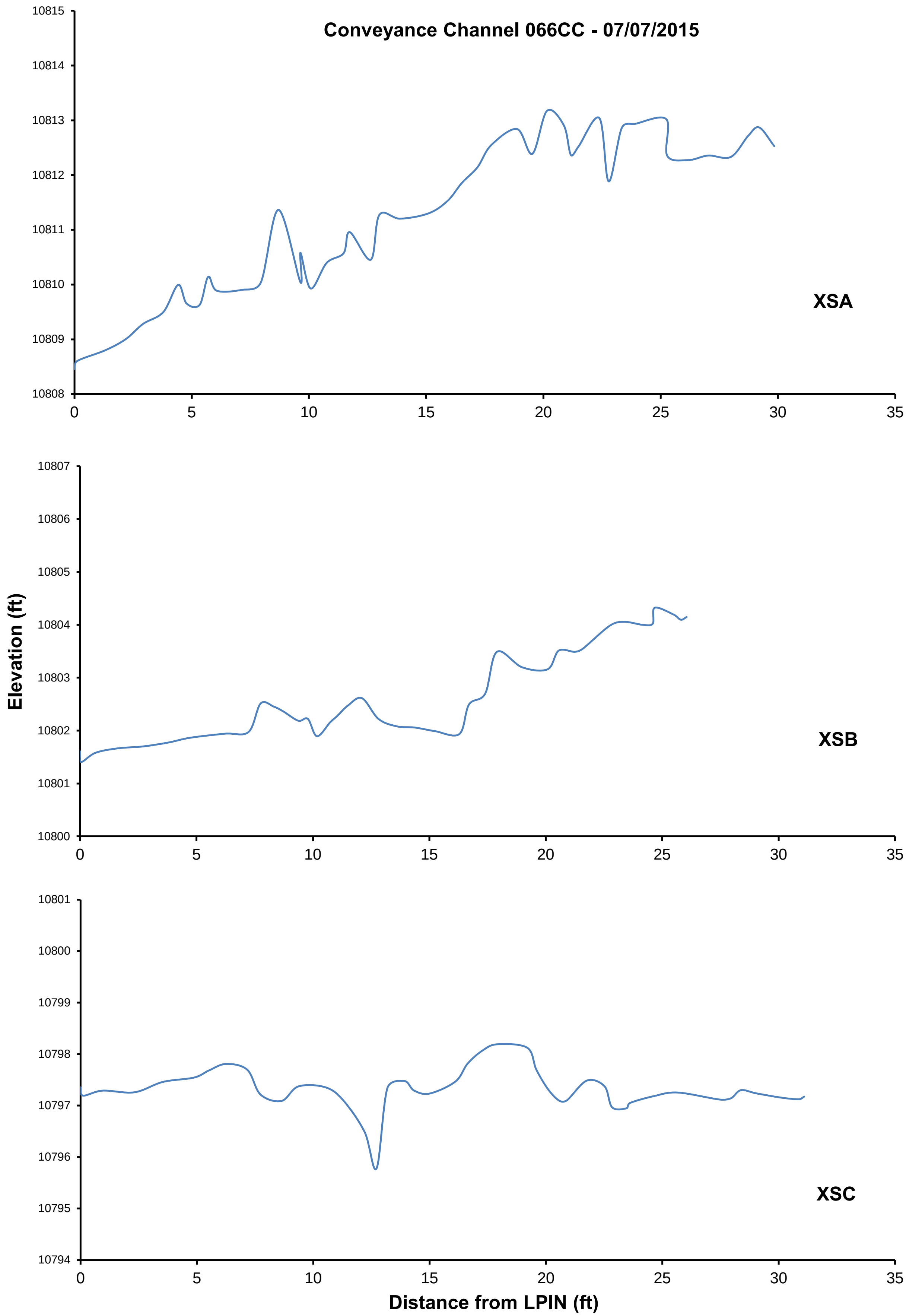


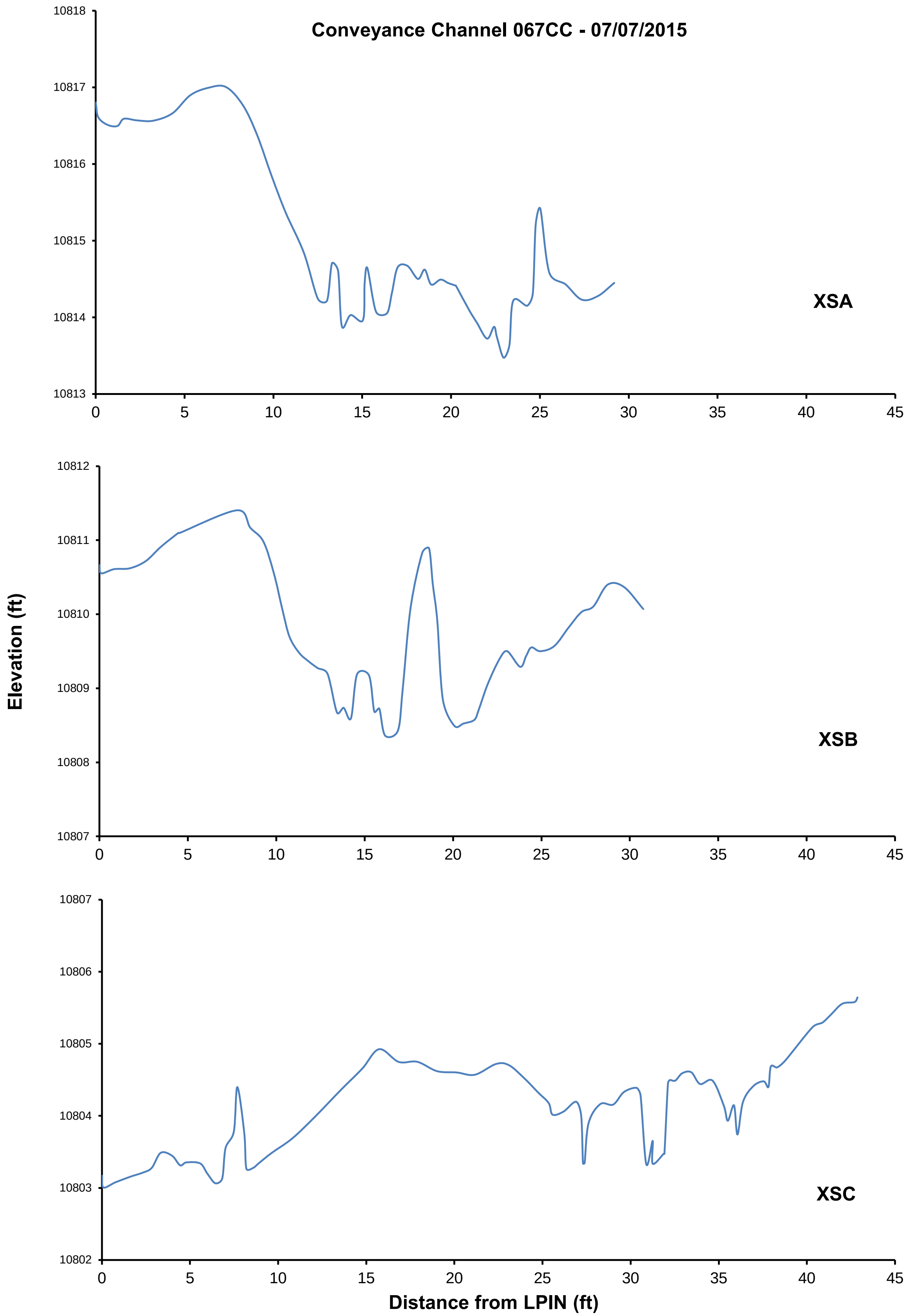
Conveyance Channel 058CC - 07/28/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
10510
10508
10506
10504
10498
10496
10494
10492
10490
10488
10486
10484
0
5
10
15
20
25
30

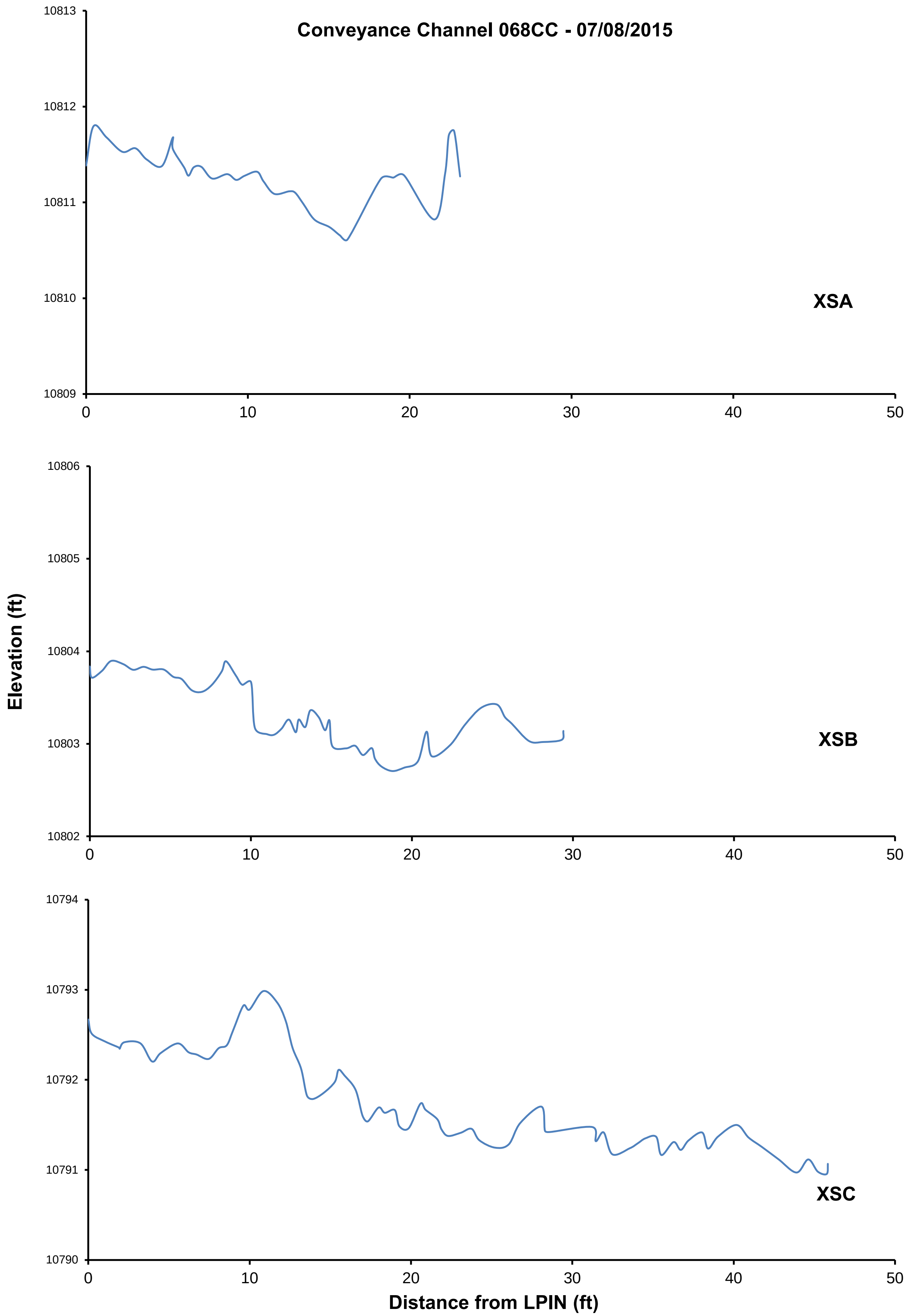

Conveyance Channel 063CC - 07/08/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
10824
10822
10820
10818
10816
10814
10812
10810
10808
10806
10804
10802
10800
10798
10796
10794
10792
10790
0
10
20
30
40
50

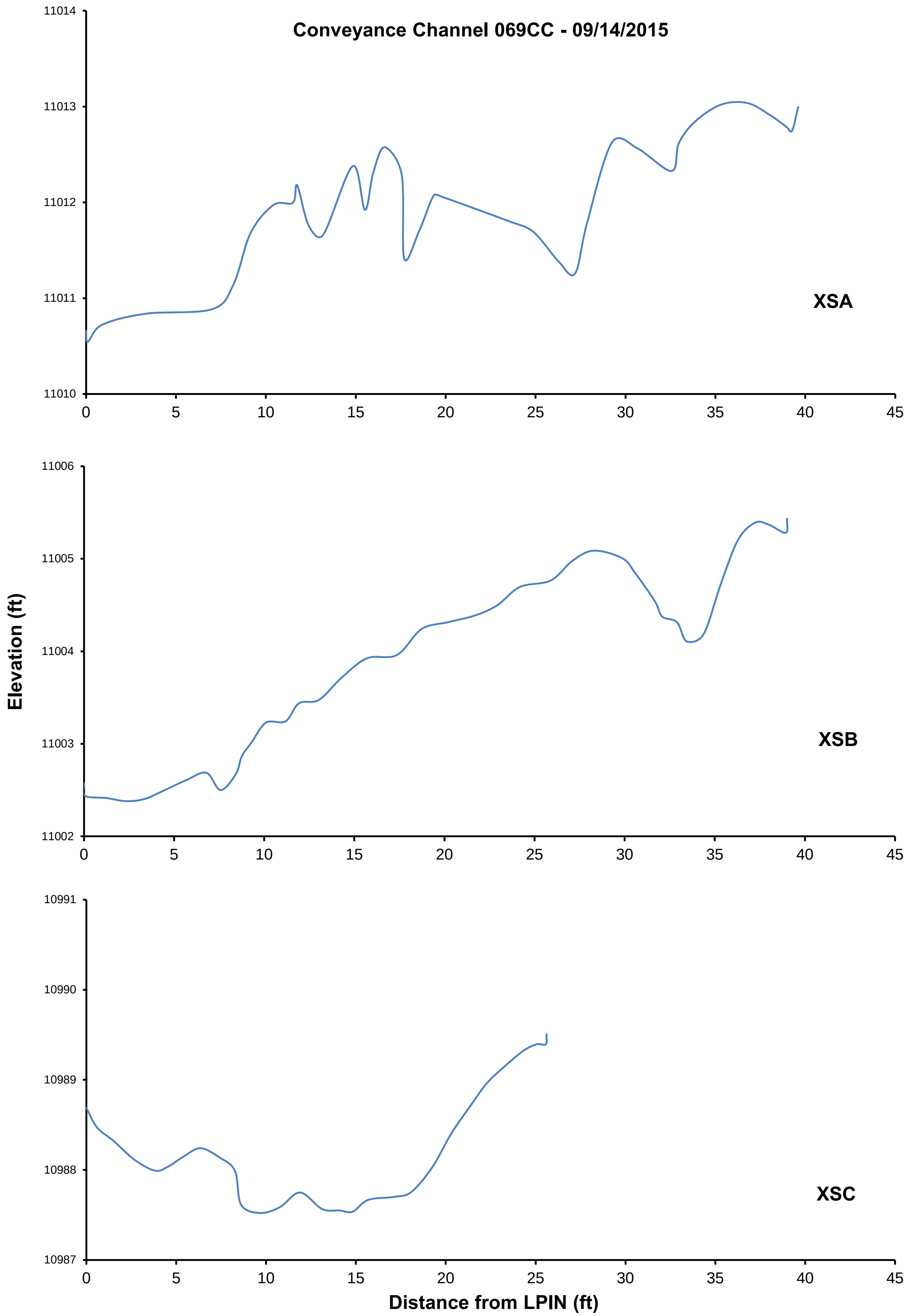

Conveyance Channel 064CC - 07/07/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10563
10562
10561
10560
10559
10558
10557
10556
10555
10554
10553
10552
10547
10546
10545
10544
10543
10542
0
10
20
30
40

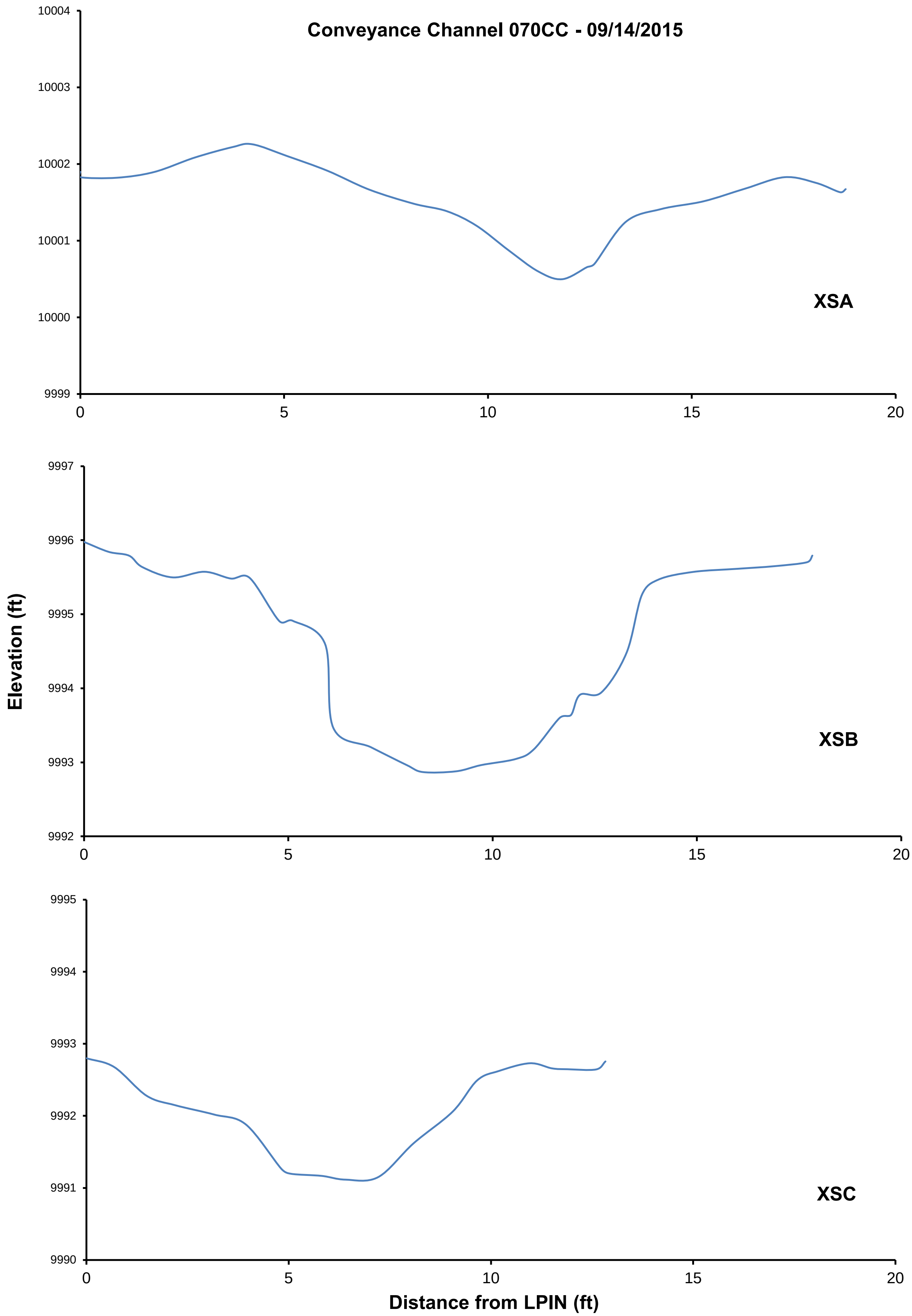

Conveyance Channel 065CC - 07/07/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
10813
10812
10811
10810
10809
10808
10807
10808
10807
10806
10805
10804
10803
10802
10799
10798
10797
10796
10795
10794
10793
0
5
10
15
20
25

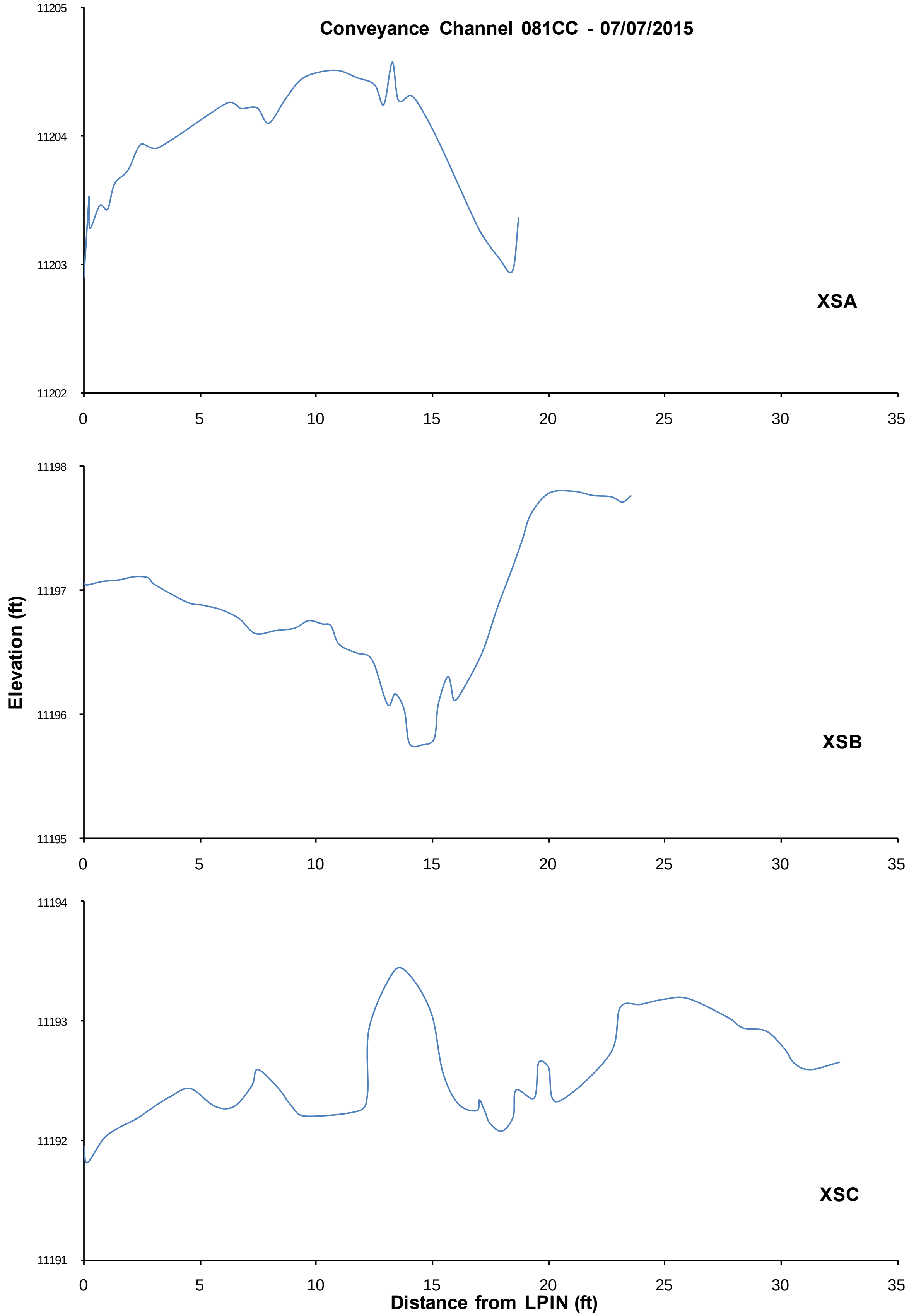

Conveyance Channel 066CC - 07/07/2015
10815
10814
10813
10812
10811
10810
10809
10808
0
5
10
15
20
25
30
35
XSA
10807
10806
10805
10804
10803
10802
10801
10800
XSB
Elevation (ft)
10801
10800
10799
10798
10797
10796
10795
10794
XSC
Distance from LPIN (ft)

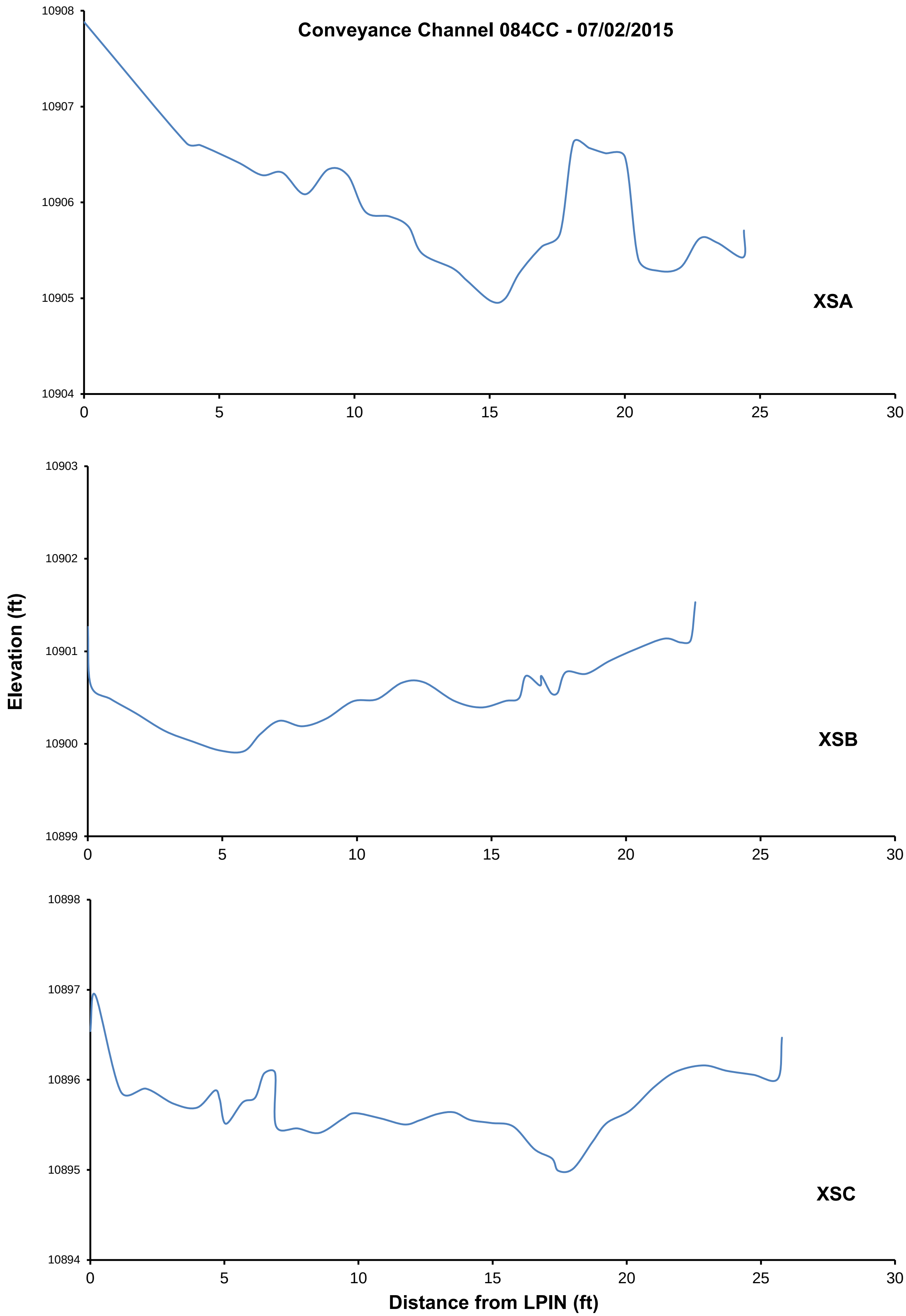

Conveyance Channel 067CC - 07/07/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10818
10817
10816
10815
10814
10813
10812
10811
10810
10809
10808
10807
10806
10805
10804
10803
10802
0
5
10
15
20
25
30
35
40
45


Conveyance Channel 068CC - 07/08/2015
10813
10812
10811
10810
10809
0
10
20
30
40
50
XSA
10806
10805
10804
10803
10802
XSB
10794
10793
10792
10791
10790
XSC
Elevation (ft)
Distance from LPIN (ft)

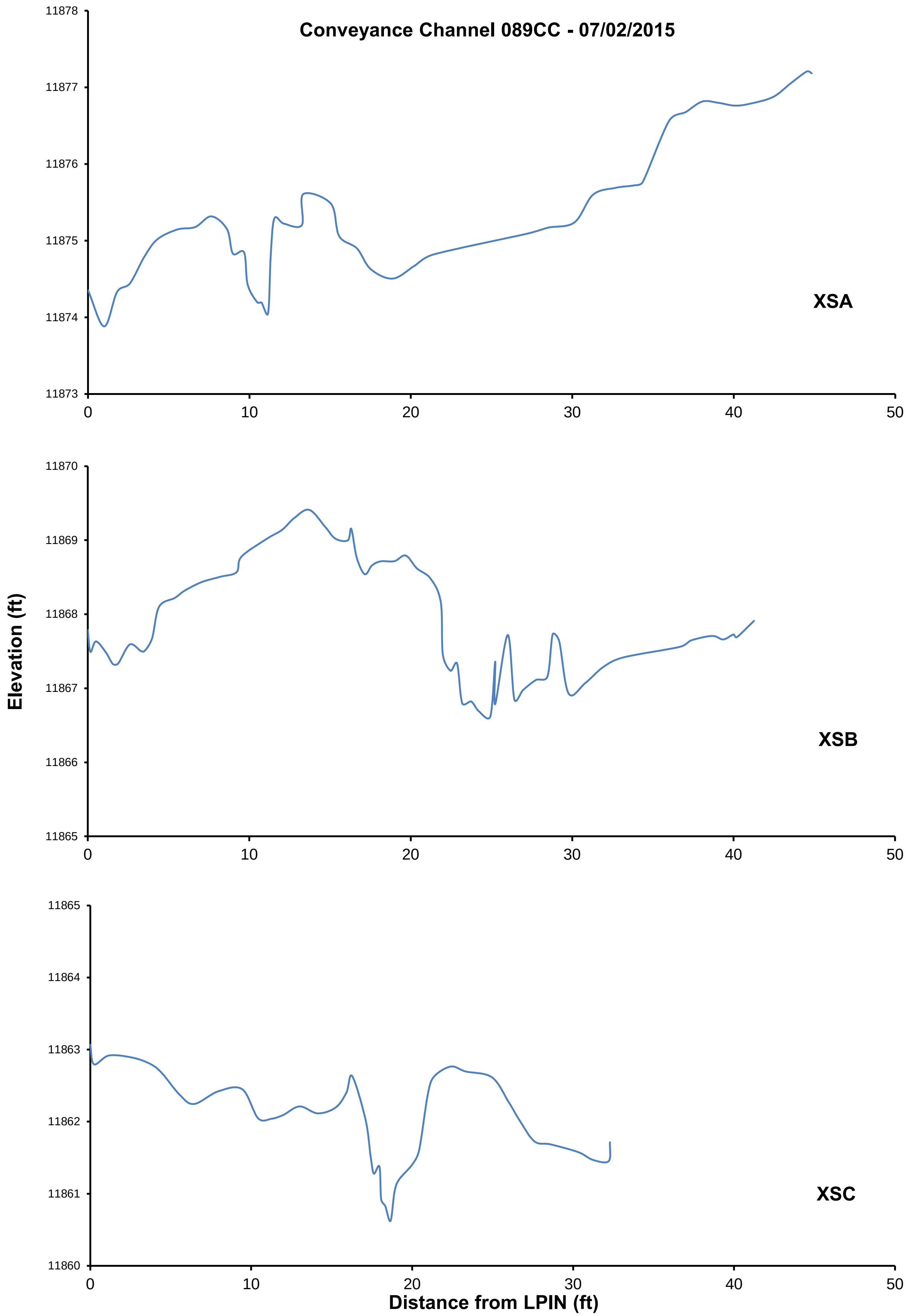

Conveyance Channel 069CC - 09/14/2015
Elevation (ft)
XSA
XSB
XSC
11014
11013
11012
11011
11010
11006
11005
11004
11003
11002
10991
10990
10989
10988
10987
0
5
10
15
20
25
30
35
40
45
Distance from LPIN (ft)

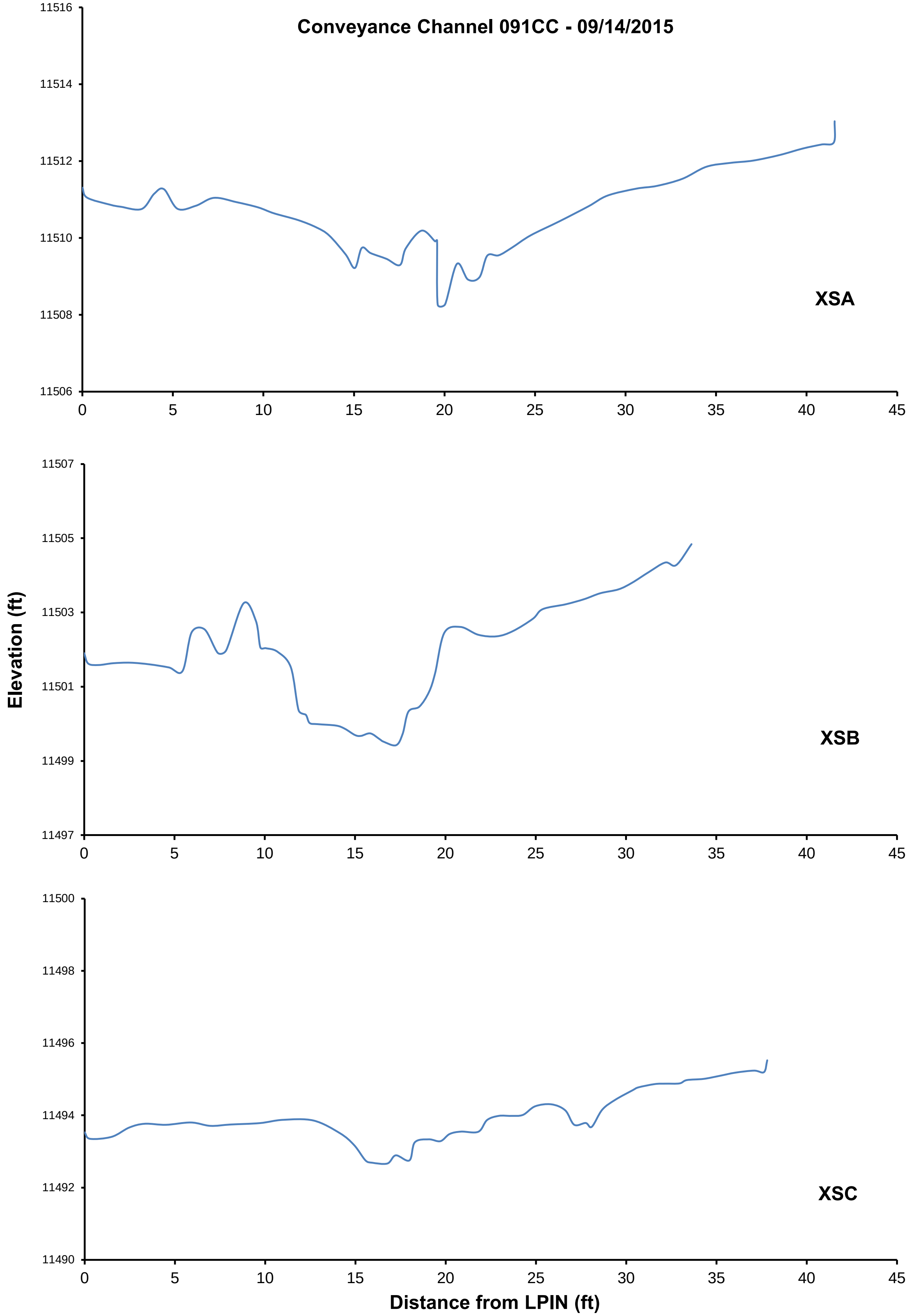

Conveyance Channel 070CC - 09/14/2015
10004
10003
10002
10001
10000
9999
0
5
10
15
20
XSA
9997
9996
9995
9994
9993
9992
XSB
9995
9994
9993
9992
9991
9990
XSC
Elevation (ft)
Distance from LPIN (ft)

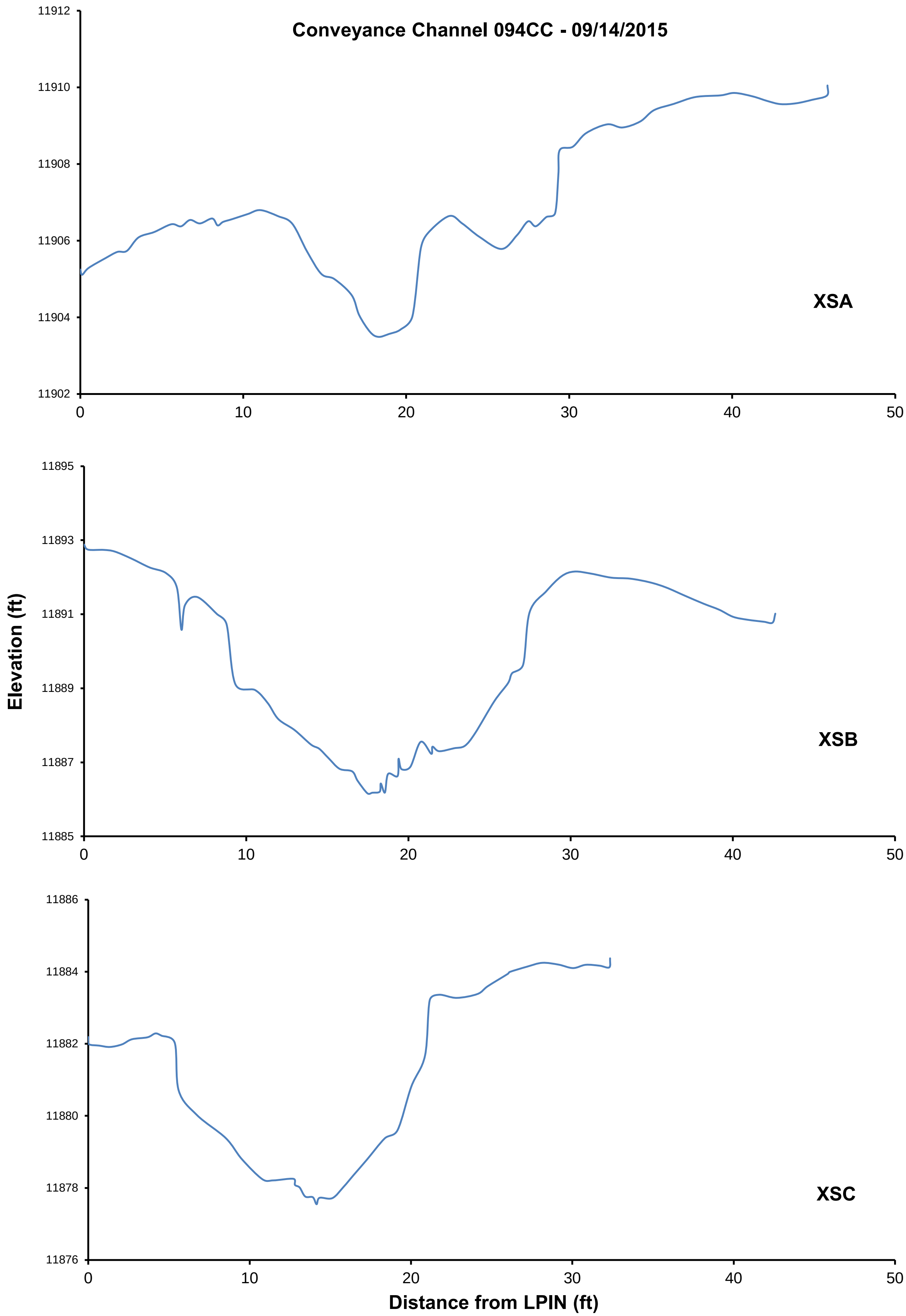

Conveyance Channel 081CC - 07/07/2015
Elevation (ft)
11205
11204
11203
11202
XSA
0
5
10
15
20
25
30
35
11198
11197
11196
11195
XSB
11194
11193
11192
11191
XSC
Distance from LPIN (ft)

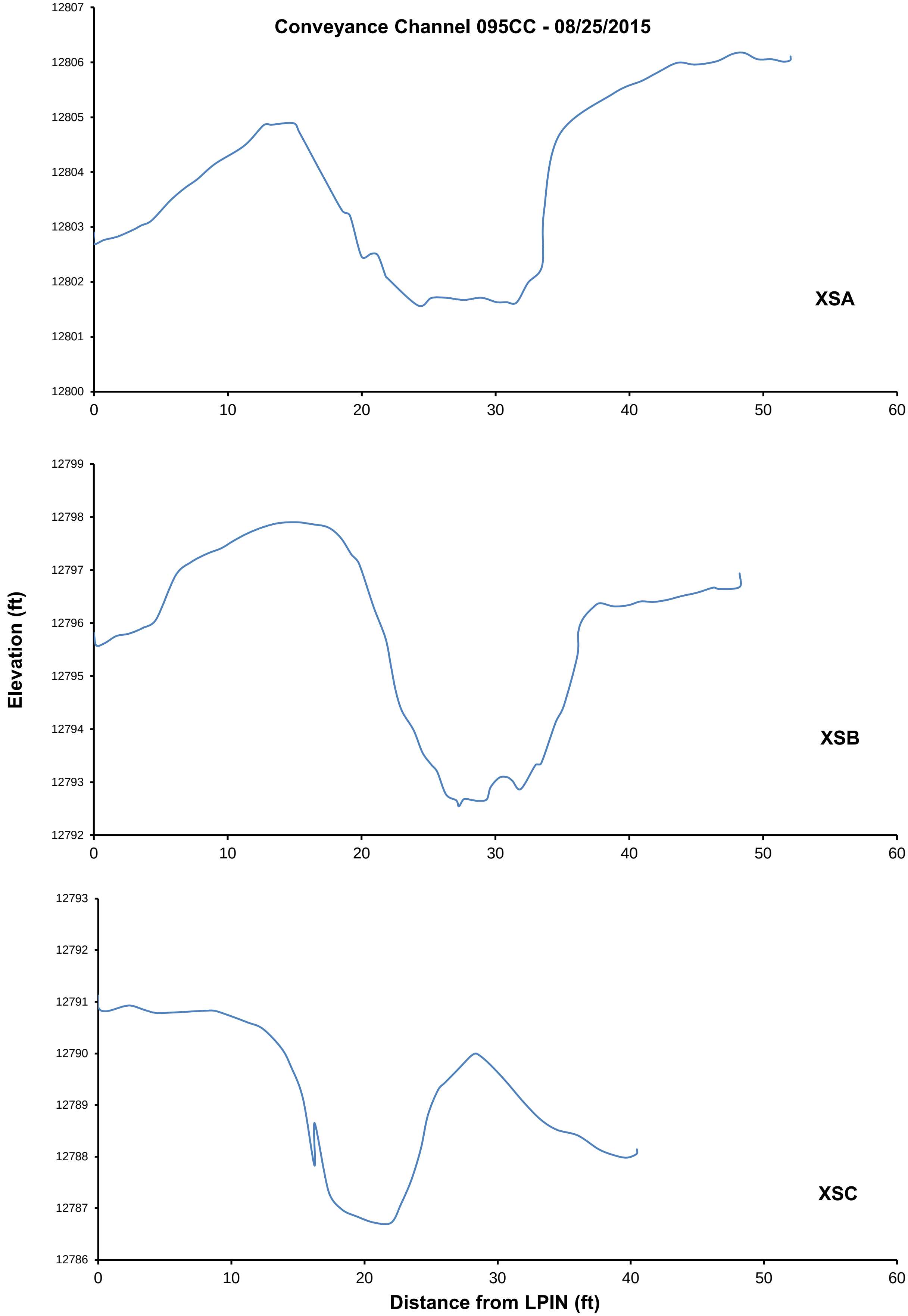


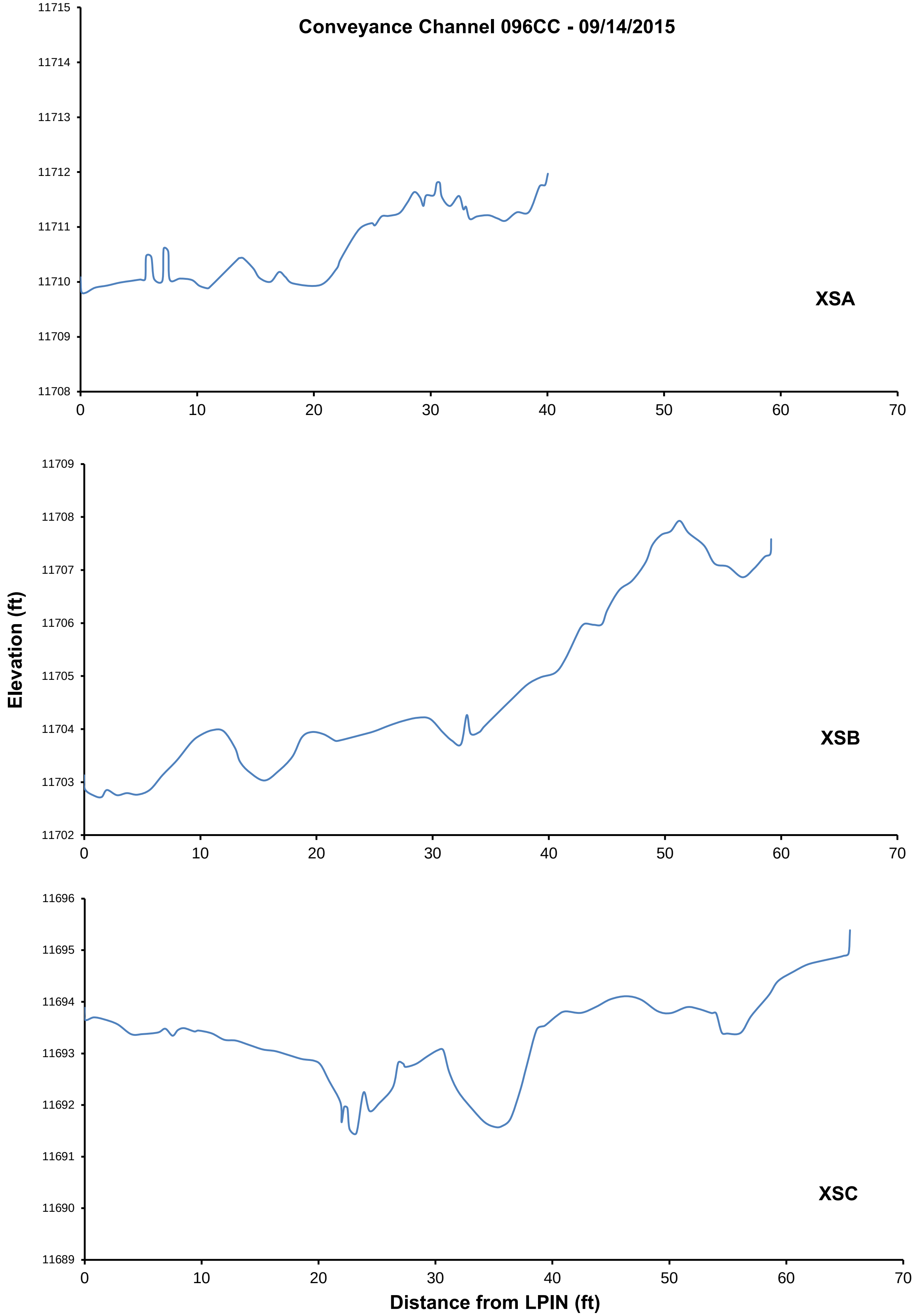
Conveyance Channel 084CC - 07/02/2015
10908
10907
10906
10905
10904
0
5
10
15
20
25
30
XSA
10903
10902
10901
10900
10899
XSB
10898
10897
10896
10895
10894
XSC
Elevation (ft)
Distance from LPIN (ft)

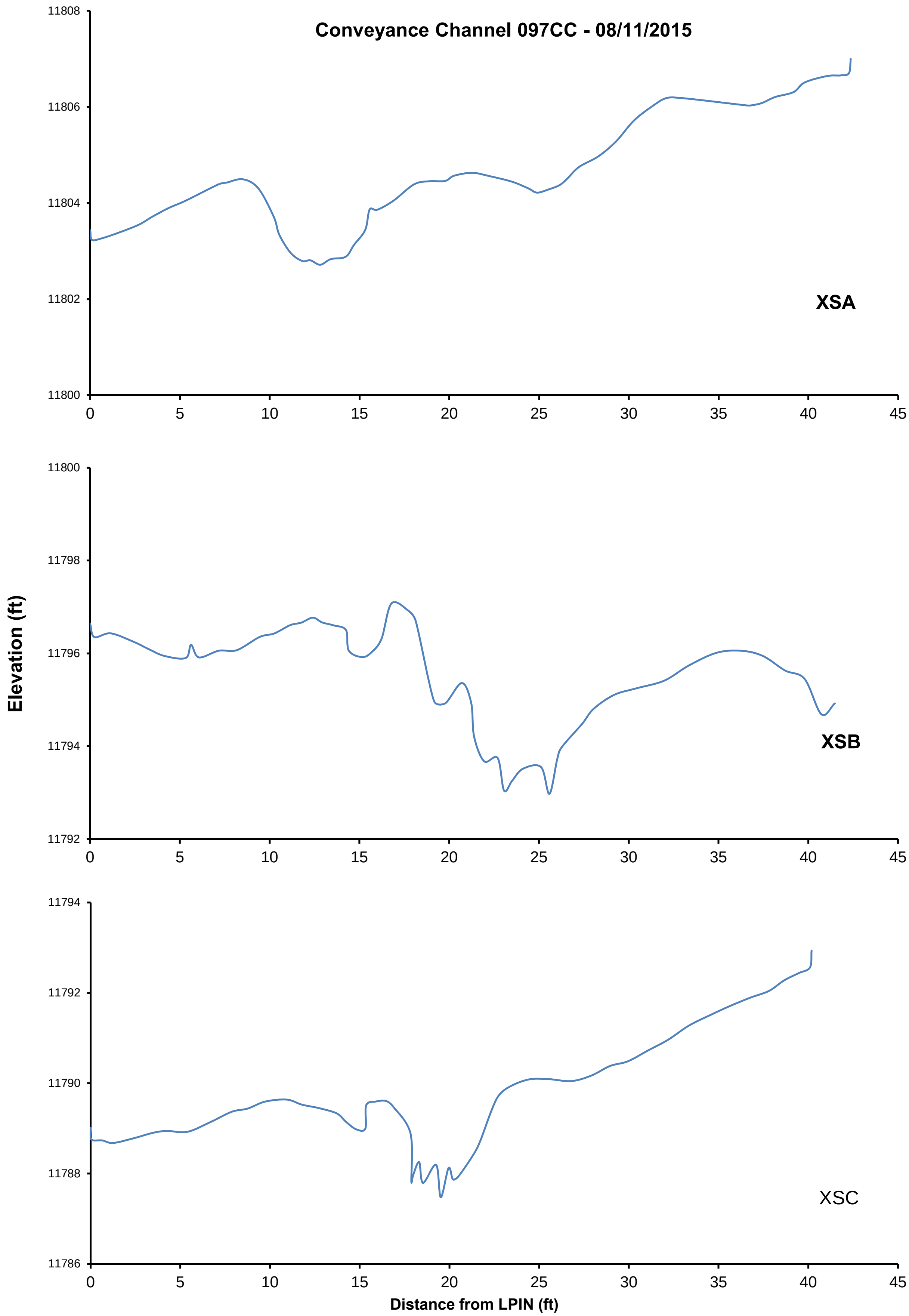

Conveyance Channel 089CC - 07/02/2015
XSA
11878
11877
11876
11875
11874
11873
0
10
20
30
40
50
XSB
11870
11869
11868
11867
11866
11865
0
10
20
30
40
50
Elevation (ft)
XSC
11865
11864
11863
11862
11861
11860
0
10
20
30
40
50
Distance from LPIN (ft)


Conveyance Channel 091CC - 09/14/2015
11516
11514
11512
11510
11508
11506
0
5
10
15
20
25
30
35
40
45
XSA
11507
11505
11503
11501
11499
11497
XSB
11500
11498
11496
11494
11492
11490
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 094CC - 09/14/2015
11912
11910
11908
11906
11904
11902
0
10
20
30
40
50
XSA
11895
11893
11891
11889
11887
11885
XSB
11886
11884
11882
11880
11878
11876
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 095CC - 08/25/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
12807
12806
12805
12804
12803
12802
12801
12800
12799
12798
12797
12796
12795
12794
12793
12792
12791
12790
12789
12788
12787
12786
0
10
20
30
40
50
60


Conveyance Channel 096CC - 09/14/2015
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
11715
11714
11713
11712
11711
11710
11709
11708
11709
11708
11707
11706
11705
11704
11703
11702
11696
11695
11694
11693
11692
11691
11690
11689
0
10
20
30
40
50
60
70


Conveyance Channel 097CC - 08/11/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11808
11806
11804
11802
11800
11798
11796
11794
11792
11790
11788
11786
0
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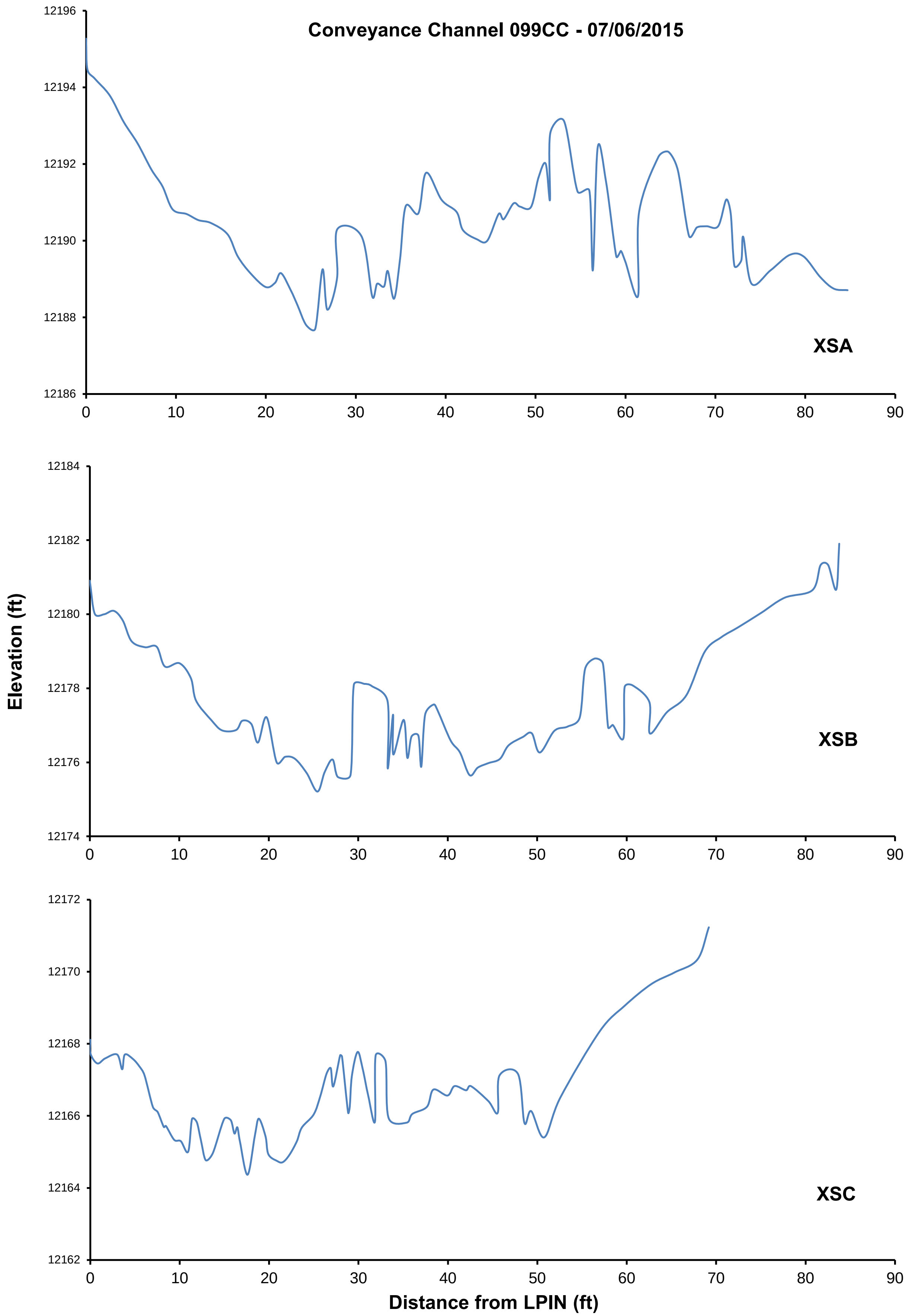
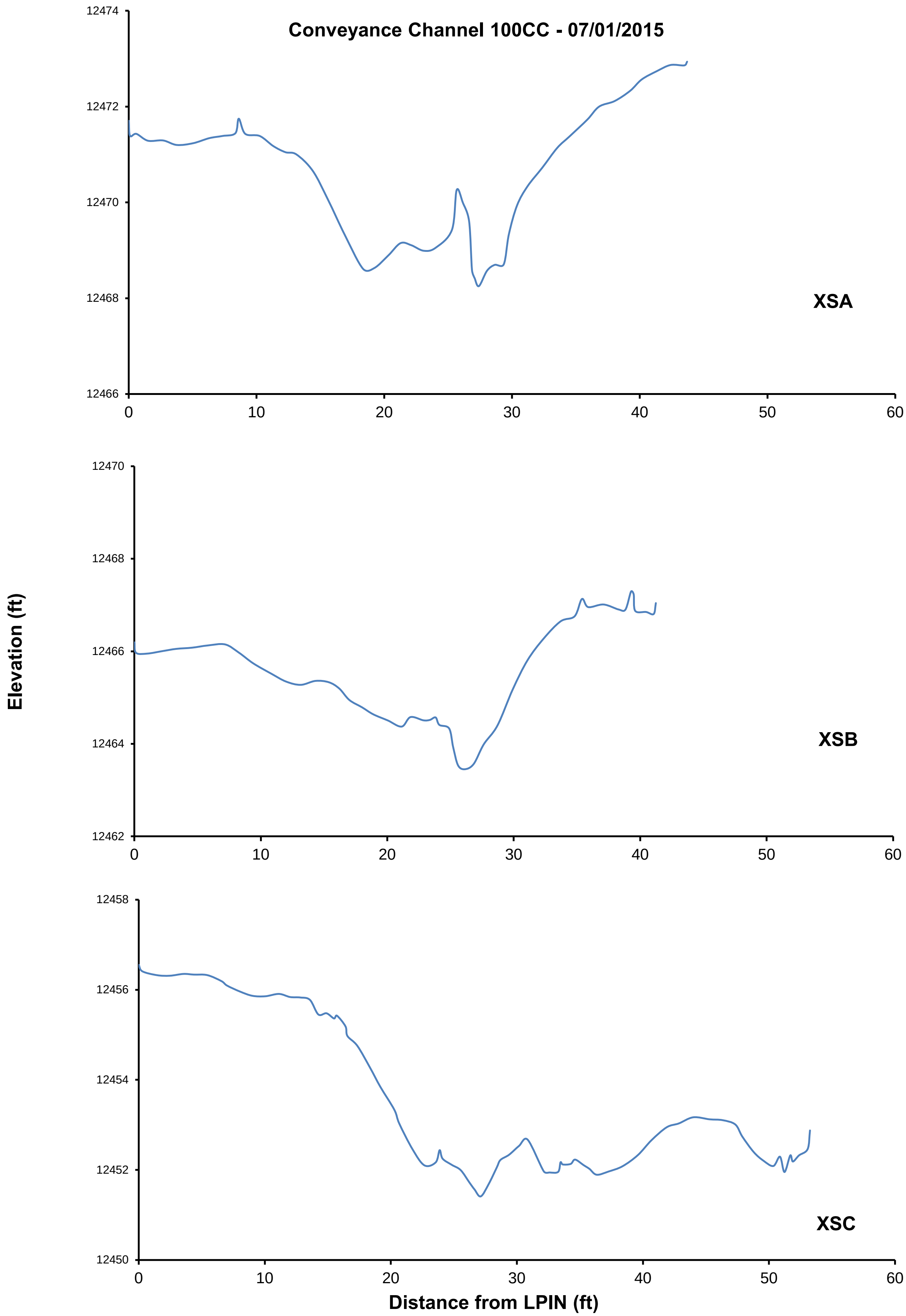
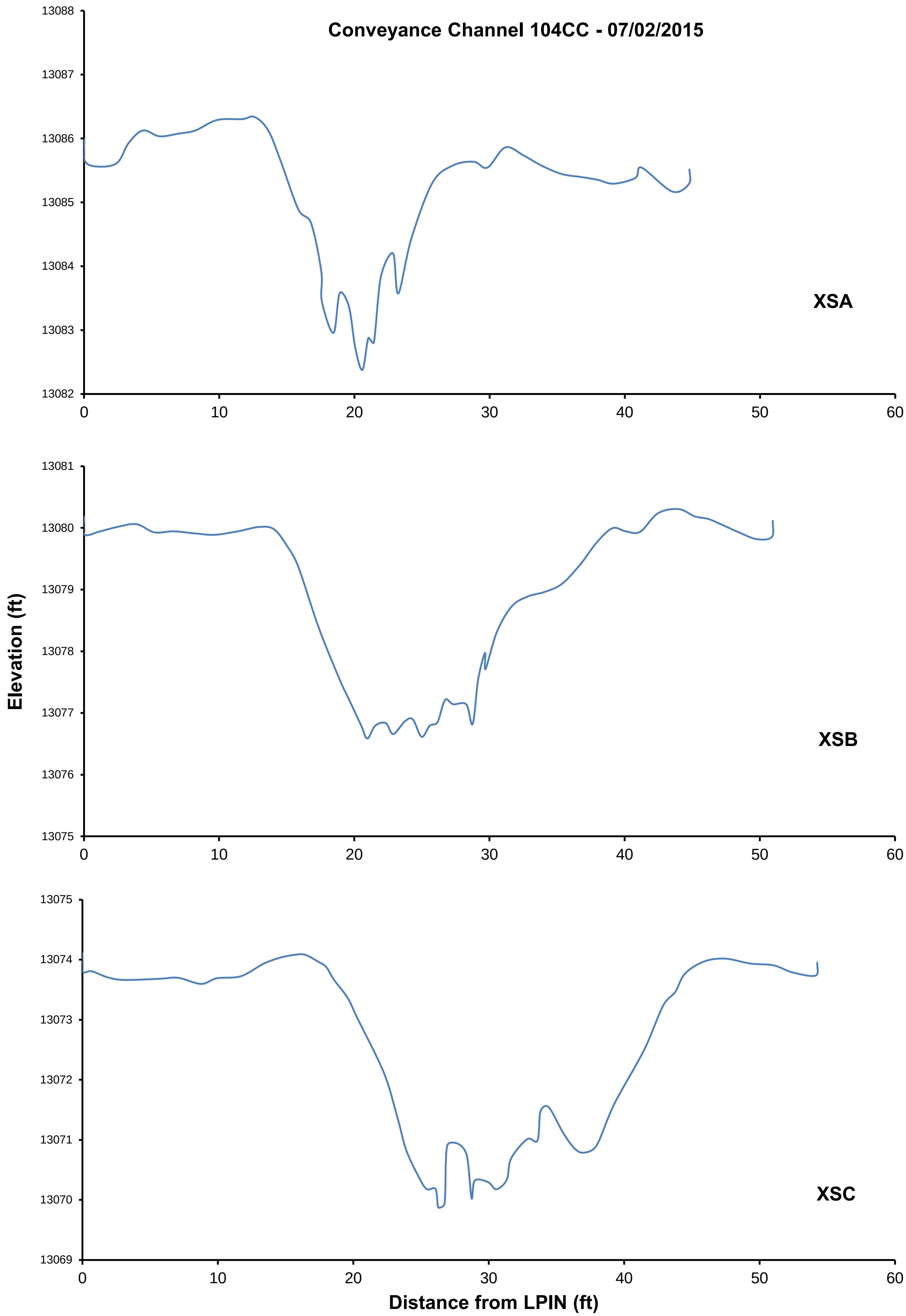
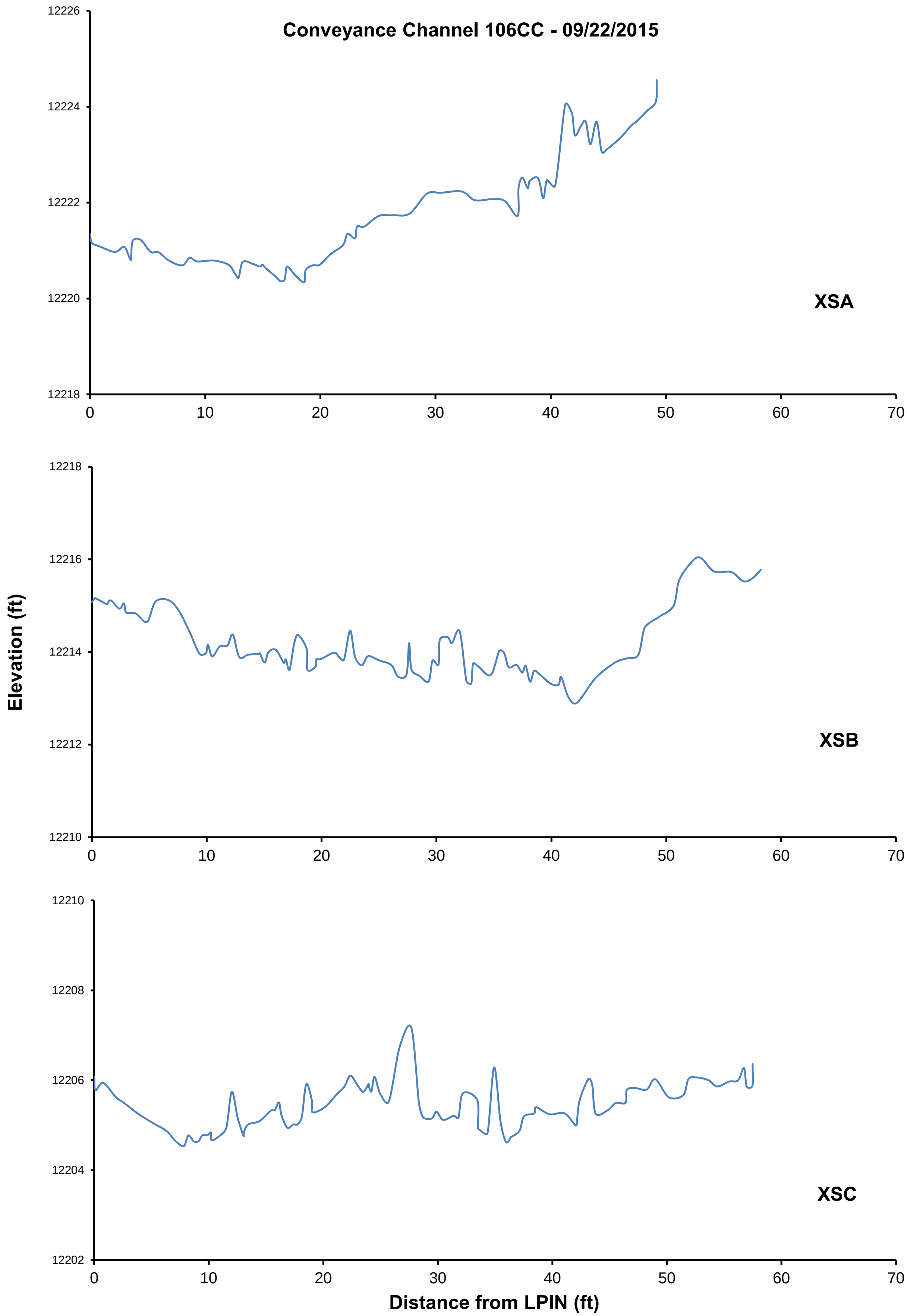
20
25
30
35
40
45

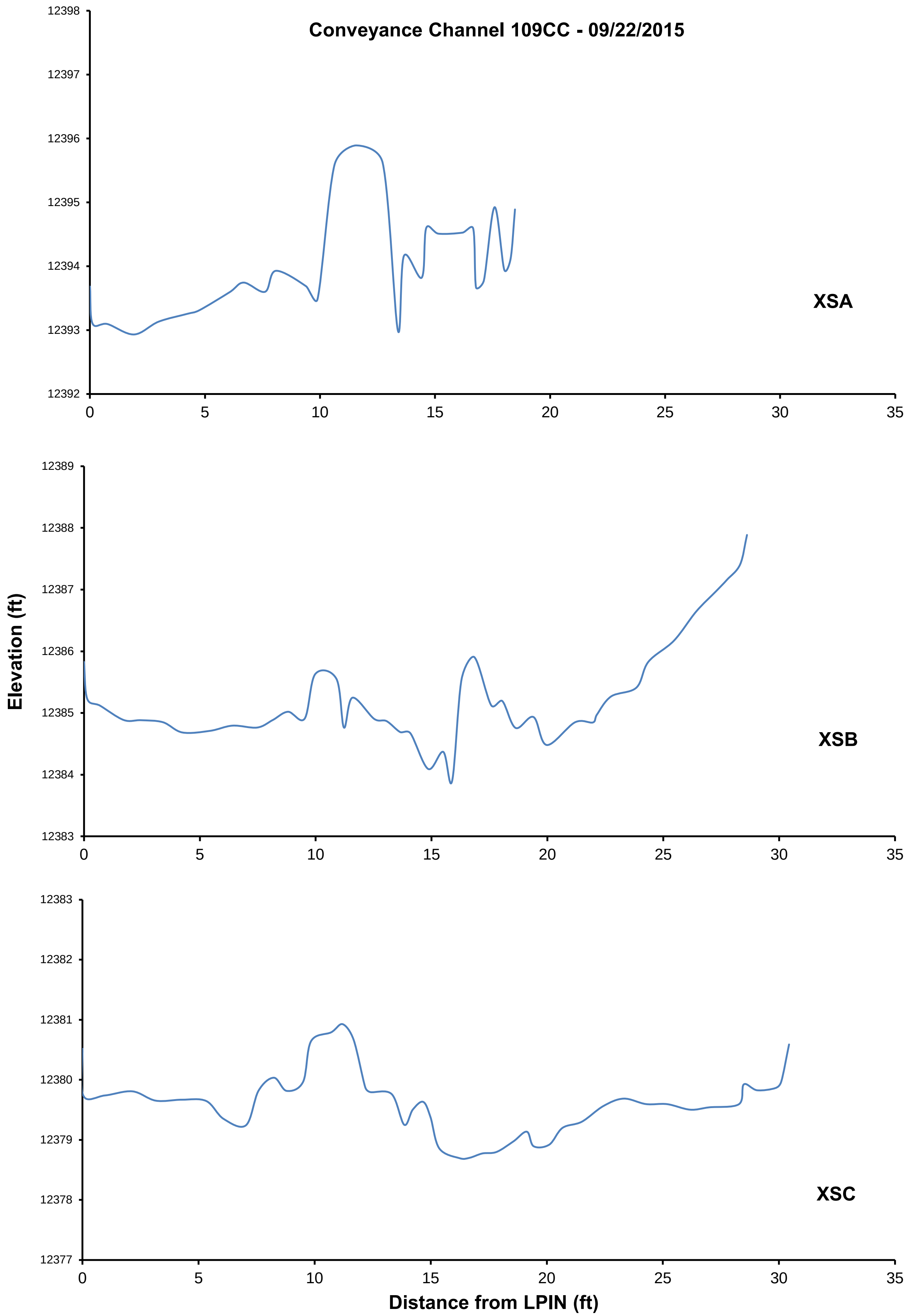


Conveyance Channel 099CC - 07/06/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12196
12194
12192
12190
12188
12186
12184
12182
12180
12178
12176
12174
12172
12170
12168
12166
12164
12162
0
10
20
30
40
50
60
70
80
90

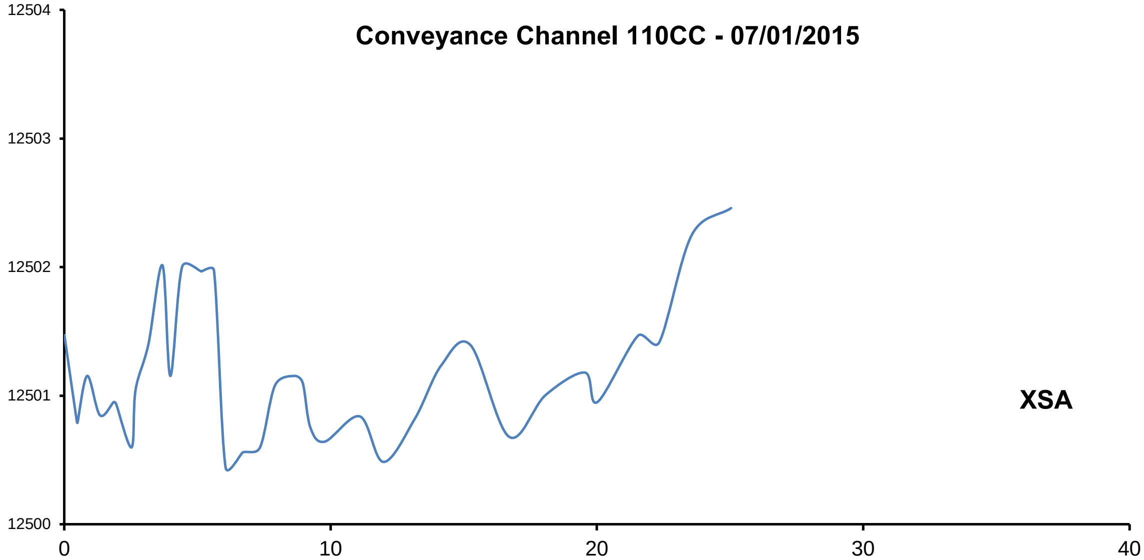

Conveyance Channel 100CC - 07/01/2015
12474
12472
12470
12468
12466
0
10
20
30
40
50
60
XSA
12470
12468
12466
12464
12462
XSB
12458
12456
12454
12452
12450
XSC
Elevation (ft)
Distance from LPIN (ft)

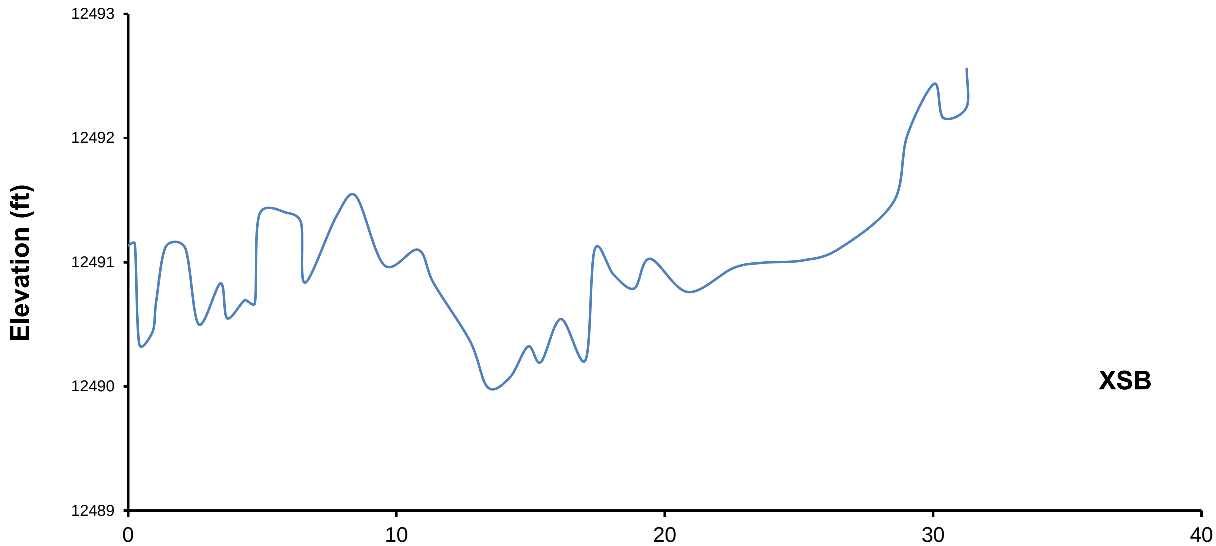

Conveyance Channel 104CC - 07/02/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13088
13087
13086
13085
13084
13083
13082
13081
13080
13079
13078
13077
13076
13075
13074
13073
13072
13071
13070
13069
0
10
20
30
40
50
60

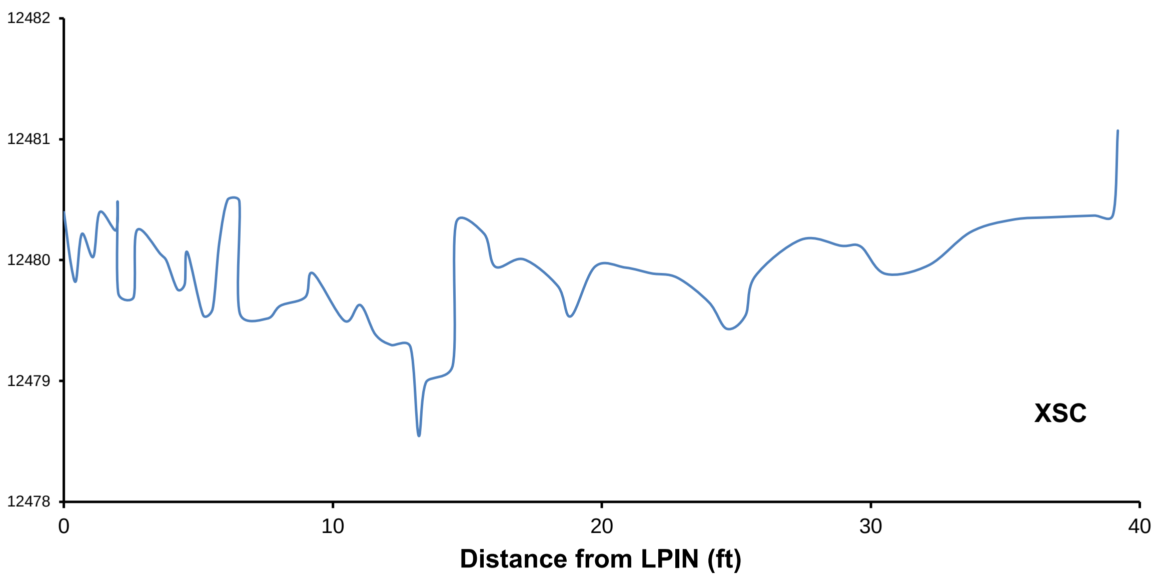

Conveyance Channel 106CC - 09/22/2015
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
12226
12224
12222
12220
12218
12216
12214
12212
12210
12208
12206
12204
12202
0
10
20
30
40
50
60
70

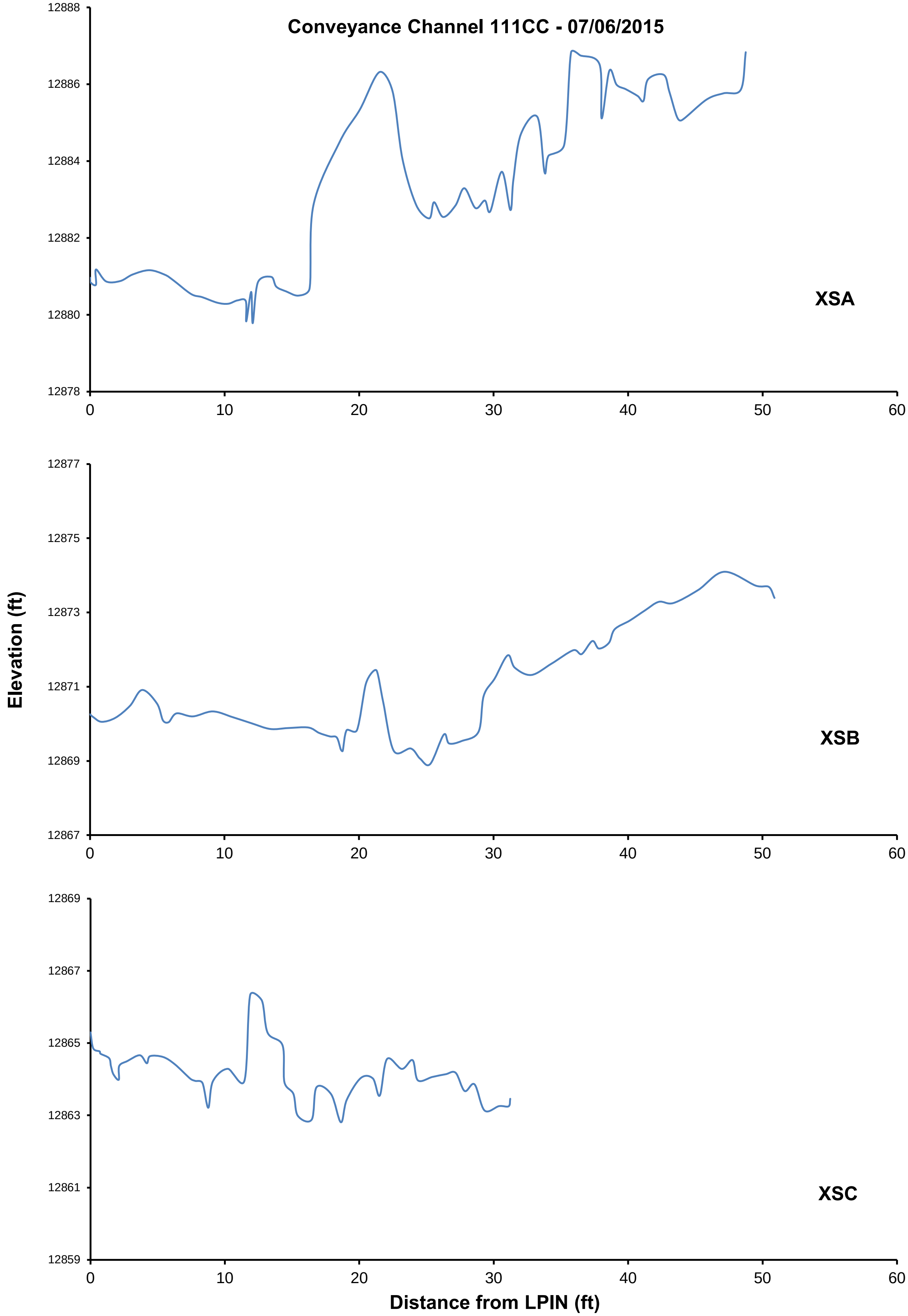


Conveyance Channel 109CC - 09/22/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12398
12397
12396
12395
12394
12393
12392
12389
12388
12387
12386
12385
12384
12383
12383
12382
12381
12380
12379
12378
12377
0
5
10
15
20
25
30
35

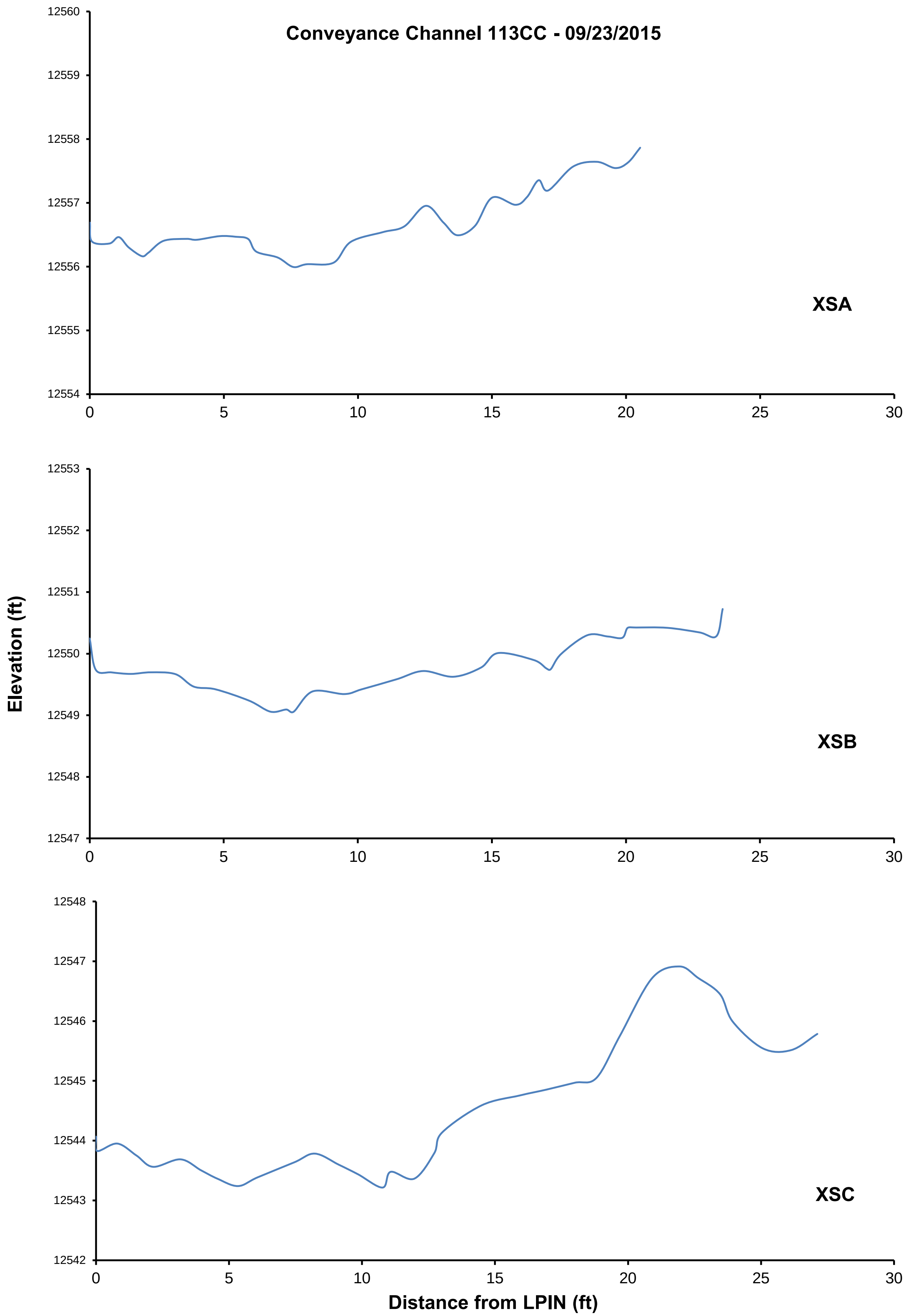

Conveyance Channel 110CC - 07/01/2015
12504
12503
12502
12501
12500
0
10
20
30
40
XSA

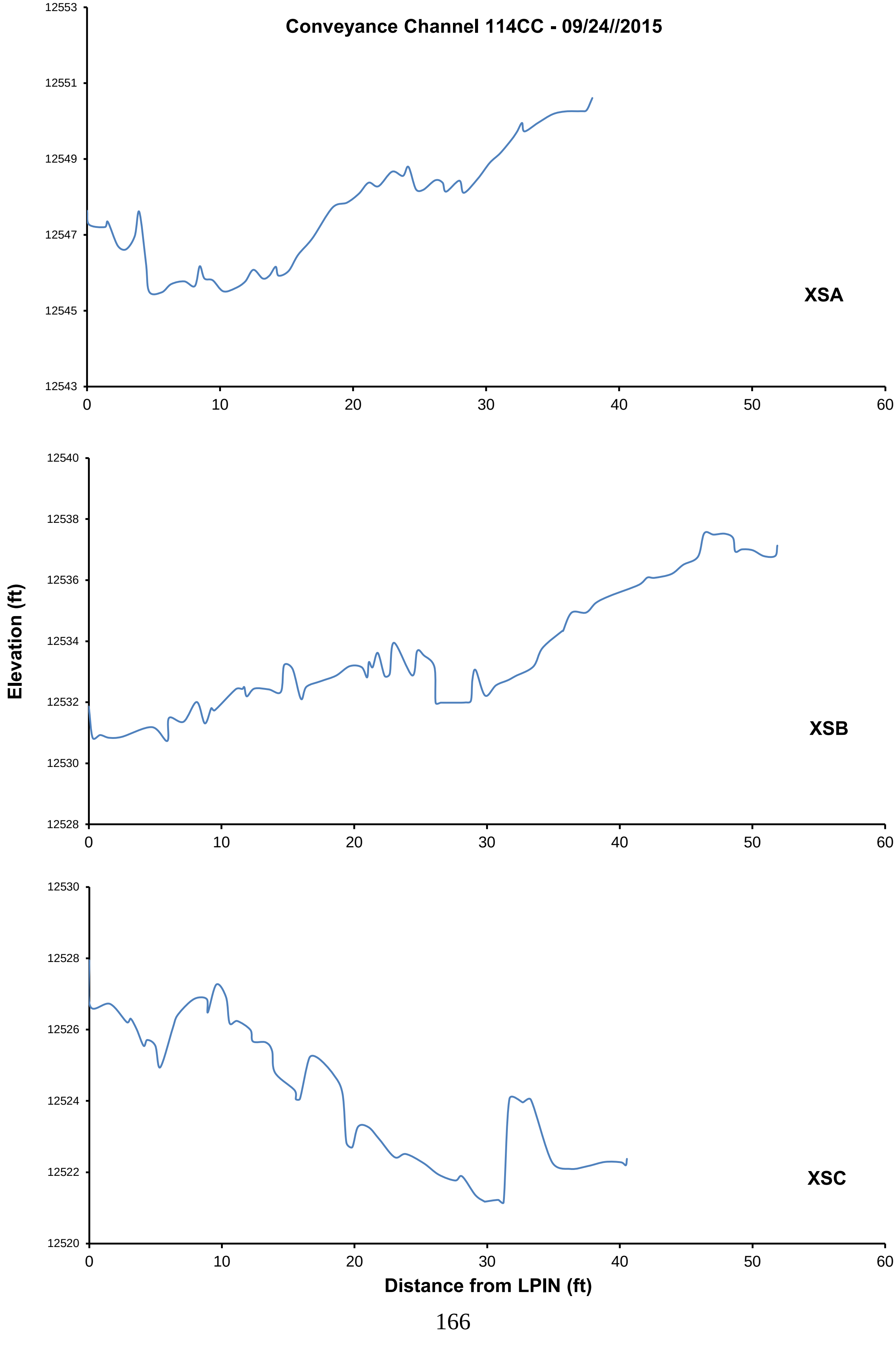

Elevation (ft)
12493
12492
12491
12490
12489
0
10
20
30
40
XSB


12482
12481
12480
12479
12478
0
10
20
30
40
XSC
Distance from LPIN (ft)

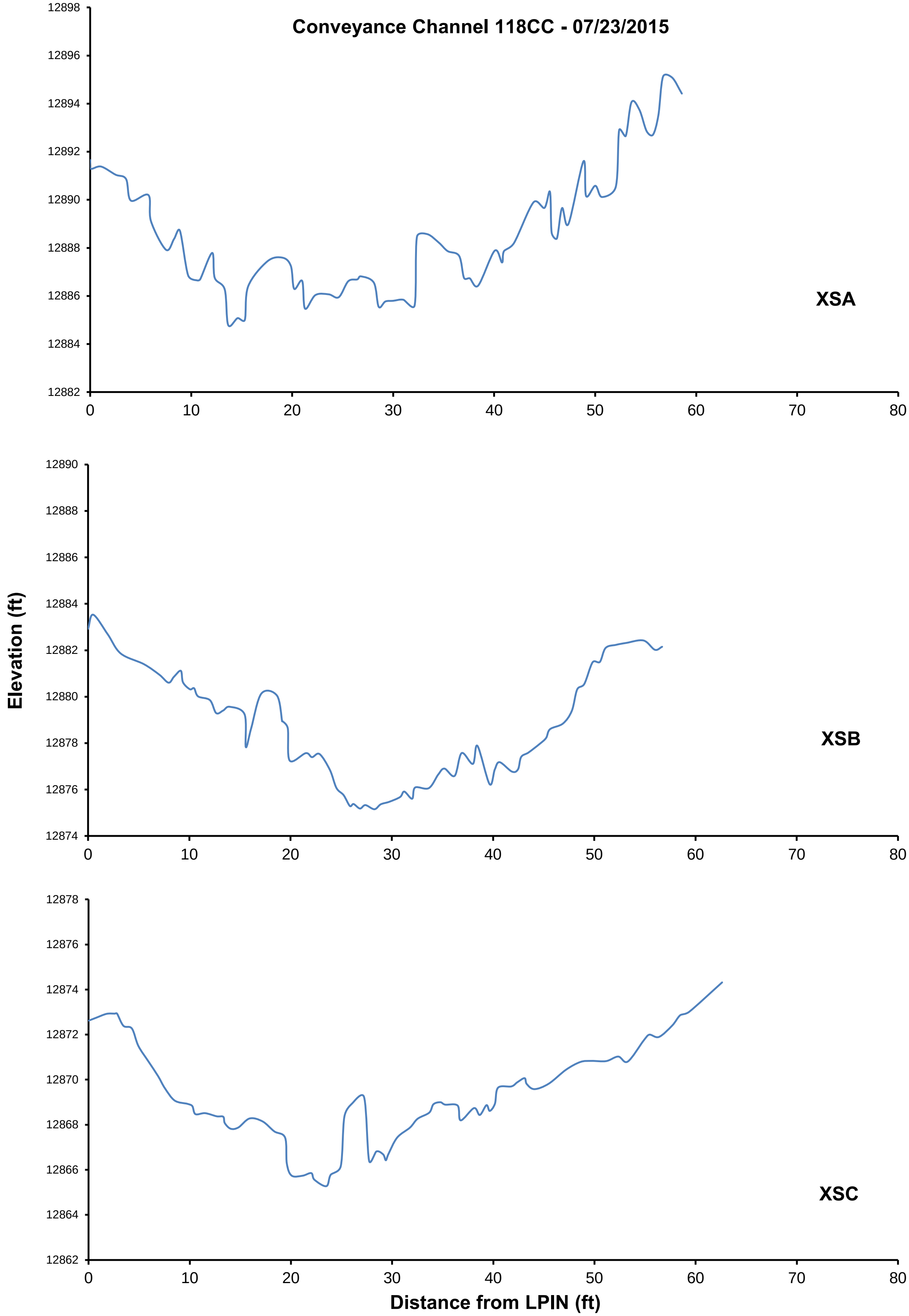


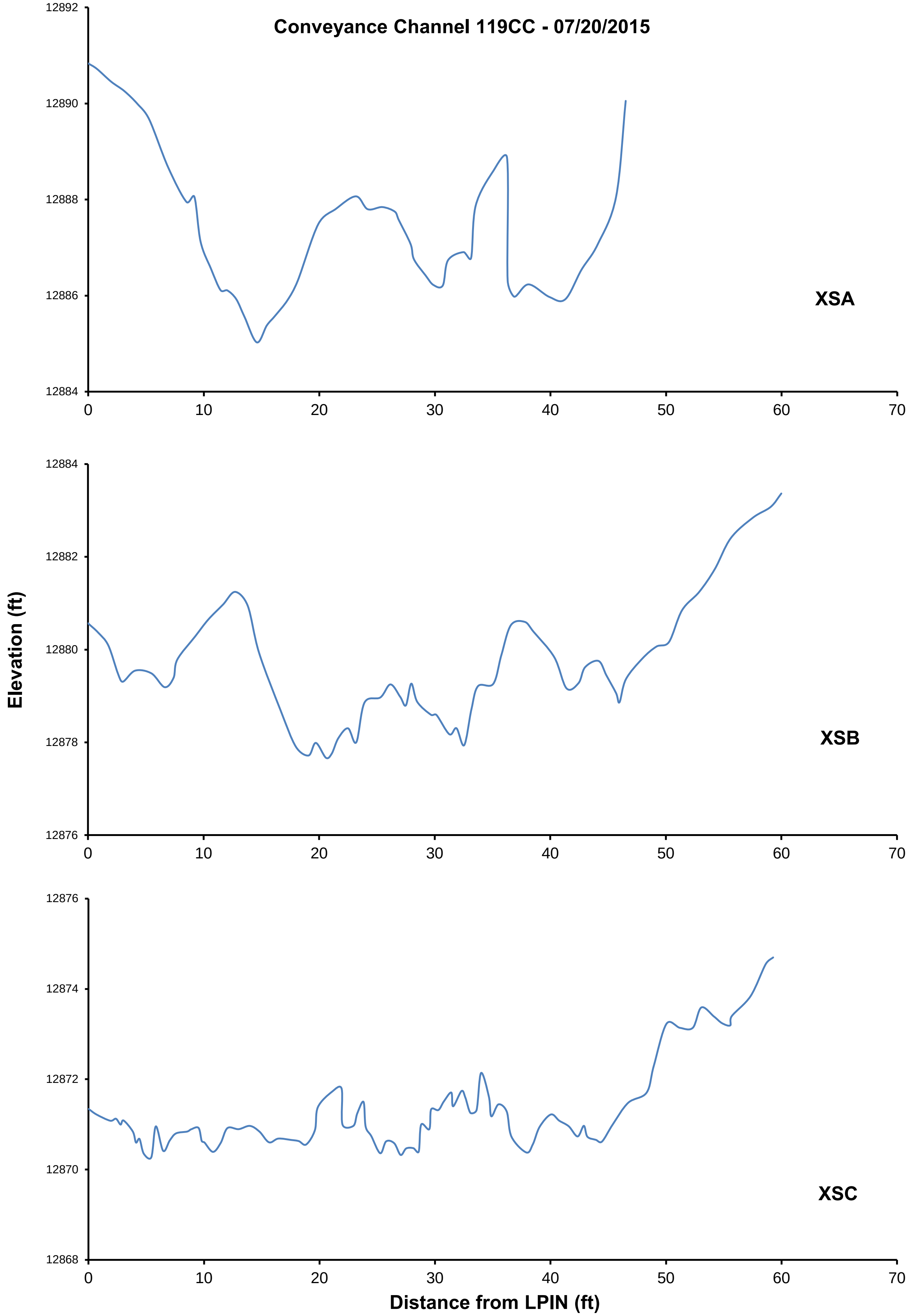
Conveyance Channel 111CC - 07/06/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12888
12886
12884
12882
12880
12878
12877
12875
12873
12871
12869
12867
12869
12867
12865
12863
12861
12859
0
10
20
30
40
50
60

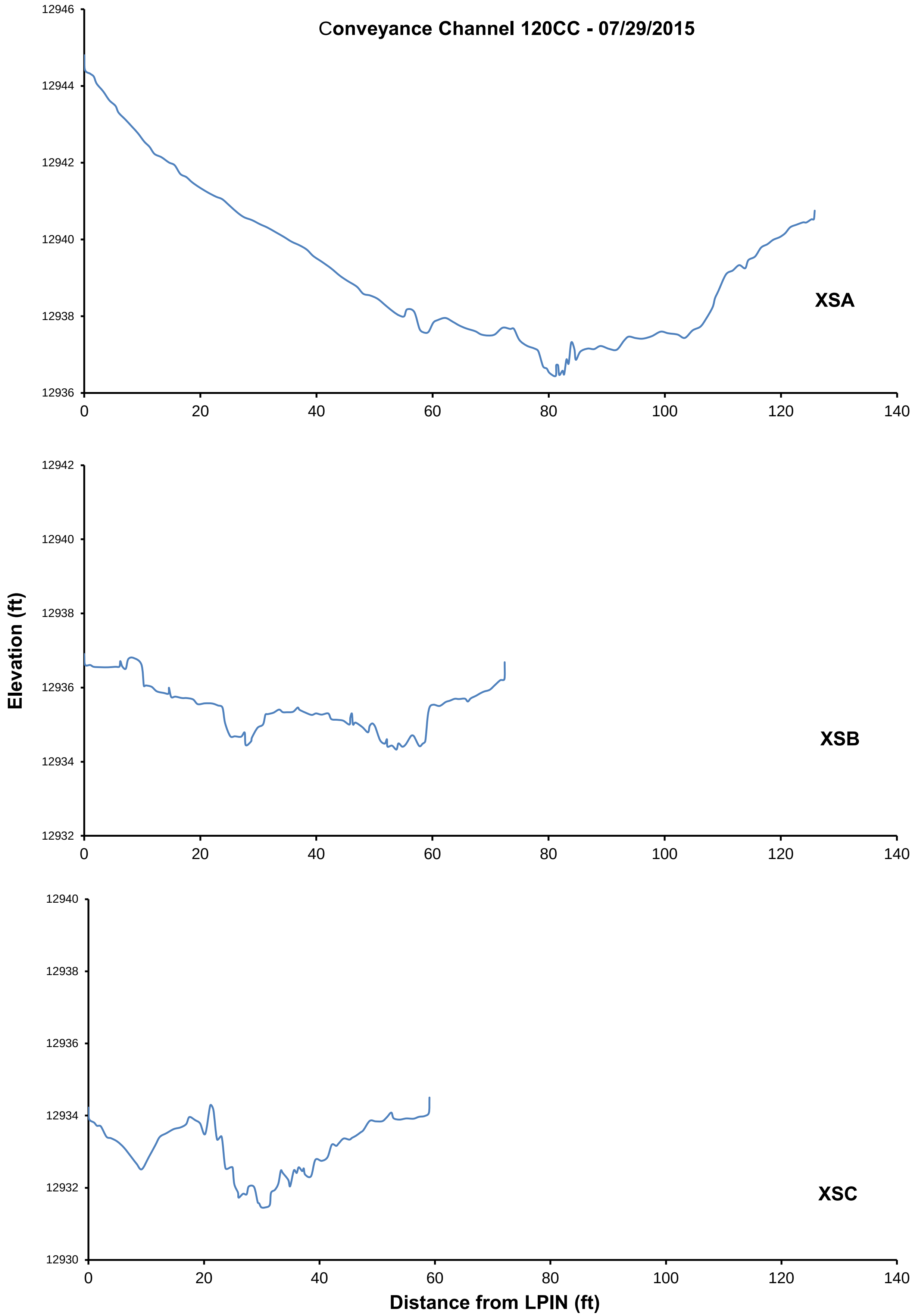

Conveyance Channel 113CC - 09/23/2015
12560
12559
12558
12557
12556
12555
12554
0
5
10
15
20
25
30
XSA
12553
12552
12551
12550
12549
12548
12547
XSB
12548
12547
12546
12545
12544
12543
12542
XSC
Elevation (ft)
Distance from LPIN (ft)

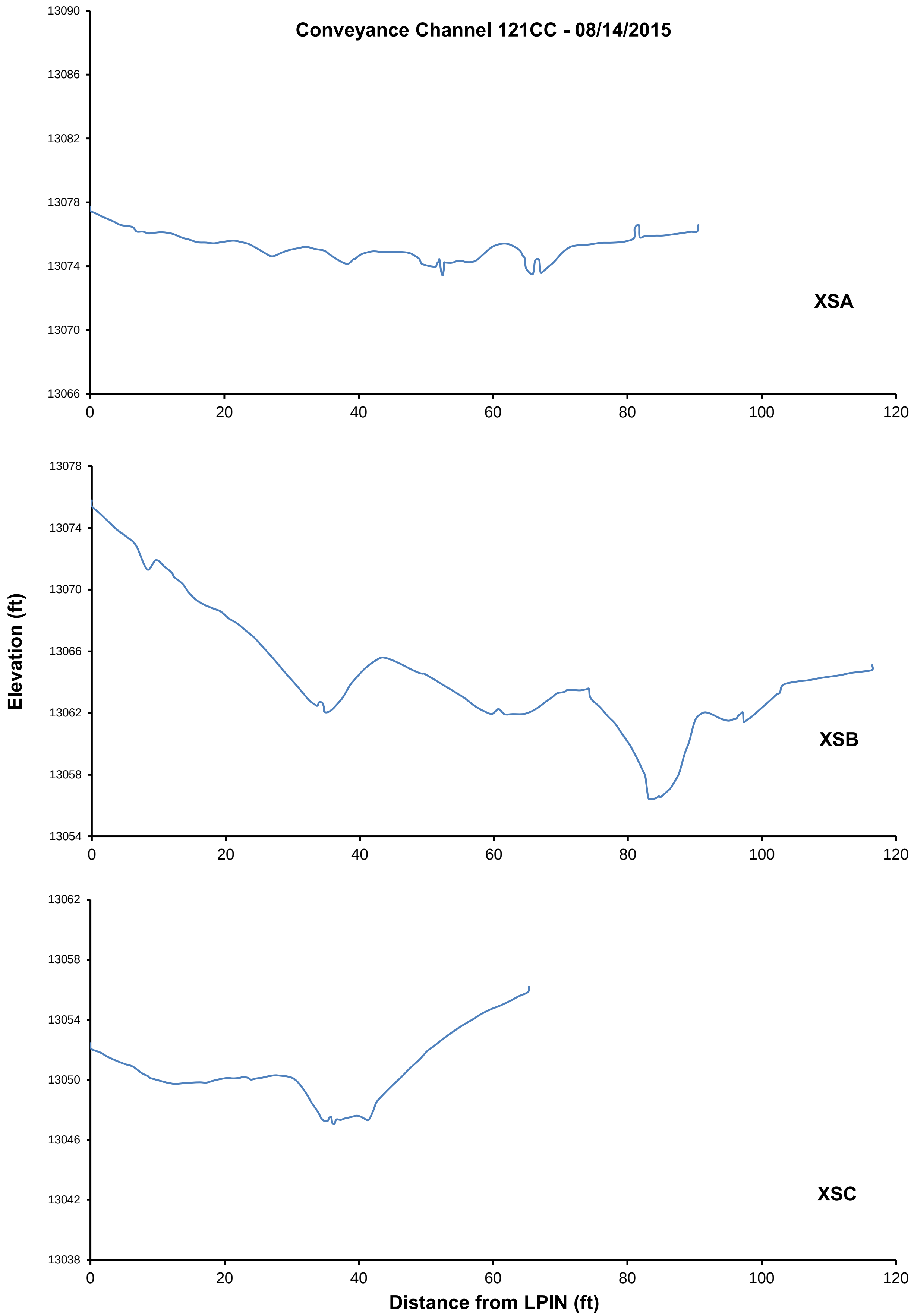


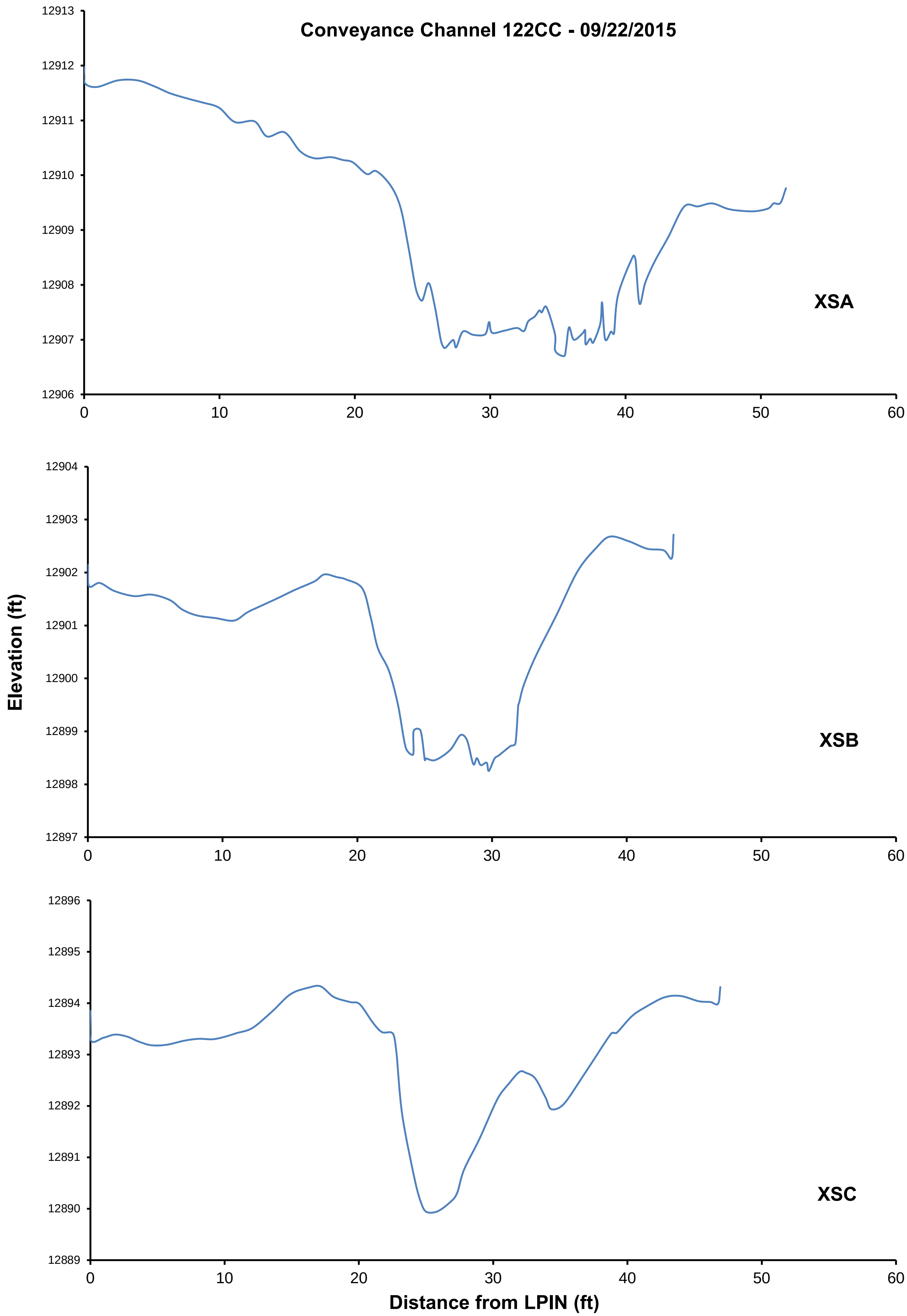
Conveyance Channel 114CC - 09/24//2015
12553
12551
12549
12547
12545
12543
0
10
20
30
40
50
60
XSA
12540
12538
12536
12534
12532
12530
12528
Elevation (ft)
XSB
12530
12528
12526
12524
12522
12520
XSC
Distance from LPIN (ft)


Conveyance Channel 118CC - 07/23/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12898
12896
12894
12892
12890
12888
12886
12884
12882
12880
12878
12876
12874
12872
12870
12868
12866
12864
12862
0
10
20
30
40
50
60
70
80

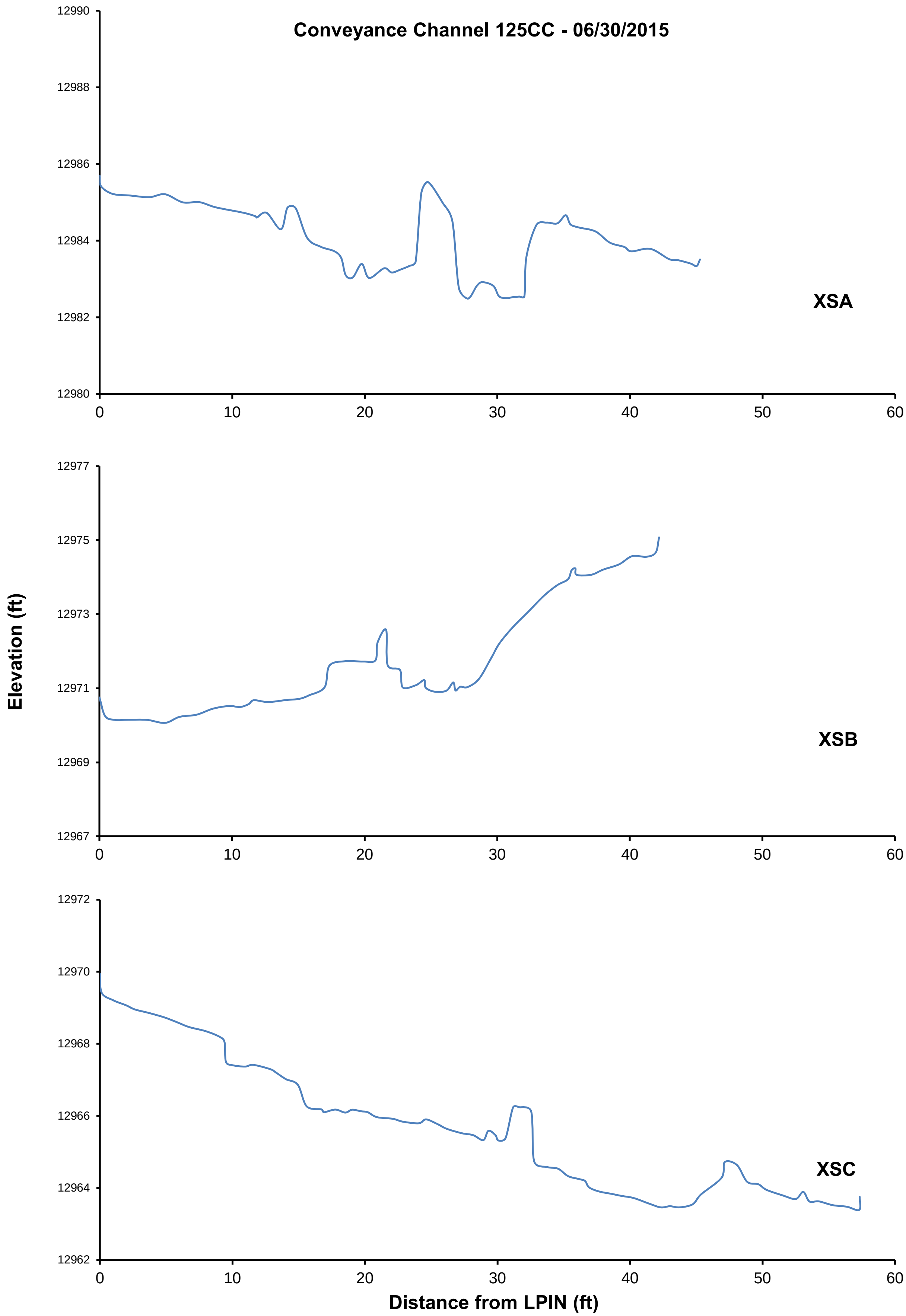

Conveyance Channel 119CC - 07/20/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
12892
12890
12888
12886
12884
12882
12880
12878
12876
12874
12872
12870
12868
0
10
20
30
40
50
60
70

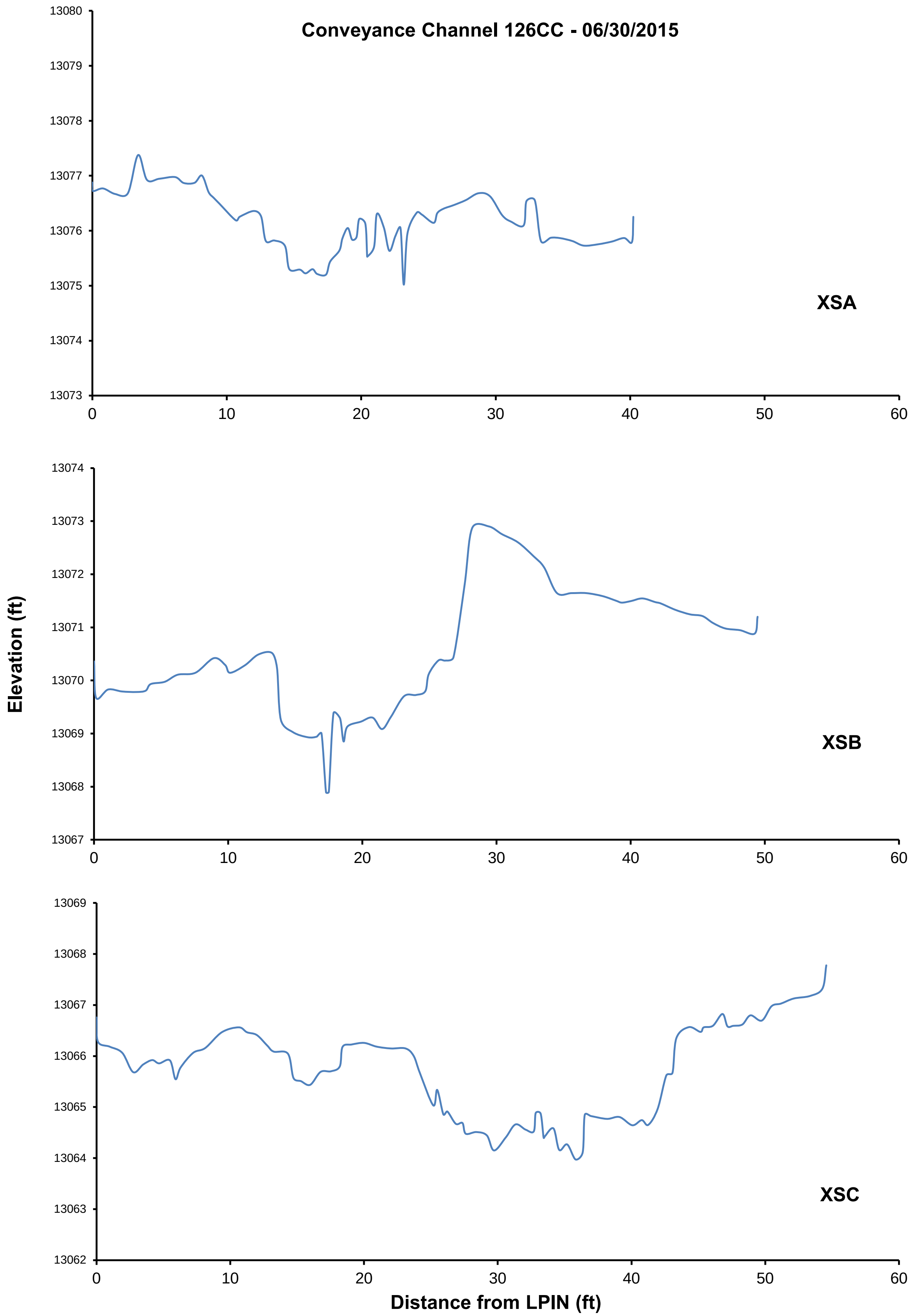

Conveyance Channel 120CC - 07/29/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12946
12944
12942
12940
12938
12936
12934
12932
12930
0
20
40
60
80
100
120
140


Conveyance Channel 121CC - 08/14/2015
13090
13086
13082
13078
13074
13070
13066
0
20
40
60
80
100
120
XSA
13078
13074
13070
13066
13062
13058
13054
XSB
Elevation (ft)
13062
13058
13054
13050
13046
13042
13038
XSC
Distance from LPIN (ft)



Conveyance Channel 122CC - 09/22/2015
12913
12912
12911
12910
12909
12908
12907
12906
0
10
20
30
40
50
60
XSA
12904
12903
12902
12901
12900
12899
12898
12897
0
10
20
30
40
50
60
XSB
Elevation (ft)
12896
12895
12894
12893
12892
12891
12890
12889
0
10
20
30
40
50
60
XSC
Distance from LPIN (ft)


Conveyance Channel 125CC - 06/30/2015
Elevation (ft)
12990
12988
12986
12984
12982
12980
XSA
12977
12975
12973
12971
12969
12967
XSB
12972
12970
12968
12966
12964
12962
XSC
0
10
20
30
40
50
60
Distance from LPIN (ft)



Conveyance Channel 126CC - 06/30/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13080
13079
13078
13077
13076
13075
13074
13073
13074
13073
13072
13071
13070
13069
13068
13067
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13067
13066
13065
13064
13063
13062
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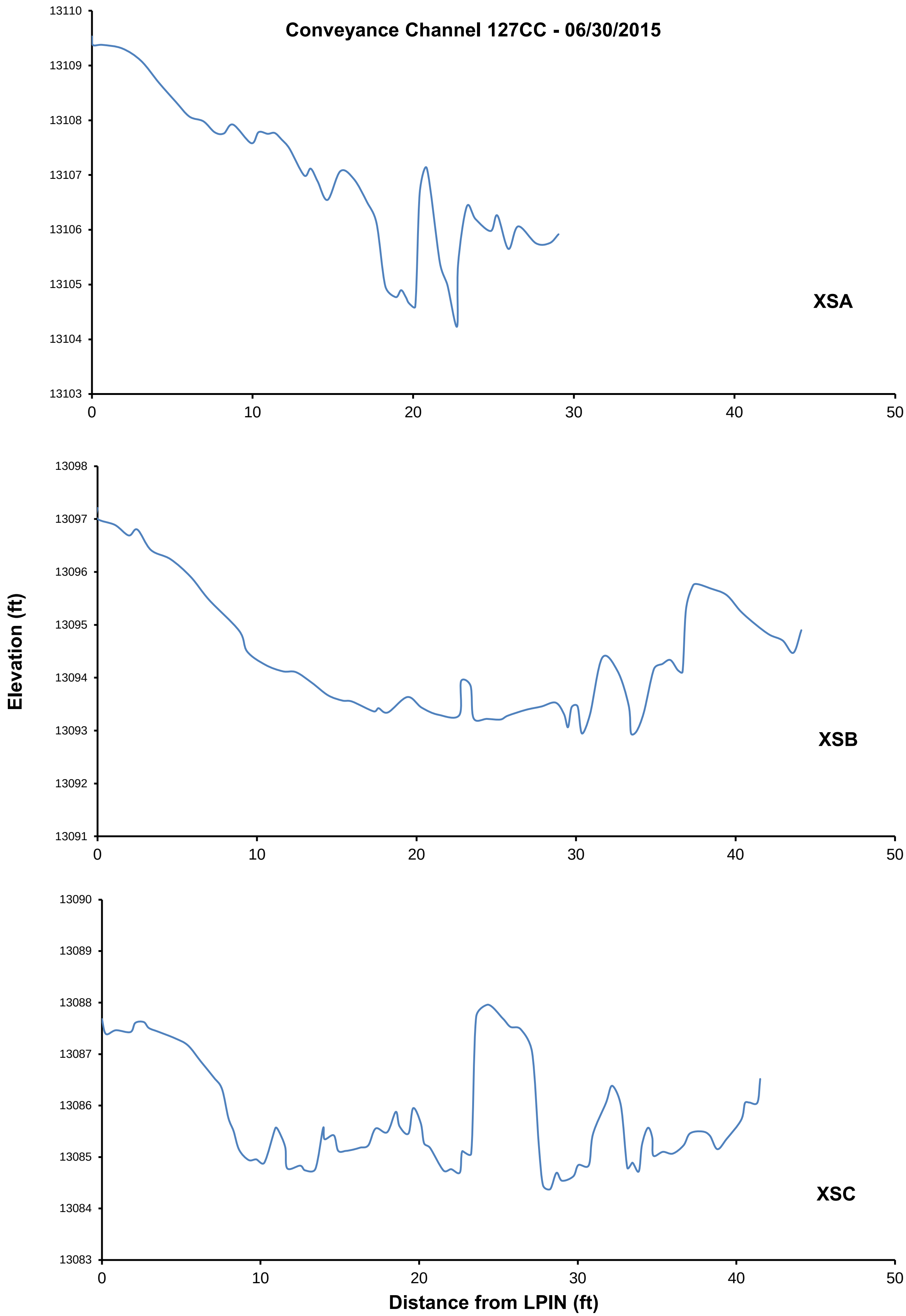
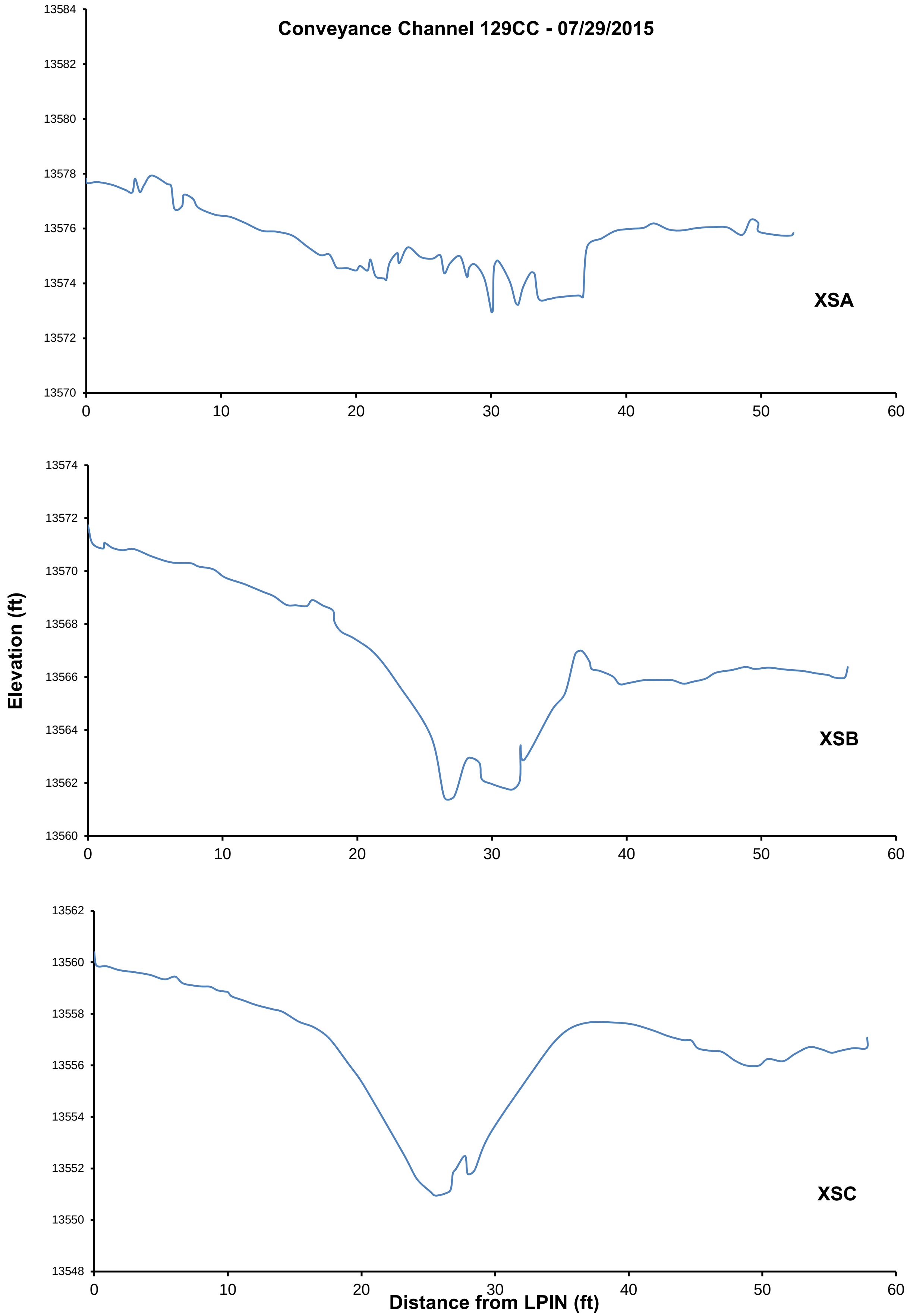
50
60


Conveyance Channel 127CC - 06/30/2015
13110
13109
13108
13107
13106
13105
13104
13103
0
10
20
30
40
50
XSA
13098
13097
13096
13095
13094
13093
13092
13091
XSB
13090
13089
13088
13087
13086
13085
13084
13083
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 129CC - 07/29/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13584
13582
13580
13578
13576
13574
13572
13570
13568
13566
13564
13562
13560
13558
13556
13554
13552
13550
13548
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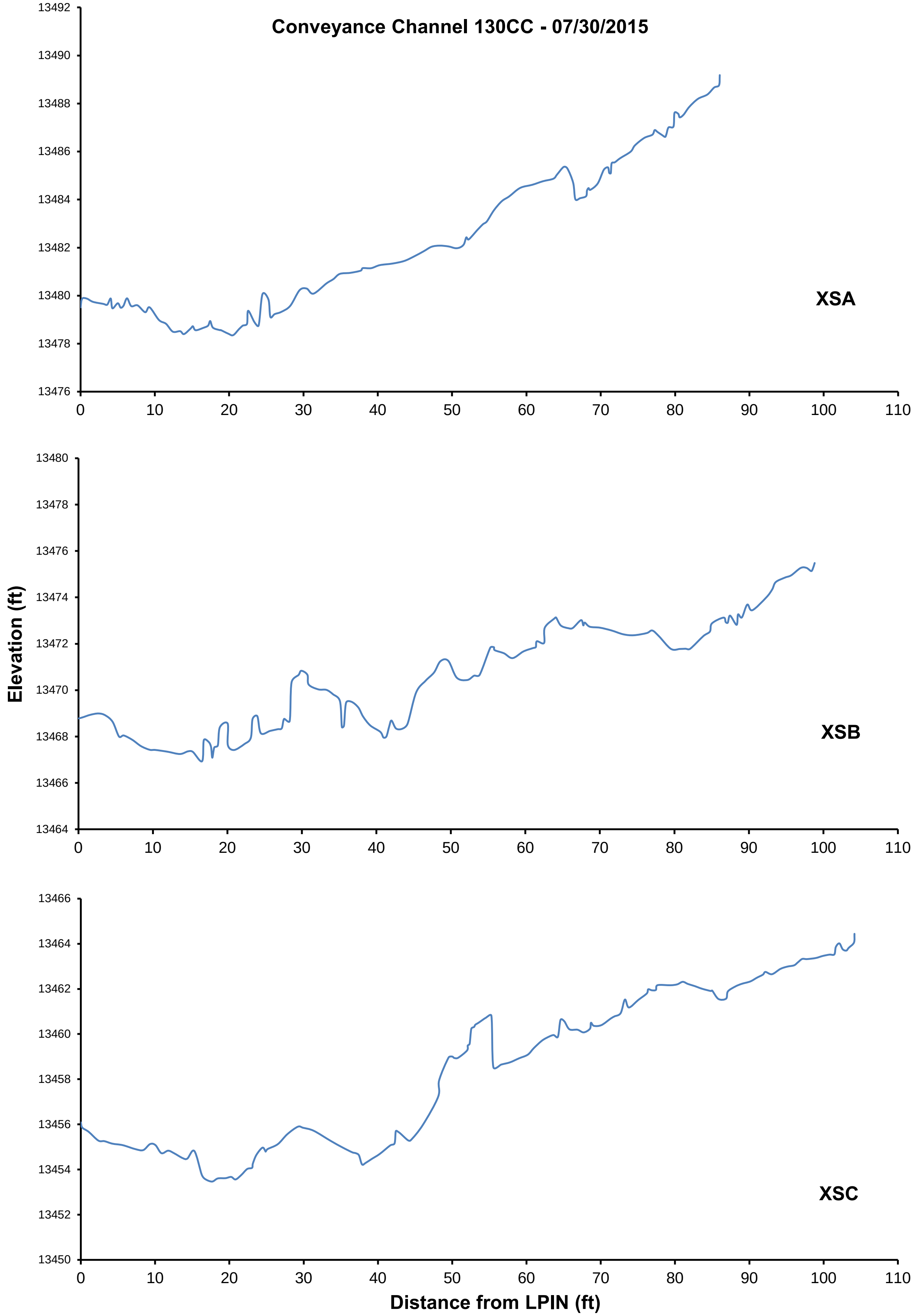
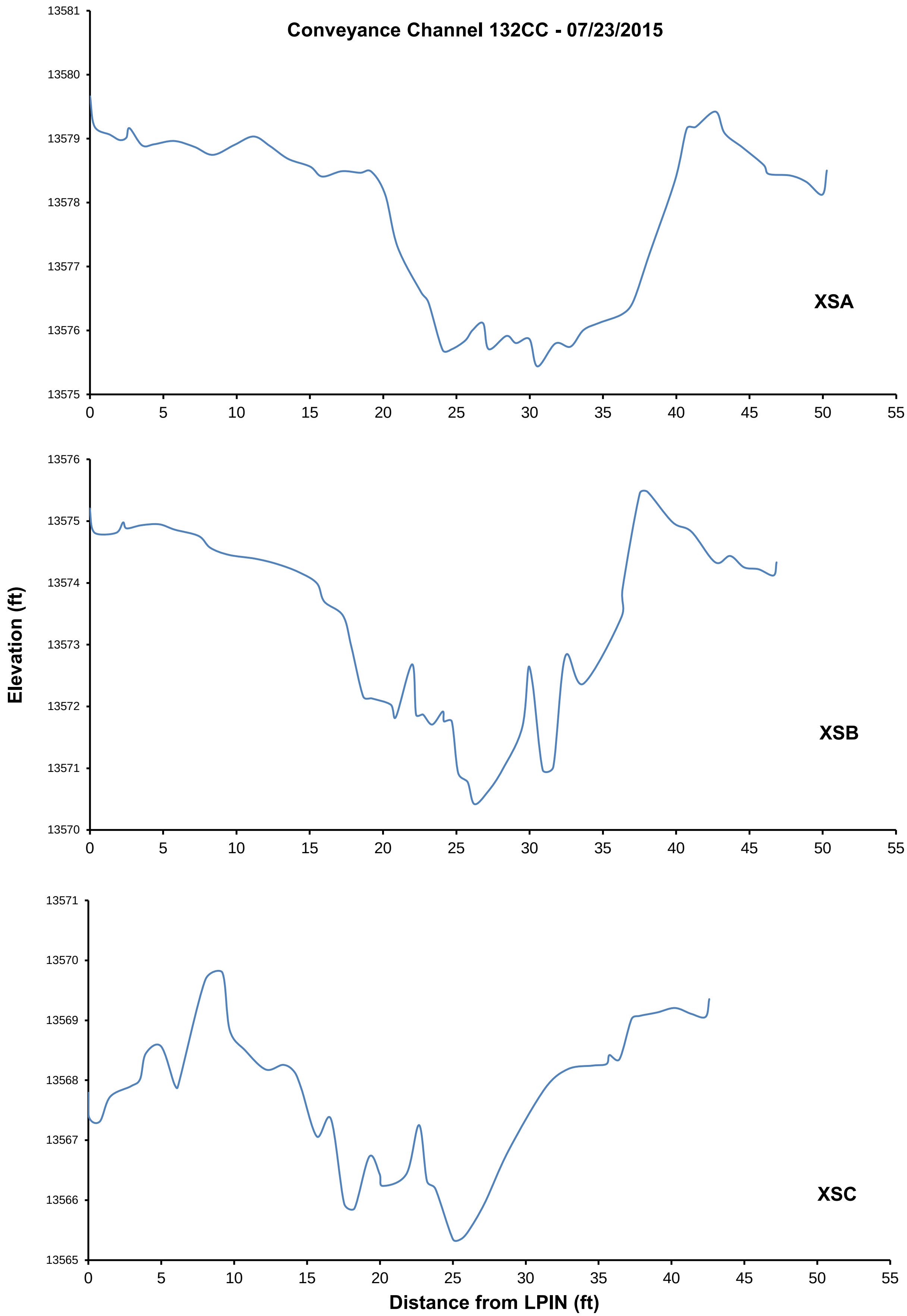
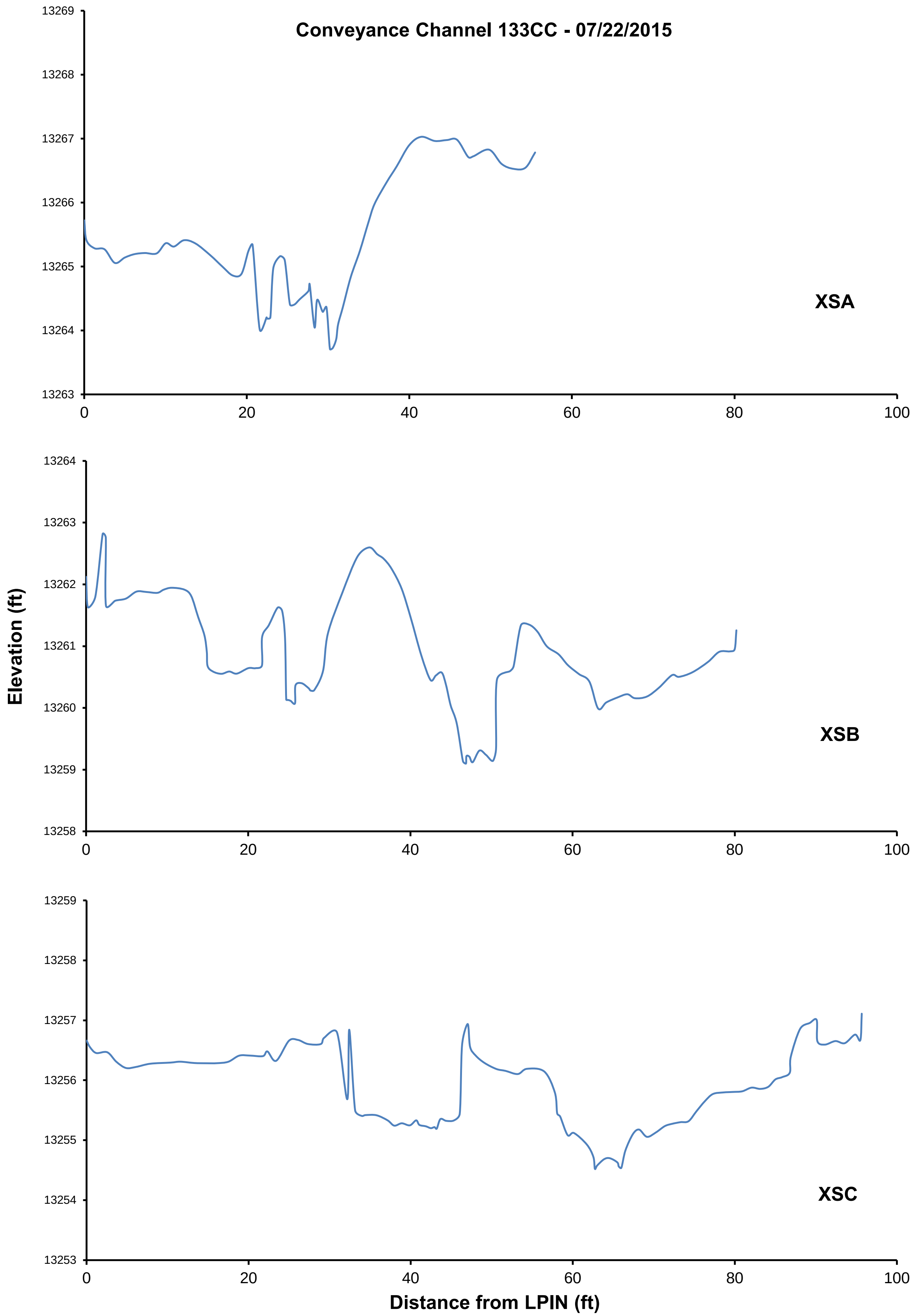
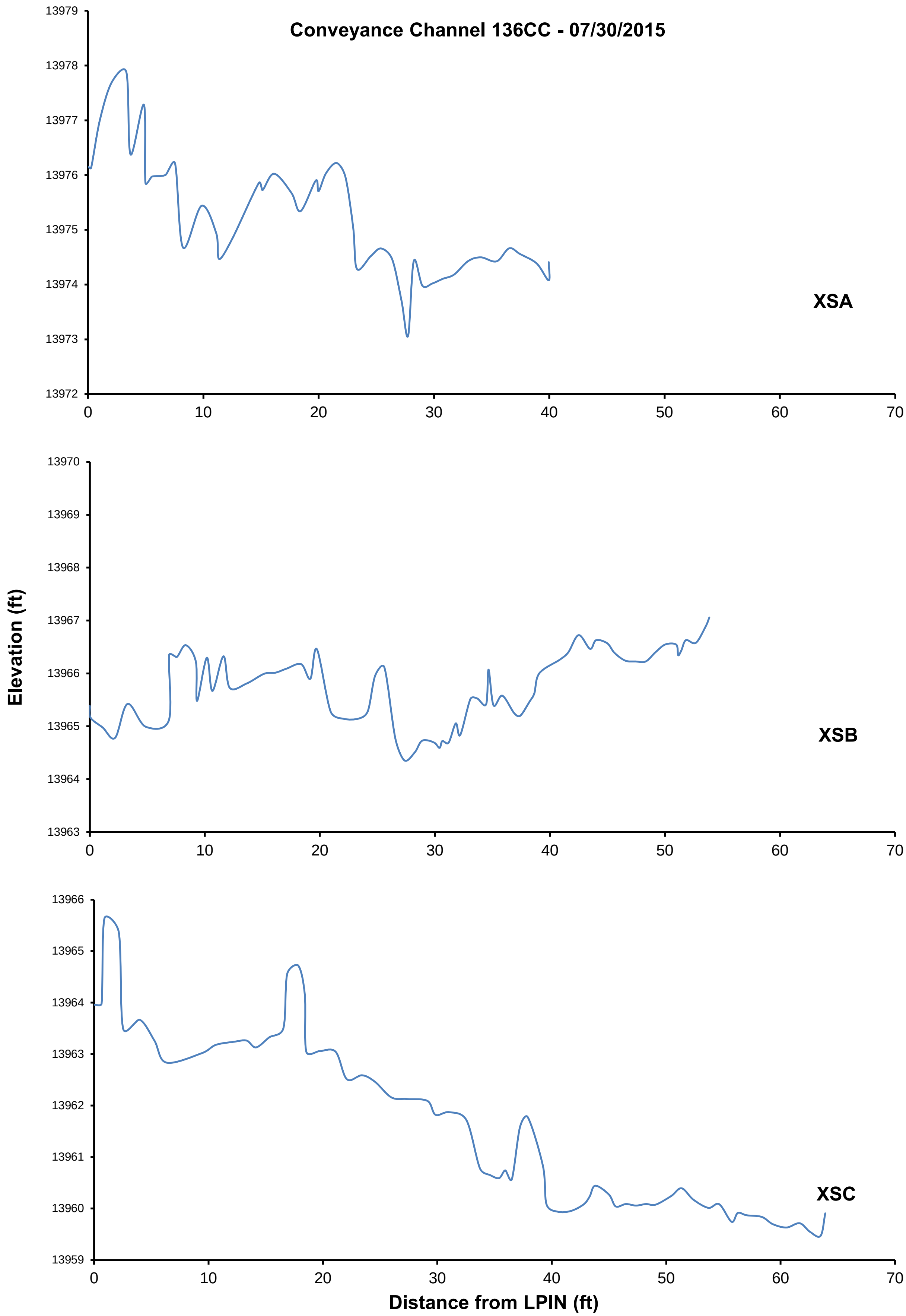
20
30
40
50
60

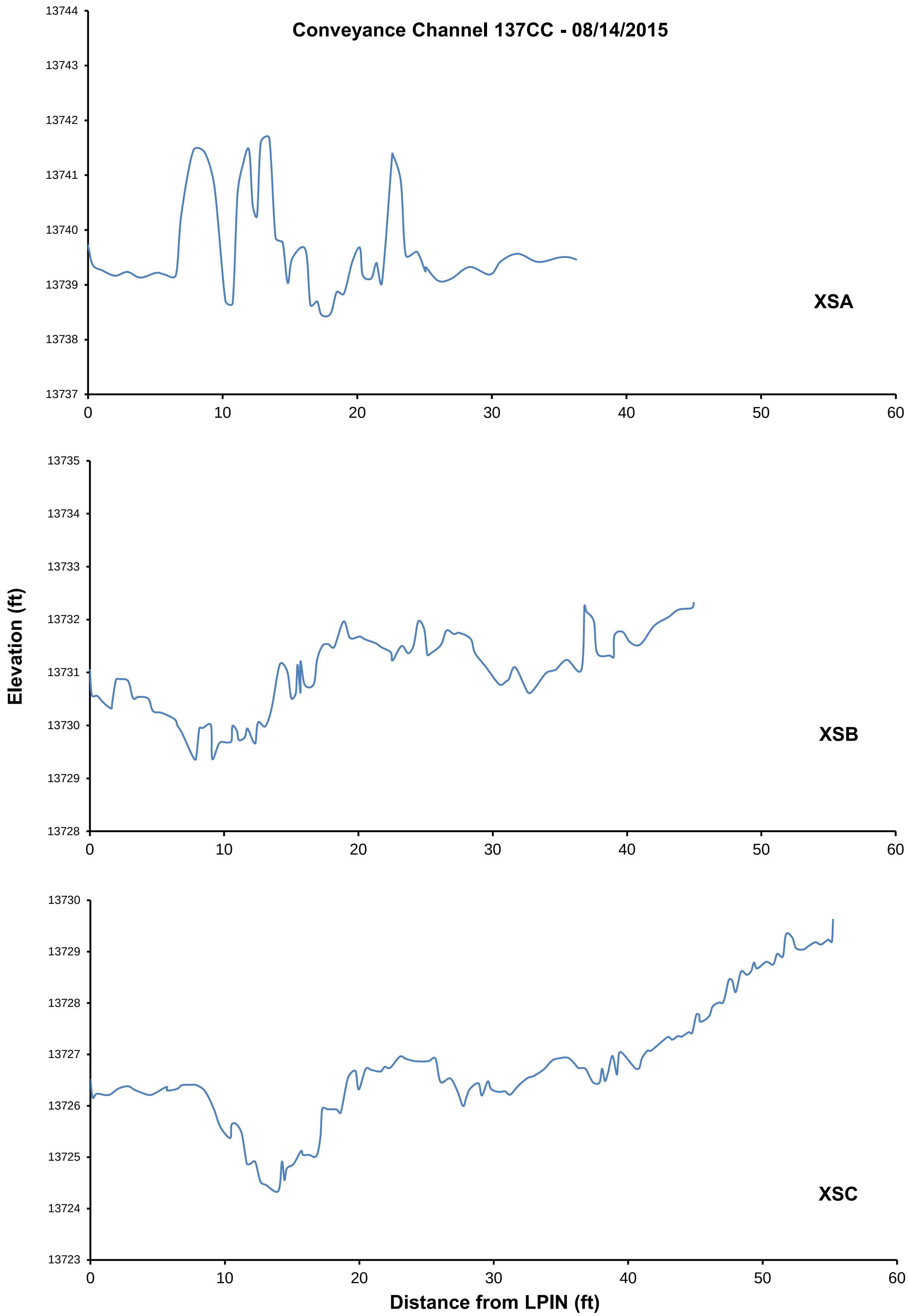

Conveyance Channel 130CC - 07/30/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13492
13490
13488
13486
13484
13482
13480
13478
13476
13474
13472
13470
13468
13466
13464
13462
13460
13458
13456
13454
13452
13450
0
10
20
30
40
50
60
70
80
90
100
110


Conveyance Channel 132CC - 07/23/2015
Elevation (ft)
13581
13580
13579
13578
13577
13576
13575
13576
13575
13574
13573
13572
13571
13570
13571
13570
13569
13568
13567
13566
13565
0
5
10
15
20
25
30
35
40
45
50
55
XSA
XSB
XSC
Distance from LPIN (ft)

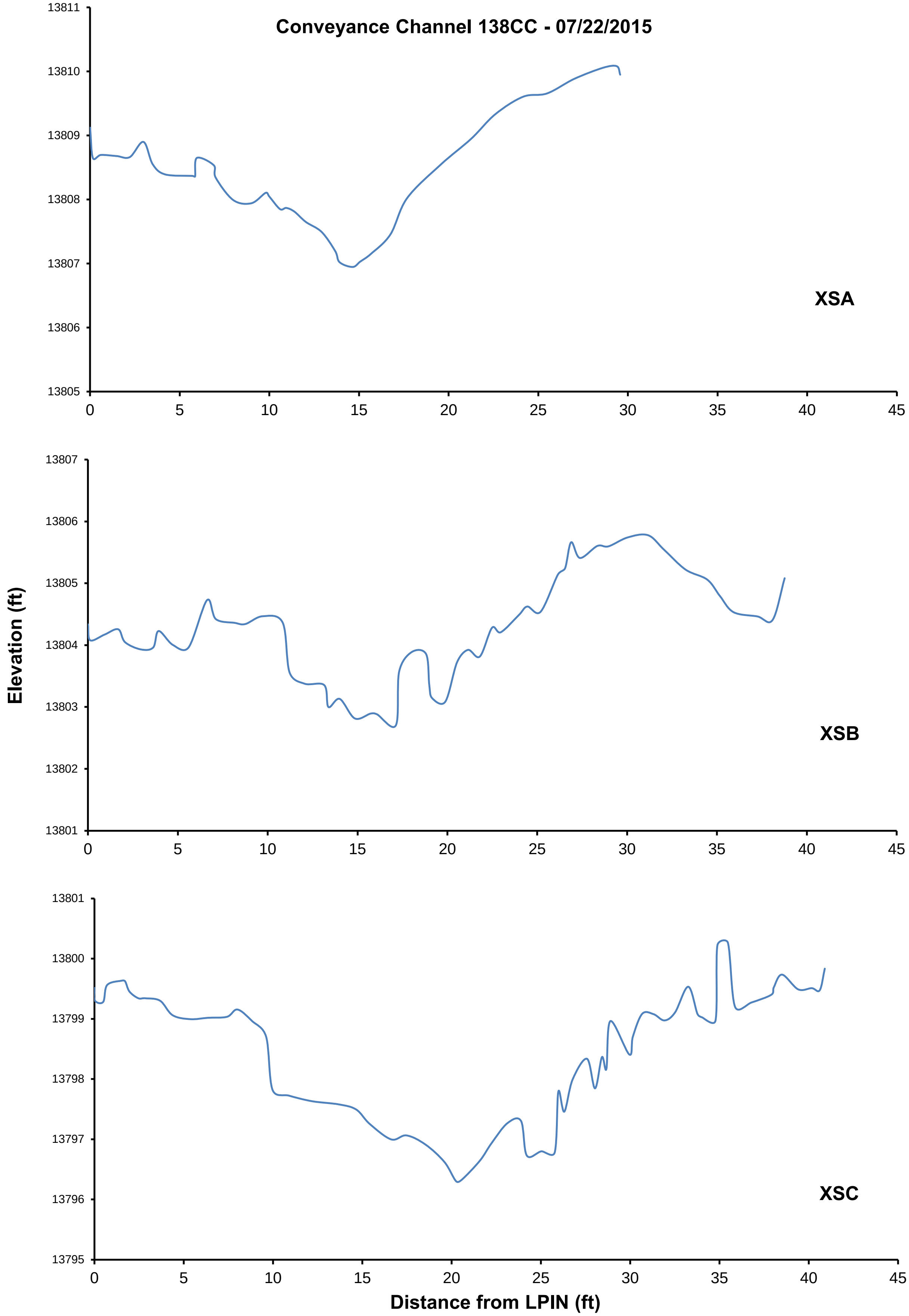


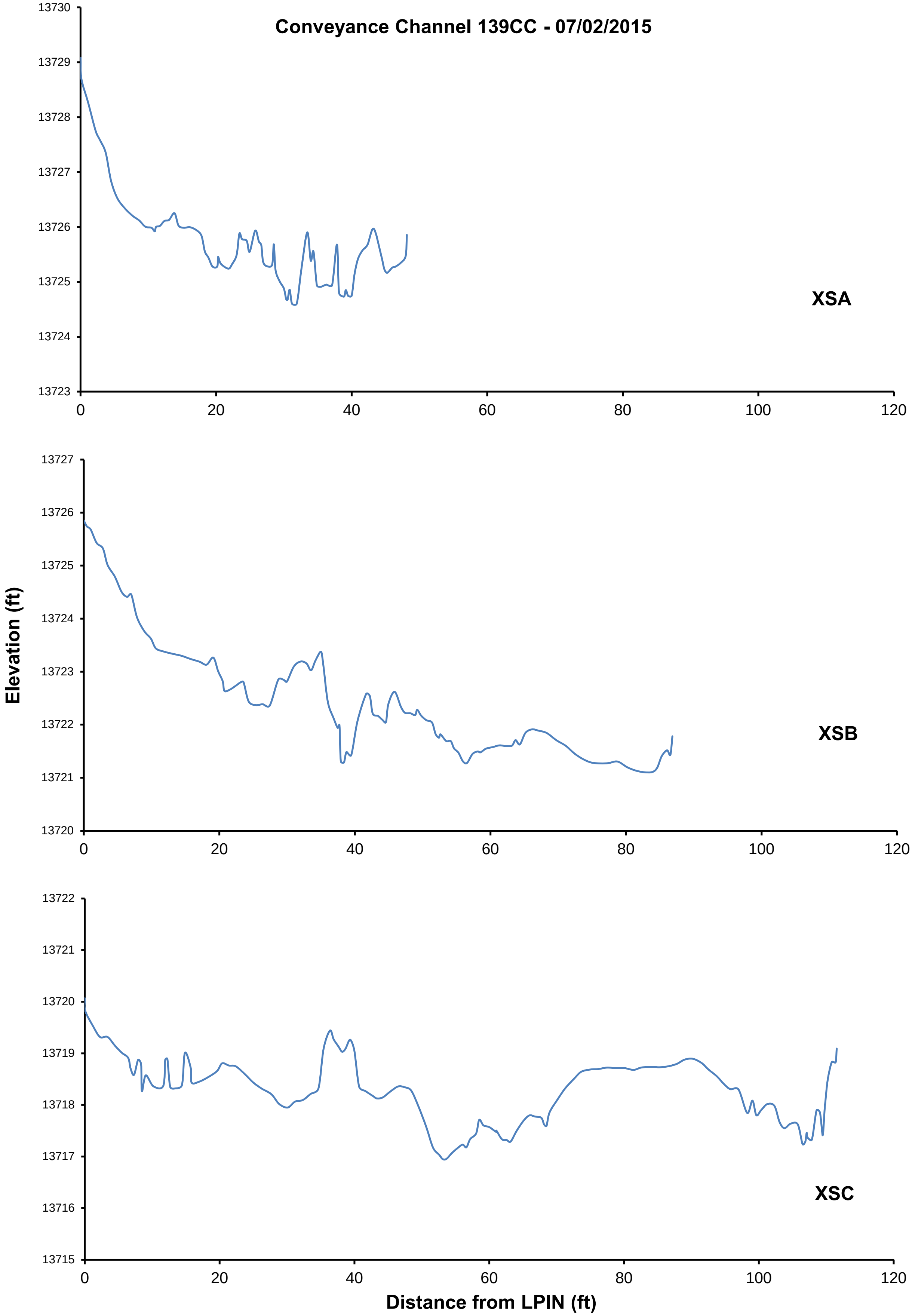
Conveyance Channel 133CC - 07/22/2015
XSA
13269
13268
13267
13266
13265
13264
13263
0
20
40
60
80
100
XSB
13264
13263
13262
13261
13260
13259
13258
0
20
40
60
80
100
XSC
13259
13258
13257
13256
13255
13254
13253
0
20
40
60
80
100
Elevation (ft)
Distance from LPIN (ft)

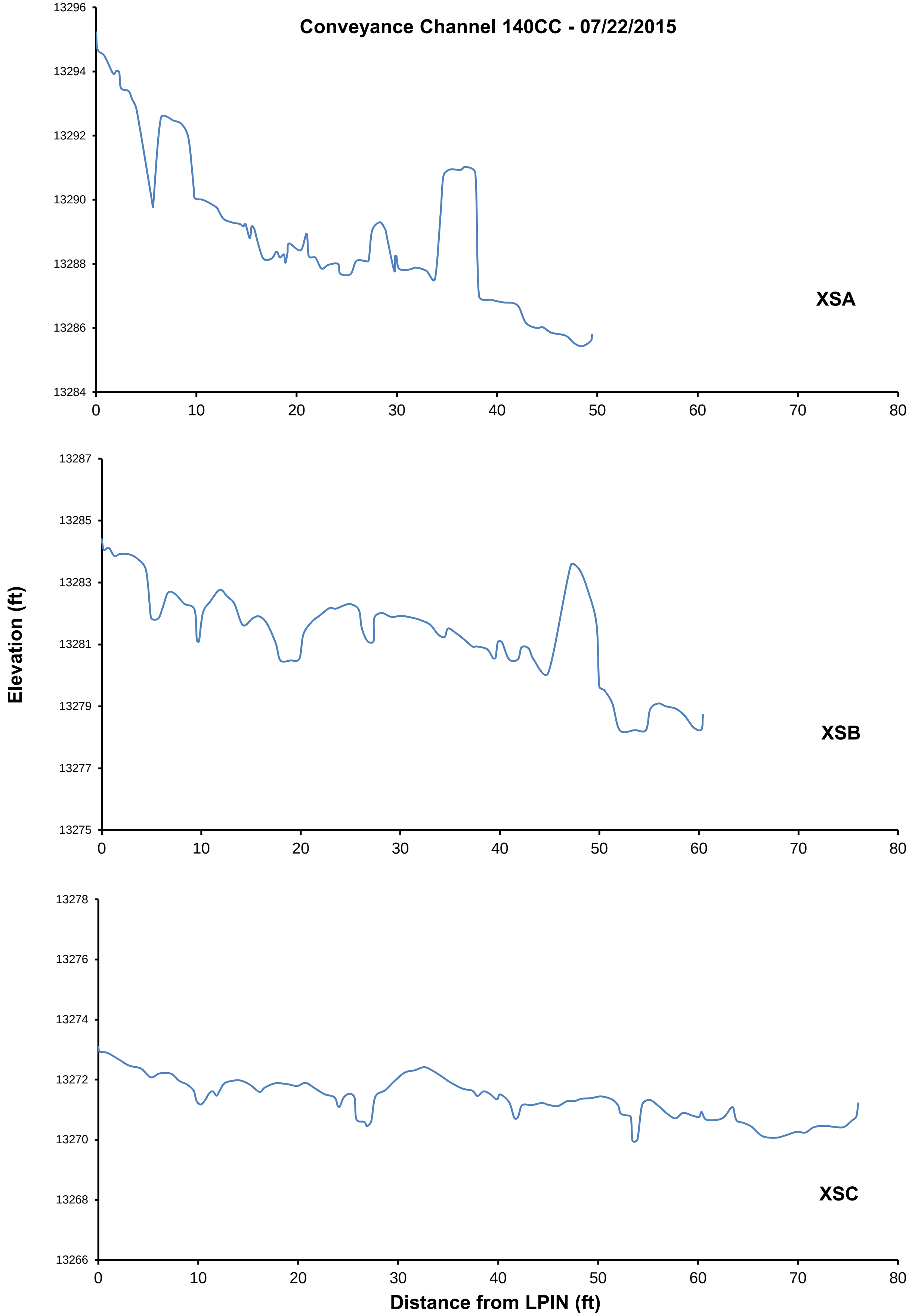

Conveyance Channel 136CC - 07/30/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13979
13978
13977
13976
13975
13974
13973
13972
13970
13969
13968
13967
13966
13965
13964
13963
13966
13965
13964
13963
13962
13961
13960
13959
0
10
20
30
40
50
60
70

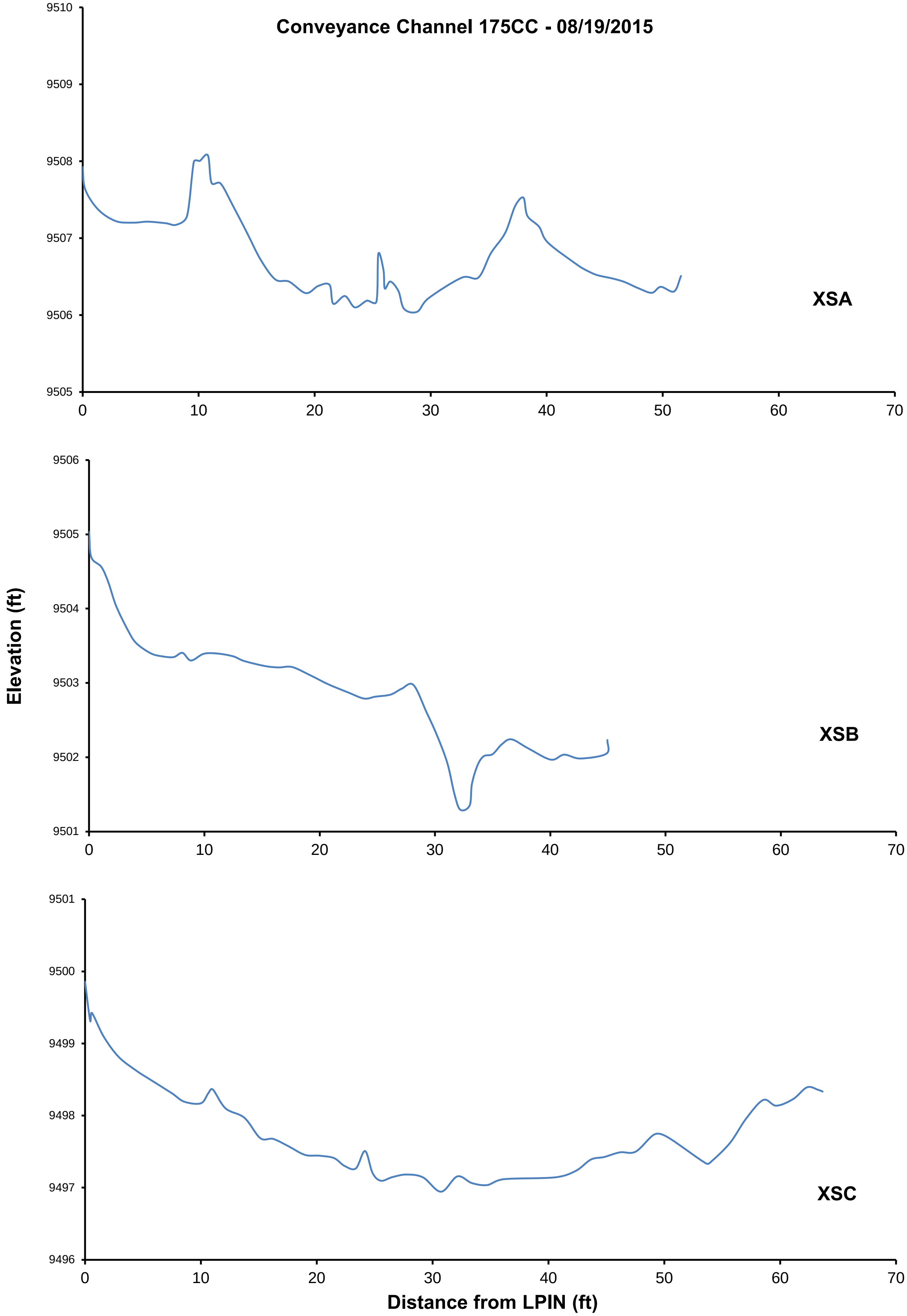


Conveyance Channel 137CC - 08/14/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13744
13743
13742
13741
13740
13739
13738
13737
13735
13734
13733
13732
13731
13730
13729
13728
13727
13726
13725
13724
13723
0
10
20
30
40
50
60

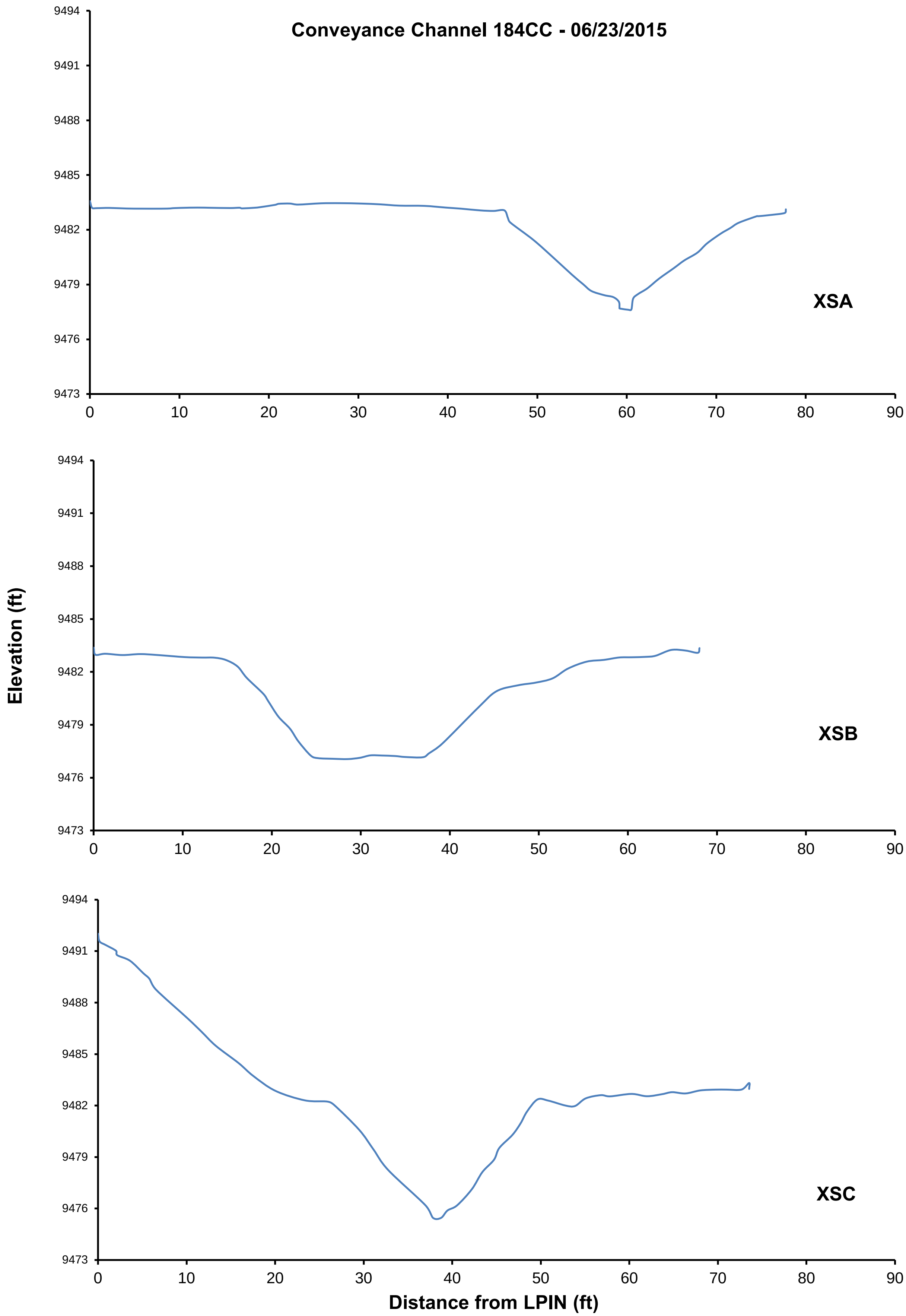

Conveyance Channel 138CC - 07/22/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)

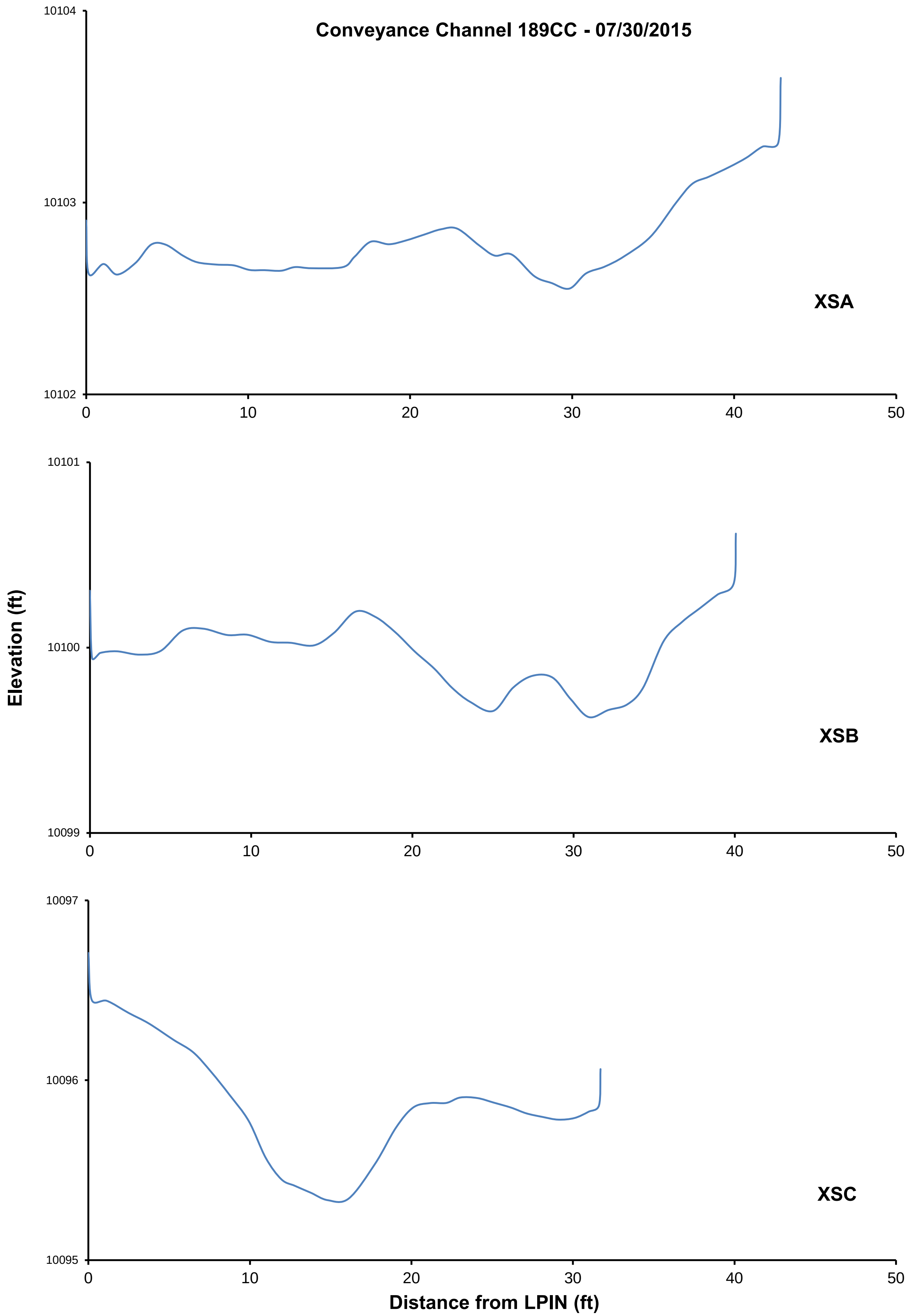

Conveyance Channel 139CC - 07/02/2015
13730
13729
13728
13727
13726
13725
13724
13723
0
20
40
60
80
100
120
XSA
13727
13726
13725
13724
13723
13722
13721
13720
XSB
13722
13721
13720
13719
13718
13717
13716
13715
XSC
Elevation (ft)
Distance from LPIN (ft)

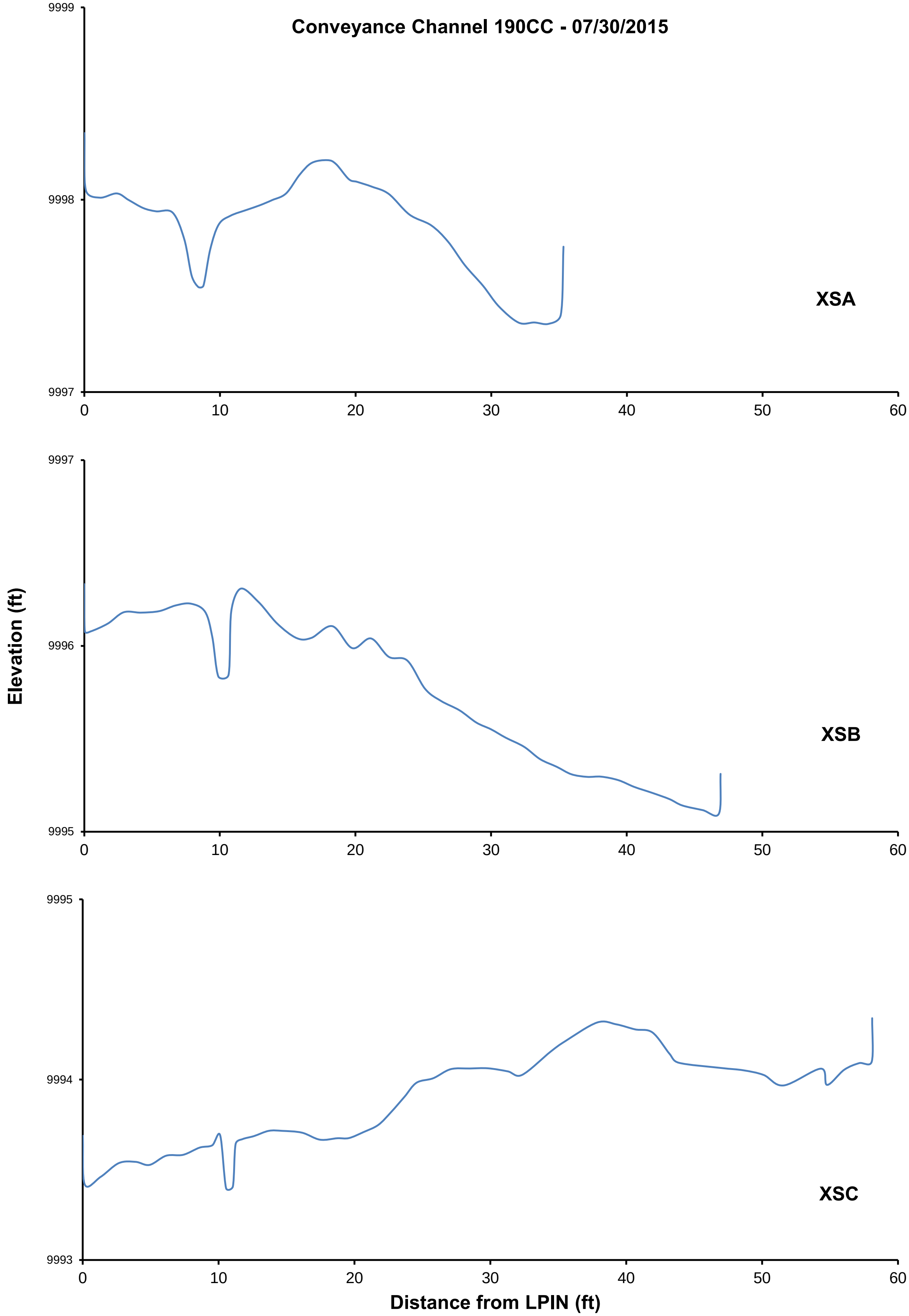

Conveyance Channel 140CC - 07/22/2015
13296
13294
13292
13290
13288
13286
13284
0
10
20
30
40
50
60
70
80
XSA
13287
13285
13283
13281
13279
13277
13275
XSB
13278
13276
13274
13272
13270
13268
13266
XSC
Elevation (ft)
Distance from LPIN (ft)



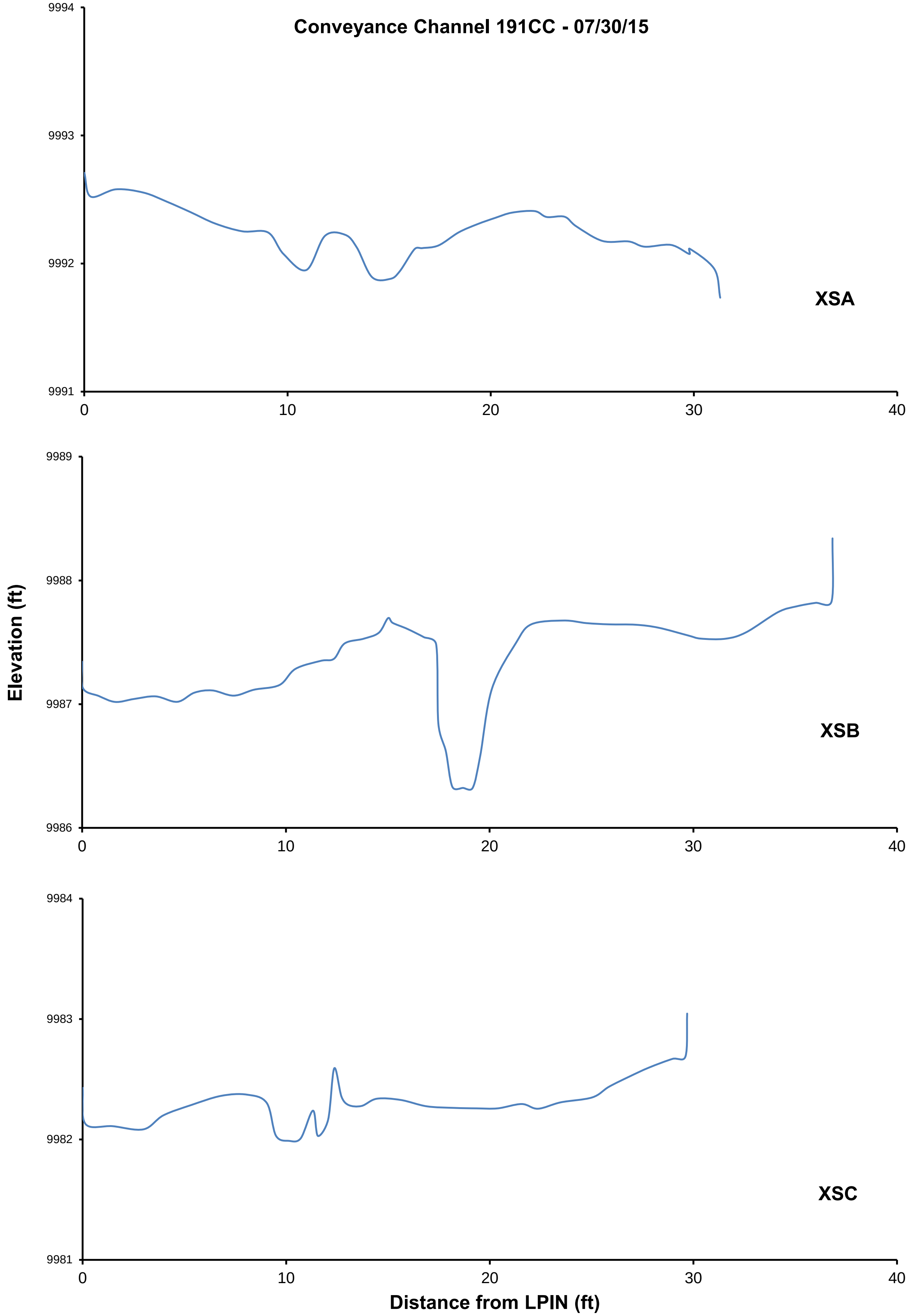
Conveyance Channel 175CC - 08/19/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9510
9509
9508
9507
9506
9505
9504
9503
9502
9501
9500
9499
9498
9497
9496
0
10
20
30
40
50
60
70

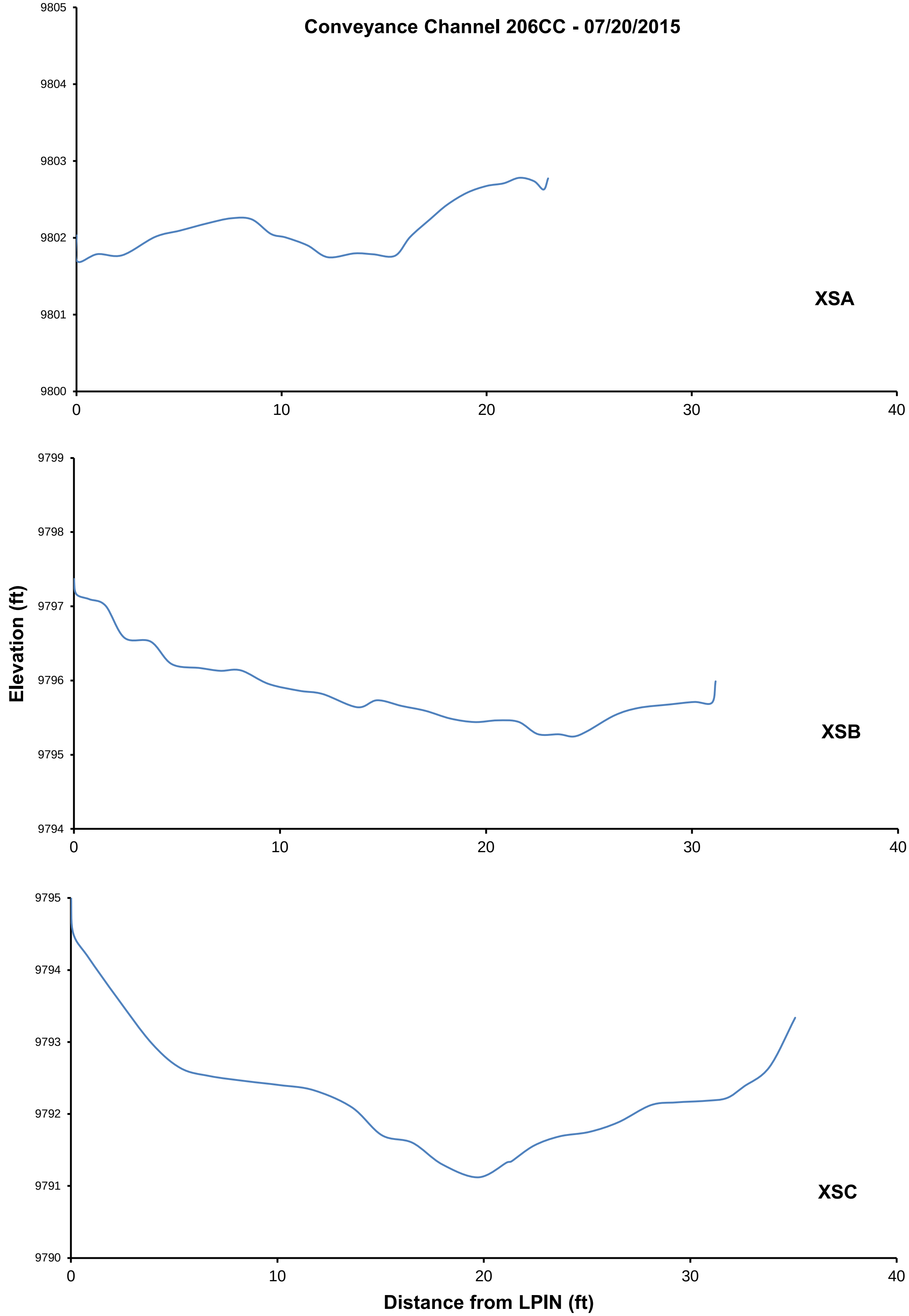

Conveyance Channel 184CC - 06/23/2015
Elevation (ft)
9494
9491
9488
9485
9482
9479
9476
9473
0
10
20
30
40
50
60
70
80
90
XSA
XSB
XSC
Distance from LPIN (ft)

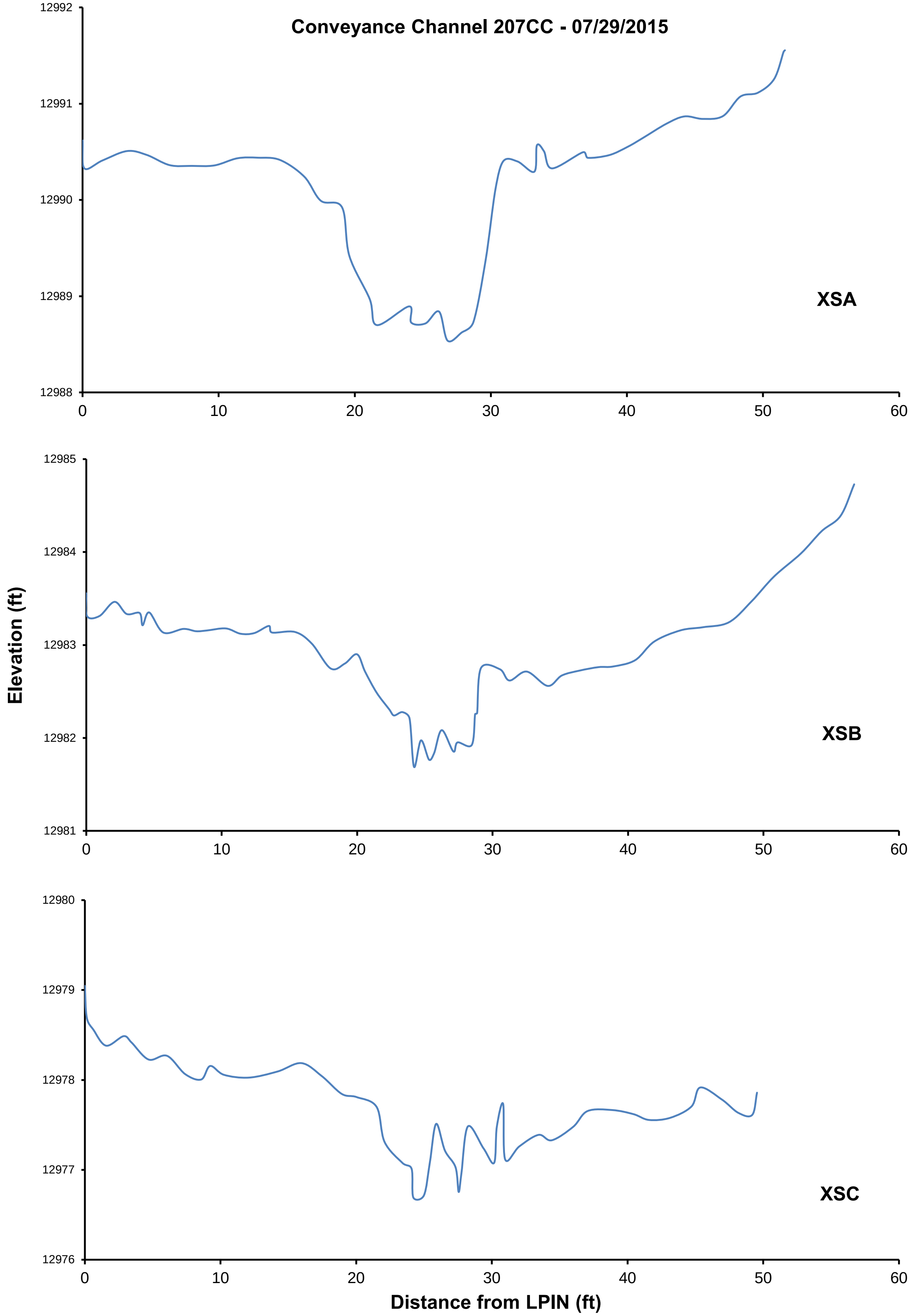

Conveyance Channel 189CC - 07/30/2015
10104
10103
10102
0
10
20
30
40
50
XSA
10101
10100
10099
XSB
10097
10096
10095
XSC
Elevation (ft)
Distance from LPIN (ft)



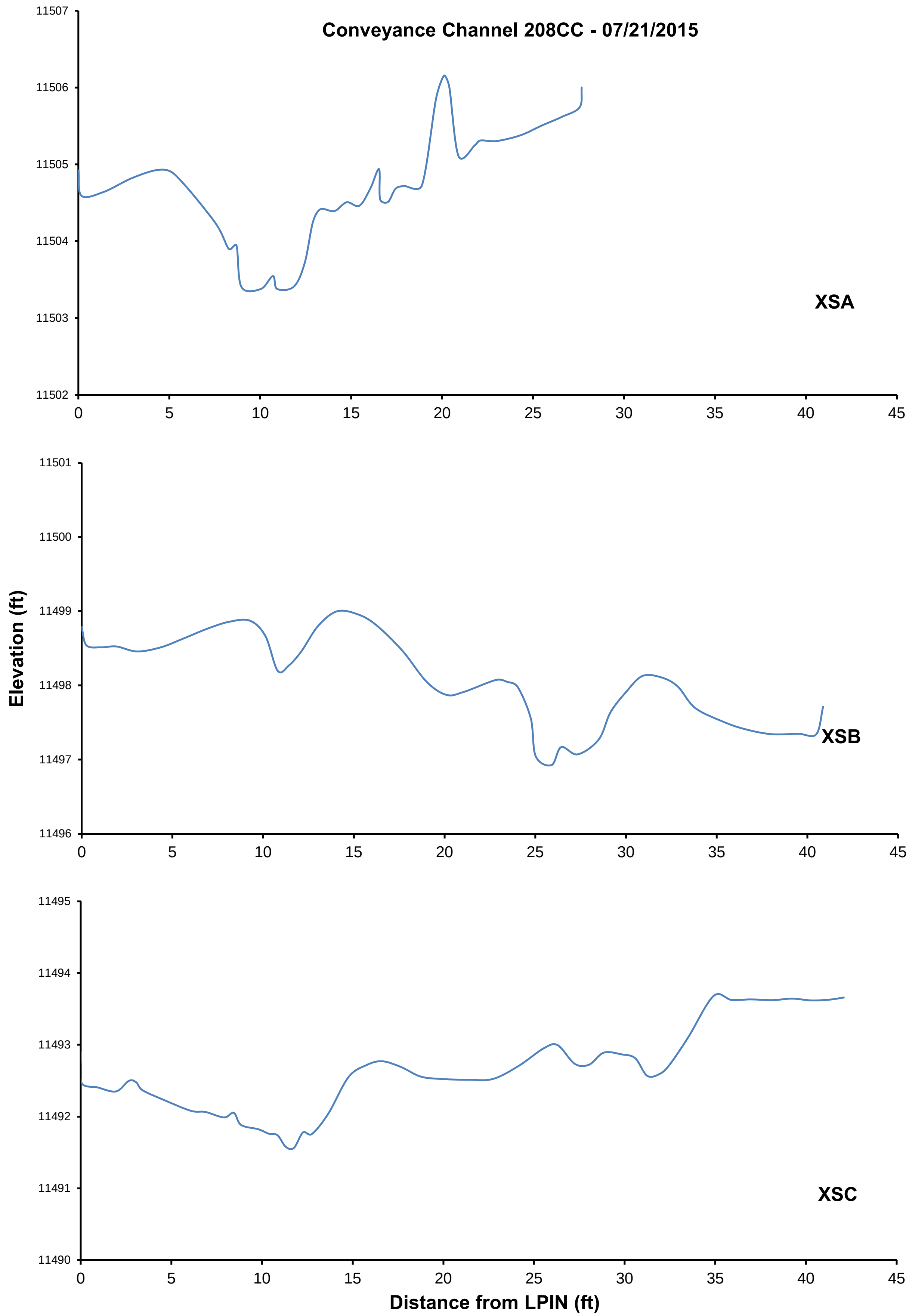
Conveyance Channel 190CC - 07/30/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9999
9998
9997
9996
9995
9994
9993
0
10
20
30
40
50
60

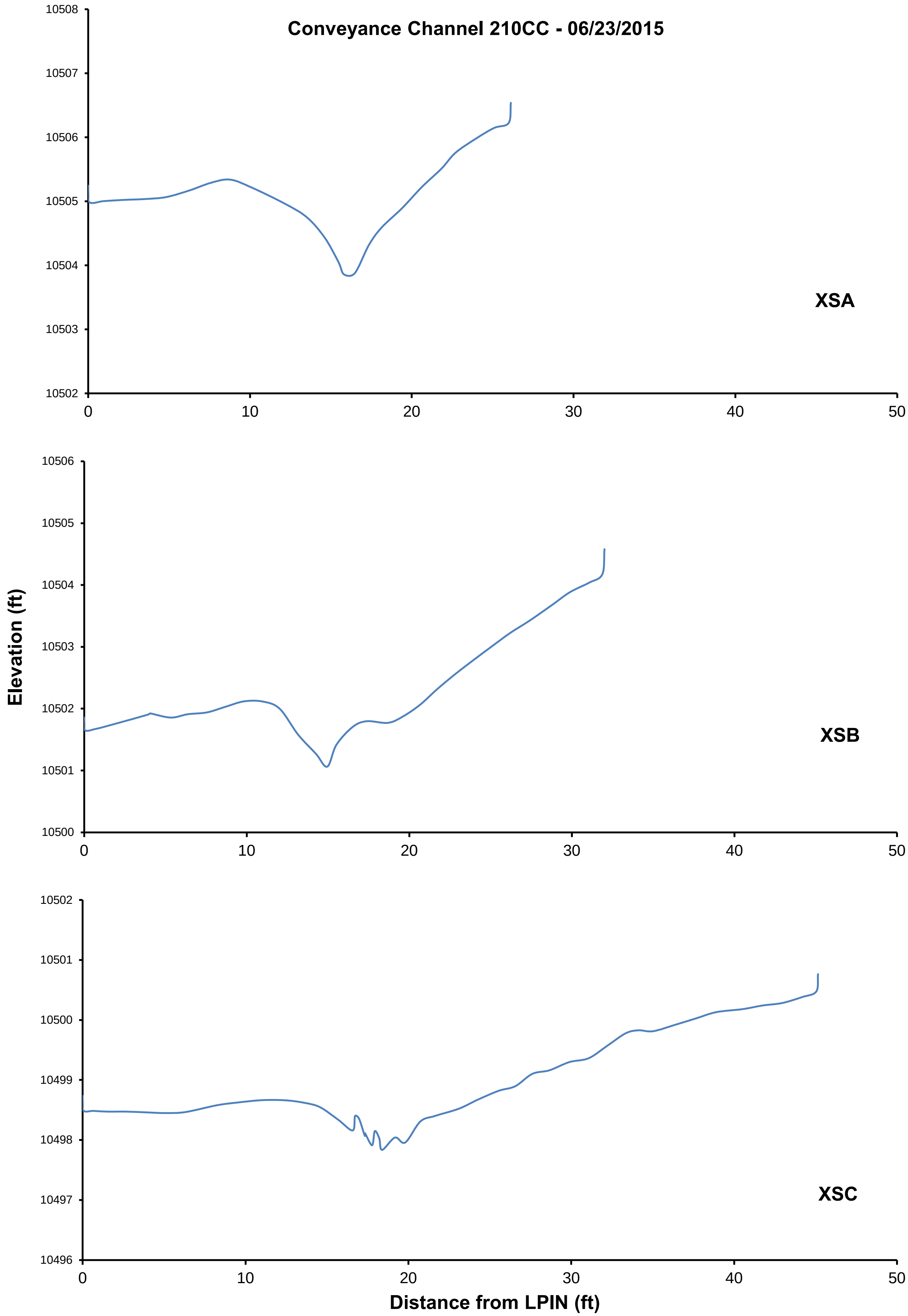

Conveyance Channel 191CC - 07/30/15
9994
9993
9992
9991
0
10
20
30
40
XSA
9989
9988
9987
9986
XSB
9984
9983
9982
9981
XSC
Elevation (ft)
Distance from LPIN (ft)

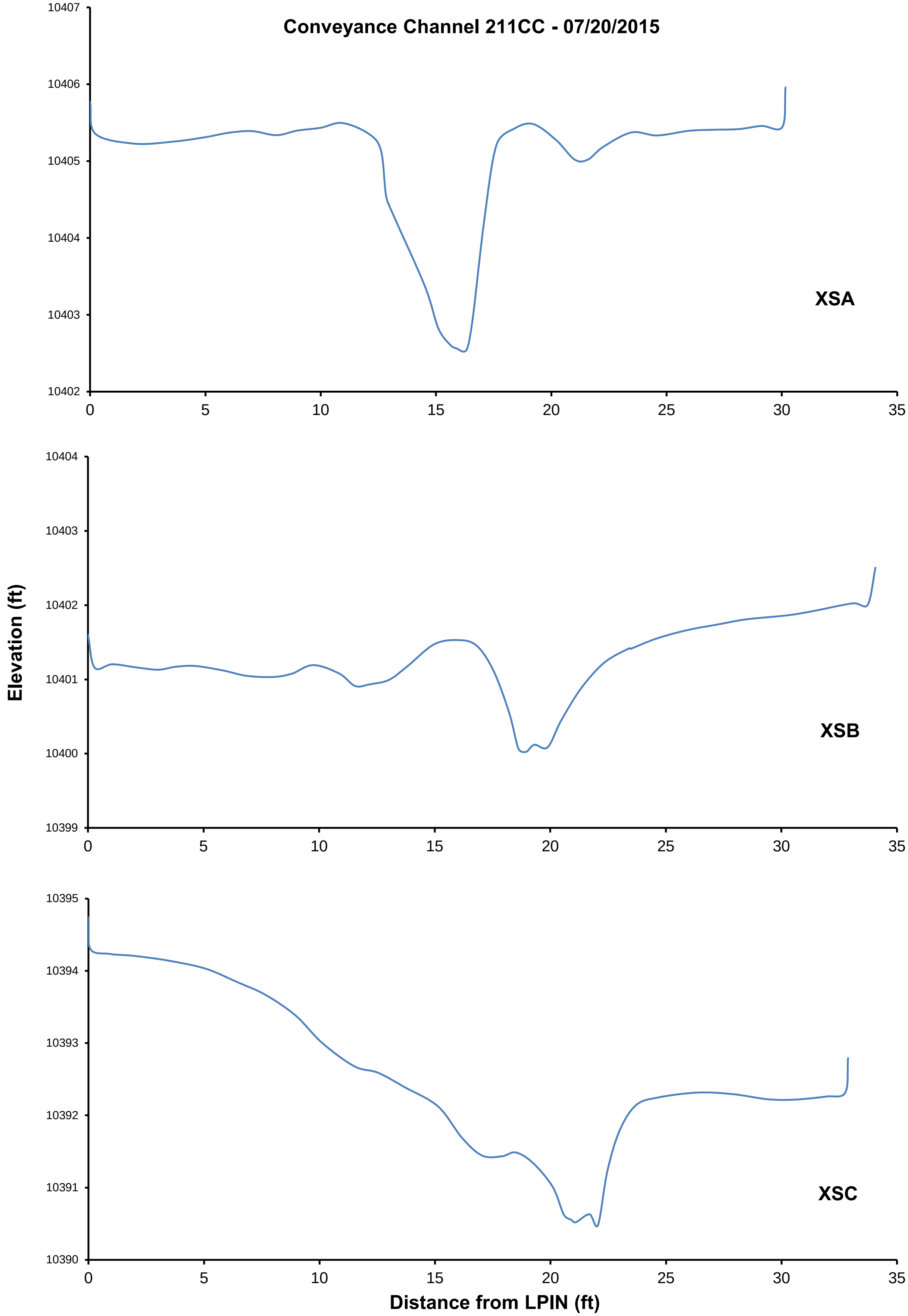

Conveyance Channel 206CC - 07/20/2015
9805
9804
9803
9802
9801
9800
0
10
20
30
40
XSA
9799
9798
9797
9796
9795
9794
XSB
Elevation (ft)
9795
9794
9793
9792
9791
9790
XSC
Distance from LPIN (ft)

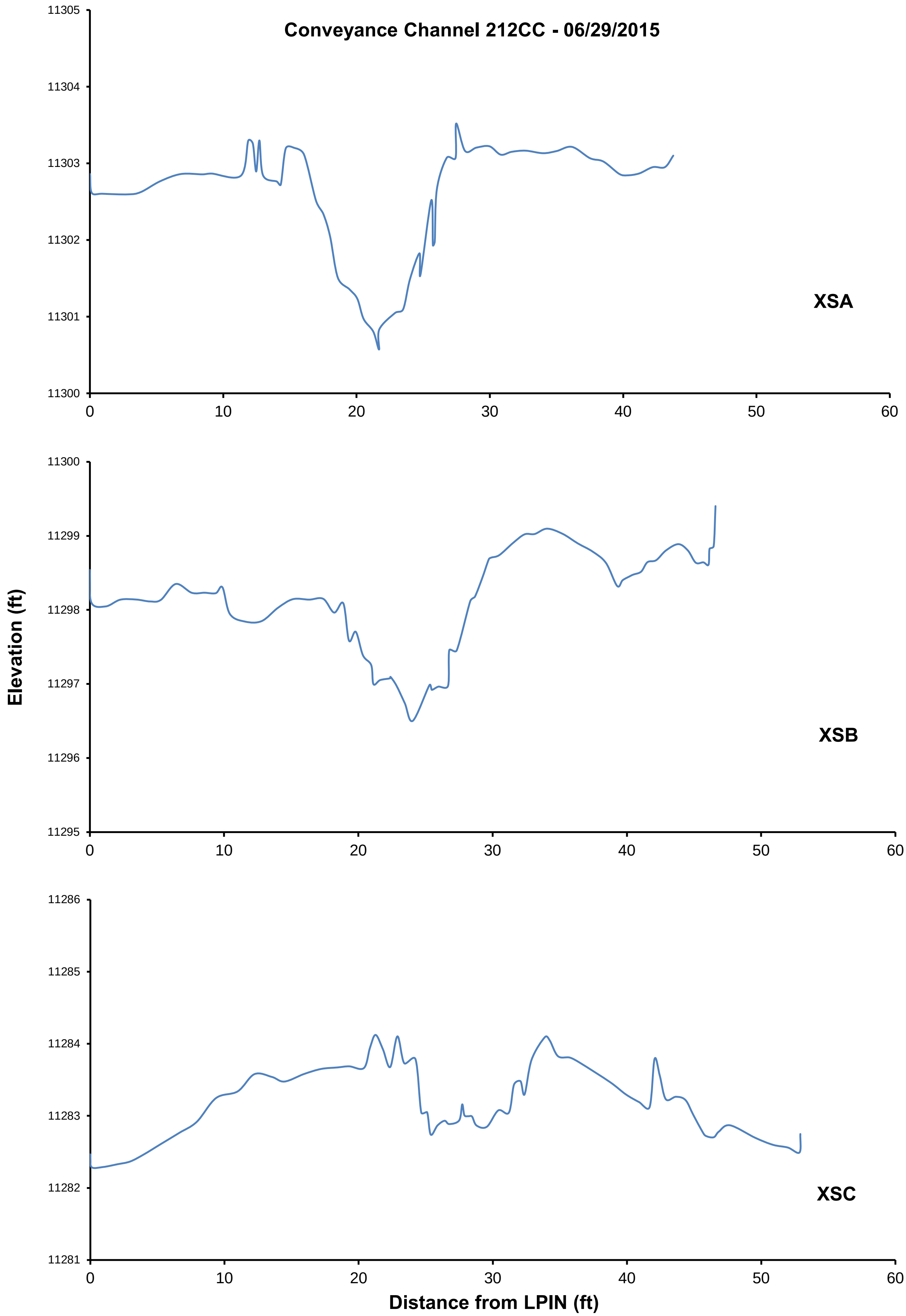


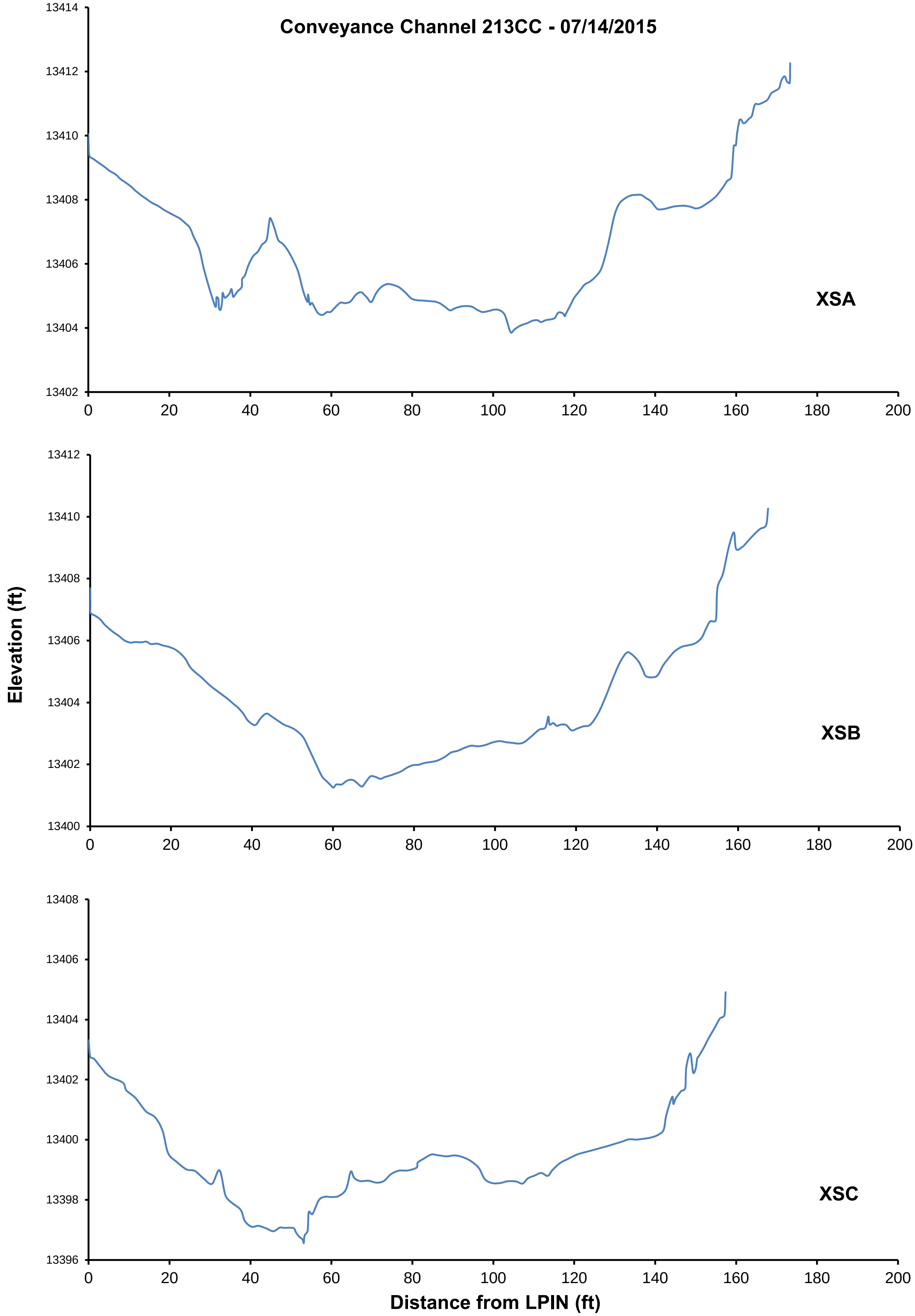
Conveyance Channel 207CC - 07/29/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12992
12991
12990
12989
12988
12985
12984
12983
12982
12981
12980
12979
12978
12977
12976
0
10
20
30
40
50
60


Conveyance Channel 208CC - 07/21/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
11507
11506
11505
11504
11503
11502
11501
11500
11499
11498
11497
11496
11495
11494
11493
11492
11491
11490
0
5
10
15
20
25
30
35
40
45


Conveyance Channel 210CC - 06/23/2015
10508
10507
10506
10505
10504
10503
10502
0
10
20
30
40
50
XSA
10506
10505
10504
10503
10502
10501
10500
0
10
20
30
40
50
XSB
Elevation (ft)
10502
10501
10500
10499
10498
10497
10496
0
10
20
30
40
50
XSC
Distance from LPIN (ft)


Conveyance Channel 211CC - 07/20/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10407
10406
10405
10404
10403
10402
10404
10403
10402
10401
10400
10399
10395
10394
10393
10392
10391
10390
0
5
10
15
20
25
30
35


Conveyance Channel 212CC - 06/29/2015
11305
11304
11303
11302
11301
11300
0
10
20
30
40
50
60
XSA
11300
11299
11298
11297
11296
11295
0
10
20
30
40
50
60
XSB
11286
11285
11284
11283
11282
11281
0
10
20
30
40
50
60
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 213CC - 07/14/2015
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
13414
13412
13410
13408
13406
13404
13402
13400
13398
13396
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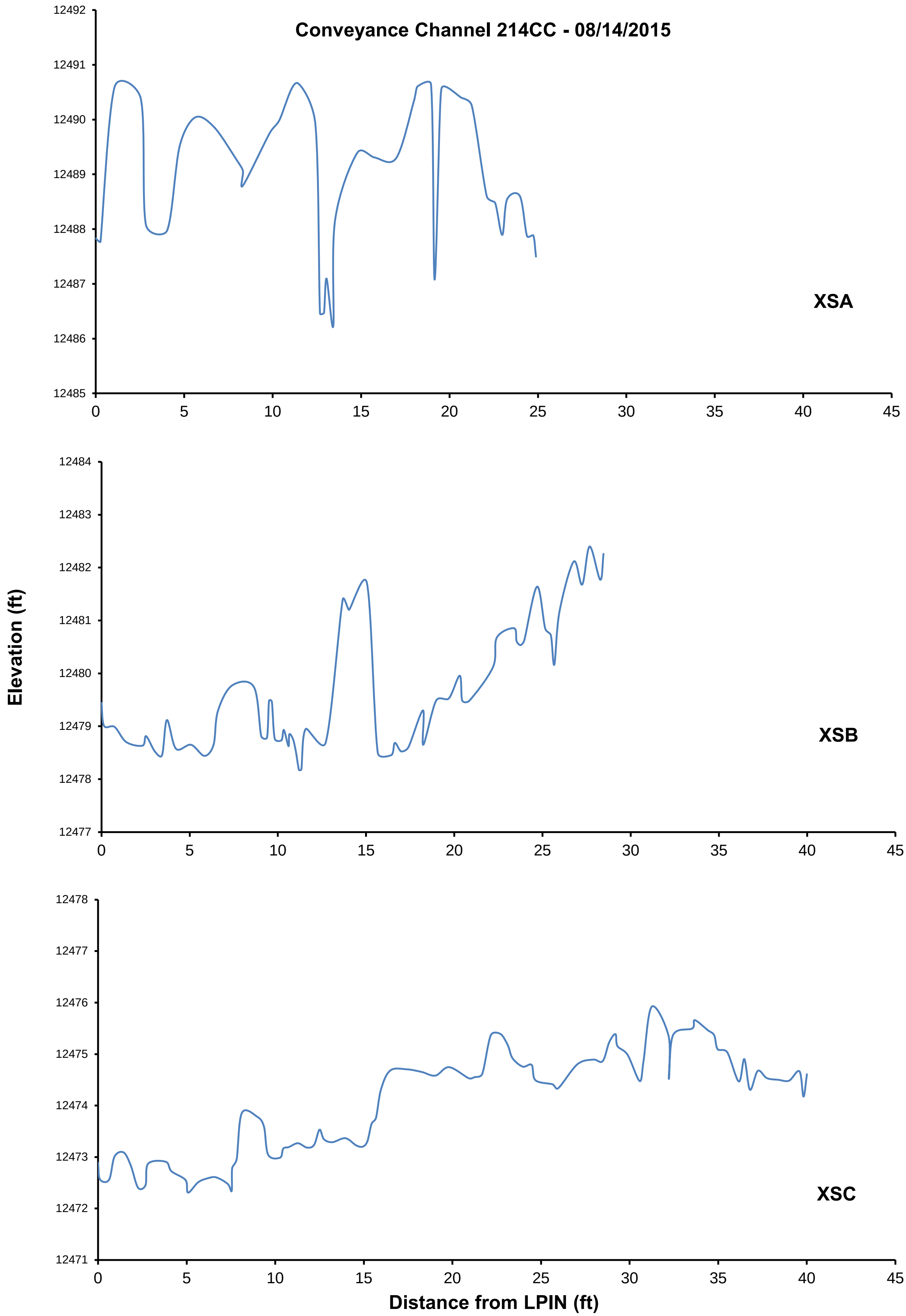
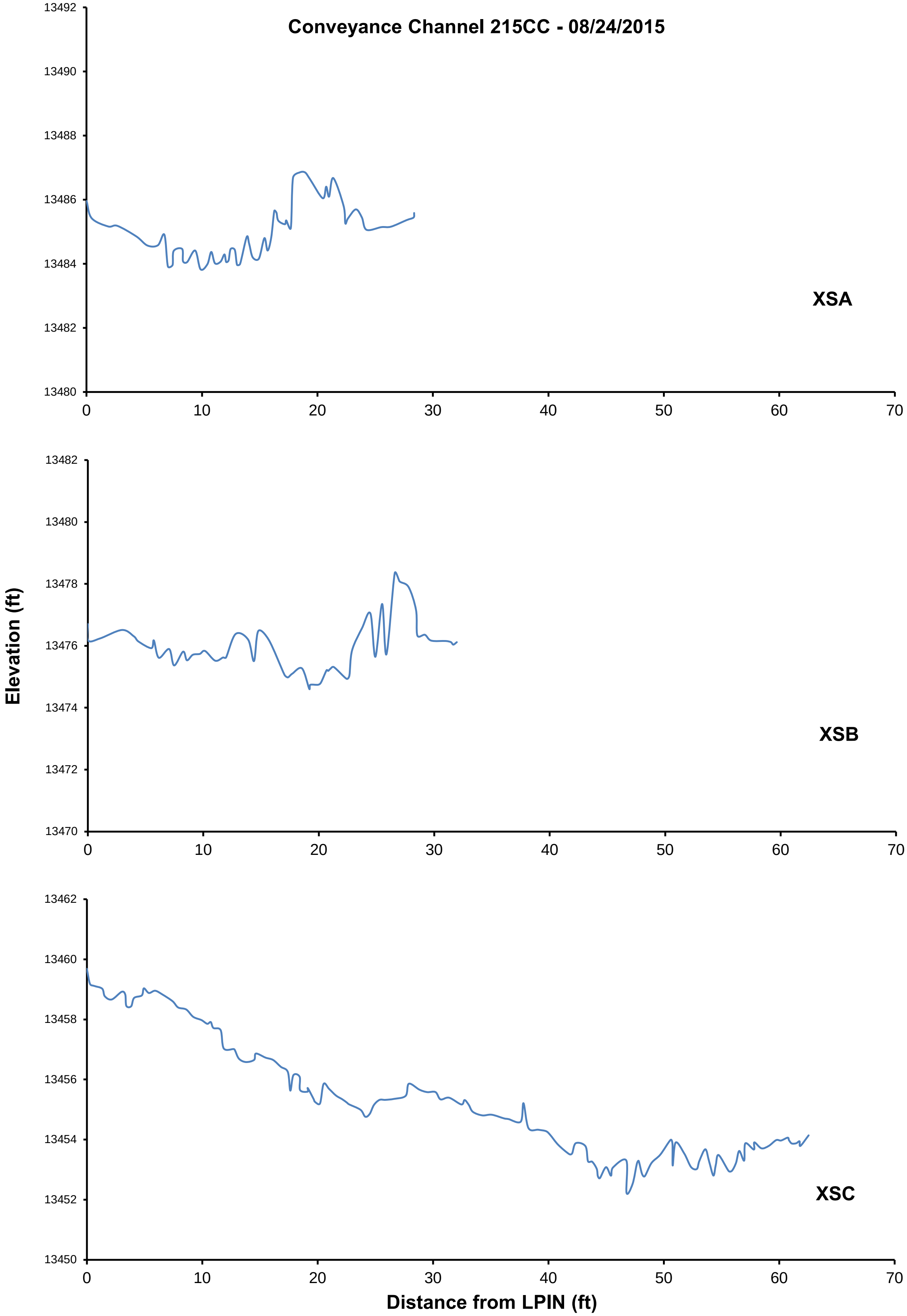
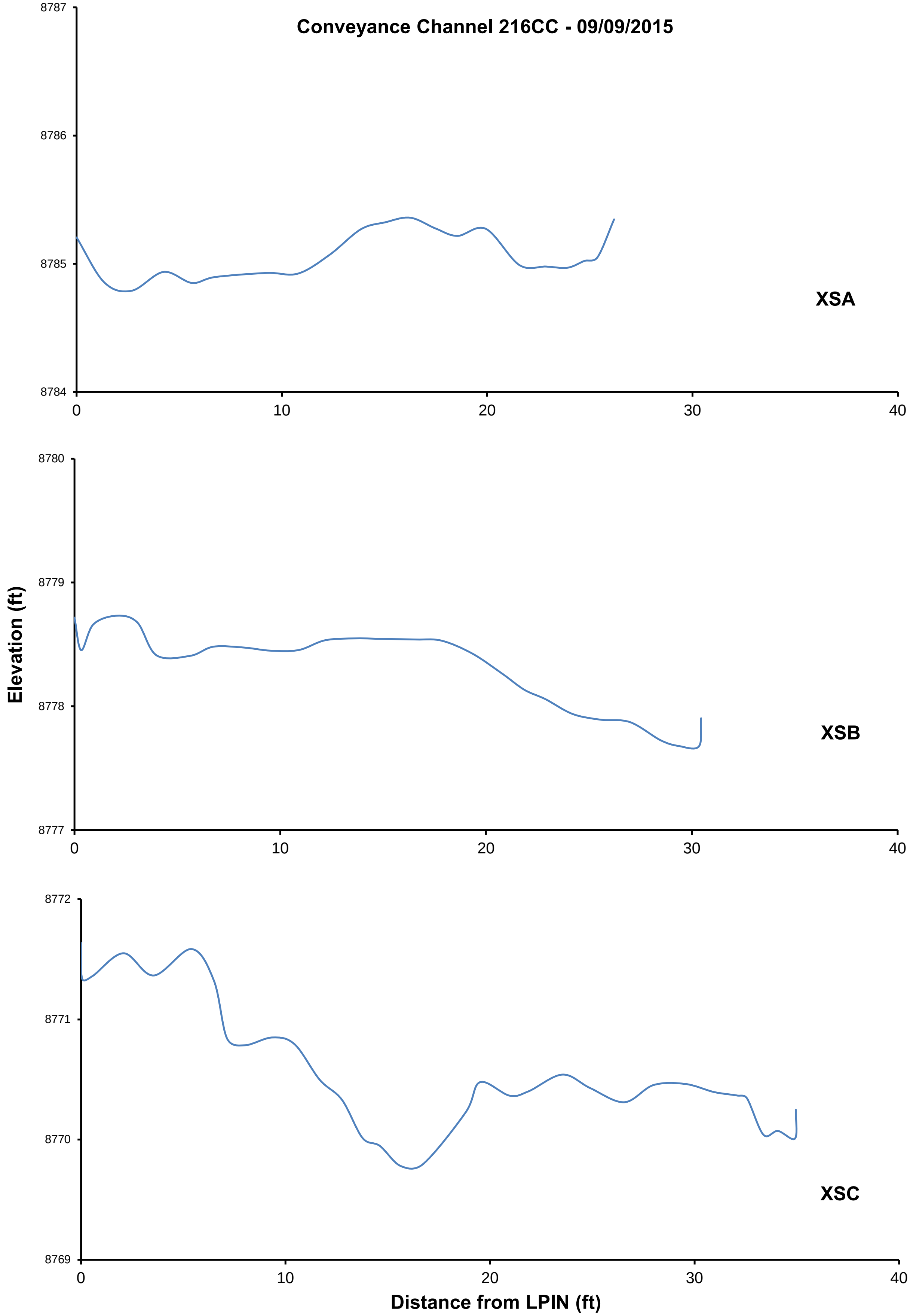
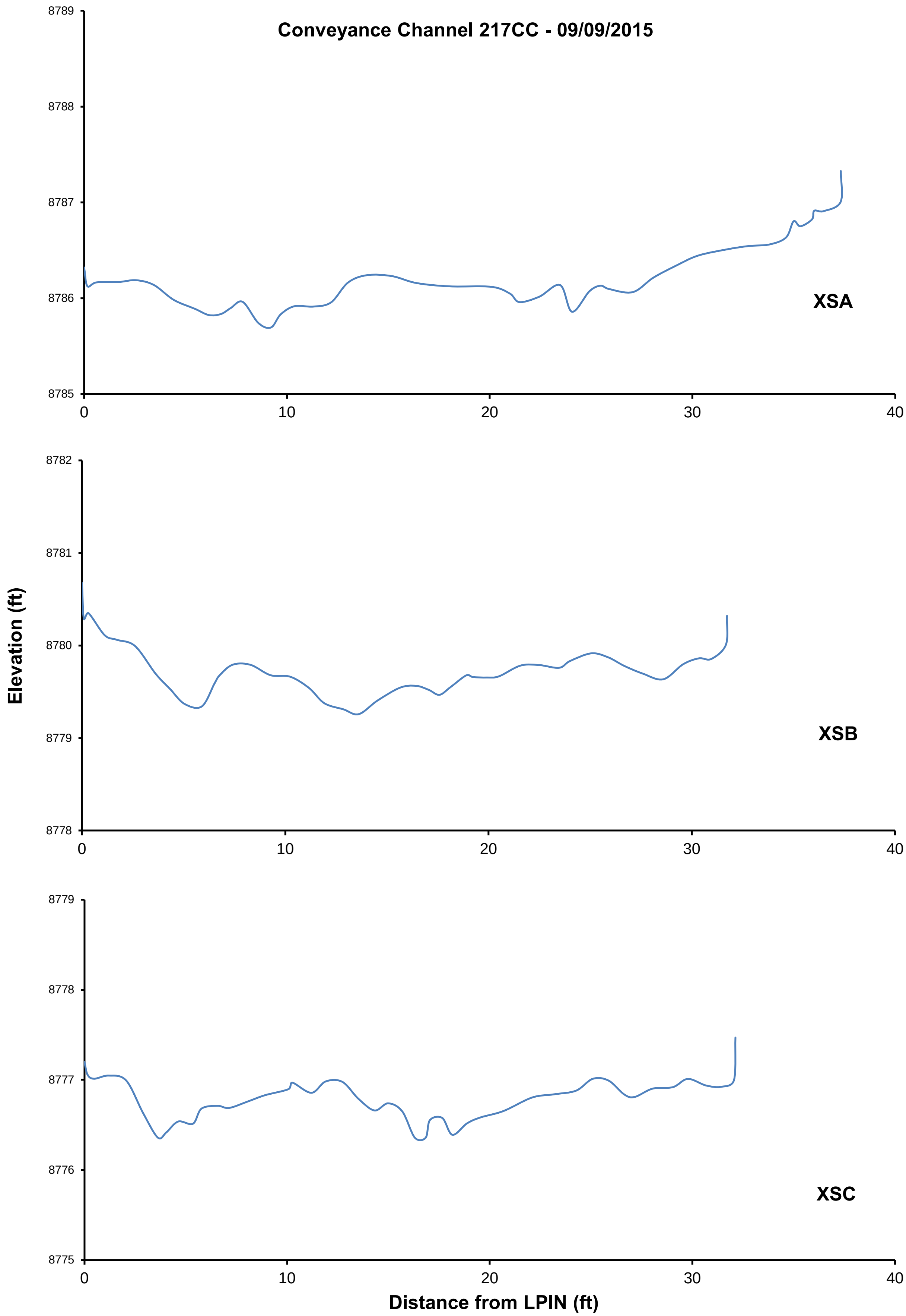
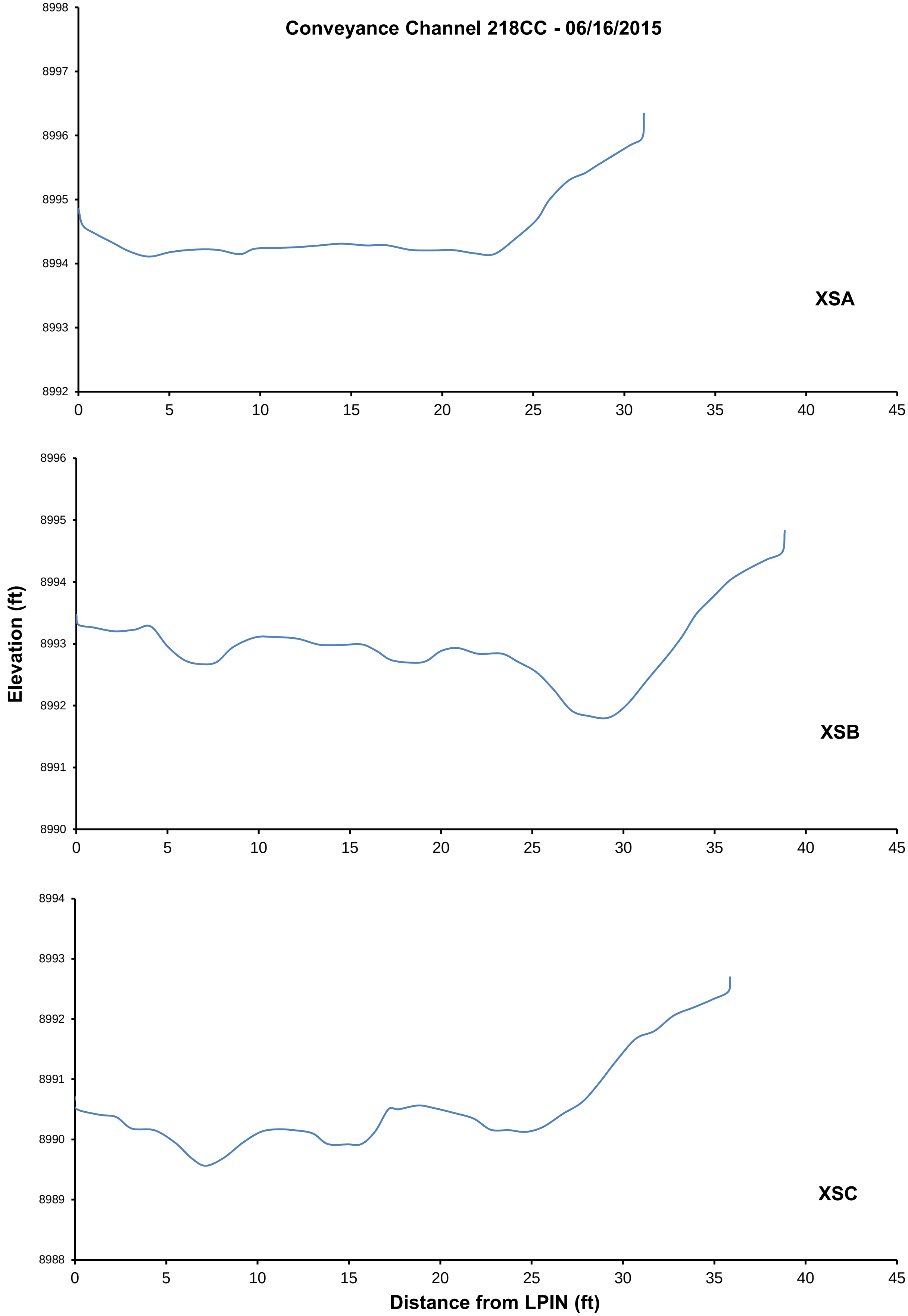
40
60
80
100
120
140
160
180
200

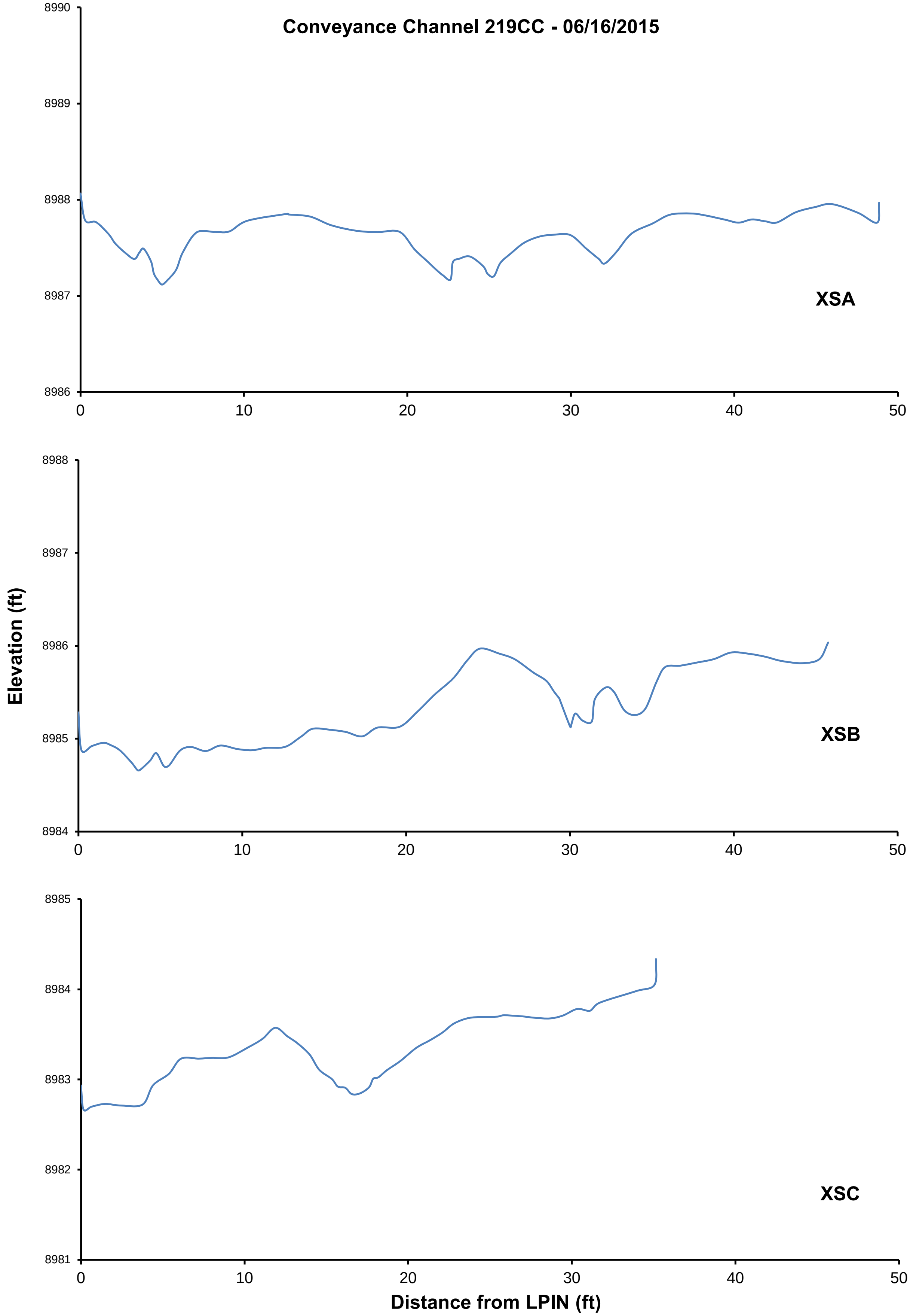

Conveyance Channel 214CC - 08/14/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12492
12491
12490
12489
12488
12487
12486
12485
12484
12483
12482
12481
12480
12479
12478
12477
12476
12475
12474
12473
12472
12471
0
5
10
15
20
25
30
35
40
45


Conveyance Channel 215CC - 08/24/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
13492
13490
13488
13486
13484
13482
13480
13478
13476
13474
13472
13470
13462
13460
13458
13456
13454
13452
13450
0
10
20
30
40
50
60
70

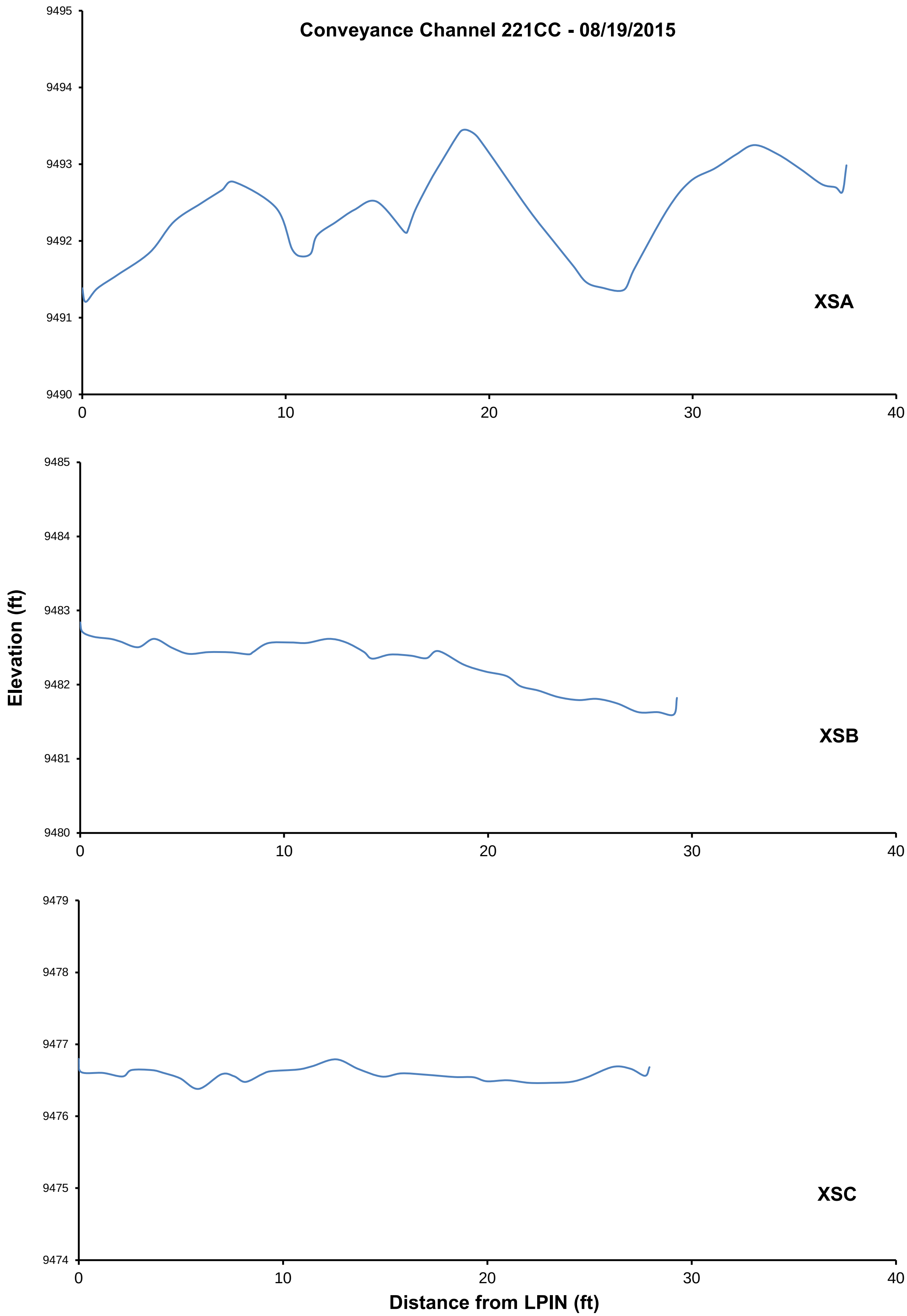

Conveyance Channel 216CC - 09/09/2015
8787
8786
8785
8784
0
10
20
30
40
XSA
8780
8779
8778
8777
XSB
8772
8771
8770
8769
XSC
Elevation (ft)
Distance from LPIN (ft)

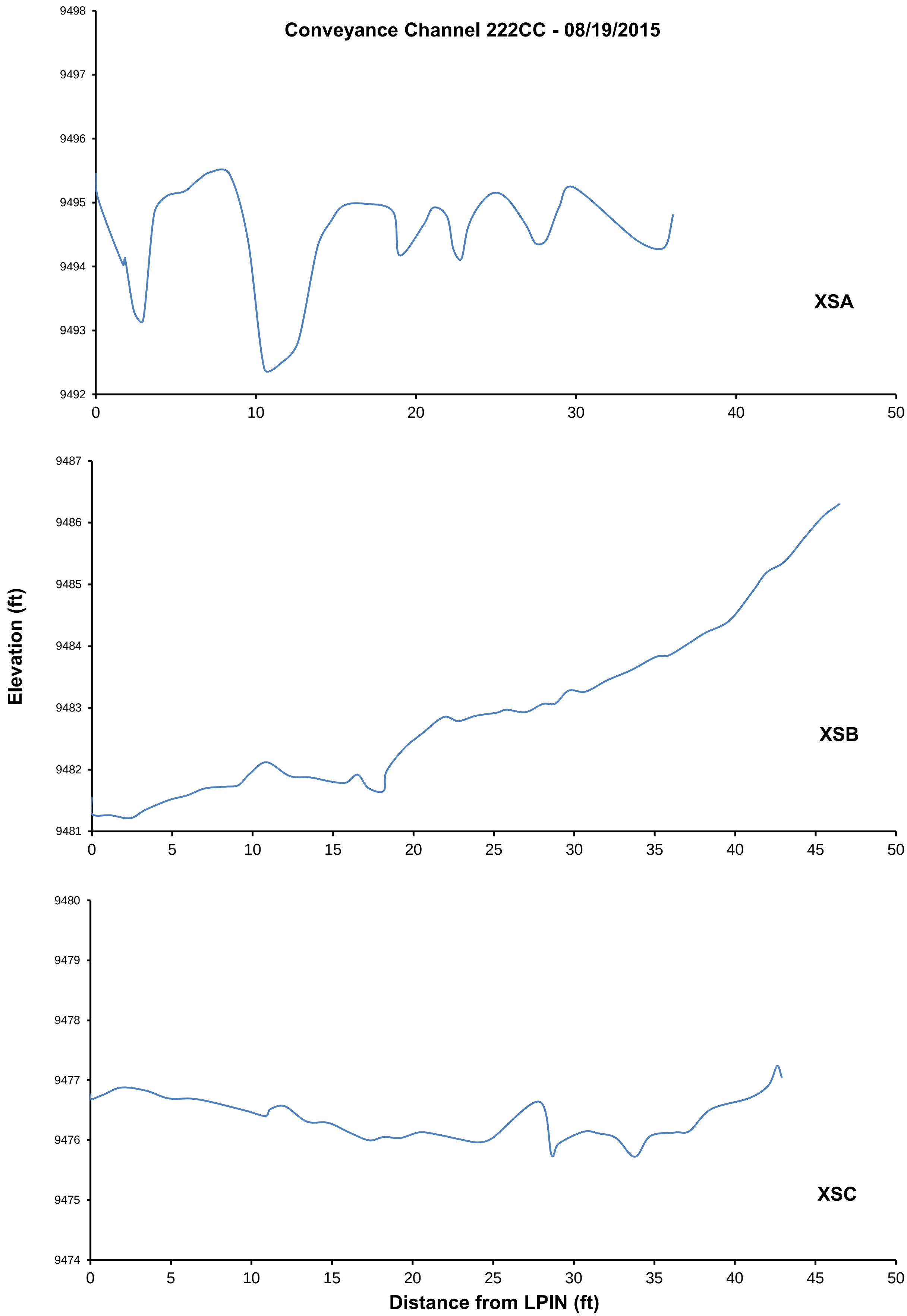

Conveyance Channel 217CC - 09/09/2015
Elevation (ft)
8789
8788
8787
8786
8785
XSA
8782
8781
8780
8779
8778
XSB
8779
8778
8777
8776
8775
XSC
0
10
20
30
40
Distance from LPIN (ft)

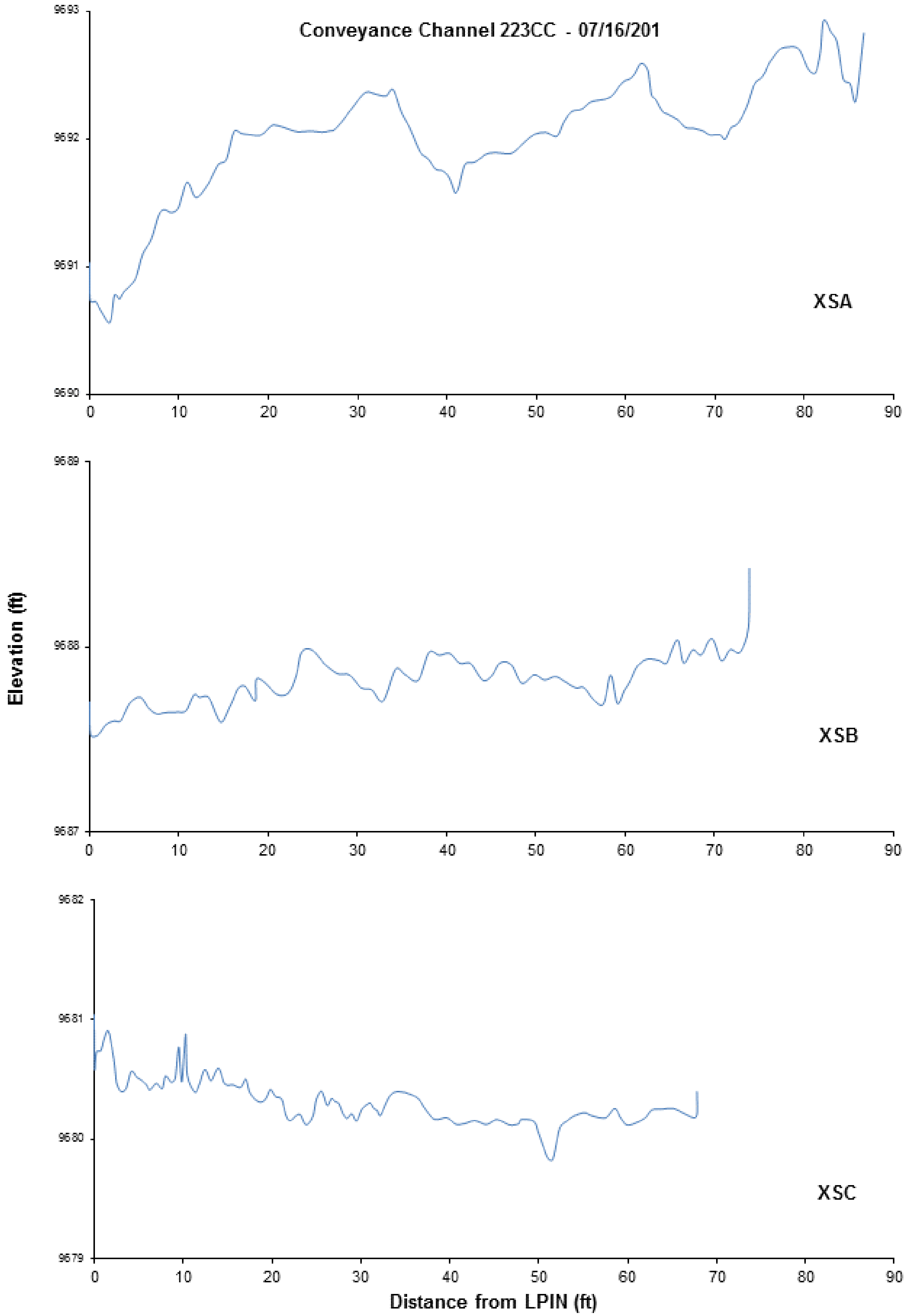

Conveyance Channel 218CC - 06/16/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
8998
8997
8996
8995
8994
8993
8992
8991
8990
8989
8988
0
5
10
15
20
25
30
35
40
45

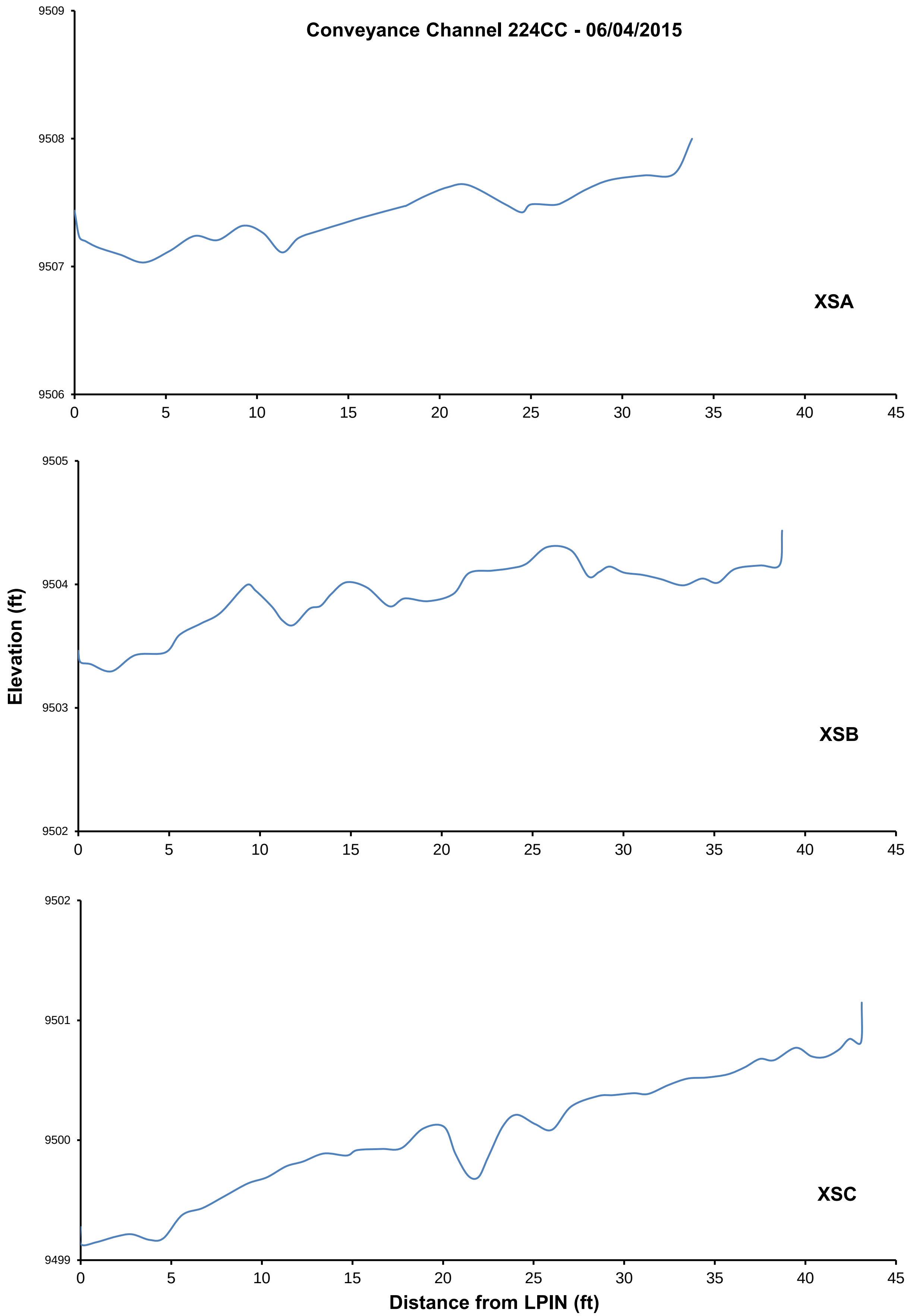


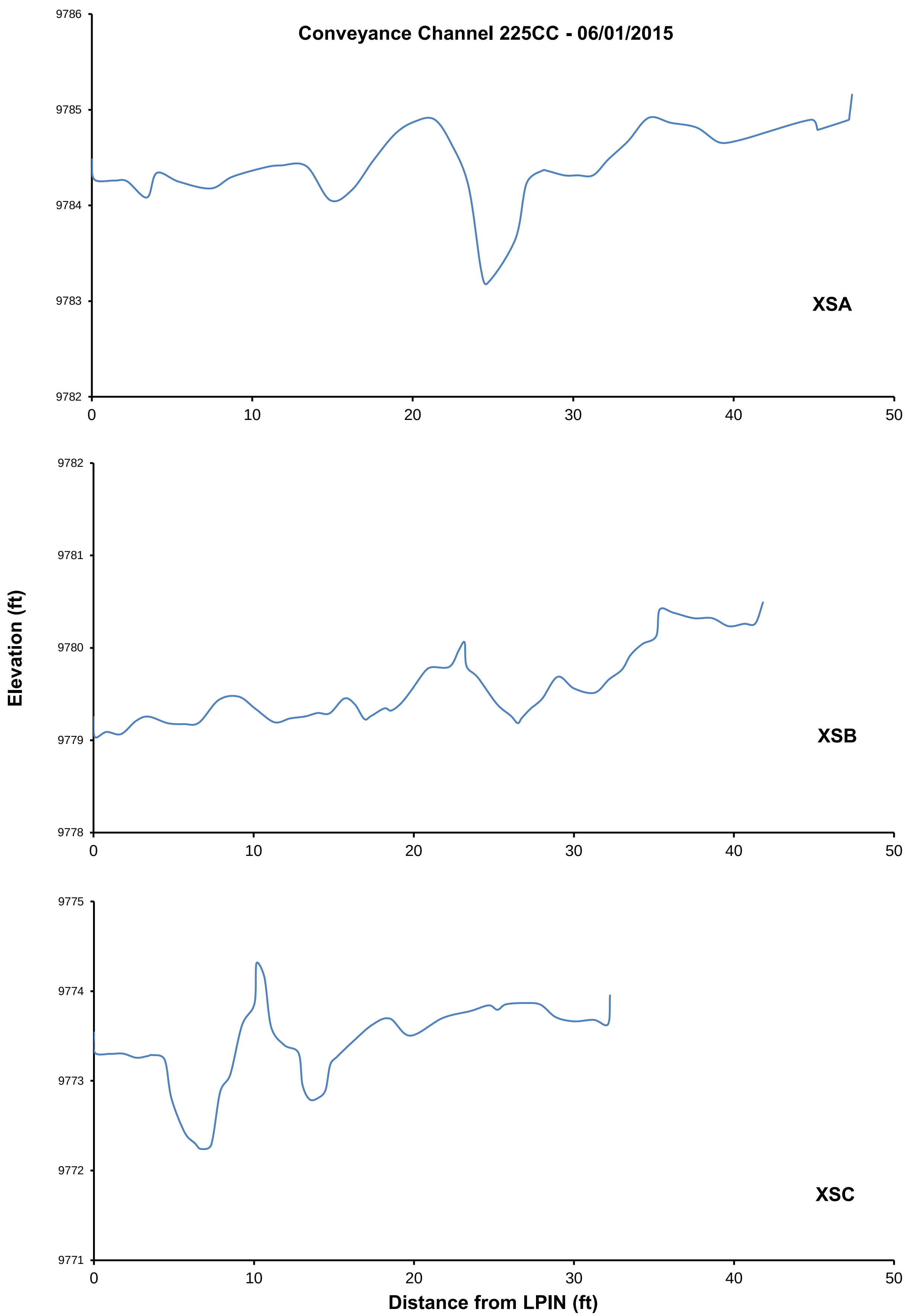
Conveyance Channel 219CC - 06/16/2015
Elevation (ft)
8990
8989
8988
8987
8986
XSA
8988
8987
8986
8985
8984
XSB
8985
8984
8983
8982
8981
XSC
0
10
20
30
40
50
Distance from LPIN (ft)

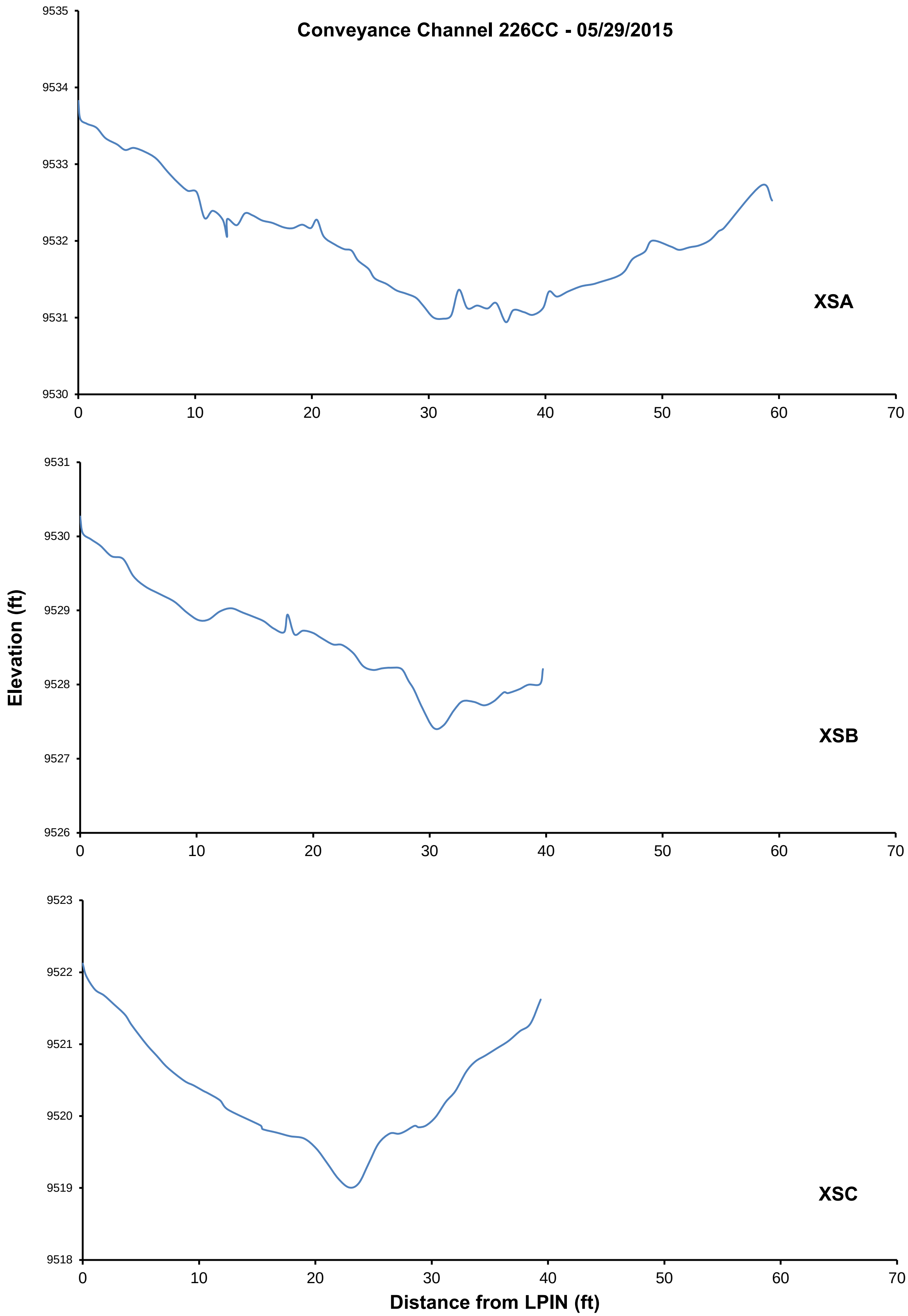

Conveyance Channel 221CC - 08/19/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9495
9494
9493
9492
9491
9490
9485
9484
9483
9482
9481
9480
9479
9478
9477
9476
9475
9474
0
10
20
30
40


Conveyance Channel 222CC - 08/19/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
9498
9497
9496
9495
9494
9493
9492
9487
9486
9485
9484
9483
9482
9481
9480
9479
9478
9477
9476
9475
9474
0
5
10
15
20
25
30
35
40
45
50

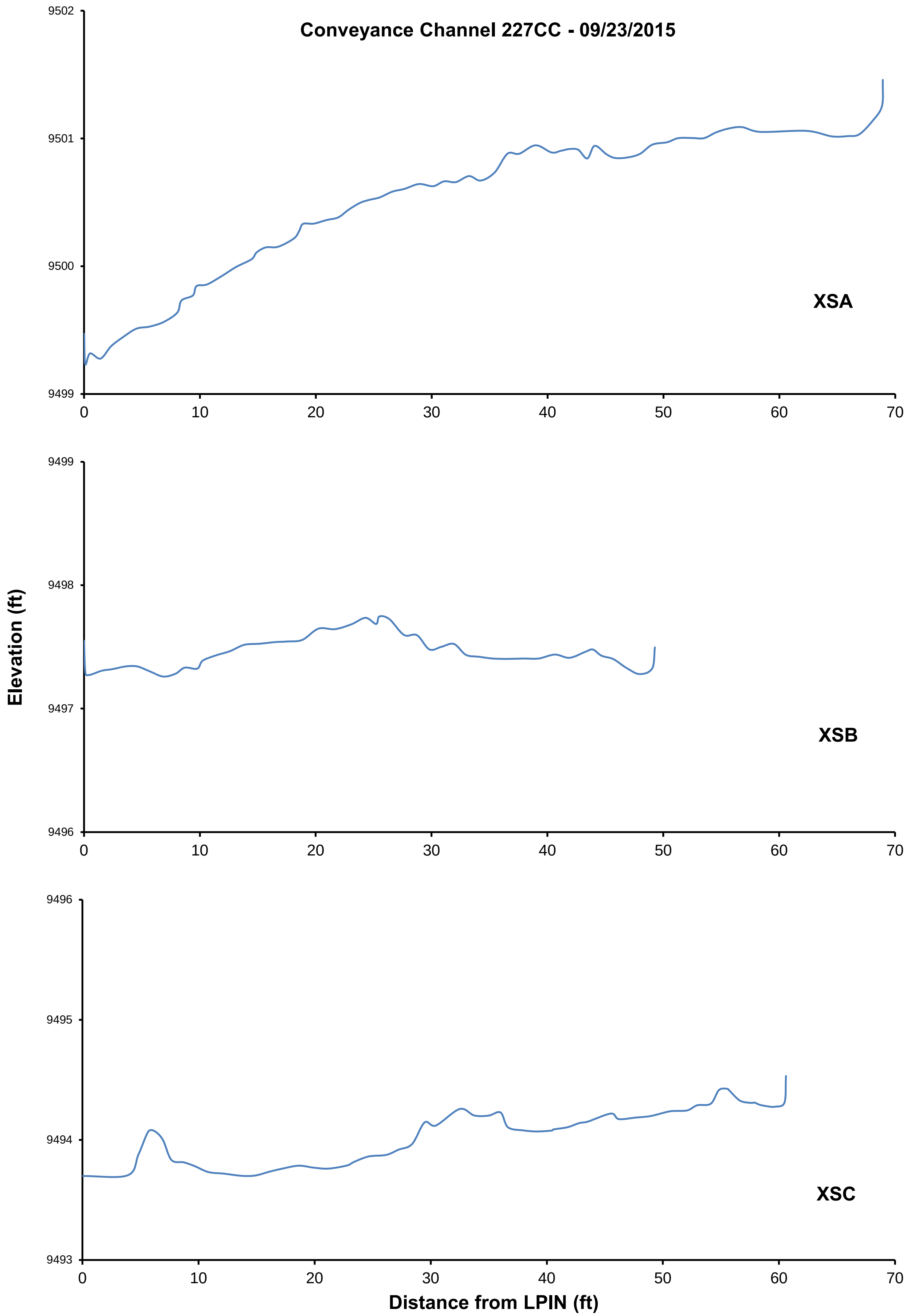

Conveyance Channel 223CC - 07/16/201
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9693
9692
9691
9690
9689
9688
9687
9682
9681
9680
9679
0
10
20
30
40
50
60
70
80
90

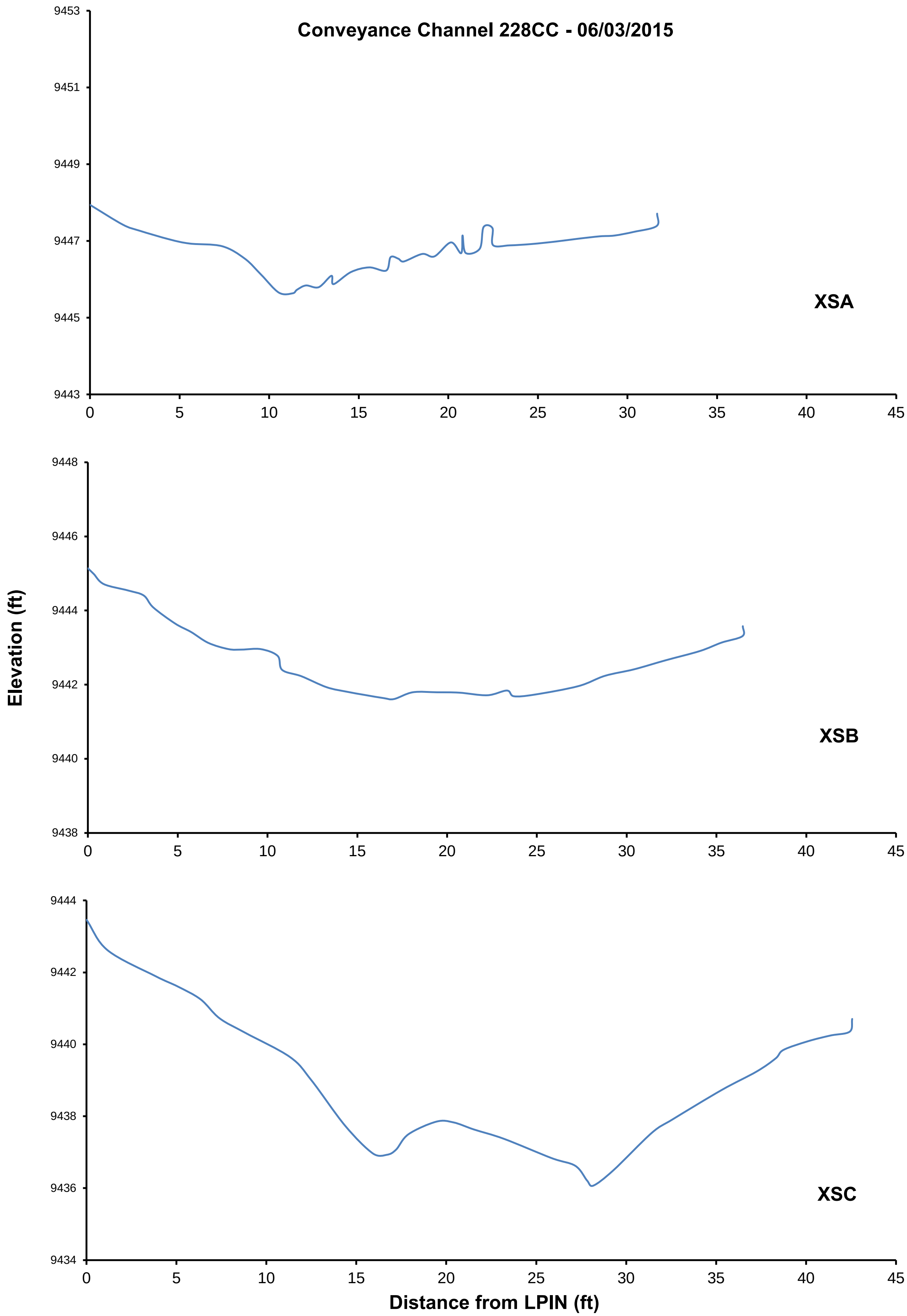

Conveyance Channel 224CC - 06/04/2015
9509
9508
9507
9506
XSA
0
5
10
15
20
25
30
35
40
45
9505
9504
9503
9502
XSB
Elevation (ft)
9502
9501
9500
9499
XSC
Distance from LPIN (ft)


Conveyance Channel 225CC - 06/01/2015
9786
9785
9784
9783
9782
XSA
0
10
20
30
40
50
9782
9781
9780
9779
9778
XSB
9775
9774
9773
9772
9771
XSC
Elevation (ft)
Distance from LPIN (ft)

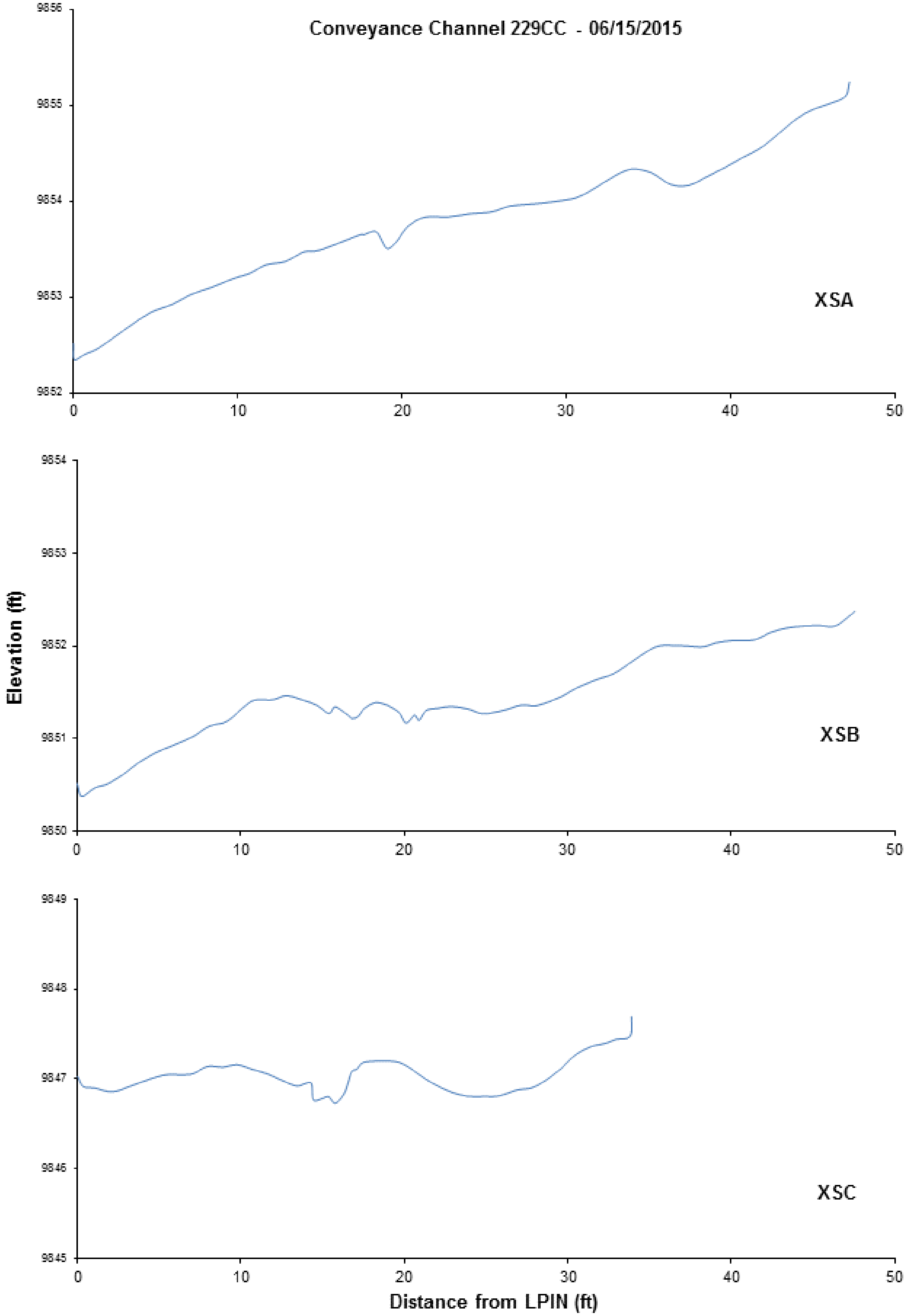


Conveyance Channel 226CC - 05/29/2015
XSA
9535
9534
9533
9532
9531
9530
XSB
9531
9530
9529
9528
9527
9526
XSC
9523
9522
9521
9520
9519
9518
0
10
20
30
40
50
60
70
Elevation (ft)
Distance from LPIN (ft)

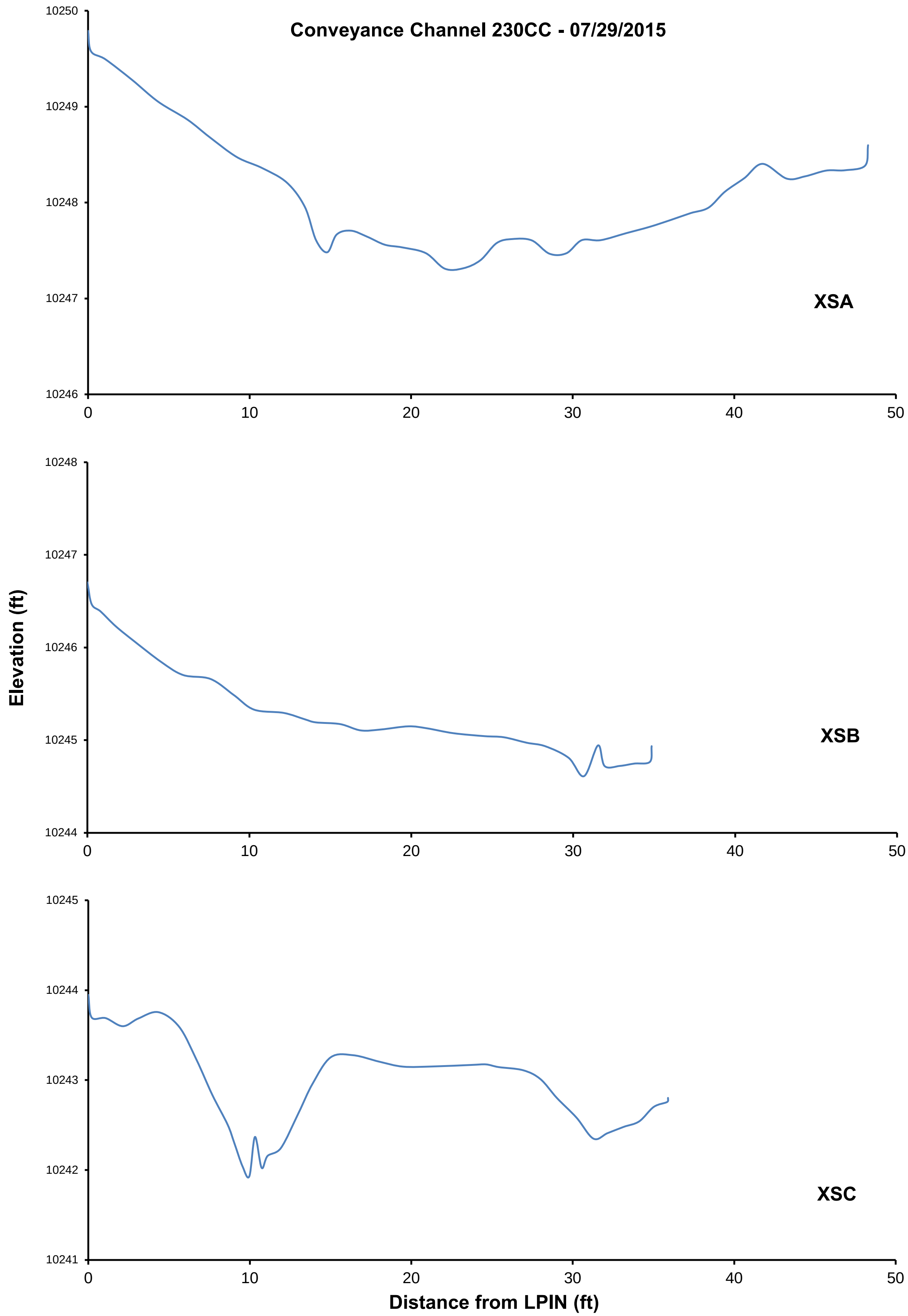

Conveyance Channel 227CC - 09/23/2015
9502
9501
9500
9499
XSA
0
10
20
30
40
50
60
70
9499
9498
9497
9496
XSB
9496
9495
9494
9493
XSC
Elevation (ft)
Distance from LPIN (ft)



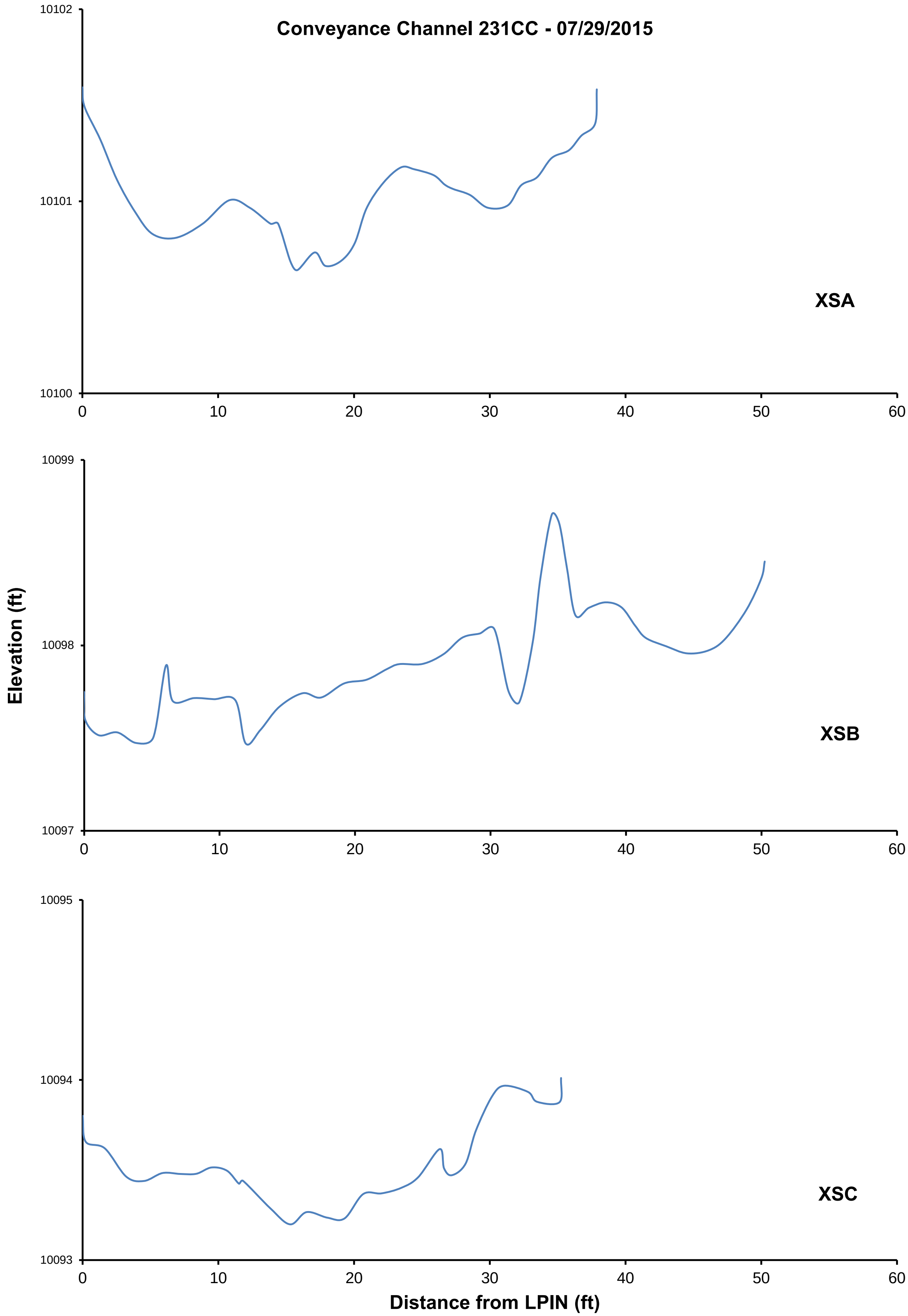
Conveyance Channel 228CC - 06/03/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9453
9451
9449
9447
9445
9443
9448
9446
9444
9442
9440
9438
9434
9436
0
5
10
15
20
25
30
35
40
45

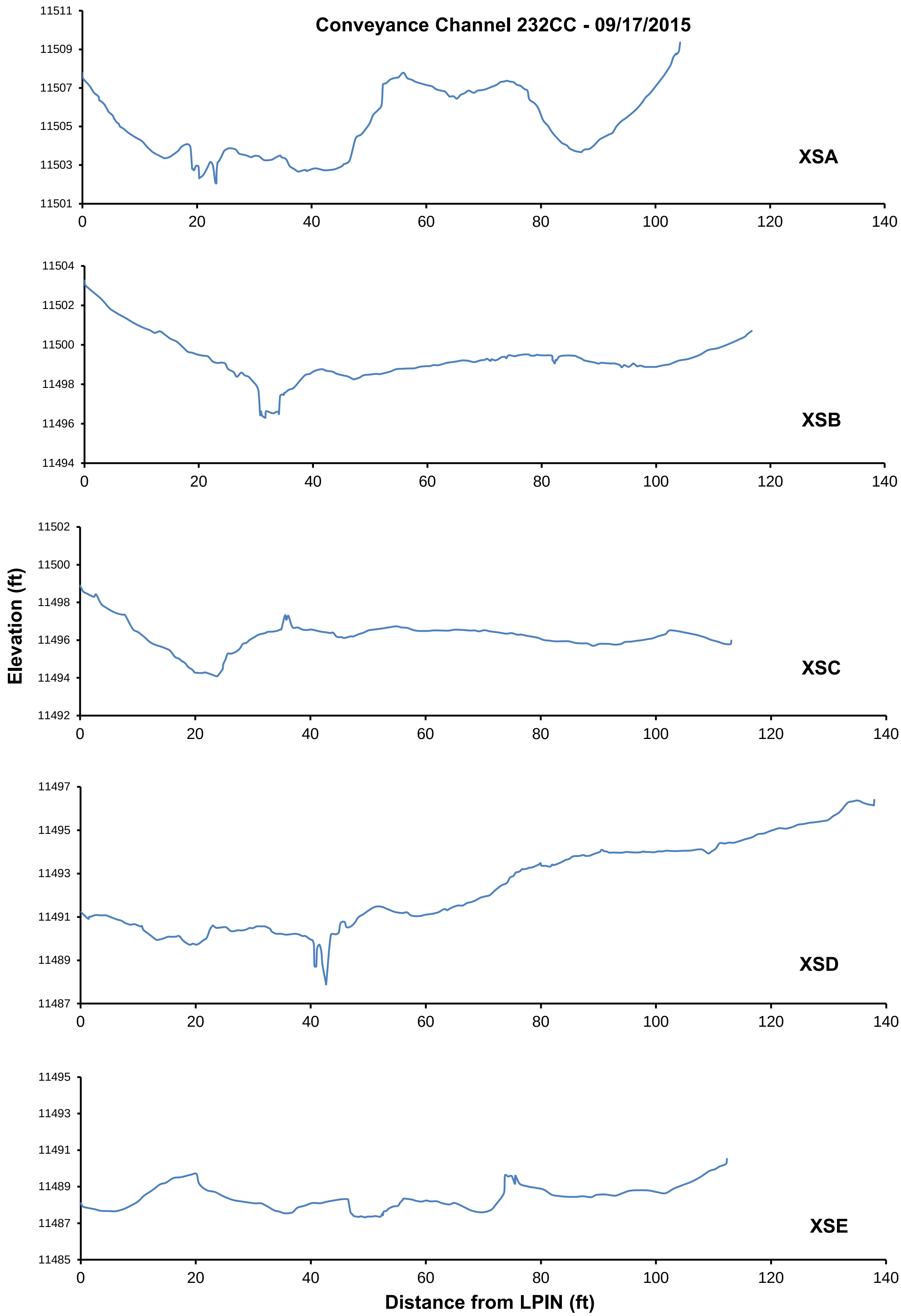


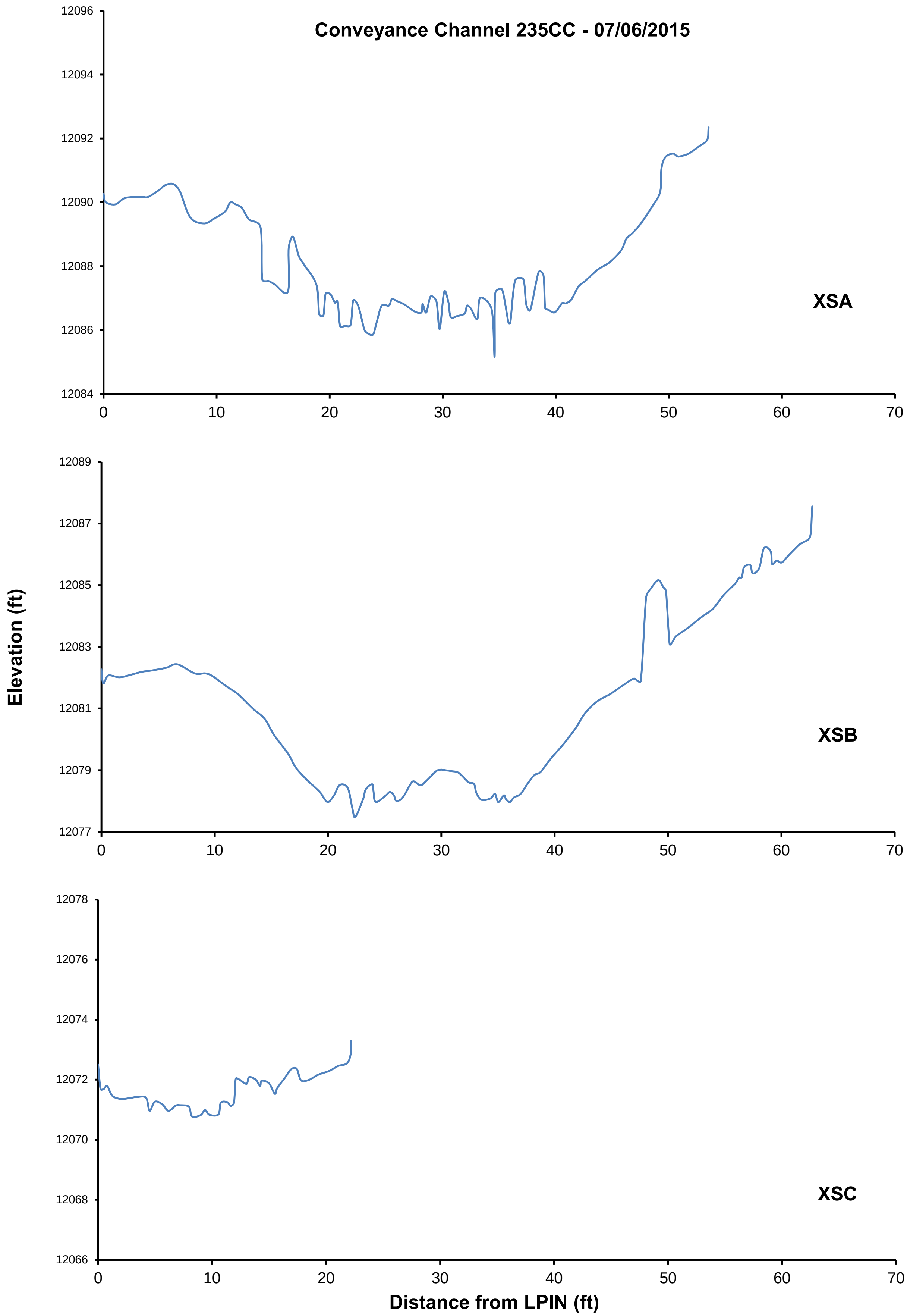
Conveyance Channel 229CC - 06/15/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9856
9855
9854
9853
9852
9854
9853
9852
9851
9850
9849
9848
9847
9846
9845
0
10
20
30
40
50

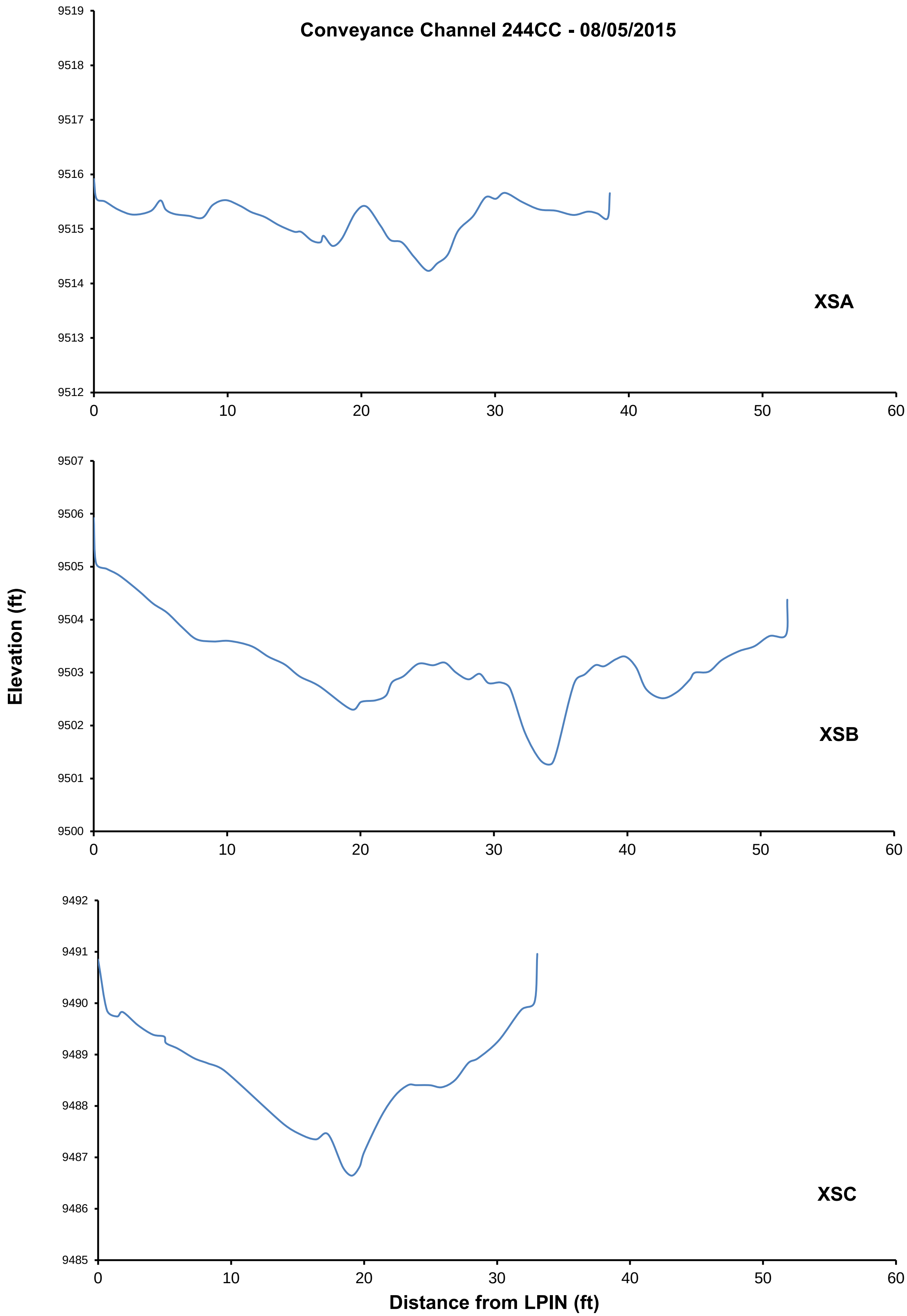


Conveyance Channel 230CC - 07/29/2015
10250
10249
10248
10247
10246
XSA
0
10
20
30
40
50
10248
10247
10246
10245
10244
XSB
0
10
20
30
40
50
10245
10244
10243
10242
10241
XSC
0
10
20
30
40
50
Elevation (ft)
Distance from LPIN (ft)

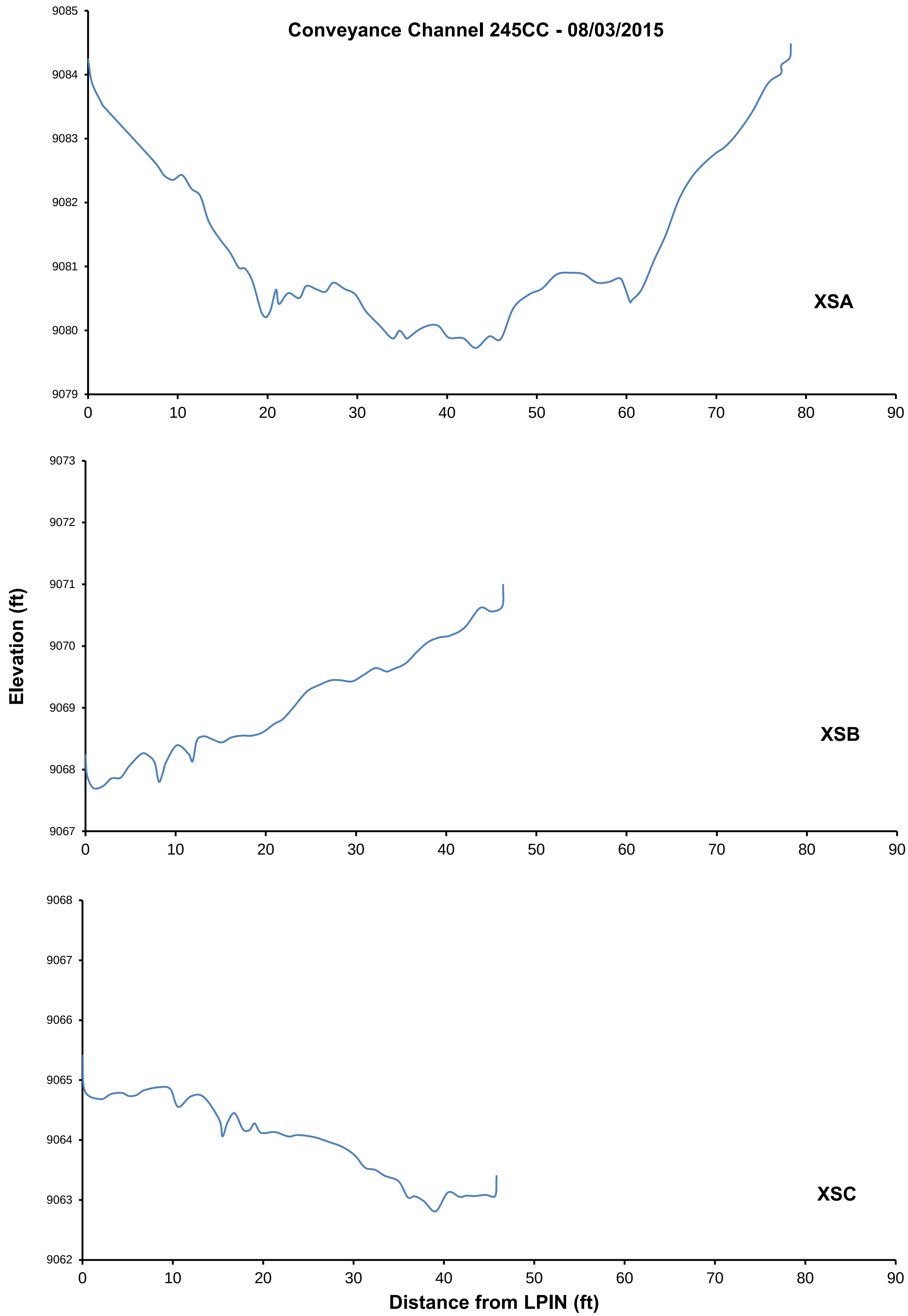

Conveyance Channel 231CC - 07/29/2015
10102
10101
10100
0
10
20
30
40
50
60
XSA
10099
10098
10097
XSB
10095
10094
10093
XSC
Elevation (ft)
Distance from LPIN (ft)


Conveyance Channel 232CC - 09/17/2015
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)

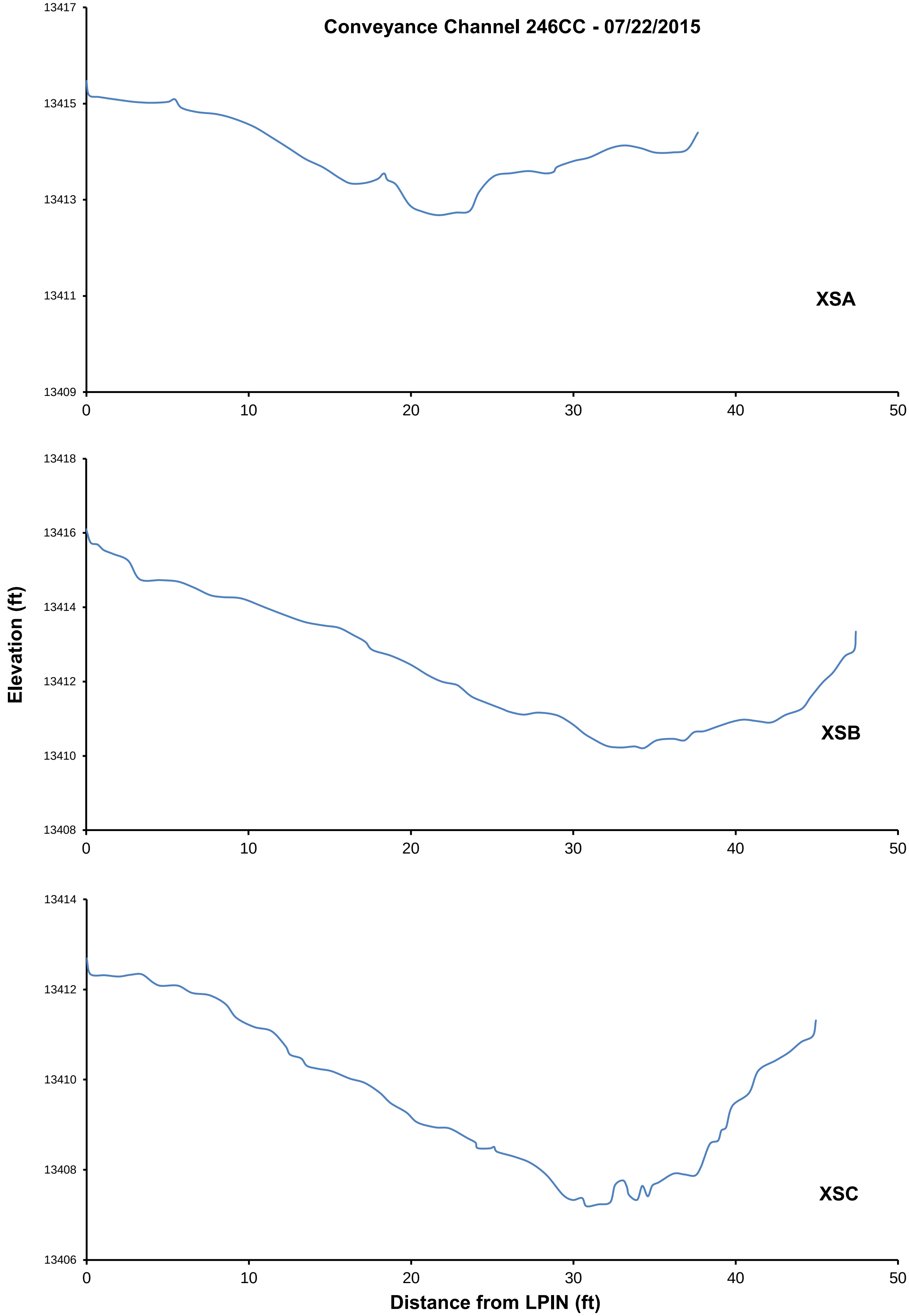

Conveyance Channel 235CC - 07/06/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
12096
12094
12092
12090
12088
12086
12084
12089
12087
12085
12083
12081
12079
12077
12078
12076
12074
12072
12070
12068
12066
0
10
20
30
40
50
60
70

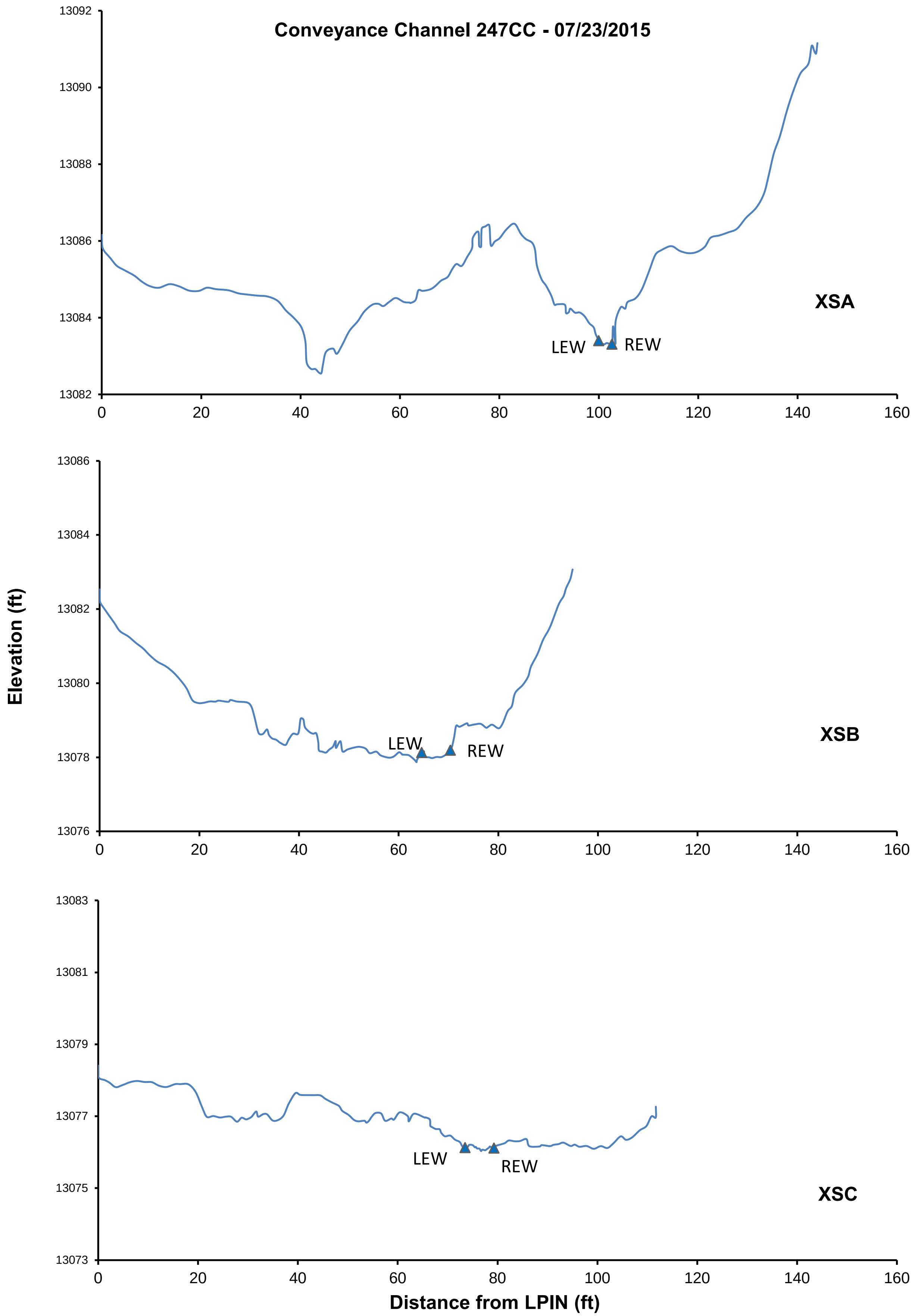


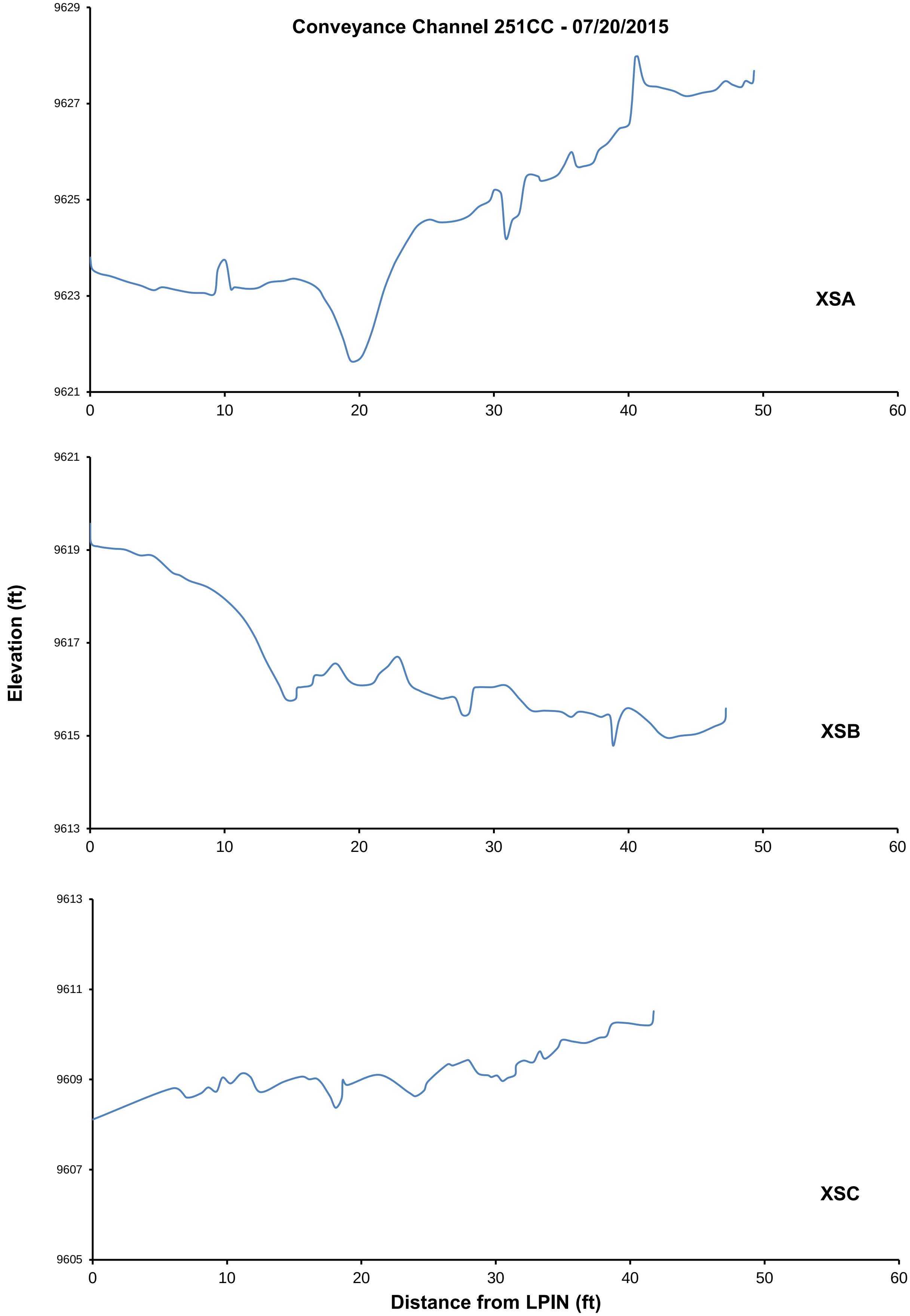
Conveyance Channel 244CC - 08/05/2015
Elevation (ft)
9519
9518
9517
9516
9515
9514
9513
9512
0
10
20
30
40
50
60
XSA
9507
9506
9505
9504
9503
9502
9501
9500
XSB
9492
9491
9490
9489
9488
9487
9486
9485
XSC
Distance from LPIN (ft)



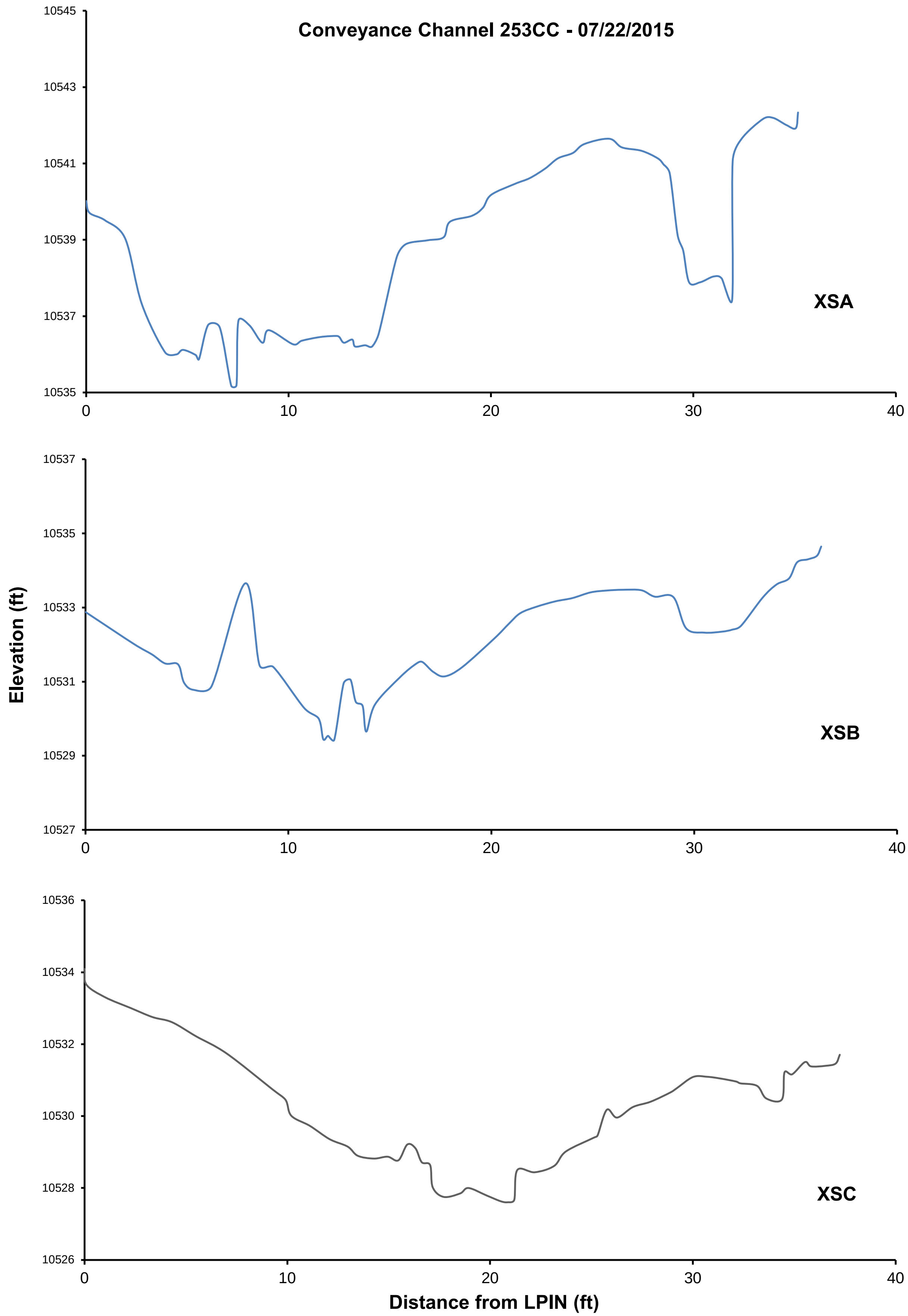
Conveyance Channel 245CC - 08/03/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
9085
9084
9083
9082
9081
9080
9079
9073
9072
9071
9070
9069
9068
9067
9068
9067
9066
9065
9064
9063
9062
0
10
20
30
40
50
60
70
80
90


Conveyance Channel 246CC - 07/22/2015
13417
13415
13413
13411
13409
XSA
0
10
20
30
40
50
13418
13416
13414
13412
13410
13408
XSB
13414
13412
13410
13408
13406
XSC
Elevation (ft)
Distance from LPIN (ft)

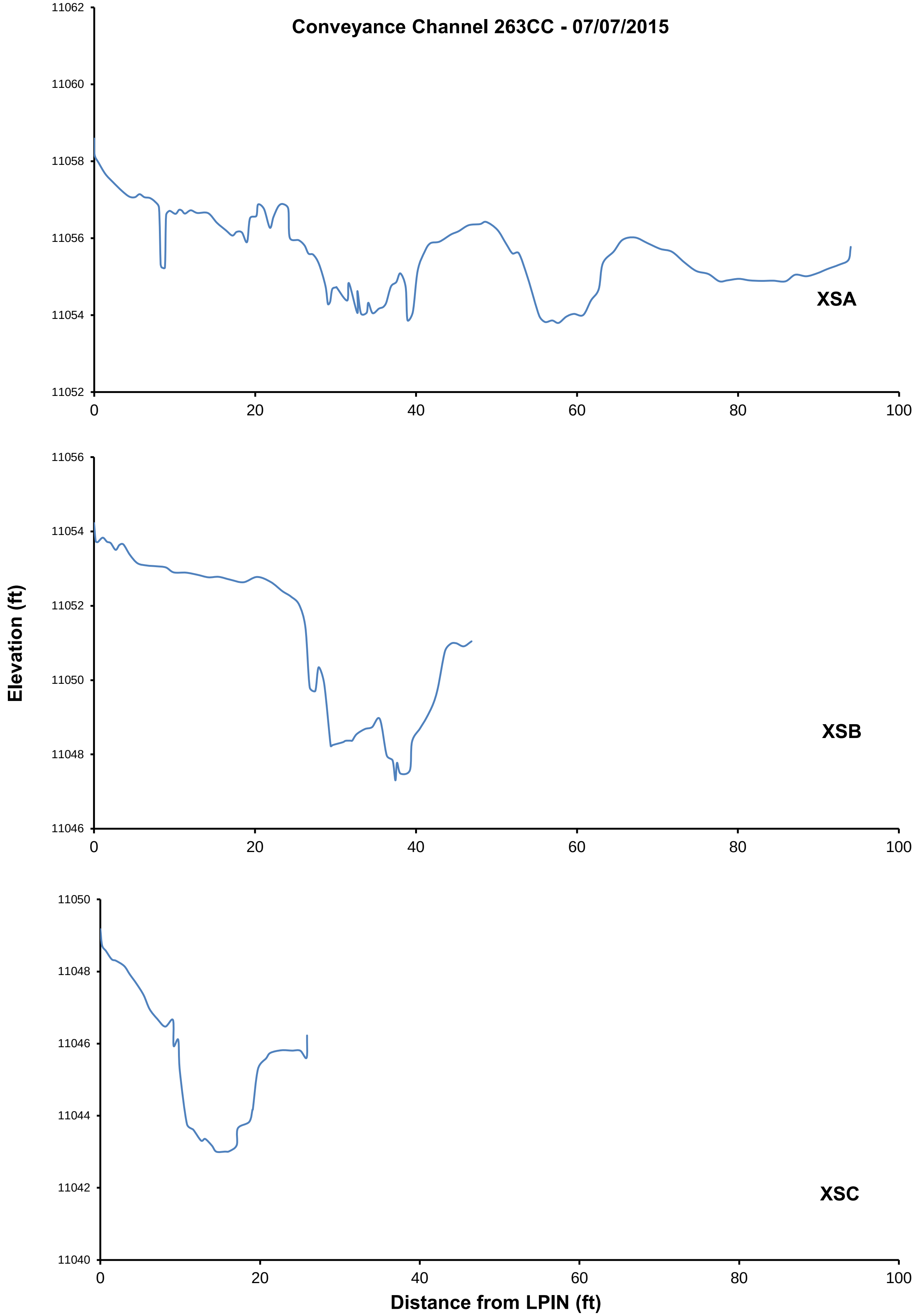

Conveyance Channel 247CC - 07/23/2015
XSA
LEW
REW
XSB
LEW
REW
XSC
LEW
REW
Elevation (ft)
Distance from LPIN (ft)
13092
13090
13088
13086
13084
13082
13086
13084
13082
13080
13078
13076
13083
13081
13079
13077
13075
13073
0
20
40
60
80
100
120
140
160

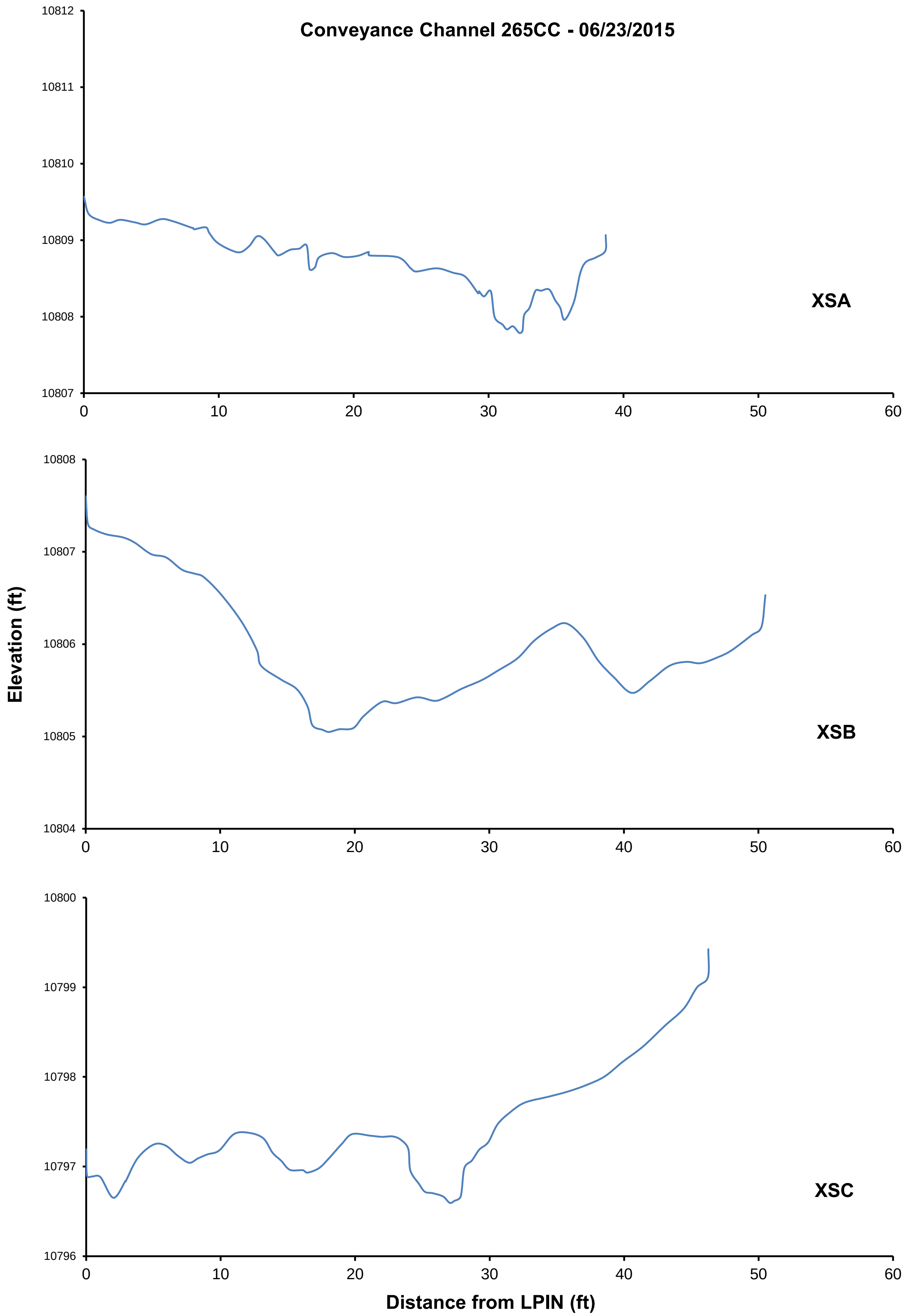


Conveyance Channel 251CC - 07/20/2015
Elevation (ft)
9629
9627
9625
9623
9621
XSA
0
10
20
30
40
50
60
9621
9619
9617
9615
9613
XSB
0
10
20
30
40
50
60
9613
9611
9609
9607
9605
XSC
0
10
20
30
40
50
60
Distance from LPIN (ft)



Conveyance Channel 253CC - 07/22/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10545
10543
10541
10539
10537
10535
10533
10531
10529
10527
10536
10534
10532
10530
10528
10526
0
10
20
30
40


Conveyance Channel 263CC - 07/07/2015
11062
11060
11058
11056
11054
11052
0
20
40
60
80
100
XSA
11056
11054
11052
11050
11048
11046
0
20
40
60
80
100
XSB
Elevation (ft)
11050
11048
11046
11044
11042
11040
0
20
40
60
80
100
XSC
Distance from LPIN (ft)



Conveyance Channel 265CC - 06/23/2015
10812
10811
10810
10809
10808
10807
0
10
20
30
40
50
60
XSA
10808
10807
10806
10805
10804
XSB
Elevation (ft)
10800
10799
10798
10797
10796
XSC
Distance from LPIN (ft)

Appendix J

Rock Weir and Sediment Pond

Site Visit Dates

Sediment Accumulation

and

Cross Section Graphs

2015

Site Visit Dates of Rock Weir Silt Fences, Pikes Peak 2015

Site ID	Site Visit Dates of Rock Weir Silt Fences on Pikes Peak, 2015																			
	5/20	5/26	5/27	5/28	5/29	6/2	6/15	6/16	6/17	6/22	6/30	7/13	7/28	8/10	8/19	8/24	9/17	9/23	9/24	9/30
002RW	X					X		O		X	X	X	X	X		X	X			X
003RW	X					X		X		X	X	X	X	X		X	X			X
006RW	X					X		X		X	X	X	X	X		X	X			X
008RW	X			X		X				X	X	X	X	X	X	X	X			
009RA	X			X		X				X	X	X	X	X		X	X			
161RW	X	X	X			X				X	X	X	X	X		X	X	X		
162RW	X		X			X				X	X	X	X	X		X	X			X
176RW	O				X	X	X			X	X	X	X	X		X	X	X		
200RW	X					X			X	X	X	X	X	X		X	X			
201RW	X					X				X	X	X	X	X		X	X			
202RW	O		X			X				X	X	X	X	X		X	O		O	

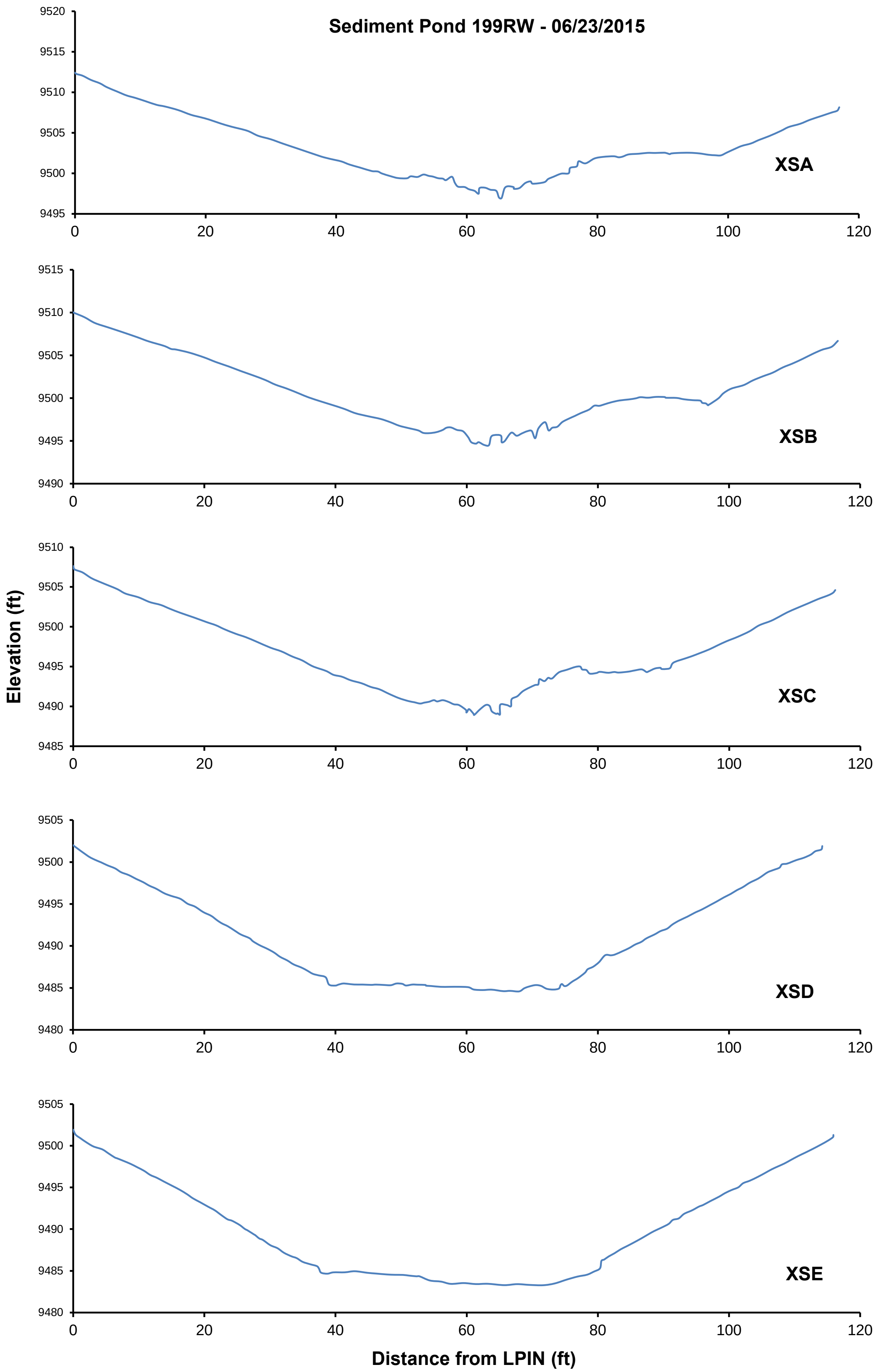
X Site visit, fence not cleaned-out.
O Site visit, fence cleaned-out.

Sediment Accumulation in Rock Weir Silt Fences, Pikes Peak 2015

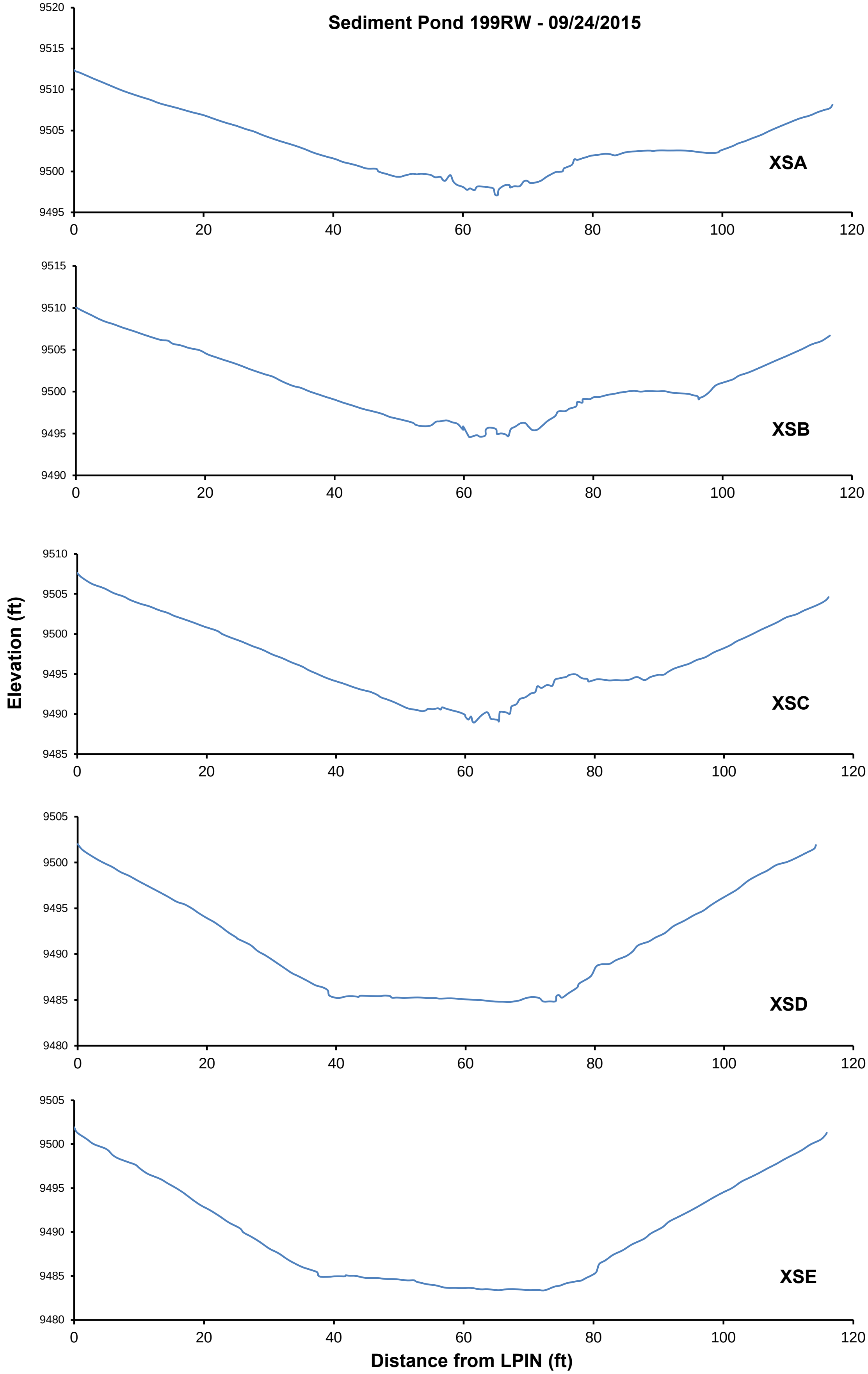
Site ID	Location	Date	Volume (ft^3)	Grab Sample
176RW	Silt Fence	5/20/15	0.07	Yes
202RW	Silt Fence	5/20/15	0.13	Yes
002RW	Silt Fence	6/16/15	0.07	Yes
202RW	Silt Fence	9/17/15	0.13	Yes
202RW	Silt Fence	9/24/15	0.13	Yes

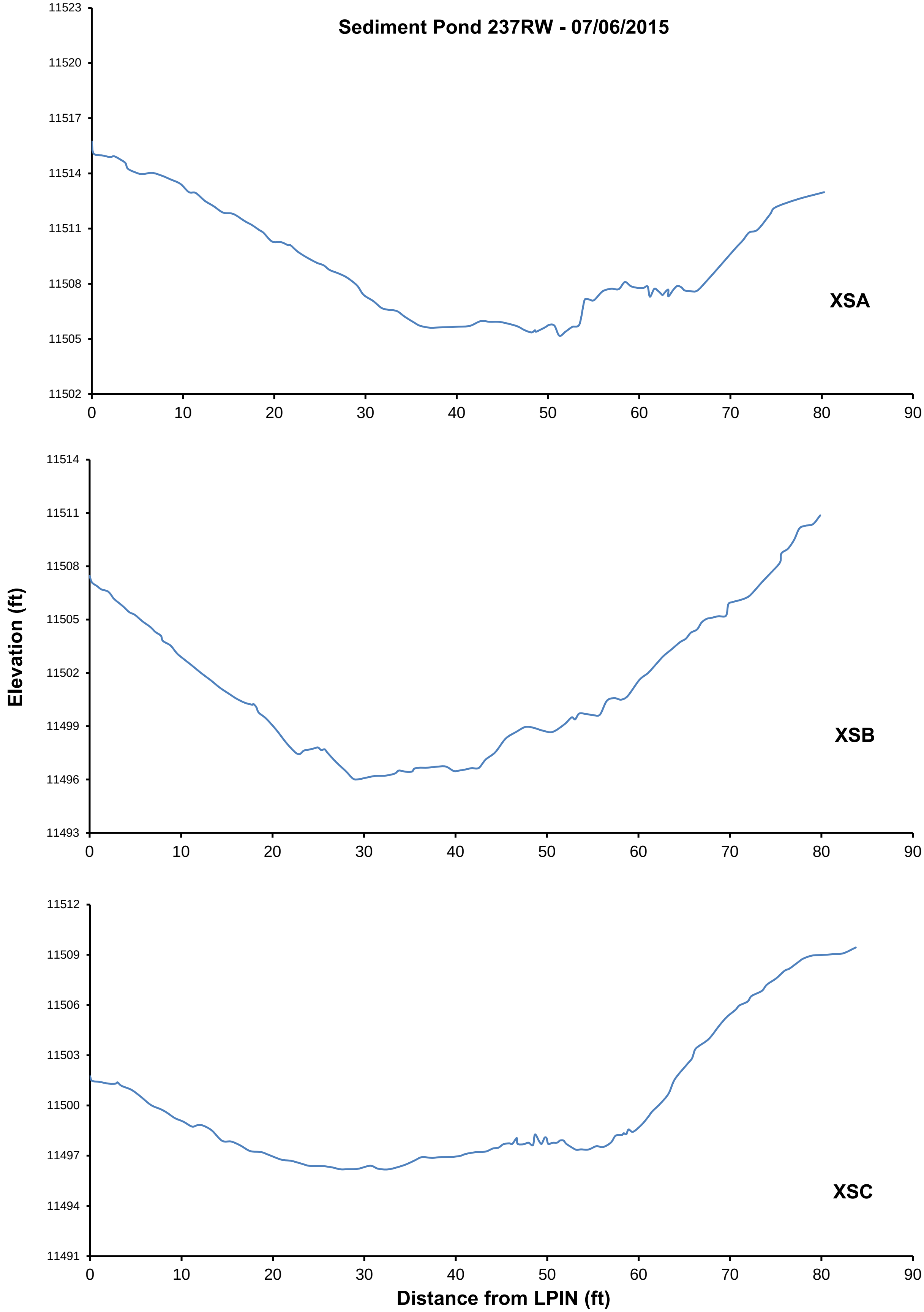
Rock Weir Sediment Accumulation Values, Pikes Peak 2015

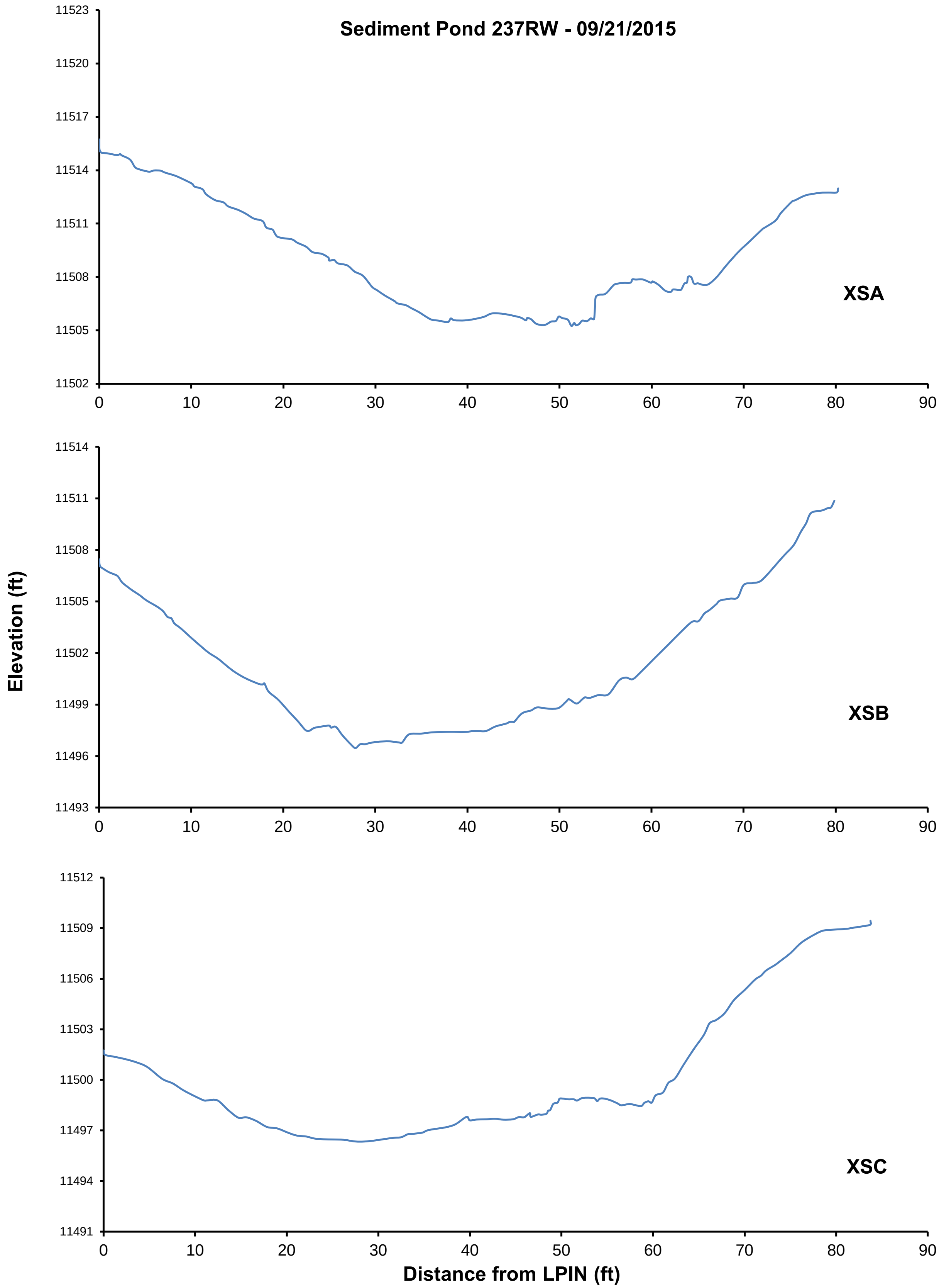
Site ID	Area (sq ft)	Survey1		Survey 2			
		Date	Average Elevation (ft)	Date	Average Elevation (ft)	Elevation Change (ft)	Volume Change (ft^3)
002RW	1679	6/16/15	8997.87	9/30/15	8997.92	0.05	84.11
003RW	521	6/16/15	8991.16	9/30/15	8991.23	0.07	36.47
006RW	798	6/16/15	8997.07	9/30/15	8997.03	-0.04	-33.52
008RW	1044	5/28/15	9498.98	8/19/15	9498.98	0.00	0.00
009RA	905	5/28/15	9695.77				
152RW	817	6/1/15	9791.72	9/24/14	9791.72	0.00	0.00
153RW	1568	6/3/15	9523.43	9/24/15	9523.44	0.01	23.17
161RW	263	5/27/15	9504.60	9/23/15	9504.72	0.12	30.83
162RW	130	5/27/15	9512.00	9/30/15	9511.99	-0.01	-1.30
176RW	372	6/15/15	10193.79	9/23/15	10193.71	-0.08	-29.50
200RW	412	6/17/15	9194.61				
201RW	183	5/29/15	9588.57				
202RW	179	5/27/15	9689.63	9/24/15	9689.61	-0.02	-2.87
233RW	359	7/2/15	11902.12	9/21/15	11902.32	0.20	71.80
239RW	381	7/28/15	12799.12				
241RW	1015	7/28/15	12551.93				
250RW	598	6/17/15	10117.35	9/23/15	10117.41	0.06	33.76

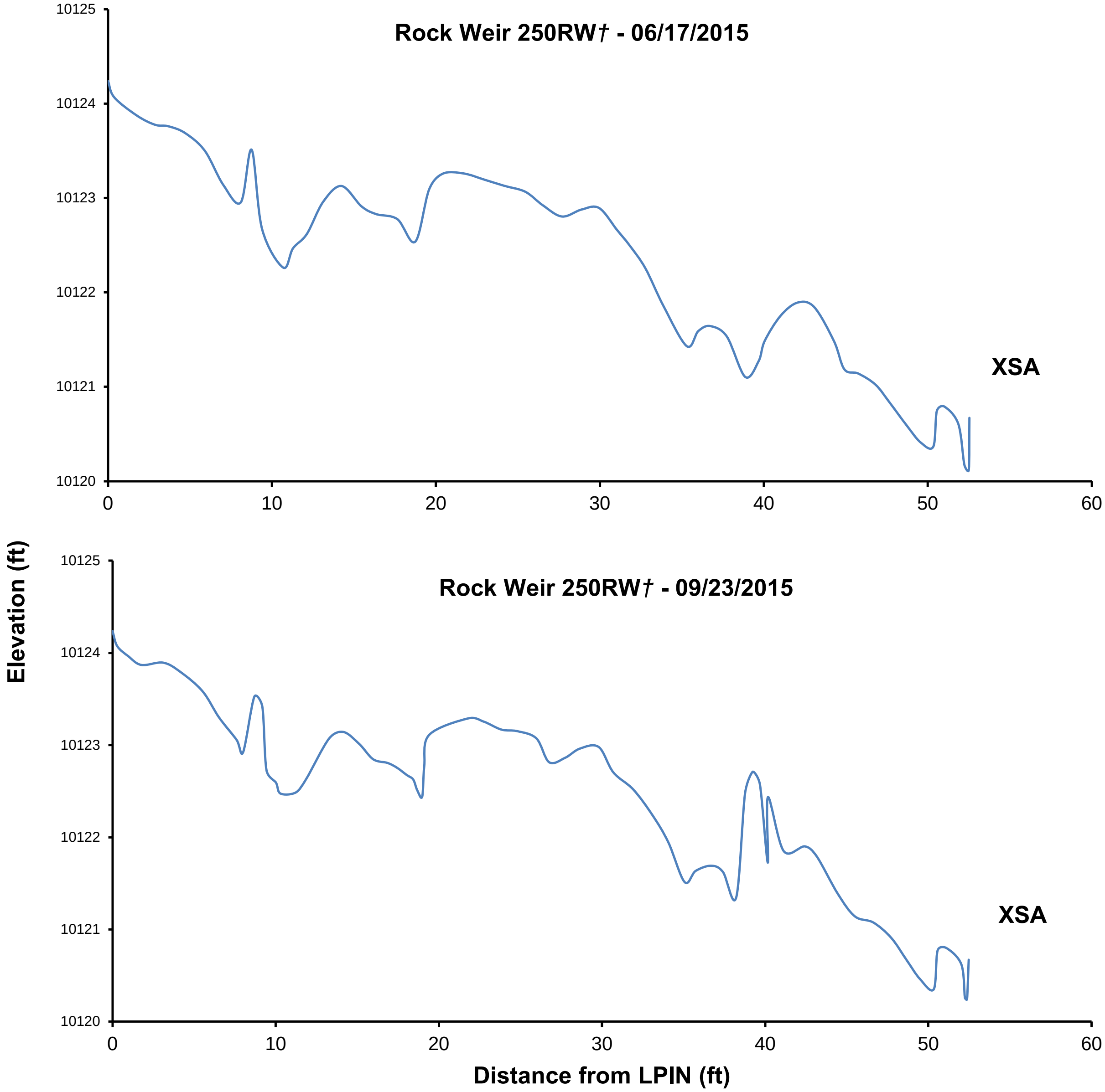


Sediment Pond 199RW - 06/23/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
9520
9515
9510
9505
9500
9495
9490
9485
9480
0
20
40
60
80
100
120

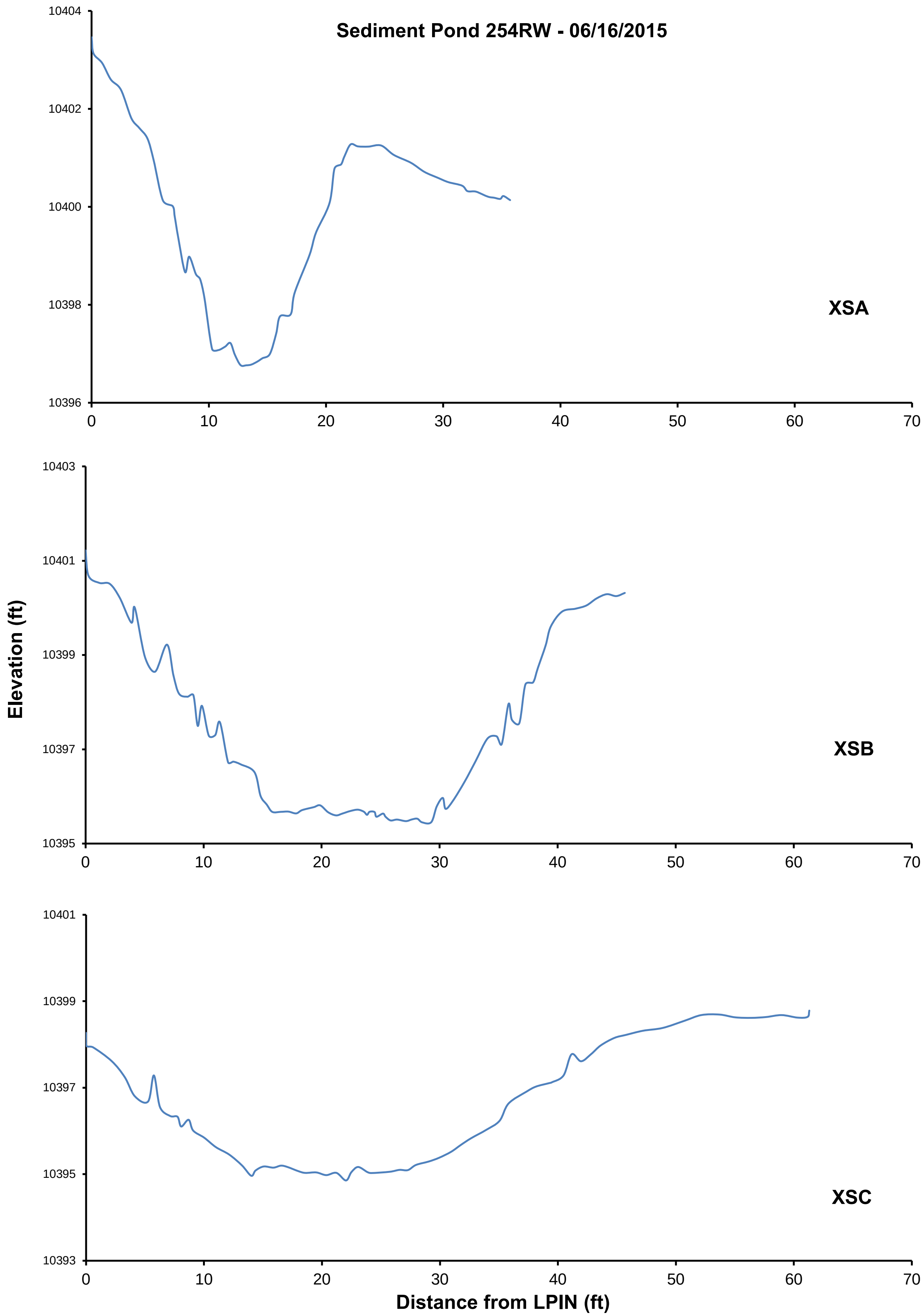

Sediment Pond 199RW - 09/24/2015
XSA
XSB
XSC
XSD
XSE
Elevation (ft)
Distance from LPIN (ft)
9520
9515
9510
9505
9500
9495
9490
9485
9480
0
20
40
60
80
100
120

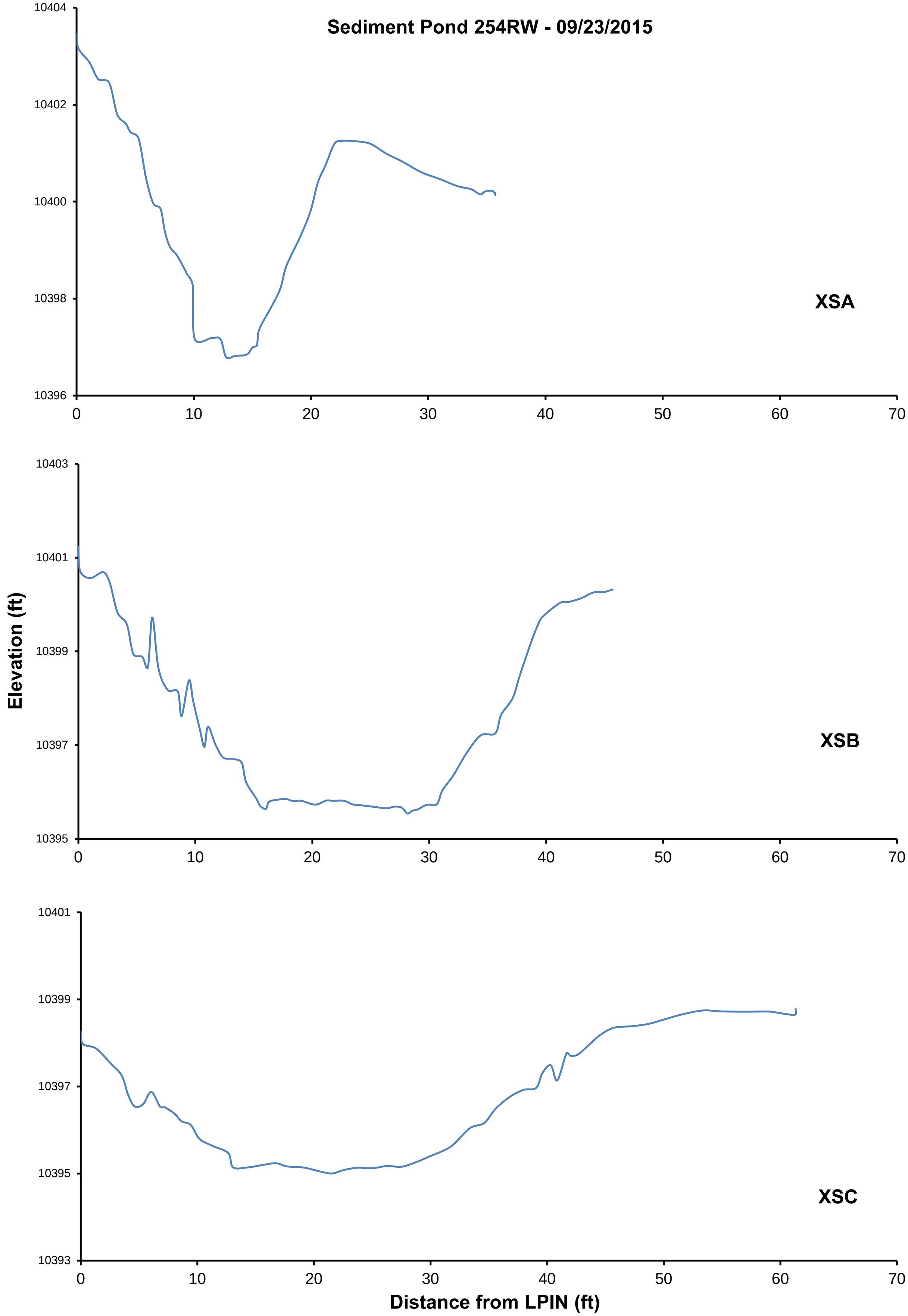

Sediment Pond 237RW - 07/06/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
11523
11520
11517
11514
11511
11508
11505
11502
11499
11496
11493
11512
11509
11506
11503
11500
11497
11494
11491
0
10
20
30
40
50
60
70
80
90

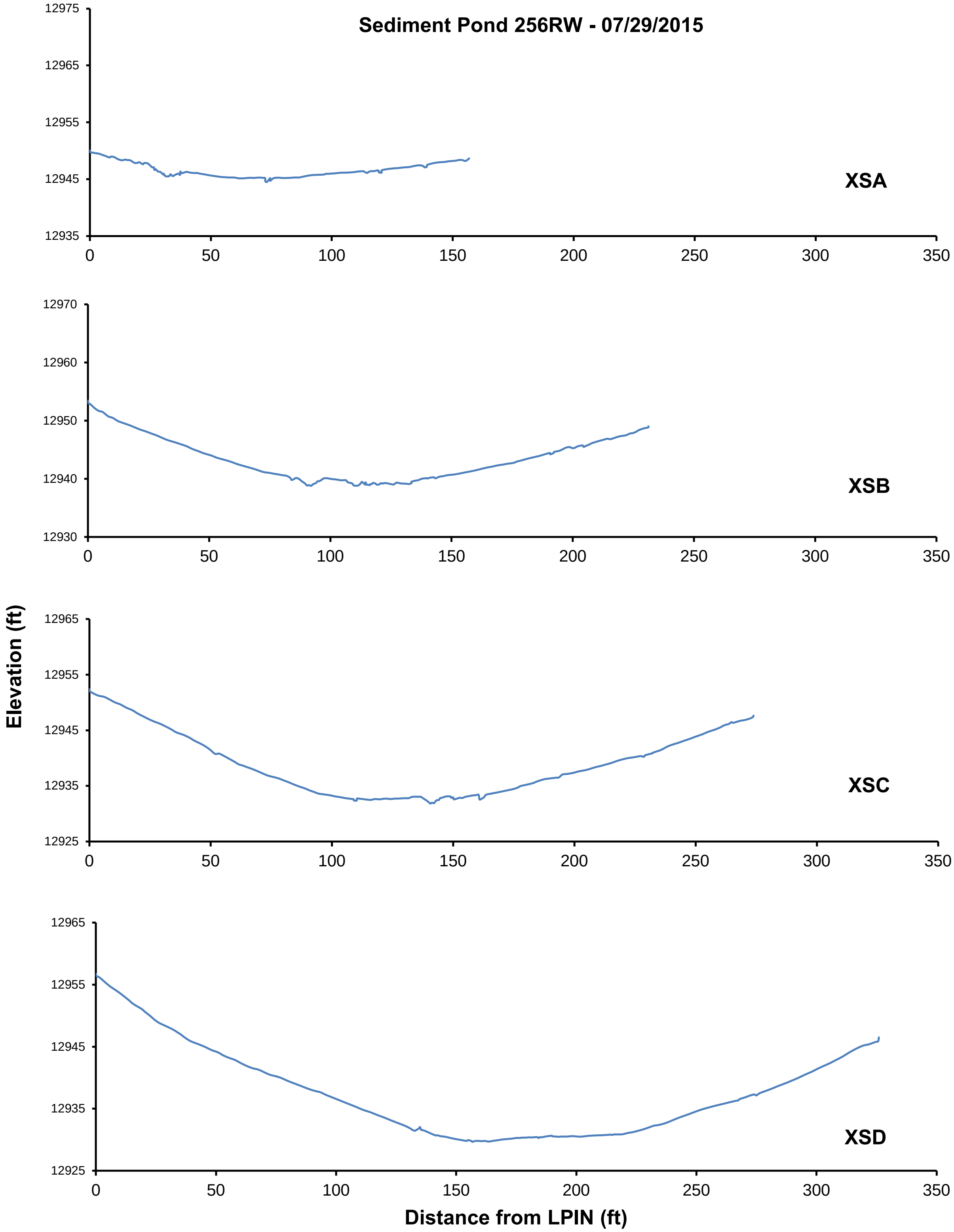

Sediment Pond 237RW - 09/21/2015
Elevation (ft)
XSA
XSB
XSC
Distance from LPIN (ft)
11523
11520
11517
11514
11511
11508
11505
11502
11499
11496
11493
11512
11509
11506
11503
11500
11497
11494
11491
0
10
20
30
40
50
60
70
80
90

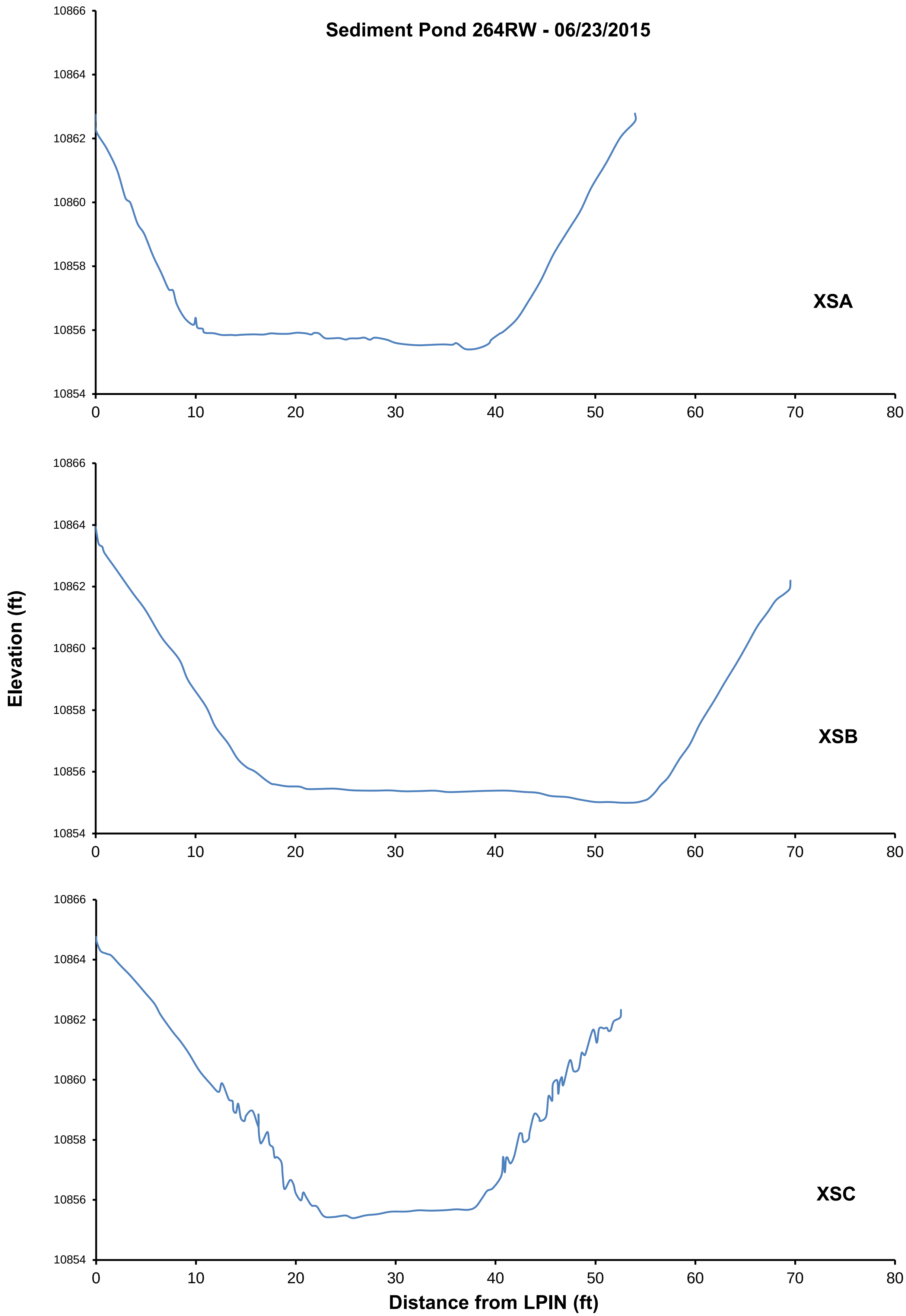


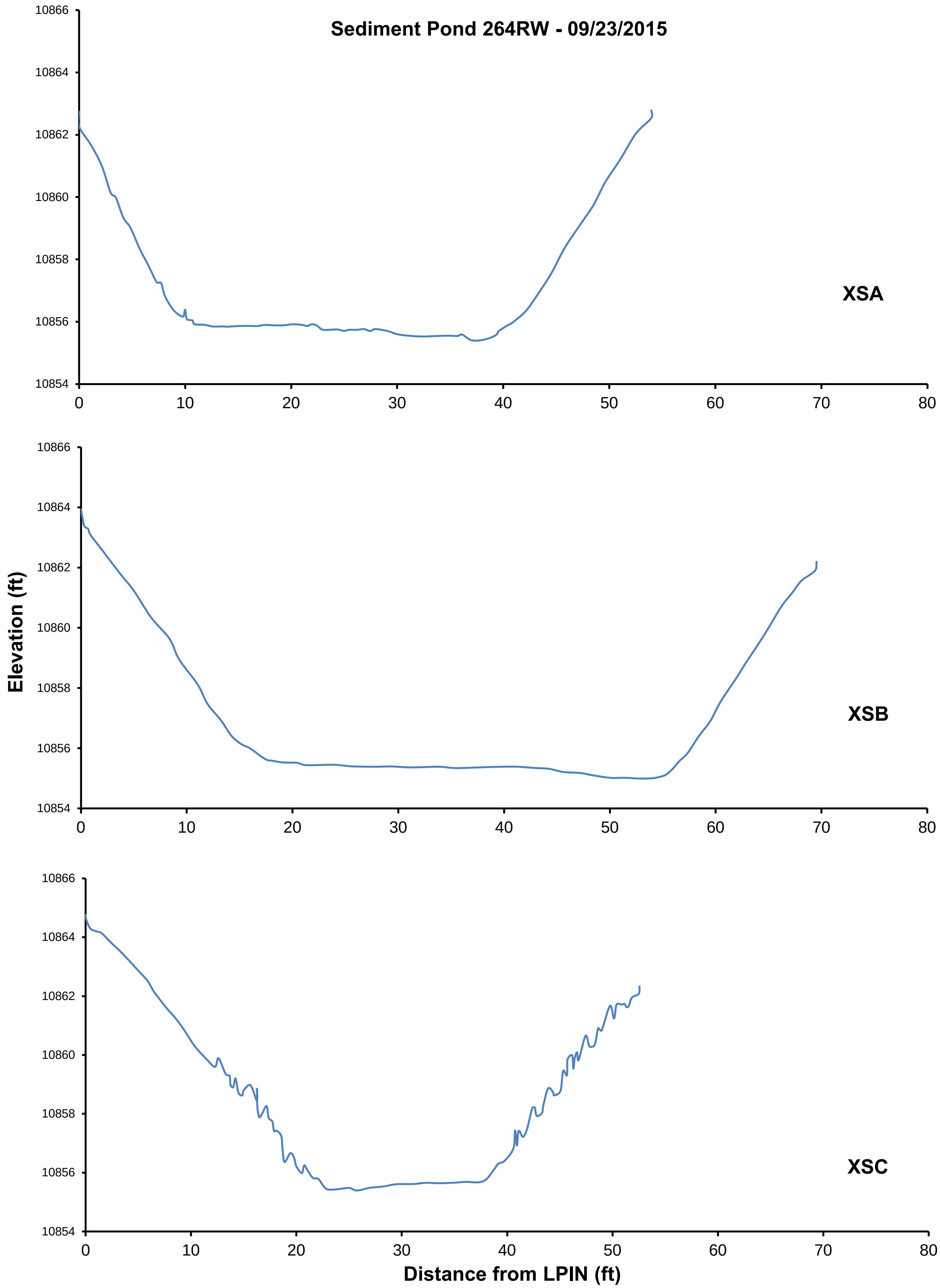
† Cross section established on cut slope above rock weir


Sediment Pond 254RW - 06/16/2015
10404
10402
10400
10398
10396
0
10
20
30
40
50
60
70
XSA
10403
10401
10399
10397
10395
XSB
10401
10399
10397
10395
10393
XSC
Elevation (ft)
Distance from LPIN (ft)


Sediment Pond 254RW - 09/23/2015
XSA
XSB
XSC
Elevation (ft)
Distance from LPIN (ft)
10404
10402
10400
10398
10396
10403
10401
10399
10397
10395
10393
0
10
20
30
40
50
60
70


Sediment Pond 256RW - 07/29/2015
XSA
XSB
XSC
XSD
Elevation (ft)
Distance from LPIN (ft)
12975
12965
12955
12945
12935
12970
12960
12950
12940
12930
12925
0
50
100
150
200
250
300
350


Sediment Pond 264RW - 06/23/2015
Elevation (ft)
10866
10864
10862
10860
10858
10856
10854
0
10
20
30
40
50
60
70
80
XSA
XSB
XSC
Distance from LPIN (ft)


Sediment Pond 264RW - 09/23/2015
Elevation (ft)
10866
10864
10862
10860
10858
10856
10854
0
10
20
30
40
50
60
70
80
XSA
XSB
XSC
Distance from LPIN (ft)

Appendix K

Rock Weir and Sediment Pond

Particle Size Distribution Summary

and

Graphs

2015

Summary of Rock Weir and Silt Fence Particle Size Distribution from Sieve Analysis of Grab Samples, Pikes Peak 2015

			Particle Size Distribution (mm)–Grab Samples 2015					
Site Name	**ID**	**Date**	**D15**	**D35**	**D50**	**D84**	**D95**	**D100**
Pikes Peak Highway - Rock Weir	002RW Silt Fence	6/16/2015	0.009	0.031	0.076	0.563	1.087	12.0
Pikes Peak Highway - Rock Weir	002RW Rock Weir	6/10/2015	0.038	0.590	1.337	4.357	6.444	15.0
Pikes Peak Highway - Rock Weir	006RW Rock Weir	09/302015	0.668	1.864	3.024	7.405	14.351	22.0
Pikes Peak Highway - Rock Weir	008RW Rock Weir	5/28/2015	0.382	1.310	2.408	6.978	11.158	16.0
Pikes Peak Highway - Rock Weir	153RW Rock Weir	9/24/2015	0.082	0.933	1.983	7.689	16.015	26.0
Pikes Peak Highway - Rock Weir	199RW Sed Pond	6/23/2015	0.516	1.252	2.148	6.703	12.956	18.0
Pikes Peak Highway - Rock Weir	202RW Silt Fence	5/20/2015	0.641	2.262	4.114	11.781	18.254	22.0
Pikes Peak Highway - Rock Weir	233RW Rock Weir	9/15/2015	0.127	0.879	1.451	4.622	12.989	21.0
Pikes Peak Highway - Rock Weir	237RW Sed Pond	7/6/2015	0.078	0.988	2.117	7.368	14.231	20.0
Pikes Peak Highway - Rock Weir	241RW Rock Weir	7/28/2015	0.069	0.742	1.360	5.394	11.564	17.0
Pikes Peak Highway - Rock Weir	250RW Rock Weir	6/17/2015	0.070	0.667	1.036	2.929	5.070	11.0
Pikes Peak Highway - Rock Weir	256RW Rock Weir	7/29/2015	0.018	0.142	0.560	2.397	5.313	9.0
Pikes Peak Highway - Rock Weir	264RW Sed Pond	9/23/2015	0.133	0.904	1.692	6.568	17.455	26.0

Sieve Analysis Worksheet

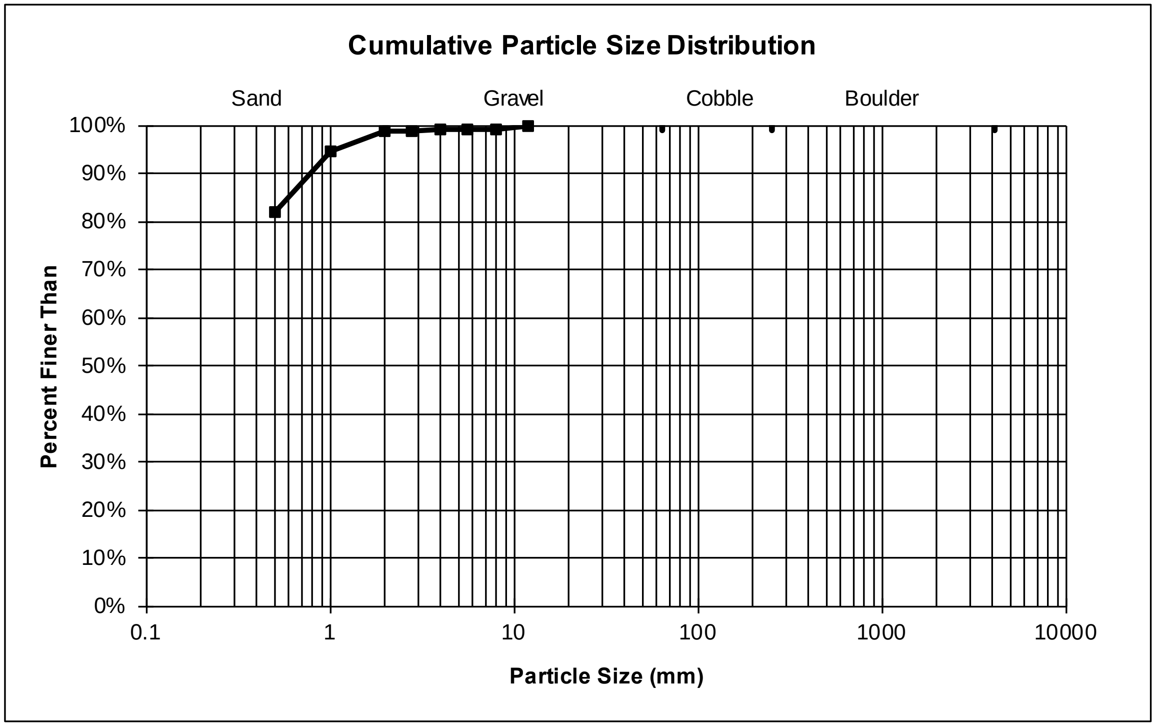
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	486.80	81.8%	
0.5	75.20	12.6%	81.8%
1.0	25.30	4.3%	94.5%
2.0	0.80	0.1%	98.7%
2.8	0.70	0.1%	98.9%
4.0	0.20	0.0%	99.0%
5.6	0.50	0.1%	99.0%
8.0	5.30	0.9%	99.1%
12.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	594.80		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **002RW Silt Fence**
DATE: 6/16/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.009	0.031	0.076	0.563	1.087	12.0



Sieve Analysis Worksheet

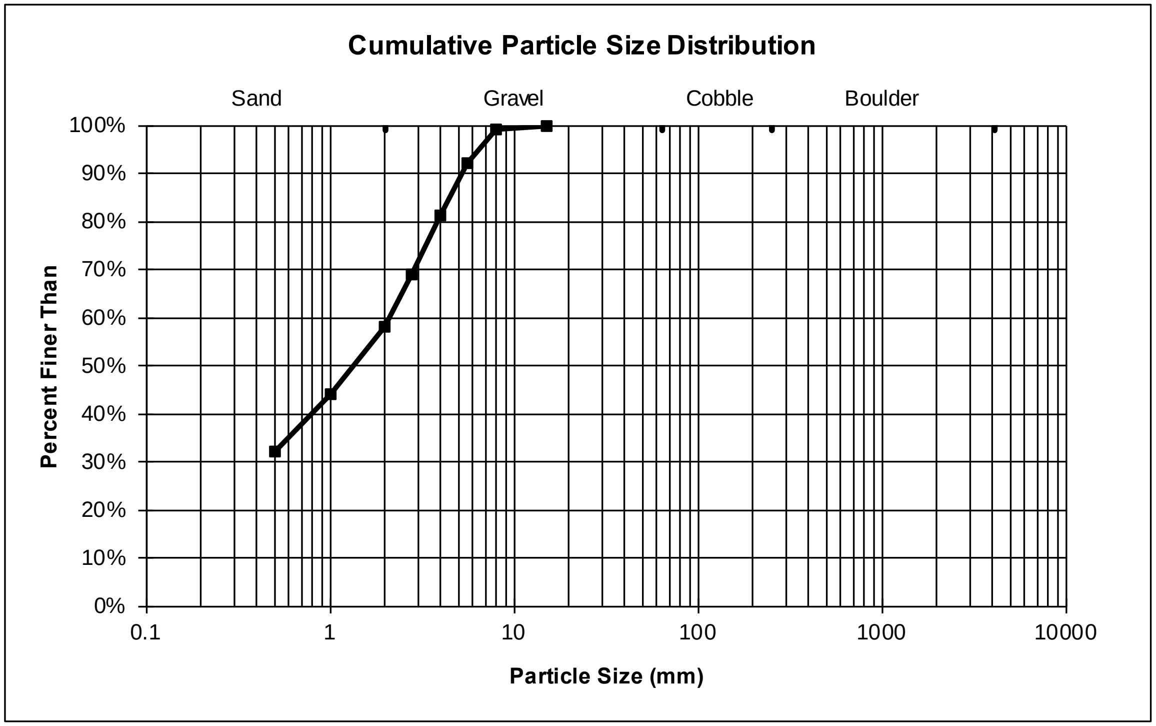
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	156.50	32.2%	
0.5	58.10	11.9%	32.2%
1.0	68.60	14.1%	44.1%
2.0	52.30	10.7%	58.2%
2.8	59.70	12.3%	68.9%
4.0	53.70	11.0%	81.2%
5.6	34.20	7.0%	92.2%
8.0	3.60	0.7%	99.3%
15.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	486.70		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **002RW**
DATE: 6/16/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.038	0.590	1.337	4.357	6.444	15.0



Sieve Analysis Worksheet

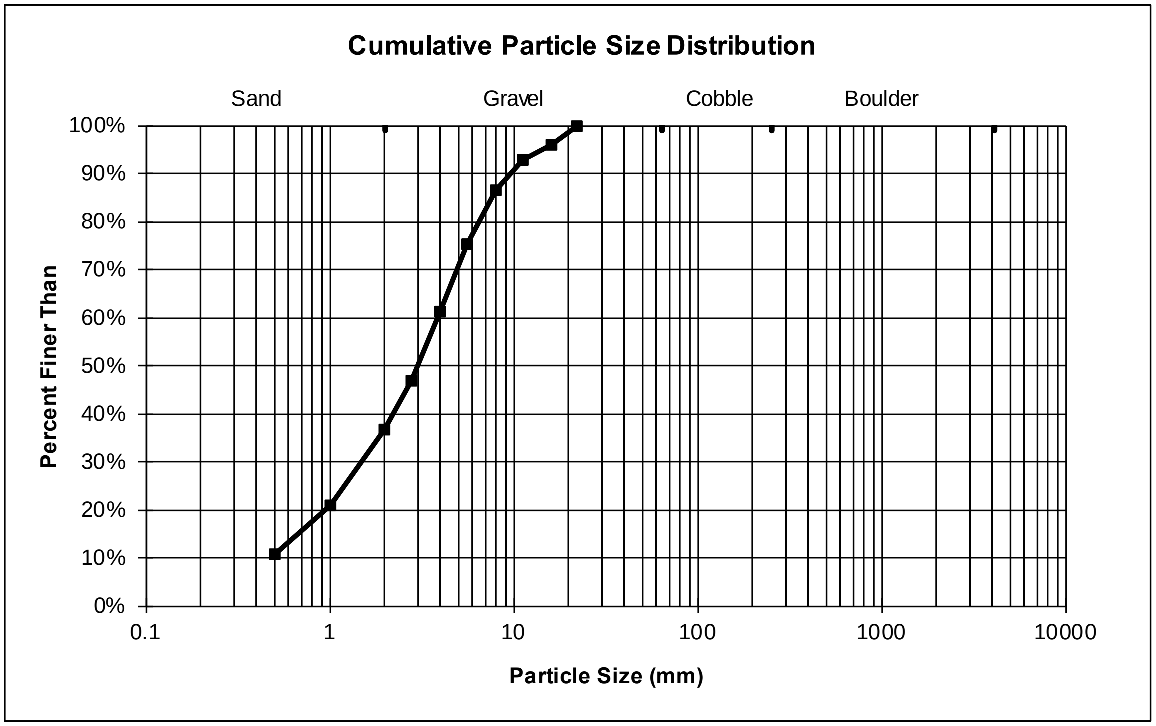
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	71.00	10.7%	
0.5	69.10	10.4%	10.7%
1.0	103.60	15.6%	21.0%
2.0	68.90	10.3%	36.6%
2.8	94.90	14.2%	46.9%
4.0	92.90	13.9%	61.2%
5.6	75.60	11.3%	75.1%
8.0	41.60	6.2%	86.5%
11.2	22.00	3.3%	92.7%
16.0	26.60	4.0%	96.0%
22.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	666.20		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **006RW**
DATE: 9/30/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.668	1.864	3.024	7.405	14.351	22.0



Sieve Analysis Worksheet

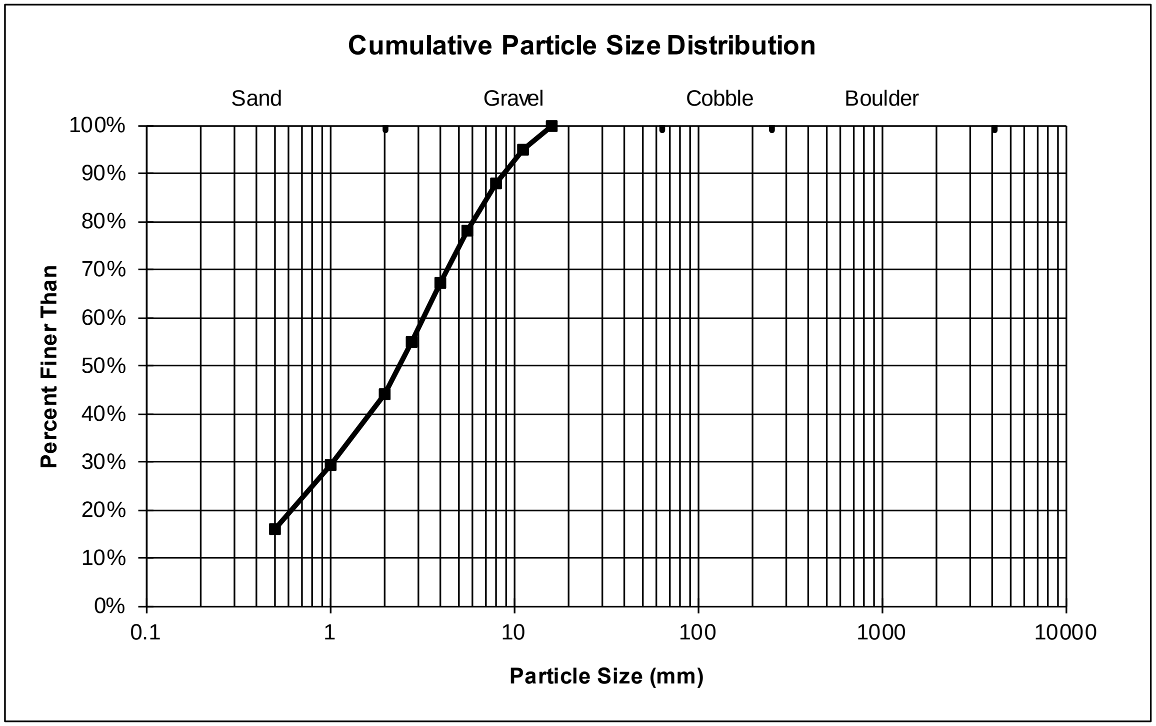
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	87.20	15.9%	
0.5	73.20	13.3%	15.9%
1.0	81.40	14.8%	29.2%
2.0	59.30	10.8%	44.0%
2.8	67.30	12.3%	54.8%
4.0	59.40	10.8%	67.1%
5.6	54.10	9.9%	77.9%
8.0	40.10	7.3%	87.8%
11.2	27.00	4.9%	95.1%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	549.00		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **008RW**
DATE: 5/28/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.382	1.310	2.408	6.978	11.158	16.0



Sieve Analysis Worksheet

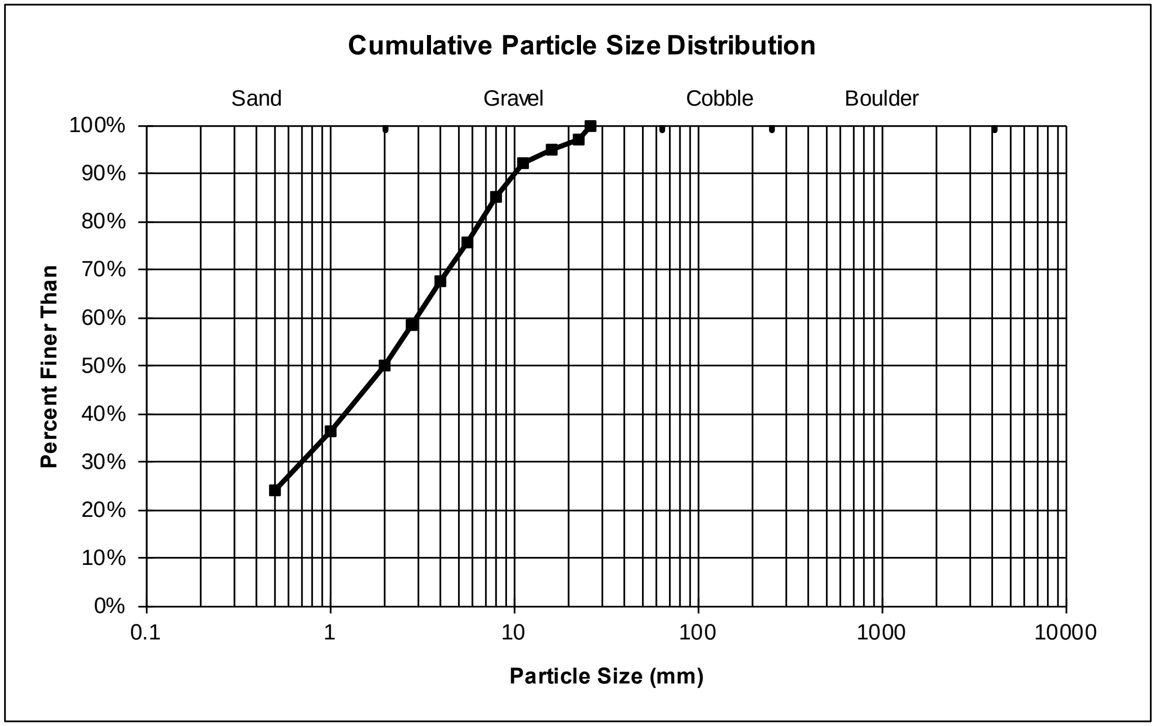
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	127.70	23.9%	
0.5	65.50	12.3%	23.9%
1.0	74.40	13.9%	36.2%
2.0	43.30	8.1%	50.2%
2.8	50.00	9.4%	58.3%
4.0	42.00	7.9%	67.7%
5.6	50.80	9.5%	75.5%
8.0	36.90	6.9%	85.1%
11.2	16.10	3.0%	92.0%
16.0	10.50	2.0%	95.0%
22.4	16.20	3.0%	97.0%
26.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	533.40		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **153RW**
DATE: 9/24/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.082	0.933	1.983	7.689	16.015	26.0



Sieve Analysis Worksheet

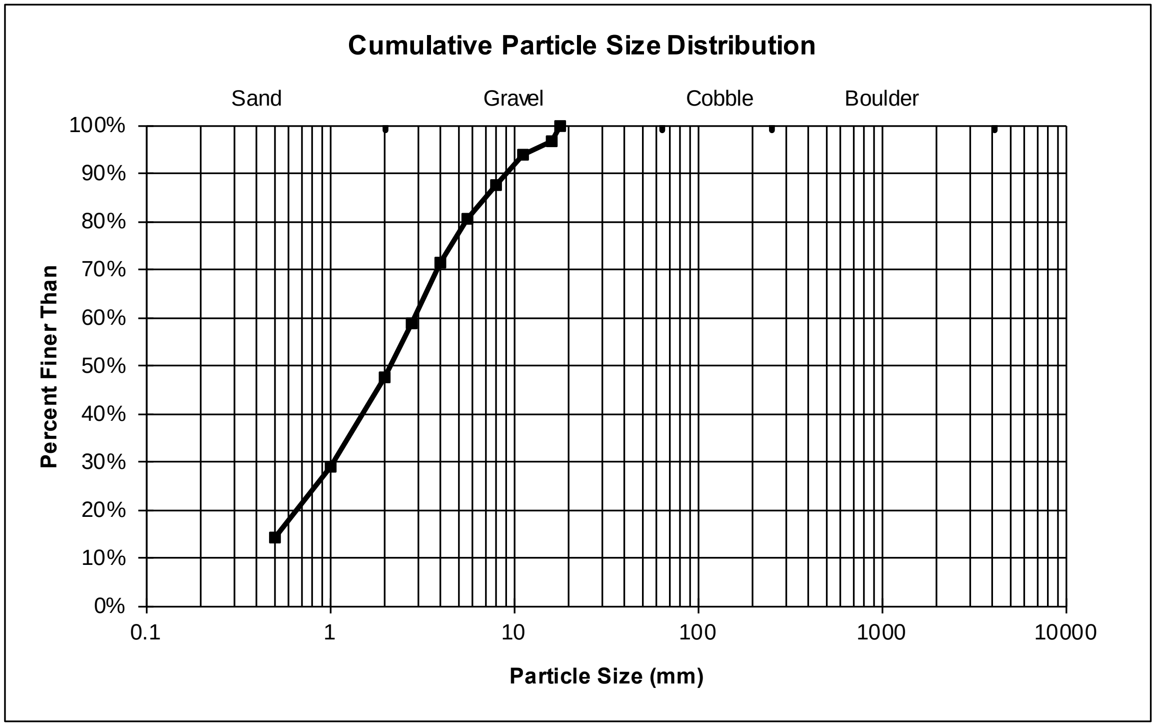
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	70.10	14.4%	
0.5	71.20	14.6%	14.4%
1.0	91.50	18.7%	28.9%
2.0	53.80	11.0%	47.7%
2.8	61.90	12.7%	58.7%
4.0	44.30	9.1%	71.3%
5.6	34.80	7.1%	80.4%
8.0	30.80	6.3%	87.5%
11.2	13.90	2.8%	93.8%
16.0	16.20	3.3%	96.7%
18.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	488.50		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Sediment Pond
ID NUMBER: **199RW**
DATE: 6/23/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.516	1.252	2.148	6.703	12.956	18.0



Sieve Analysis Worksheet

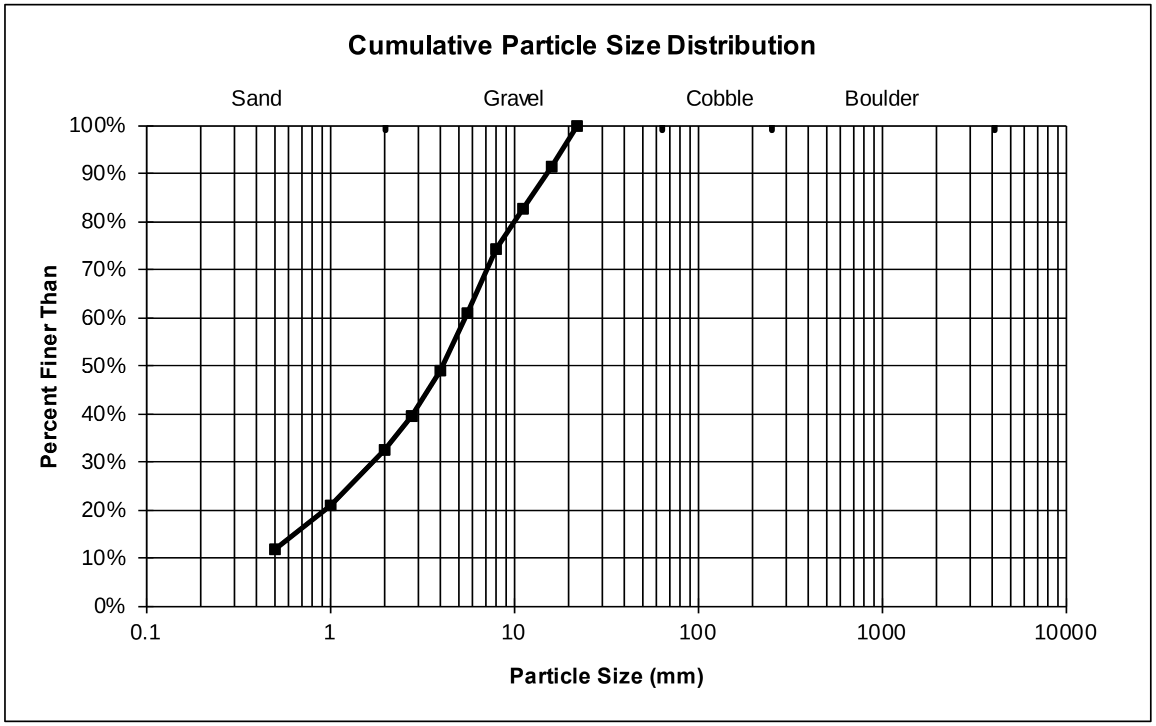
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	81.80	11.8%	
0.5	62.50	9.0%	11.8%
1.0	80.70	11.6%	20.8%
2.0	49.90	7.2%	32.4%
2.8	65.70	9.5%	39.5%
4.0	83.30	12.0%	49.0%
5.6	91.40	13.1%	61.0%
8.0	60.00	8.6%	74.1%
11.2	60.50	8.7%	82.8%
16.0	59.30	8.5%	91.5%
22.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	695.10		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Silt Fence
ID NUMBER: **202RW**
DATE: 5/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.641	2.262	4.114	11.781	18.254	22.0



Sieve Analysis Worksheet

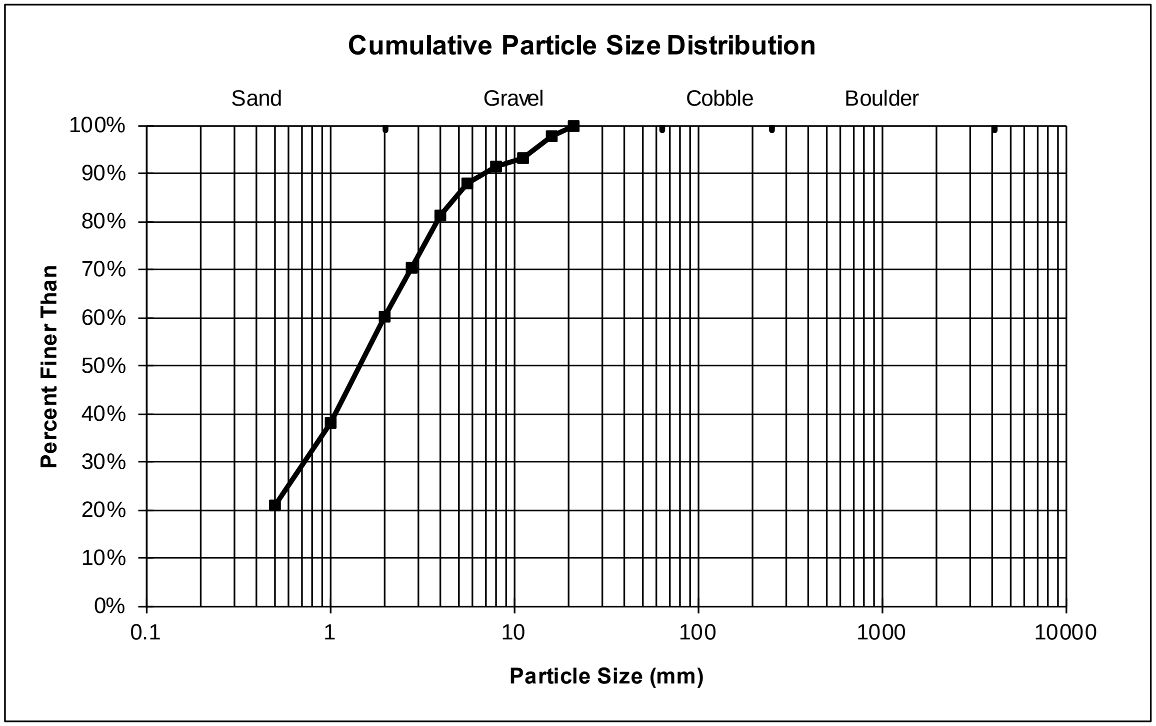
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	118.00	20.9%	
0.5	97.90	17.3%	20.9%
1.0	123.60	21.9%	38.2%
2.0	56.90	10.1%	60.1%
2.8	61.80	10.9%	70.2%
4.0	37.40	6.6%	81.2%
5.6	19.70	3.5%	87.8%
8.0	10.10	1.8%	91.3%
11.2	26.40	4.7%	93.1%
16.0	12.80	2.3%	97.7%
21.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	564.60		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **233RW**
DATE: 9/21/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.127	0.879	1.451	4.622	12.989	21.0



Sieve Analysis Worksheet

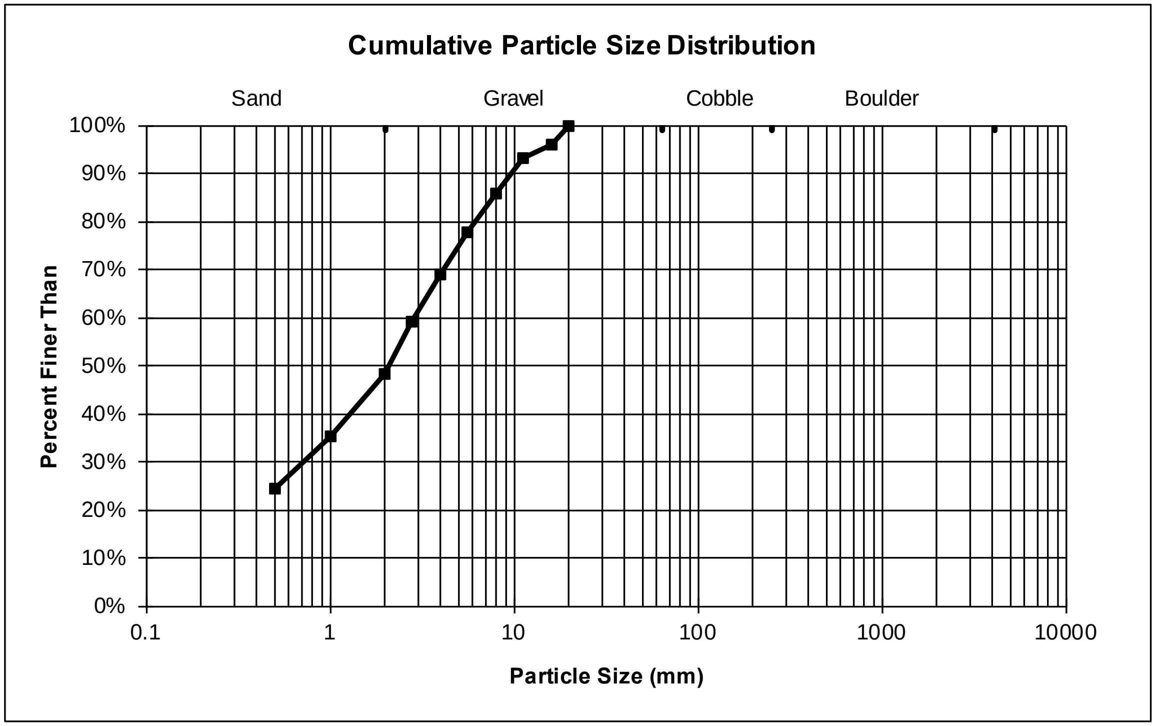
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	164.10	24.3%	
0.5	73.10	10.8%	24.3%
1.0	87.40	13.0%	35.2%
2.0	73.50	10.9%	48.2%
2.8	66.90	9.9%	59.1%
4.0	58.40	8.7%	69.0%
5.6	55.70	8.3%	77.6%
8.0	48.20	7.2%	85.9%
11.2	19.50	2.9%	93.1%
16.0	27.30	4.0%	96.0%
20.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	674.10		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Sediment Pond
ID NUMBER: **237RW**
DATE: 7/6/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.078	0.988	2.117	7.368	14.231	20.0



Sieve Analysis Worksheet

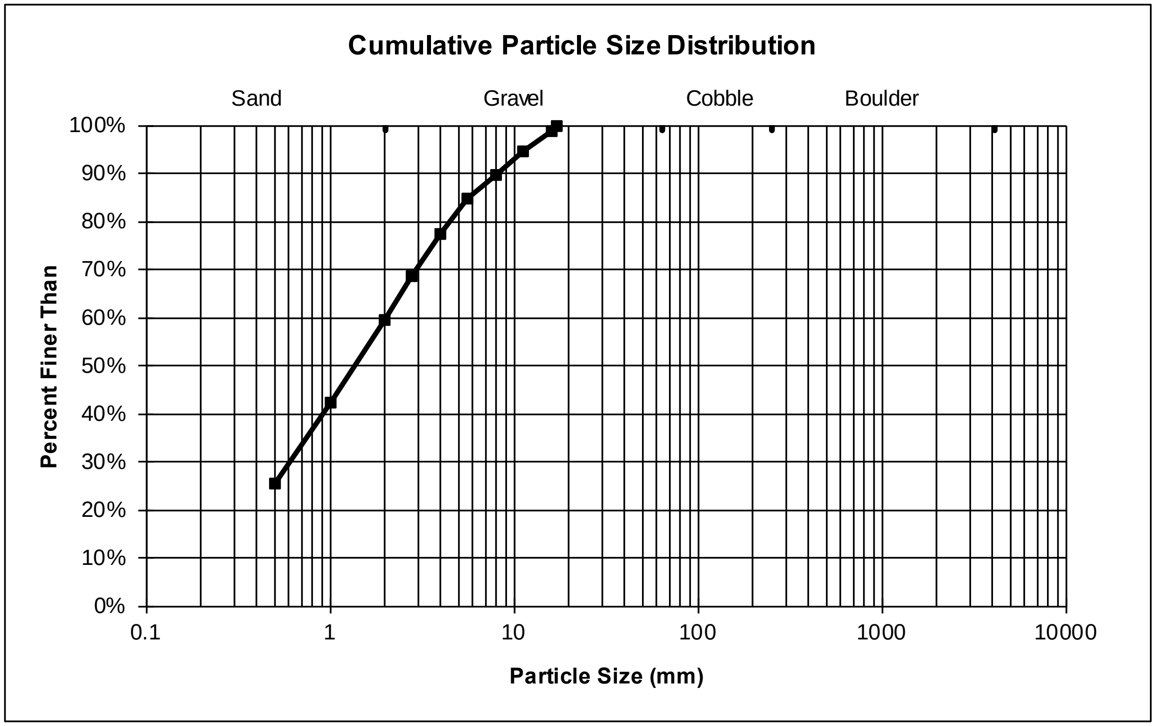
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	123.90	25.3%	
0.5	82.90	17.0%	25.3%
1.0	84.80	17.3%	42.3%
2.0	44.50	9.1%	59.6%
2.8	42.40	8.7%	68.7%
4.0	36.20	7.4%	77.4%
5.6	24.20	4.9%	84.8%
8.0	23.70	4.8%	89.8%
11.2	20.70	4.2%	94.6%
16.0	5.60	1.1%	98.9%
17.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	488.90		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **241RW**
DATE: 7/28/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.069	0.742	1.360	5.394	11.564	17.0



Sieve Analysis Worksheet

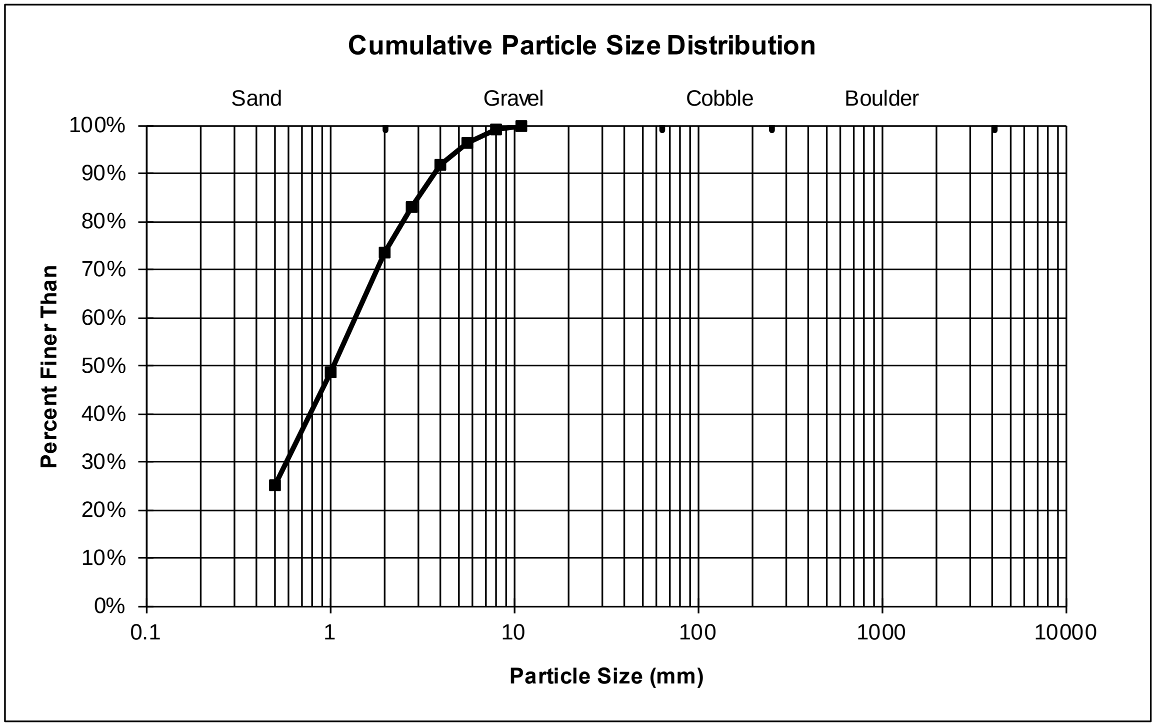
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	133.10	25.2%	
0.5	123.90	23.5%	25.2%
1.0	131.00	24.8%	48.7%
2.0	49.20	9.3%	73.6%
2.8	46.00	8.7%	82.9%
4.0	25.30	4.8%	91.6%
5.6	13.60	2.6%	96.4%
8.0	5.30	1.0%	99.0%
11.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	527.40		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Rock Weir
ID NUMBER: **250RW**
DATE: 6/17/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.070	0.667	1.036	2.929	5.070	11.0



Sieve Analysis Worksheet

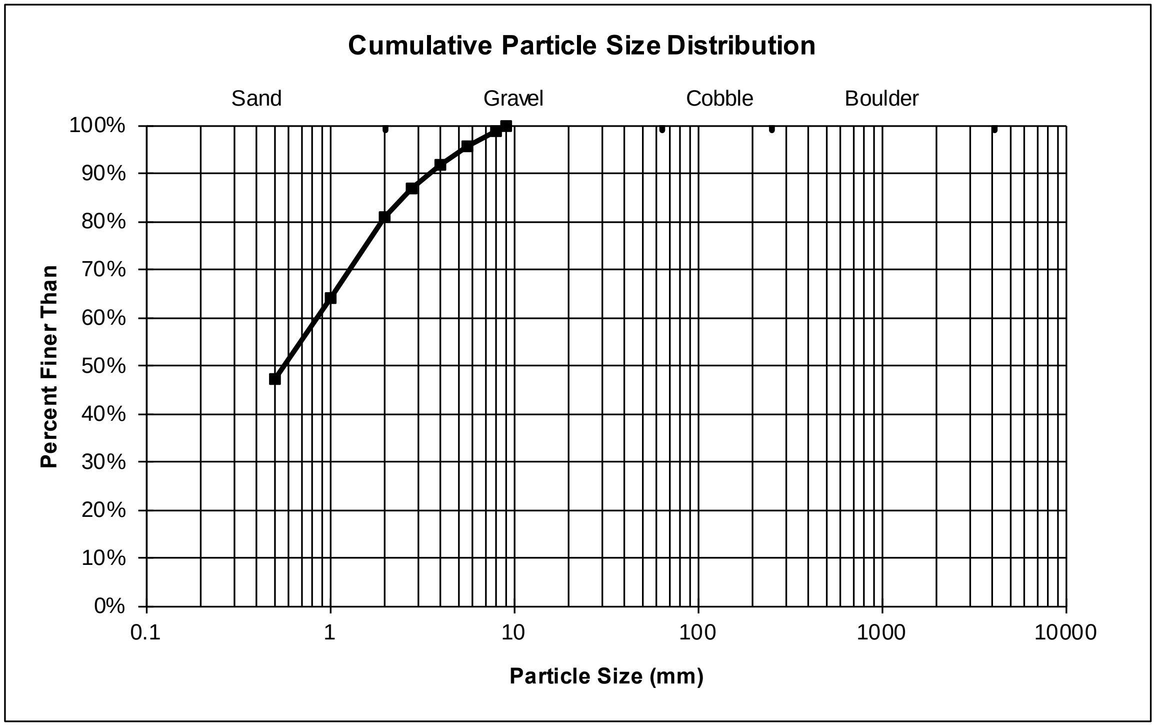
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	339.40	47.3%	
0.5	120.20	16.7%	47.3%
1.0	120.10	16.7%	64.0%
2.0	43.20	6.0%	80.8%
2.8	36.40	5.1%	86.8%
4.0	26.80	3.7%	91.9%
5.6	22.80	3.2%	95.6%
8.0	8.90	1.2%	98.8%
9.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	717.80		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Grab Sample of 2015 Sediment Accumulation

SITE NAME: Pike's Peak Highway - Sediment Pond
ID NUMBER: **256RW**
DATE: 7/29/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.018	0.142	0.560	2.397	5.313	9.0



Sieve Analysis Worksheet

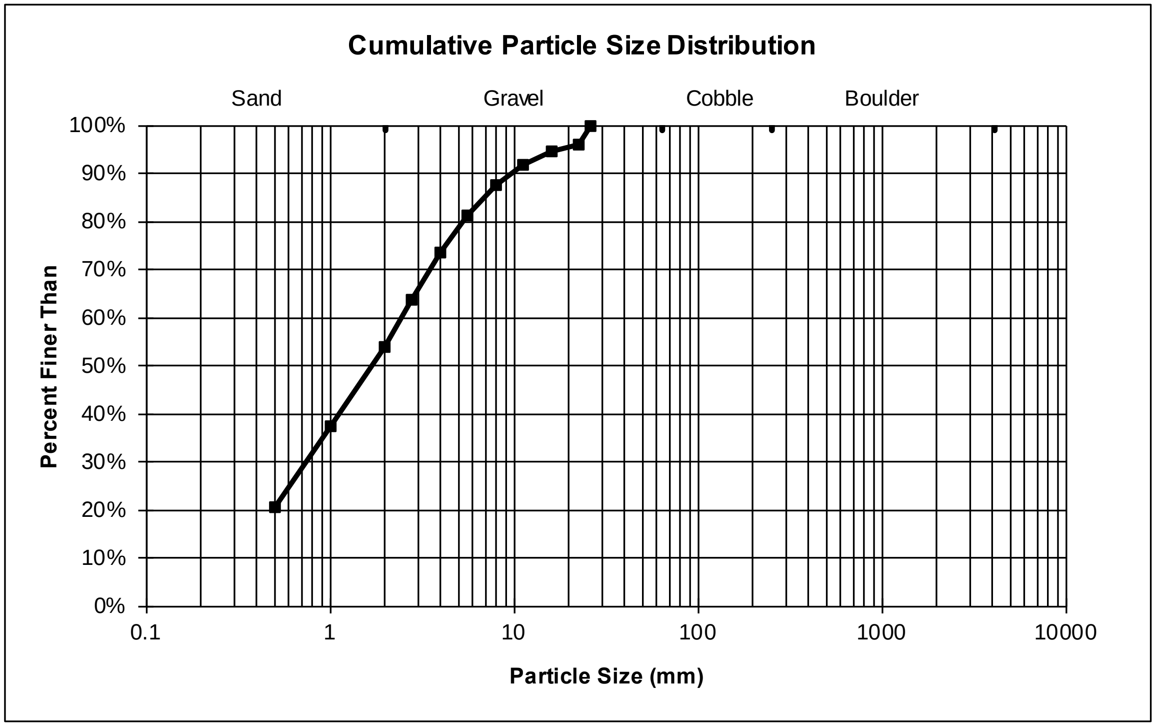
COMMENTS: Grab Sample of 2015 Sediment Accumulation

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	126.50	20.6%	
0.5	103.10	16.8%	20.6%
1.0	101.30	16.5%	37.5%
2.0	59.30	9.7%	54.0%
2.8	59.90	9.8%	63.7%
4.0	47.30	7.7%	73.4%
5.6	39.20	6.4%	81.1%
8.0	26.10	4.3%	87.5%
11.2	17.40	2.8%	91.8%
16.0	8.70	1.4%	94.6%
22.4	24.20	3.9%	96.1%
26.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	613.00		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pike's Peak Highway - Sediment Pond
ID NUMBER: **264RW**
DATE: 9/23/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.133	0.904	1.692	6.568	17.455	26.0



Appendix L

Sediment Pond

Suspended Sediment Data

2015

Summary of Sediment Pond Suspended Sediment Analysis of Grab Samples, Pikes Peak 2015

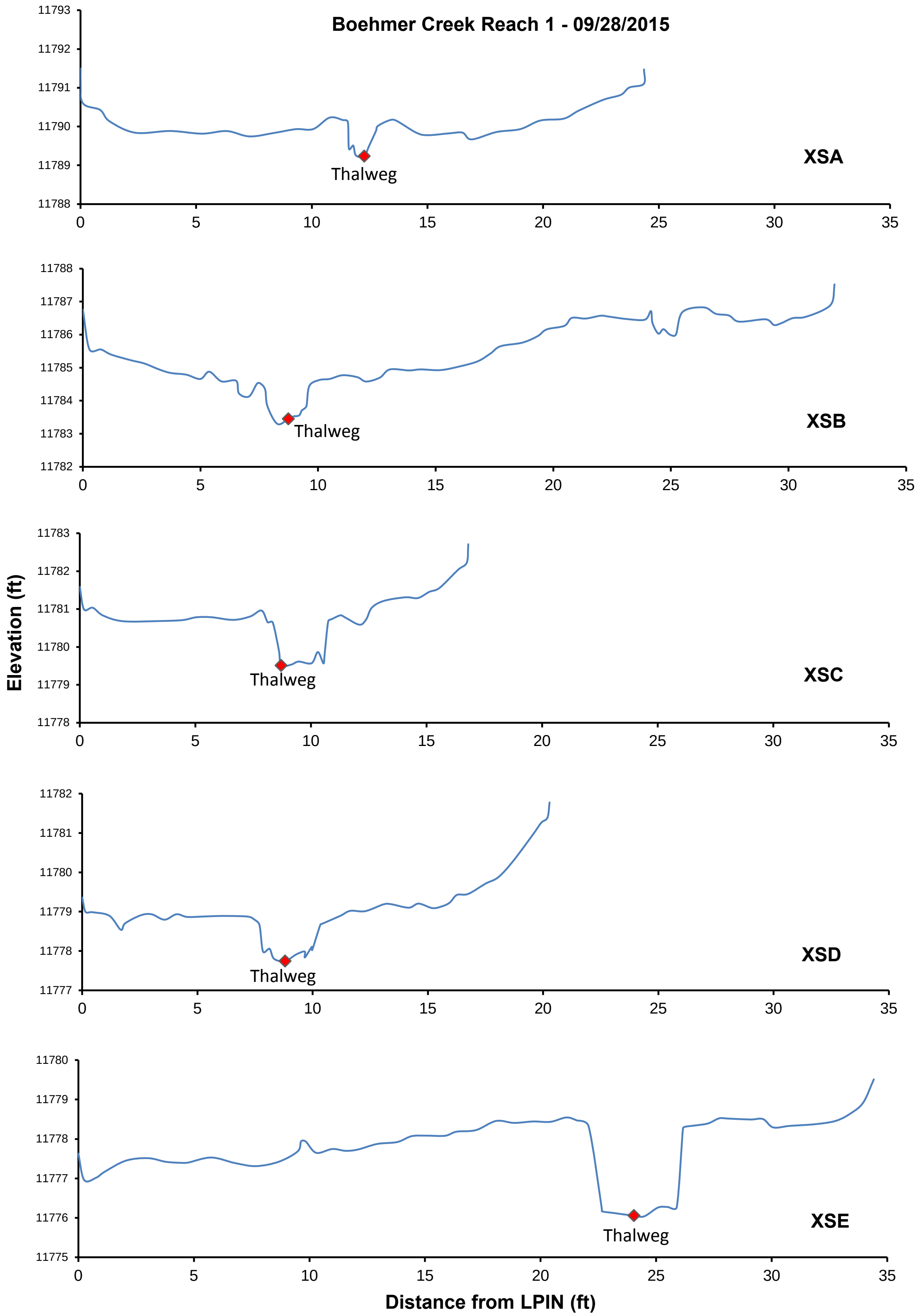
Sample ID	Date	Volume of Sample (L)	Dried Sediment Weight (mg)	Sediment Sample Total (mg/L)
199RW Entrance Culvert	05/28/15	1.00	72.8	80.9
199RW Above Sed Pond	05/28/15	1.02	3.6	3.5
199RW Exit Culvert	05/28/15	0.90	1.2	1.2
199RW Entrance Culvert	**07/08/15**	**0.96**	**599.0**	**582.3**
199RW Above Sed Pond	**07/08/15**	**0.96**	**460.3**	**479.5**
199RW Exit Culvert	**07/08/15**	**0.98**	**148.8**	**151.9**
199RW Entrance Culvert	07/13/15	0.91	411.6	452.3
199RW Above Sed Pond	07/13/15	1.00	484.4	526.5
199RW Exit Culvert	07/13/15	0.92	210.2	210.2
199RW Entrance Culvert	**09/03/15**	**0.88**	**28.7**	**32.6**
199RW Above Sed Pond	**09/03/15**	**1.05**	**20.0**	**19.0**
199RW Exit Culvert	**09/03/15**	**1.01**	**34.5**	**34.2**
237RW Entrance Culvert	07/02/15	1.03	273.9	265.9
237RW Exit Culvert	07/02/15	0.95	122.3	128.7
237RW Entrance Culvert	**07/13/15**	**0.80**	**197.5**	**246.9**
237RW Exit Culvert	**07/13/15**	**0.94**	**181.7**	**193.3**
237RW Entrance Culvert	08/11/15	0.95	170.8	179.8
237RW Exit Culvert	08/11/15	1.05	16.6	15.8
237RW Entrance Culvert	**09/03/15**	**0.98**	**349.1**	**356.2**
237RW Exit Culvert	**09/03/15**	**1.03**	**34.9**	**33.9**
262RW Entrance Culvert	07/02/15	1.01	174.9	173.1
262RW Above Sed Pond	07/02/15	0.94	243.0	258.5
262RW Exit Culvert	07/02/15	0.98	9.8	10.0
262RW Entrance Culvert	**07/08/15**	**1.01**	**183.2**	**181.4**
262RW Above Sed Pond	**07/08/15**	**1.06**	**196.5**	**185.4**
262RW Exit Culvert	**07/08/15**	**1.00**	**17.0**	**17.0**
262RW Entrance Culvert	08/11/15	1.00	233.5	233.5
262RW Above Sed Pond	08/11/15	1.01	1948.7	1929.4
262RW Exit Culvert	08/11/15	1.00	21.9	21.9

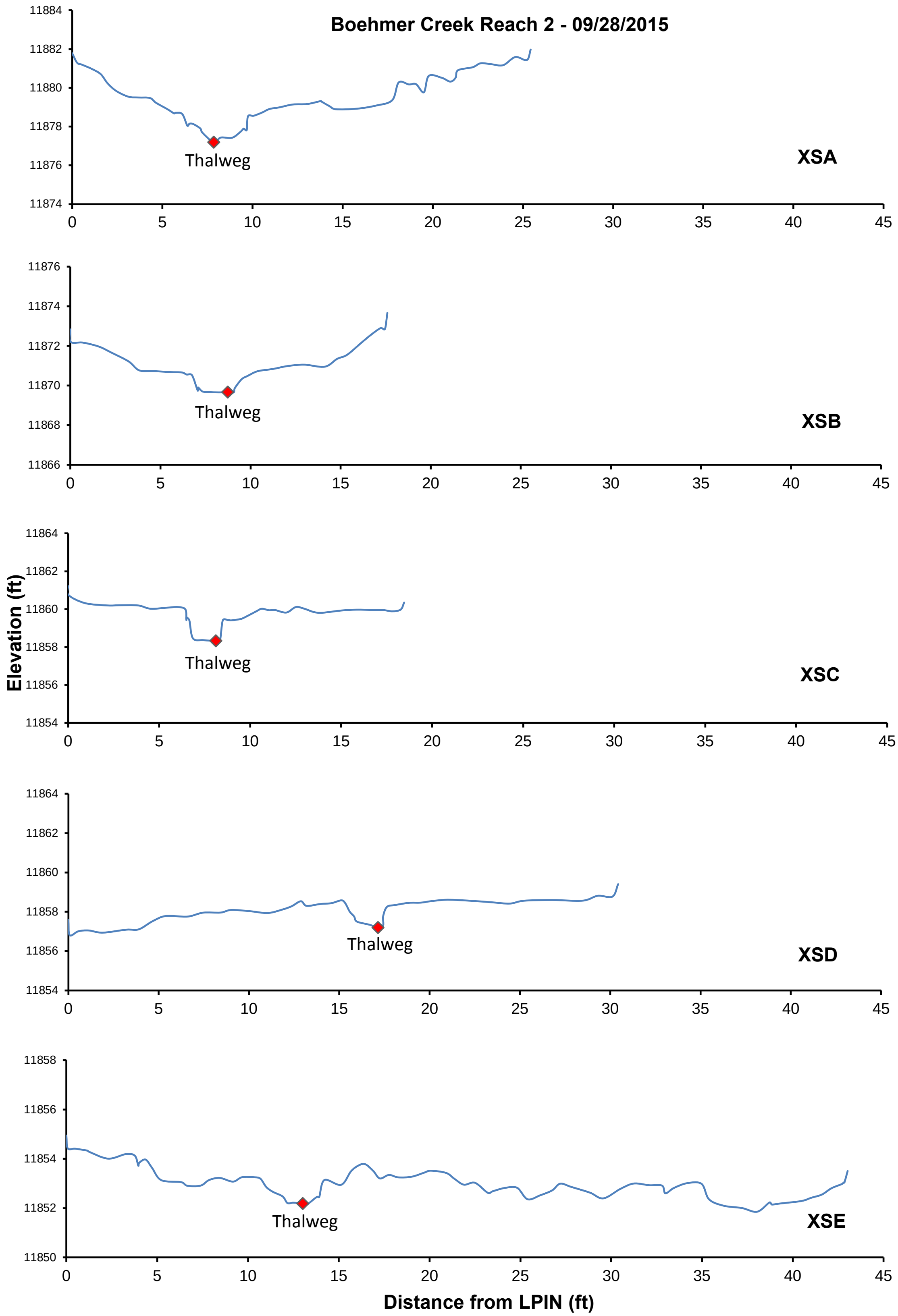
Appendix M

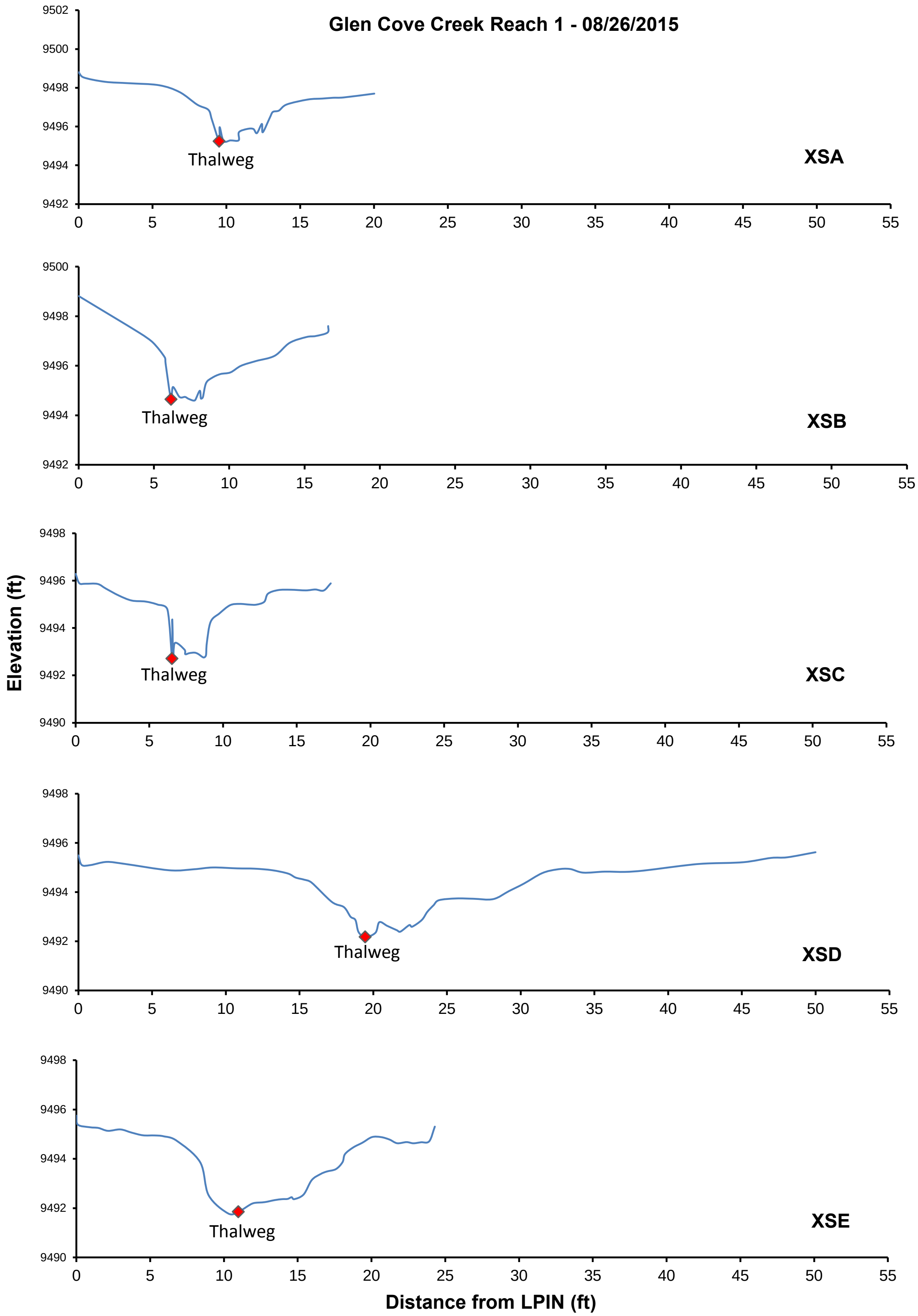
Stream Channel

Cross Section Graphs

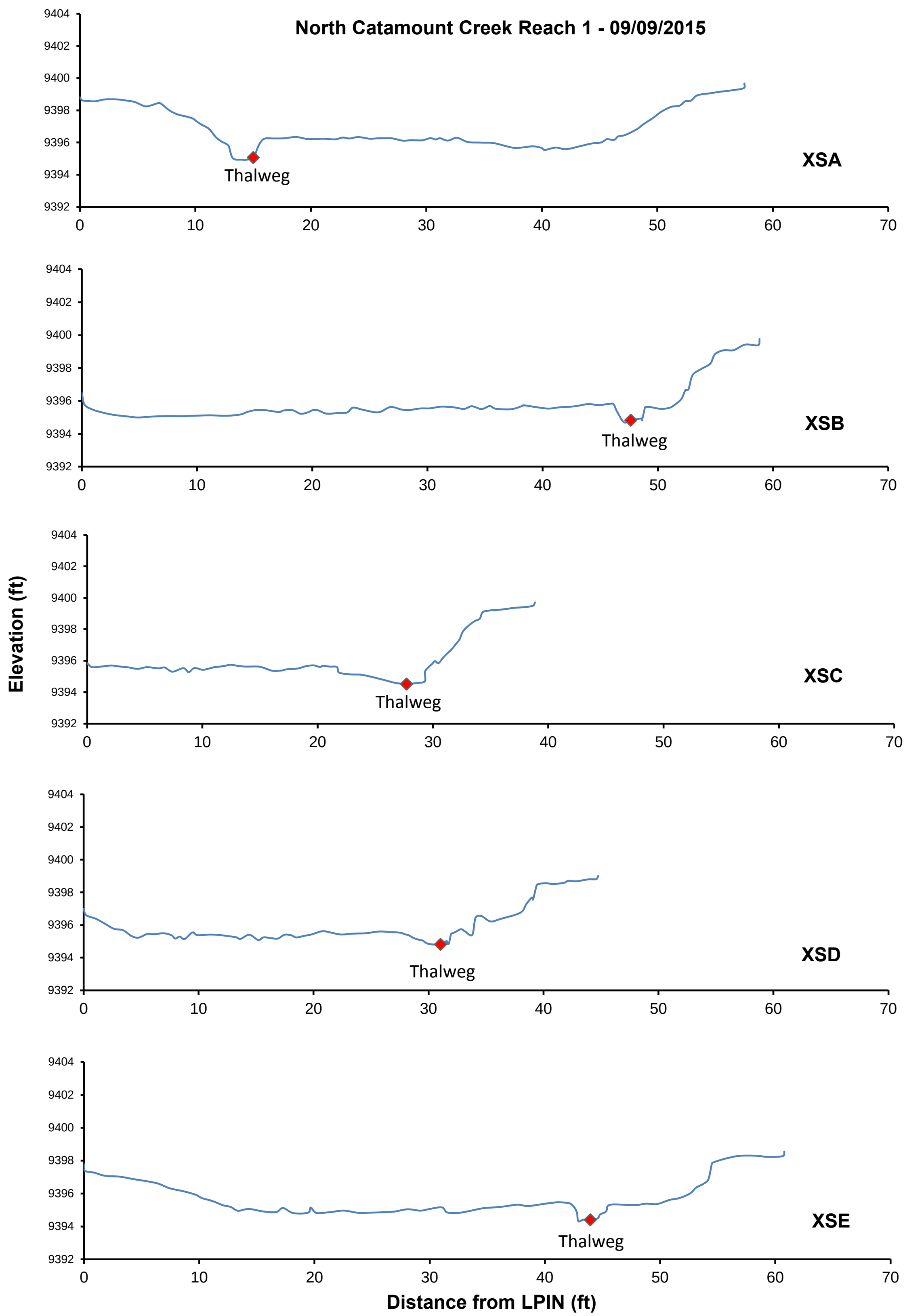
2015

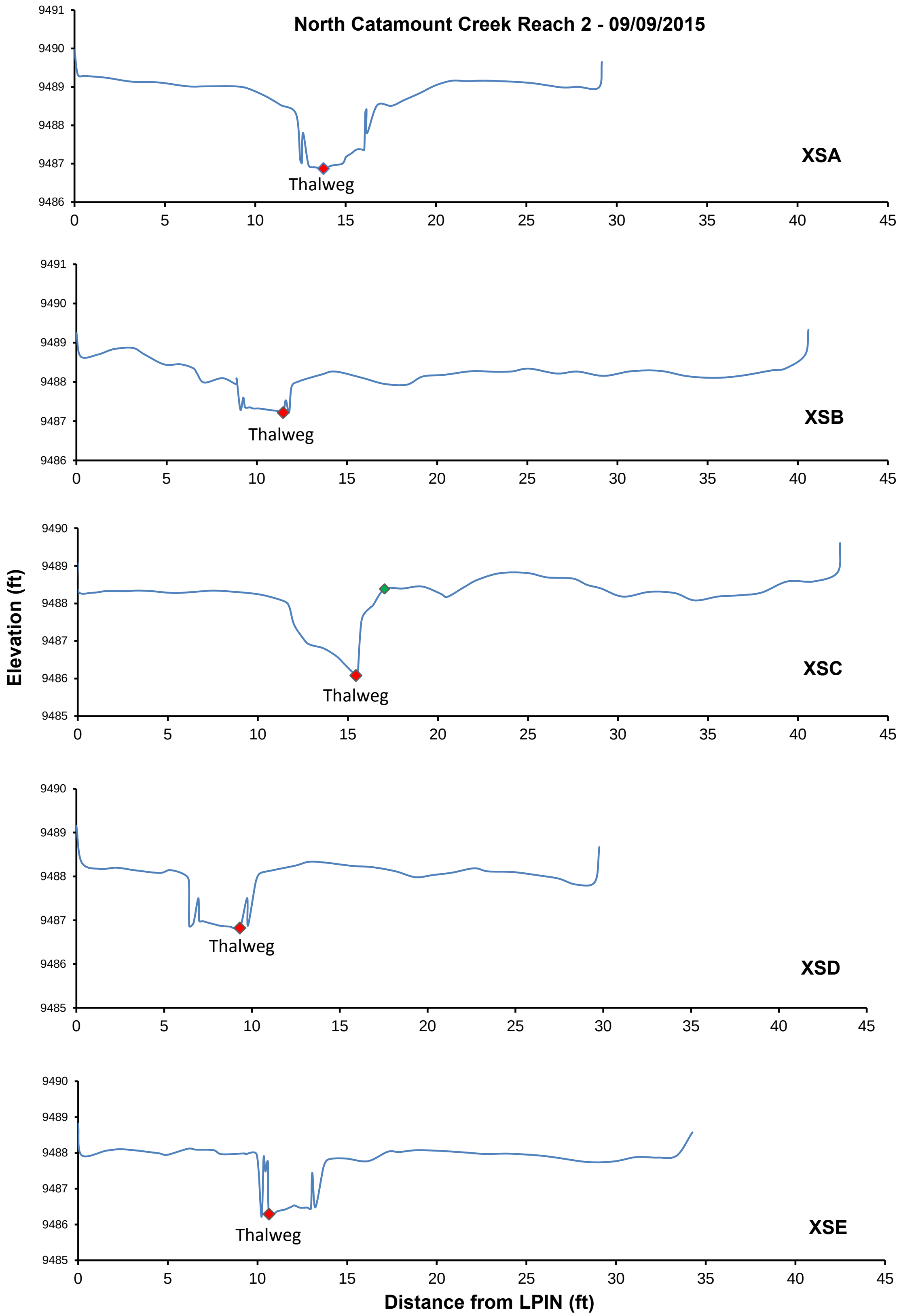

Boehmer Creek Reach 1 - 09/28/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)

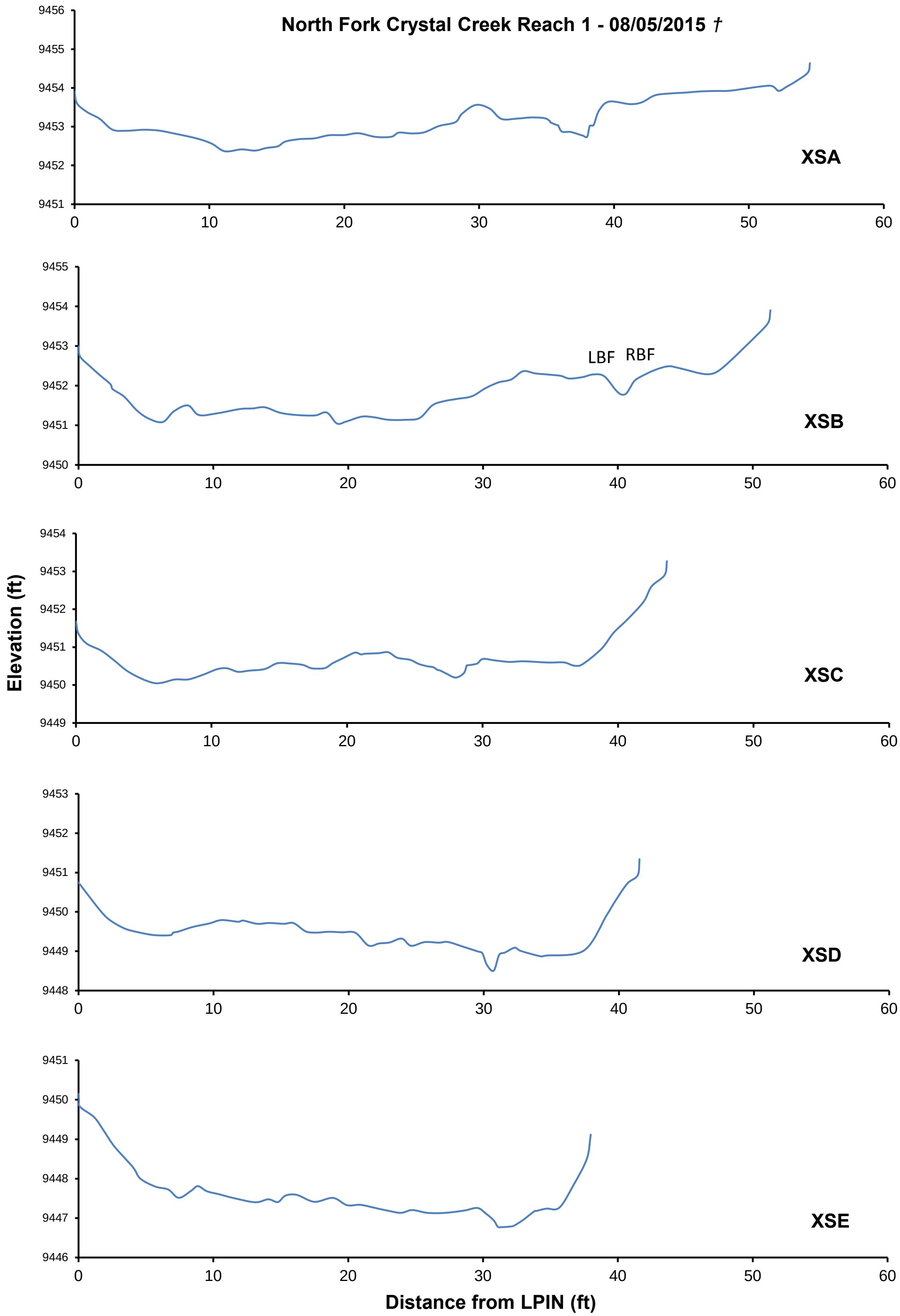

Boehmer Creek Reach 2 - 09/28/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)



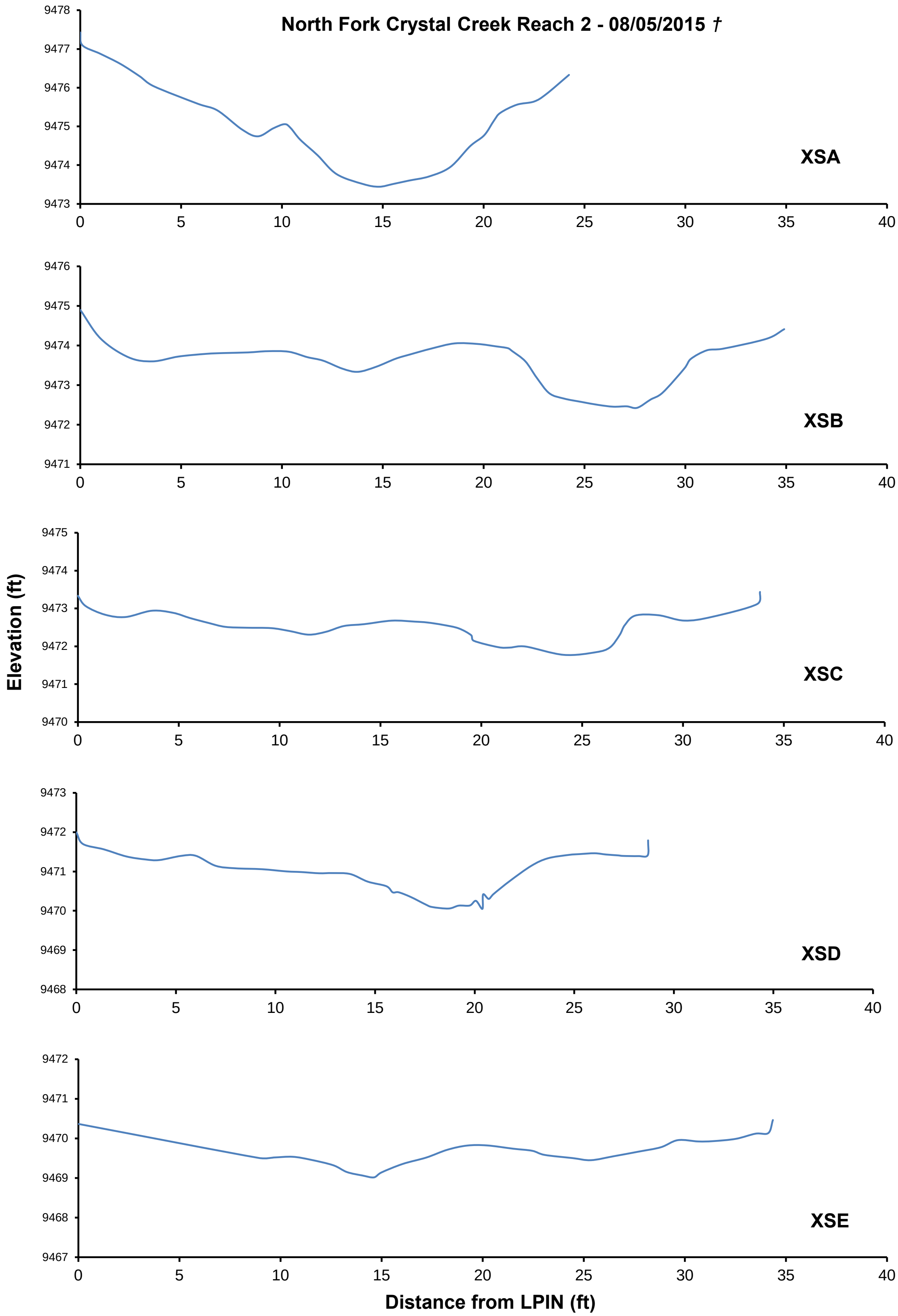
Glen Cove Creek Reach 1 - 08/26/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg


North Catamount Creek Reach 1 - 09/09/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
Elevation (ft)
Distance from LPIN (ft)
9404
9402
9400
9398
9396
9394
9392
0
10
20
30
40
50
60
70

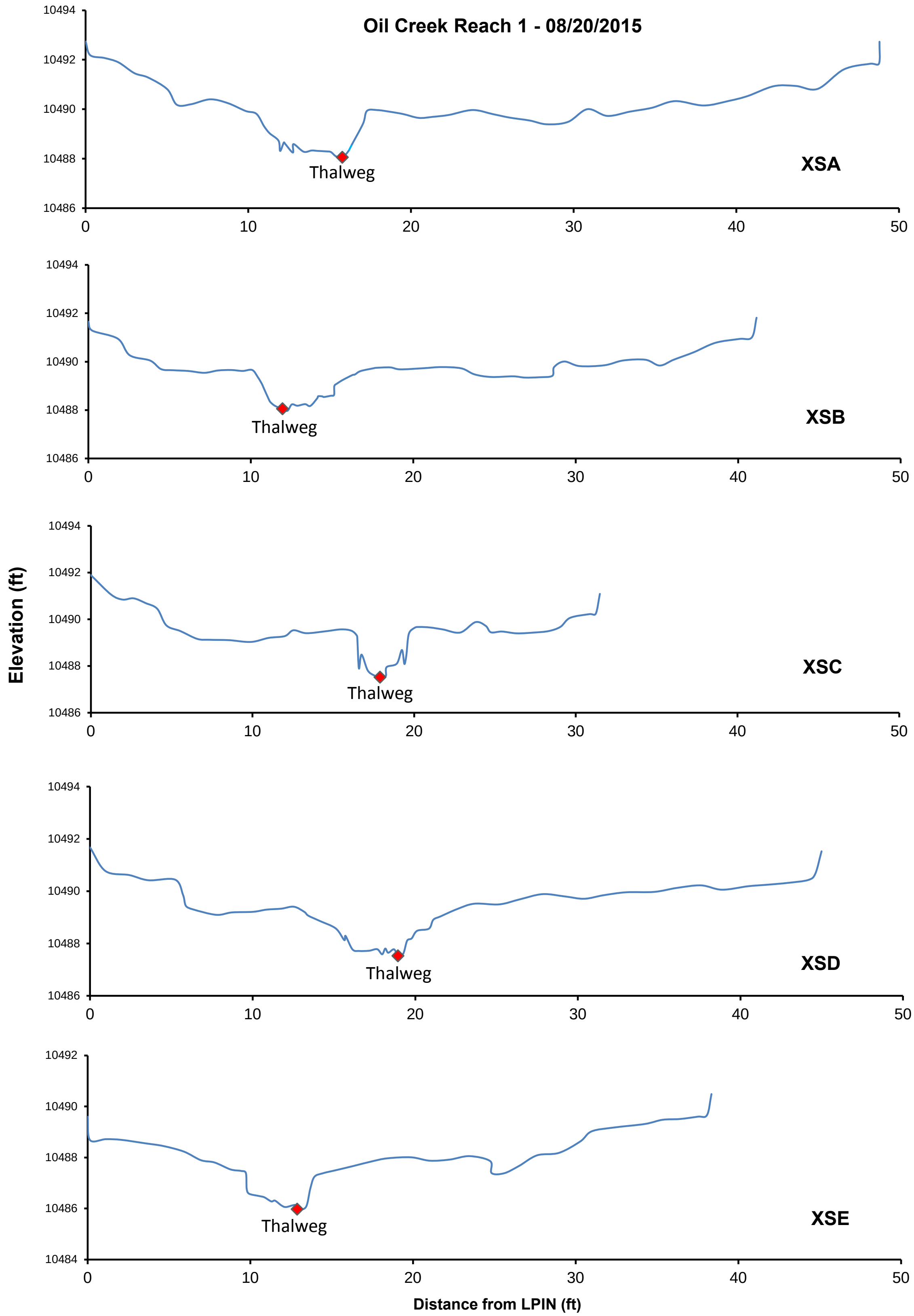

North Catamount Creek Reach 2 - 09/09/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)



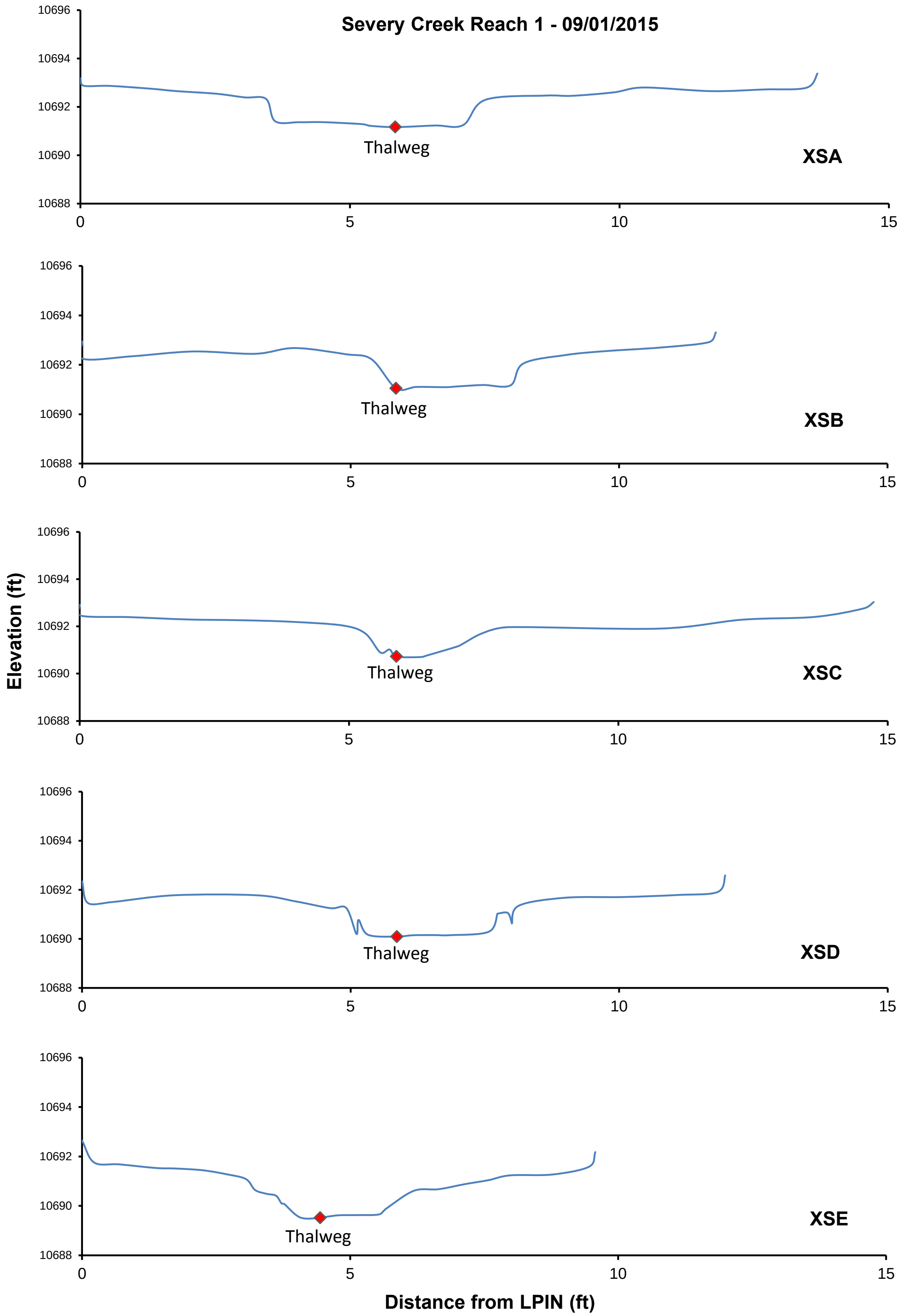
† Thalweg not identified as stream bed was dry.

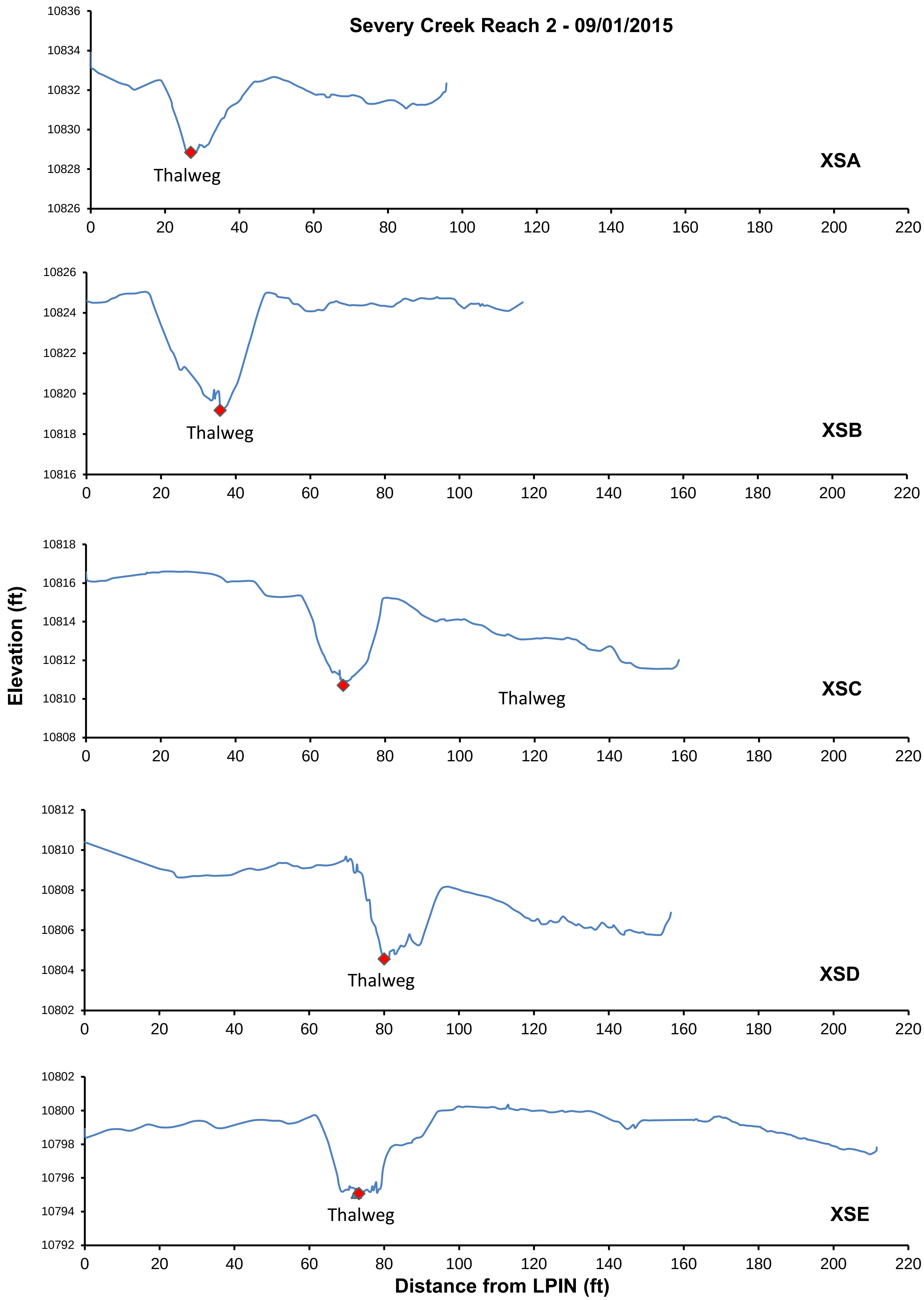


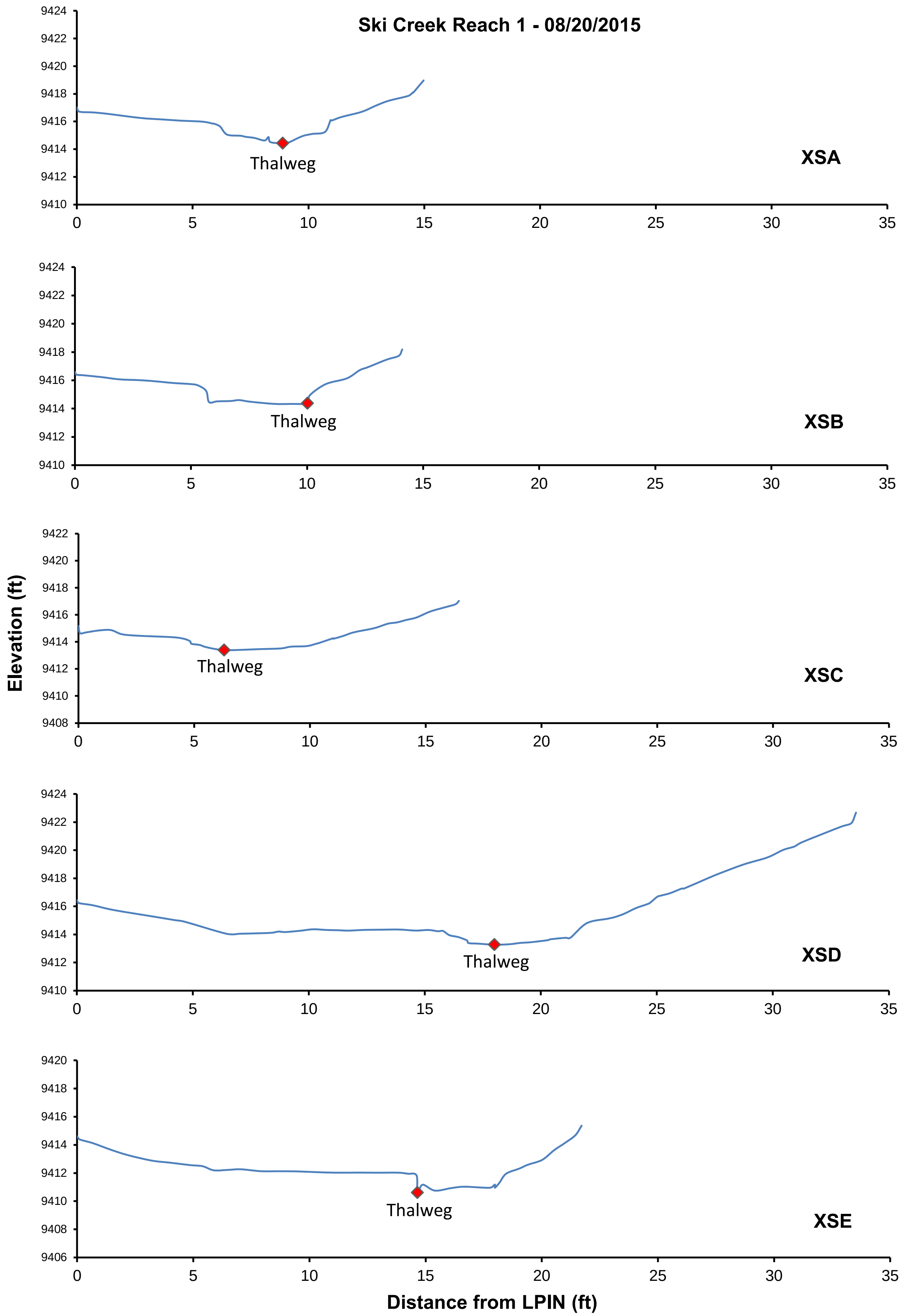
† Thalweg not identified as stream bed was dry.

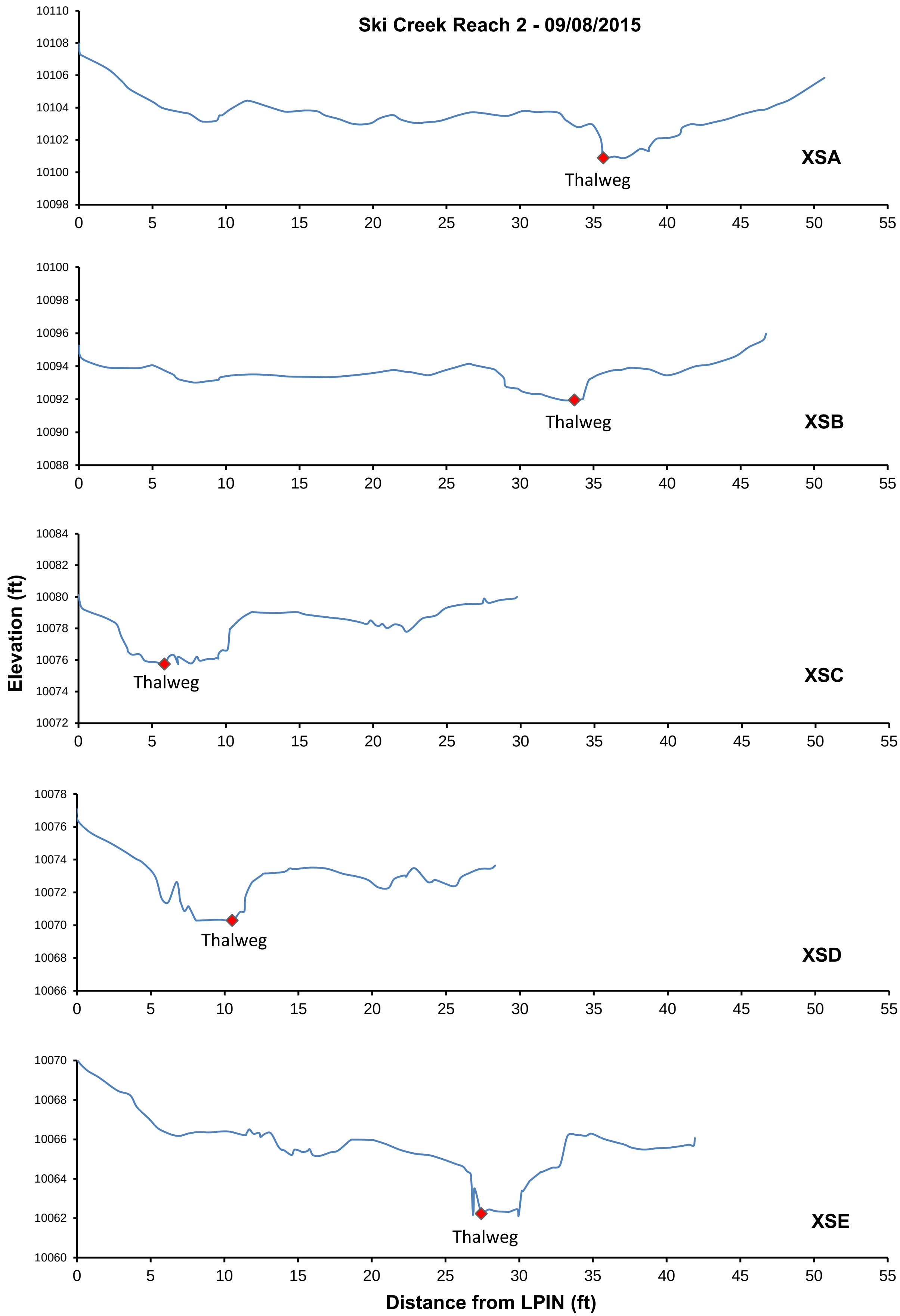


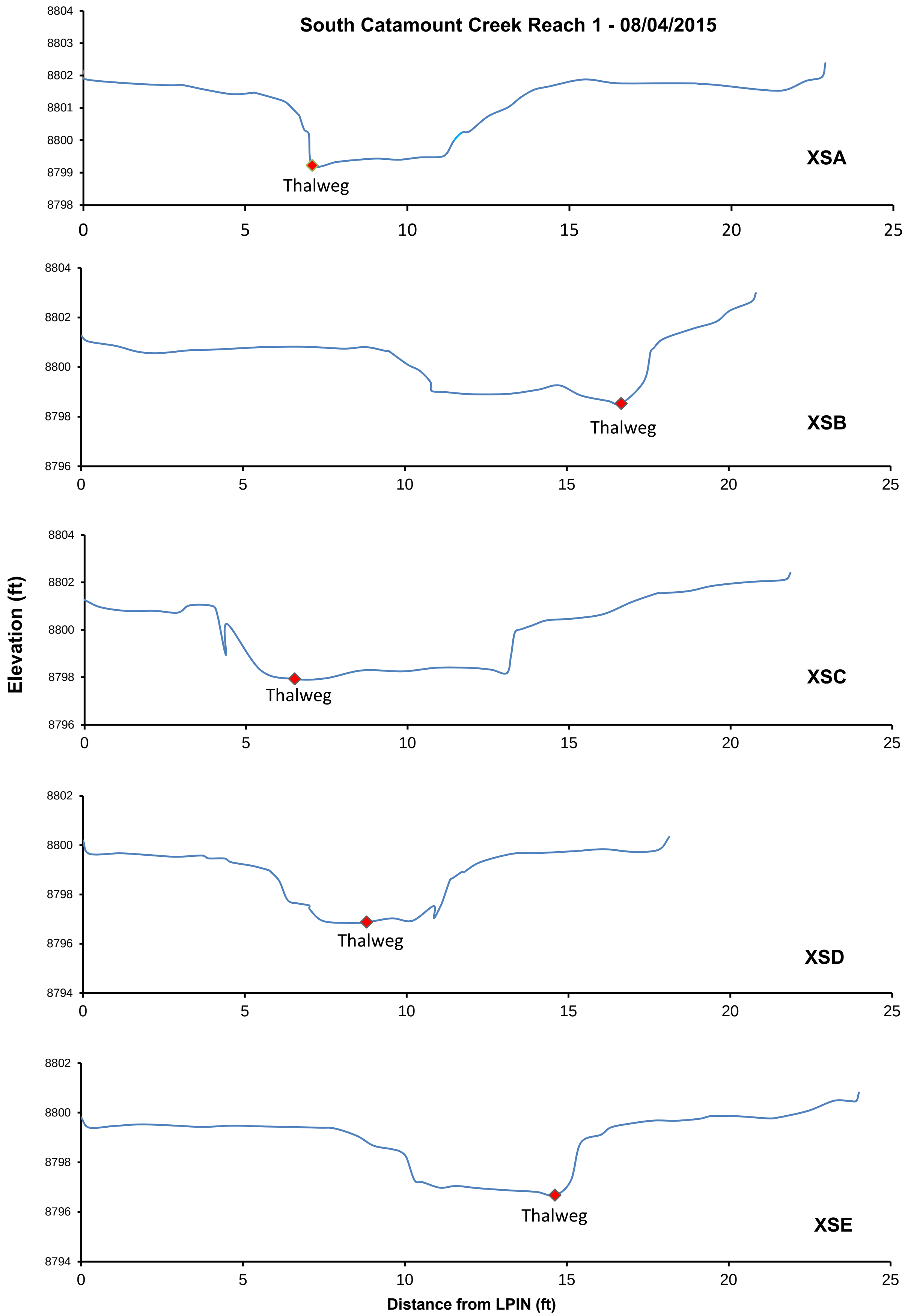
Oil Creek Reach 1 - 08/20/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)

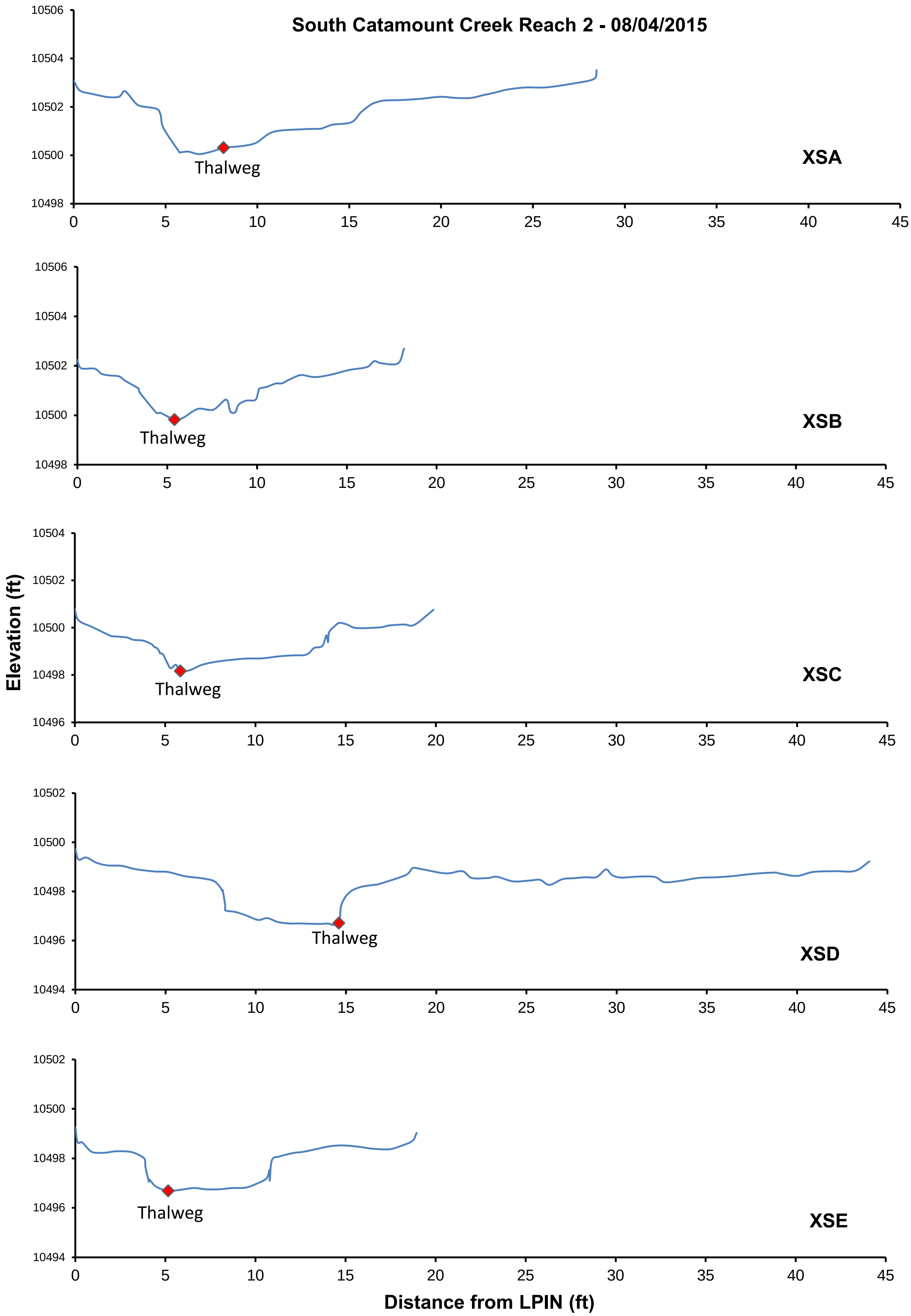

Severy Creek Reach 1 - 09/01/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
Thalweg
Thalweg
Thalweg
Thalweg
10696
10694
10692
10690
10688
0
5
10
15

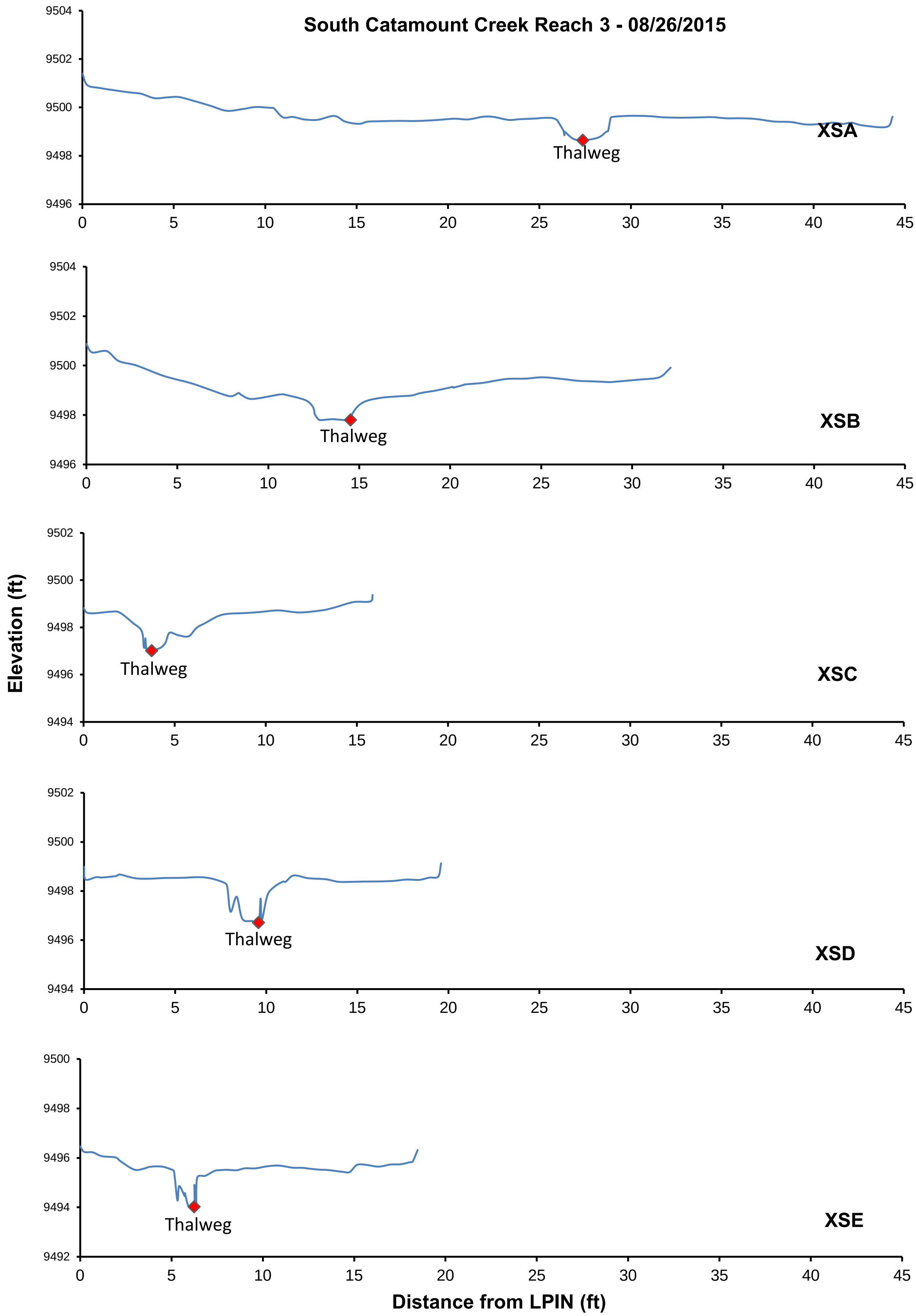

Severy Creek Reach 2 - 09/01/2015
XSA
Thalweg
XSB
Thalweg
XSC
Thalweg
XSD
Thalweg
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
10836
10834
10832
10830
10828
10826
10826
10824
10822
10820
10818
10816
10818
10816
10814
10812
10810
10808
10812
10810
10808
10806
10804
10802
10802
10800
10798
10796
10794
10792
0
20
40
60
80
100
120
140
160
180
200
220

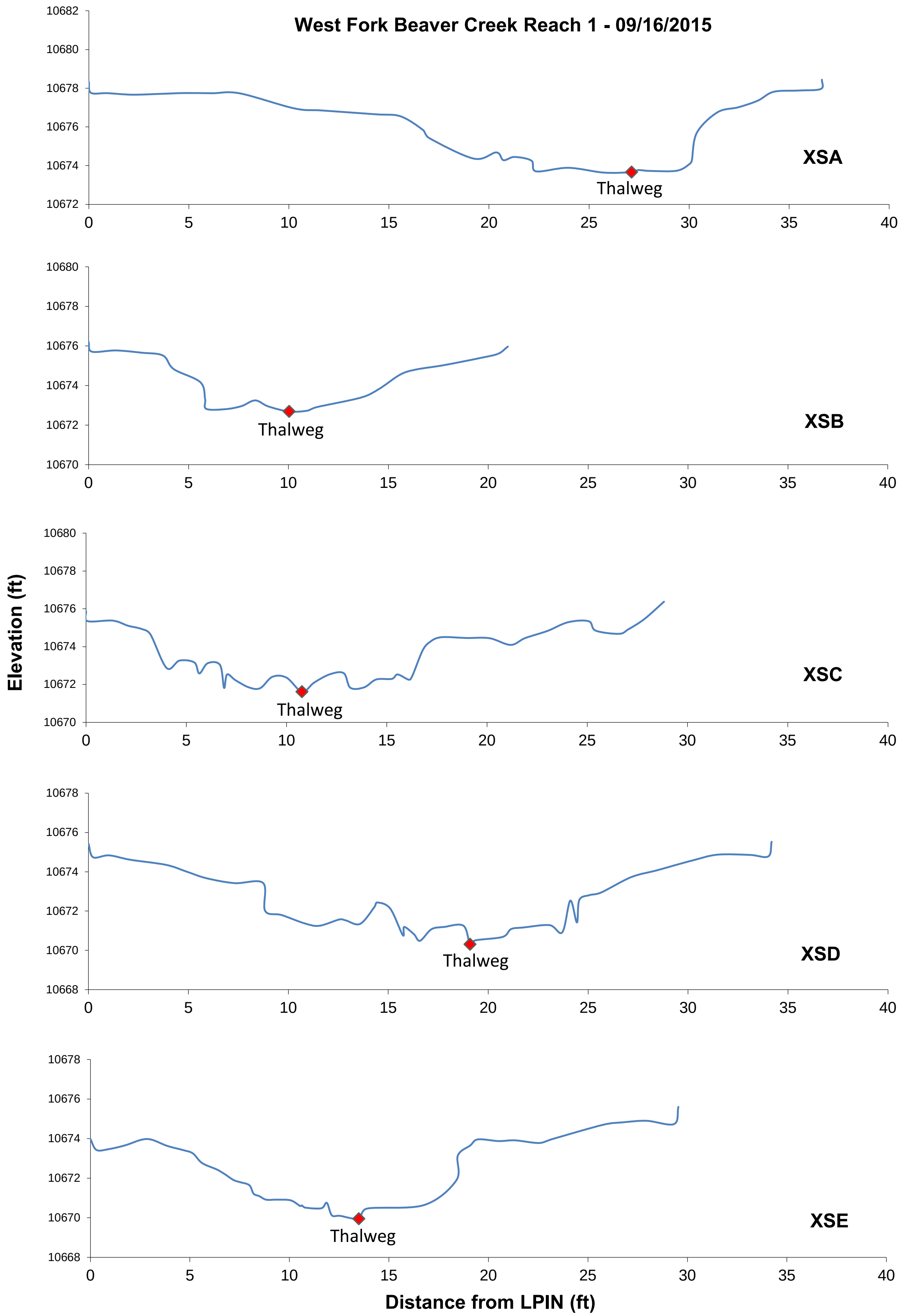

Ski Creek Reach 1 - 08/20/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)
9406
9408
9410
9412
9414
9416
9418
9420
9422
9424
0
5
10
15
20
25
30
35

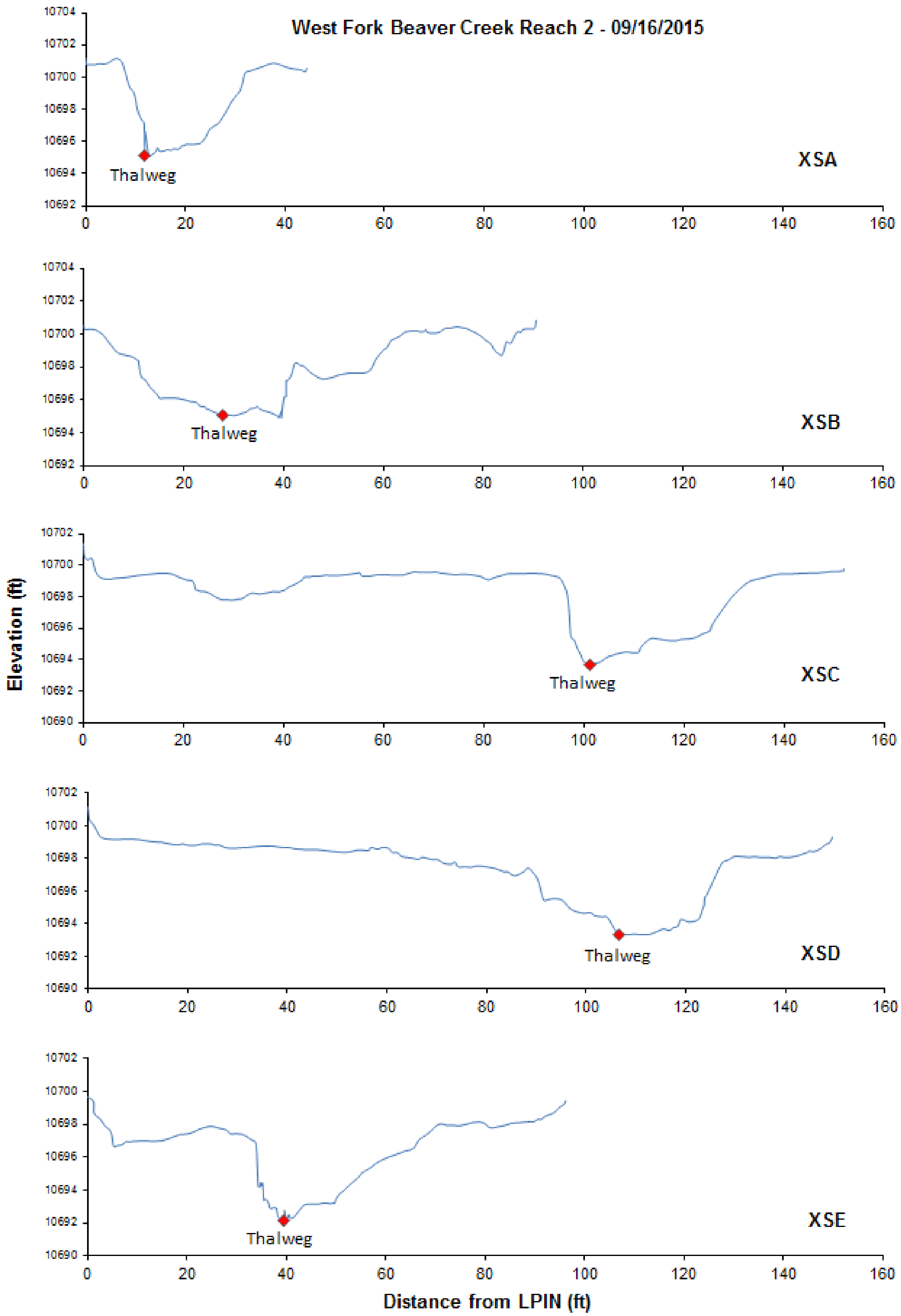

Ski Creek Reach 2 - 09/08/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)


South Catamount Creek Reach 1 - 08/04/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
8804
8803
8802
8801
8800
8799
8798
8796
8794
0
5
10
15
20
25


South Catamount Creek Reach 2 - 08/04/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
10506
10504
10502
10500
10498
10496
10494
0
5
10
15
20
25
30
35
40
45


South Catamount Creek Reach 3 - 08/26/2015
Elevation (ft)
Distance from LPIN (ft)
XSA
XSB
XSC
XSD
XSE
Thalweg
9504
9502
9500
9498
9496
9494
9492
0
5
10
15
20
25
30
35
40
45


West Fork Beaver Creek Reach 1 - 09/16/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)


West Fork Beaver Creek Reach 2 - 09/16/2015
XSA
XSB
XSC
XSD
XSE
Thalweg
Elevation (ft)
Distance from LPIN (ft)

Appendix N

Stream Pebble Count

Particle Size Distribution Graphs

2015

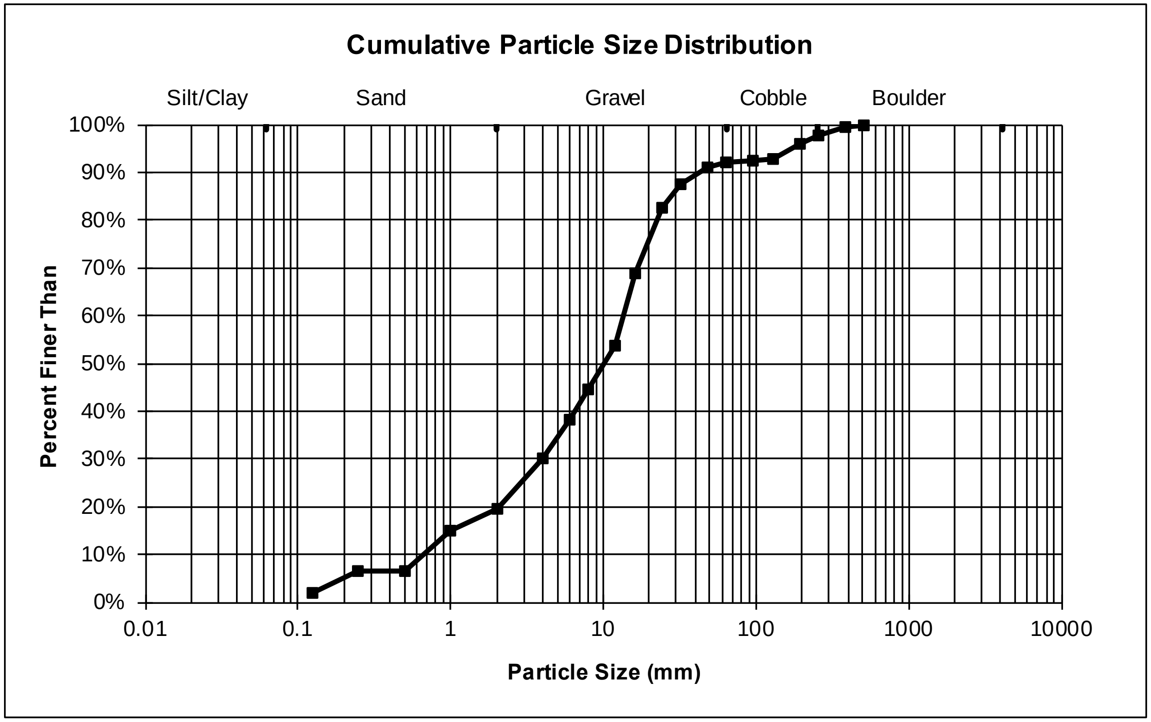
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	6	2.0%	
0.062 - 0.125	0	0.0%	2%
0.125 - 0.25	14	4.7%	7%
0.25 - .5	0	0.0%	7%
0.5 - 1.0	25	8.3%	15%
1 - 2	14	4.7%	20%
2 - 4	31	10.3%	30%
4 - 6	25	8.3%	38%
6 - 8	19	6.3%	45%
8 - 12	27	9.0%	54%
12 - 16	45	15.0%	69%
16 - 24	42	14.0%	83%
24 - 32	14	4.7%	87%
32 - 48	11	3.7%	91%
48 - 64	3	1.0%	92%
64 - 96	1	0.3%	92%
96 - 128	1	0.3%	93%
128 - 192	10	3.3%	96%
192 - 256	5	1.7%	98%
256 - 384	5	1.7%	99%
384 - 512	2	0.7%	100%
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

COMMENTS: Reach upstream from confluence with South Catamount Creek because of the transbasin diversion installed in Ski Creek

STREAM NAME: Pikes Peak Highway - Glen Cove Creek Reach 1
ID NUMBER: **GLEN1**
DATE: 8/26/2015
CREW: Karlsson, Saulsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.000	5.102	10.173	26.056	170.010	510.0



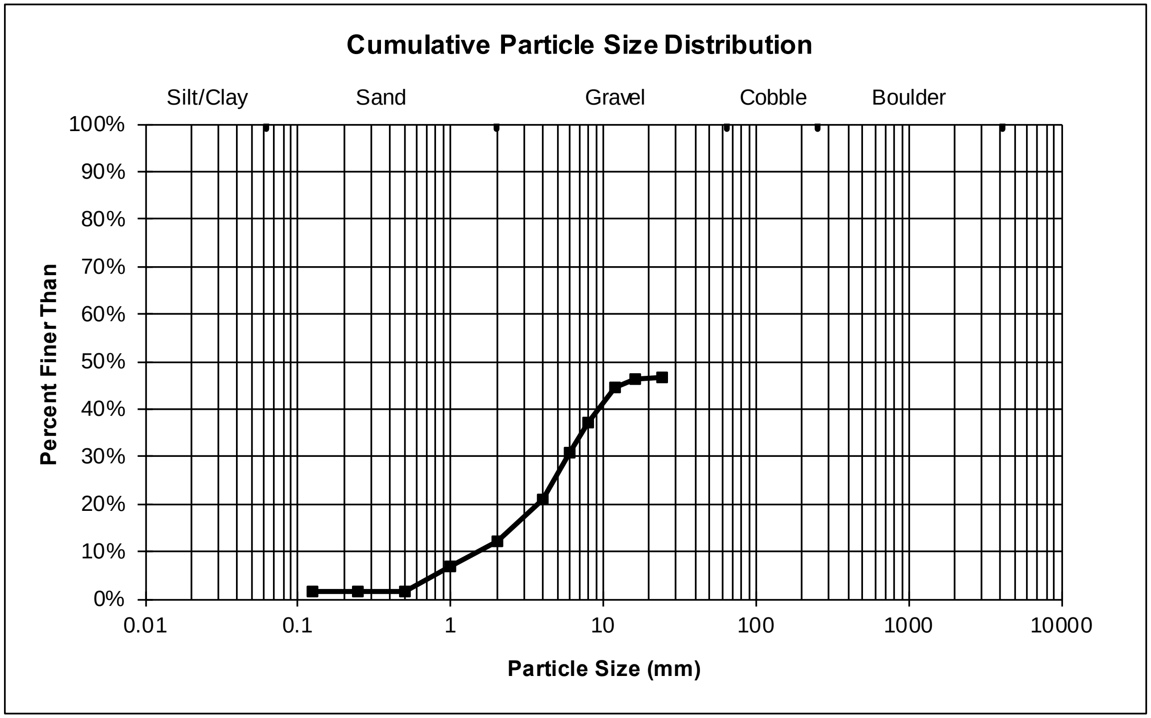
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	36	12.0%	
0.062 - 0.125	0	0.0%	2%
0.125 - 0.25	9	3.0%	2%
0.25 - .5	0	0.0%	2%
0.5 - 1.0	30	10.0%	7%
1 - 2	29	9.7%	12%
2 - 4	51	17.0%	21%
4 - 6	55	18.3%	31%
6 - 8	35	11.7%	37%
8 - 12	42	14.0%	45%
12 - 16	10	3.3%	46%
16 - 24	3	1.0%	47%
24 - 32			
32 - 48			
48 - 64			
64 - 96			
96 - 128			
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

COMMENTS: ERO Reach

STREAM NAME: Pikes Peak Highway - North Catamount Creek Reach 1
ID NUMBER: **NCAT1**
DATE: 9/9/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	2.506	**7.272**				**18.0**



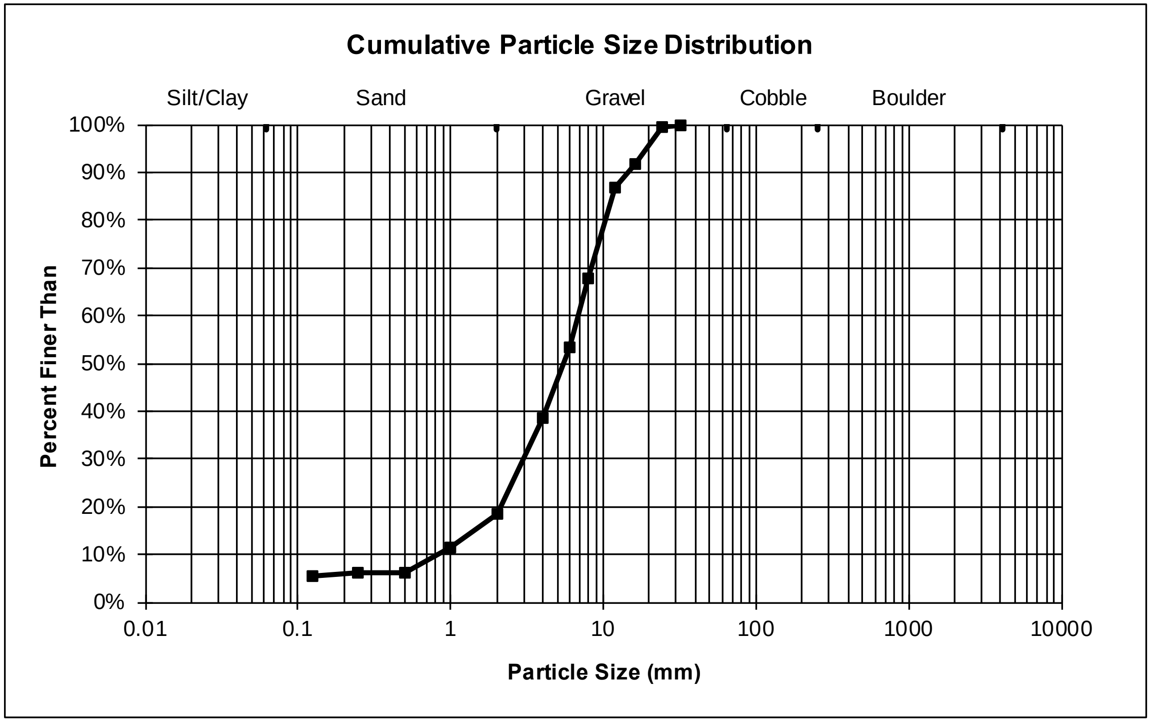
Pebble Count Worksheet

COMMENTS: Second reach 500-ft upstream from ERO Reach.

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	16	5.3%	
0.062 - 0.125	0	0.0%	5%
0.125 - 0.25	2	0.7%	6%
0.25 - .5	0	0.0%	6%
0.5 - 1.0	16	5.3%	11%
1 - 2	21	7.0%	18%
2 - 4	61	20.3%	39%
4 - 6	44	14.7%	53%
6 - 8	43	14.3%	68%
8 - 12	57	19.0%	87%
12 - 16	15	5.0%	92%
16 - 24	23	7.7%	99%
24 - 32	2	0.7%	100%
32 - 48			
48 - 64			
64 - 96			
96 - 128			
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - North Catamount Creek Reach 2
ID NUMBER: **NCAT2**
DATE: 9/9/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.438	**3.530**	**5.472**	**11.336**	**19.085**	**24.0**



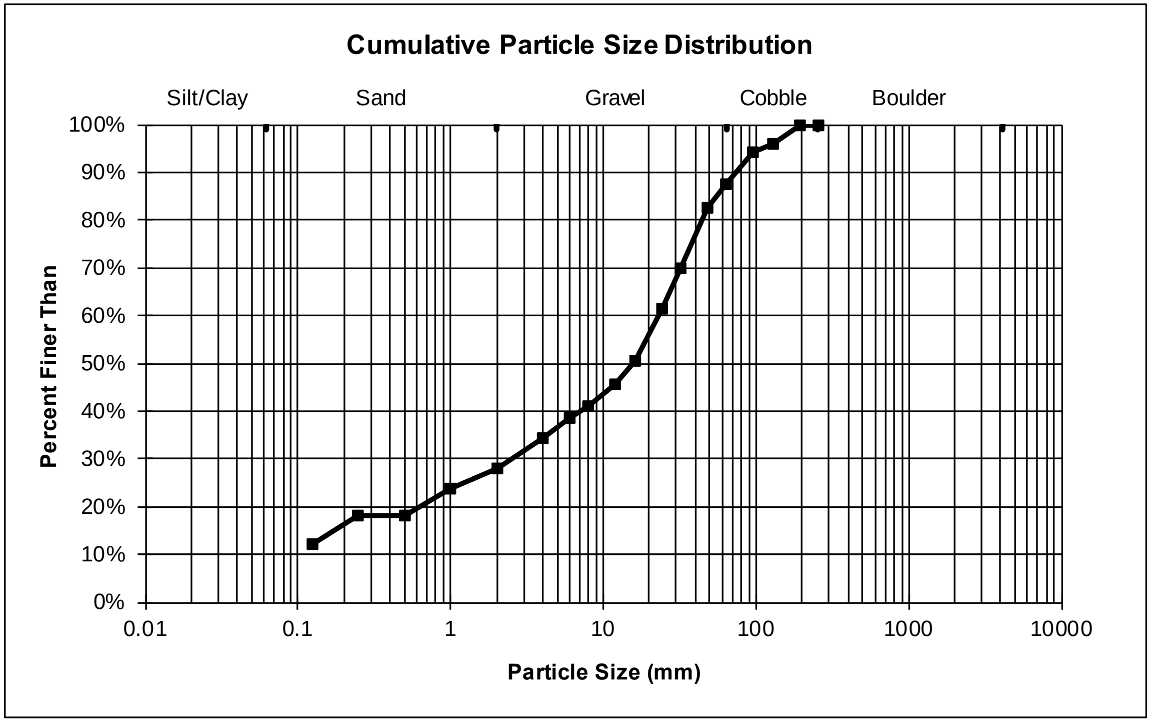
Pebble Count Worksheet

COMMENTS: ERO Reach accessed by private gate off HWY 67

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	36	12.0%	
0.062 - 0.125	0	0.0%	12%
0.125 - 0.25	18	6.0%	18%
0.25 - .5	0	0.0%	18%
0.5 - 1.0	17	5.7%	24%
1 - 2	13	4.3%	28%
2 - 4	19	6.3%	34%
4 - 6	13	4.3%	39%
6 - 8	7	2.3%	41%
8 - 12	14	4.7%	46%
12 - 16	15	5.0%	51%
16 - 24	32	10.7%	61%
24 - 32	26	8.7%	70%
32 - 48	38	12.7%	83%
48 - 64	15	5.0%	88%
64 - 96	20	6.7%	94%
96 - 128	5	1.7%	96%
128 - 192	11	3.7%	100%
192 - 256	1	0.3%	100%
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - Oil Creek Reach 1
ID NUMBER: **OILC1**
DATE: 8/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.177	4.257	15.398	51.827	107.708	200.0



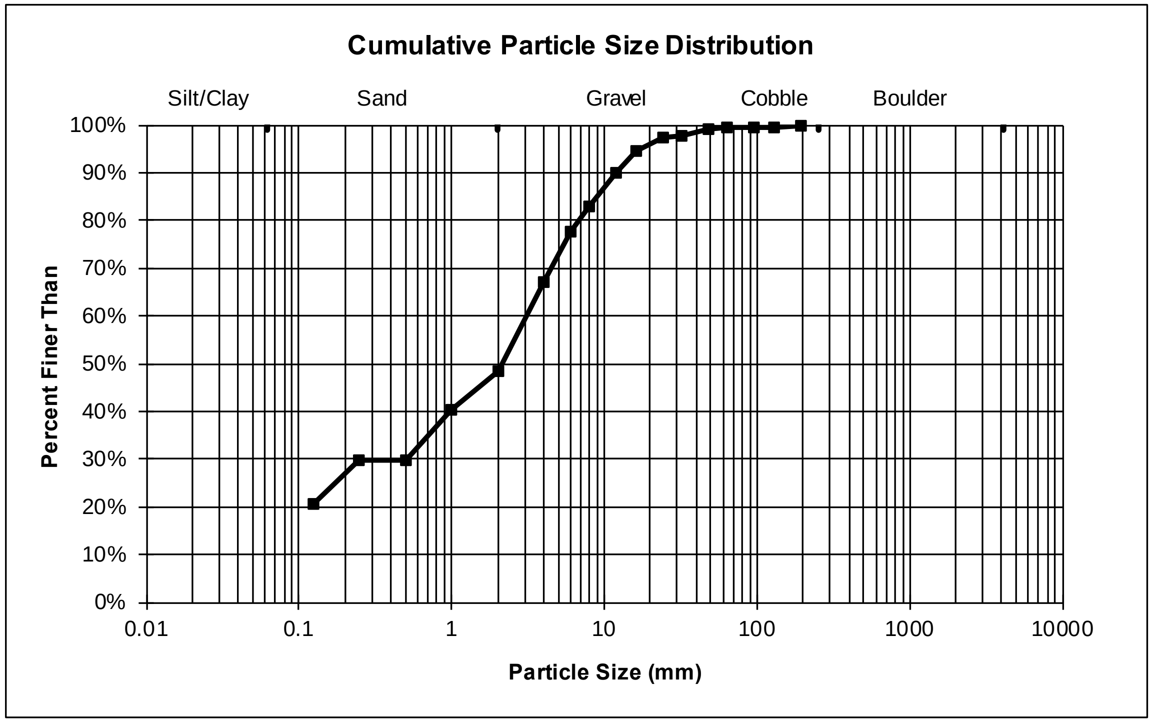
Pebble Count Worksheet

COMMENTS: ERO Reach

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	62	20.7%	
0.062 - 0.125	0	0.0%	21%
0.125 - 0.25	27	9.0%	30%
0.25 - .5	0	0.0%	30%
0.5 - 1.0	32	10.7%	40%
1 - 2	24	8.0%	48%
2 - 4	56	18.7%	67%
4 - 6	32	10.7%	78%
6 - 8	16	5.3%	83%
8 - 12	21	7.0%	90%
12 - 16	14	4.7%	95%
16 - 24	8	2.7%	97%
24 - 32	1	0.3%	98%
32 - 48	4	1.3%	99%
48 - 64	1	0.3%	99%
64 - 96	0	0.0%	99%
96 - 128	0	0.0%	99%
128 - 192	2	0.7%	100%
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - Severy Creek Reach 1
ID NUMBER: **SVRY1**
DATE: 9/1/2015
CREW: Karlsson, VonLoh, Winkler

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.000	**0.707**	**2.128**	**8.477**	**16.832**	**186.0**



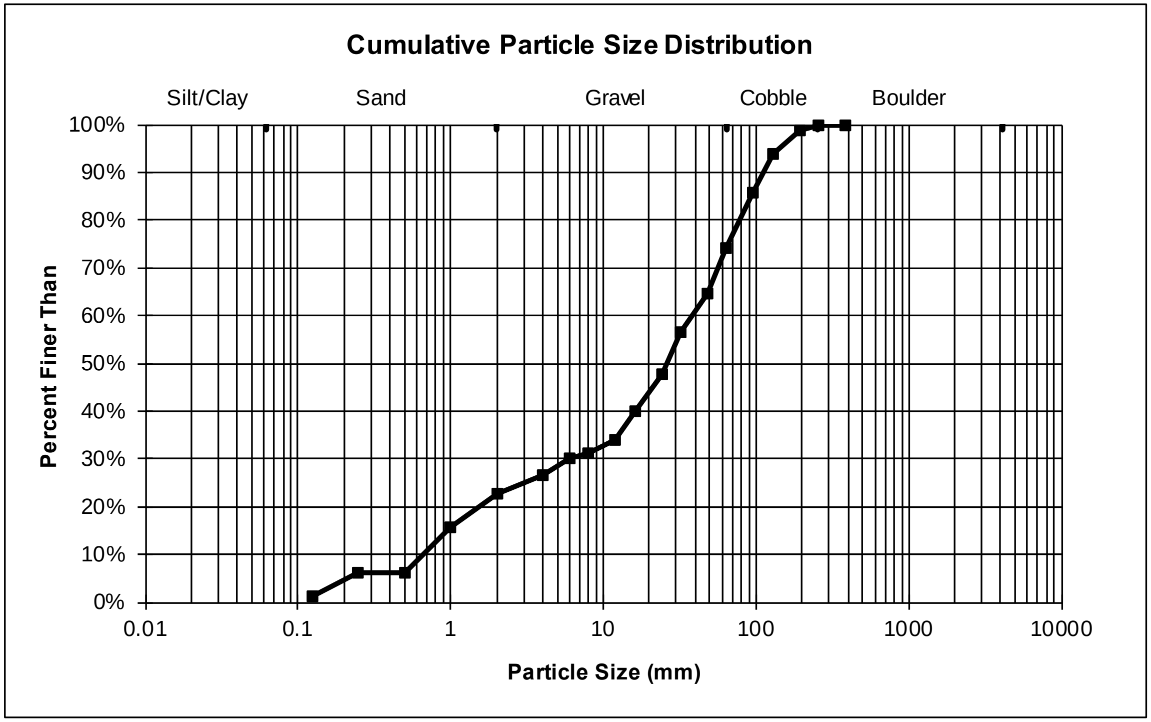
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	4	1.3%	
0.062 - 0.125	0	0.0%	1%
0.125 - 0.25	14	4.7%	6%
0.25 - .5	0	0.0%	6%
0.5 - 1.0	29	9.7%	16%
1 - 2	21	7.0%	23%
2 - 4	12	4.0%	27%
4 - 6	10	3.3%	30%
6 - 8	4	1.3%	31%
8 - 12	8	2.7%	34%
12 - 16	18	6.0%	40%
16 - 24	23	7.7%	48%
24 - 32	27	9.0%	57%
32 - 48	24	8.0%	65%
48 - 64	28	9.3%	74%
64 - 96	35	11.7%	86%
96 - 128	25	8.3%	94%
128 - 192	14	4.7%	99%
192 - 256	3	1.0%	100%
256 - 384	1	0.3%	100%
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

COMMENTS: Second reach 1000-ft upstream from ERO Reach.

STREAM NAME: Pikes Peak Highway - Severy Creek Reach 2
ID NUMBER: **SVRY2**
DATE: 9/1/2015
CREW: Karlsson, VonLoh, Winkler

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.953	12.589	25.858	90.597	139.619	310.0



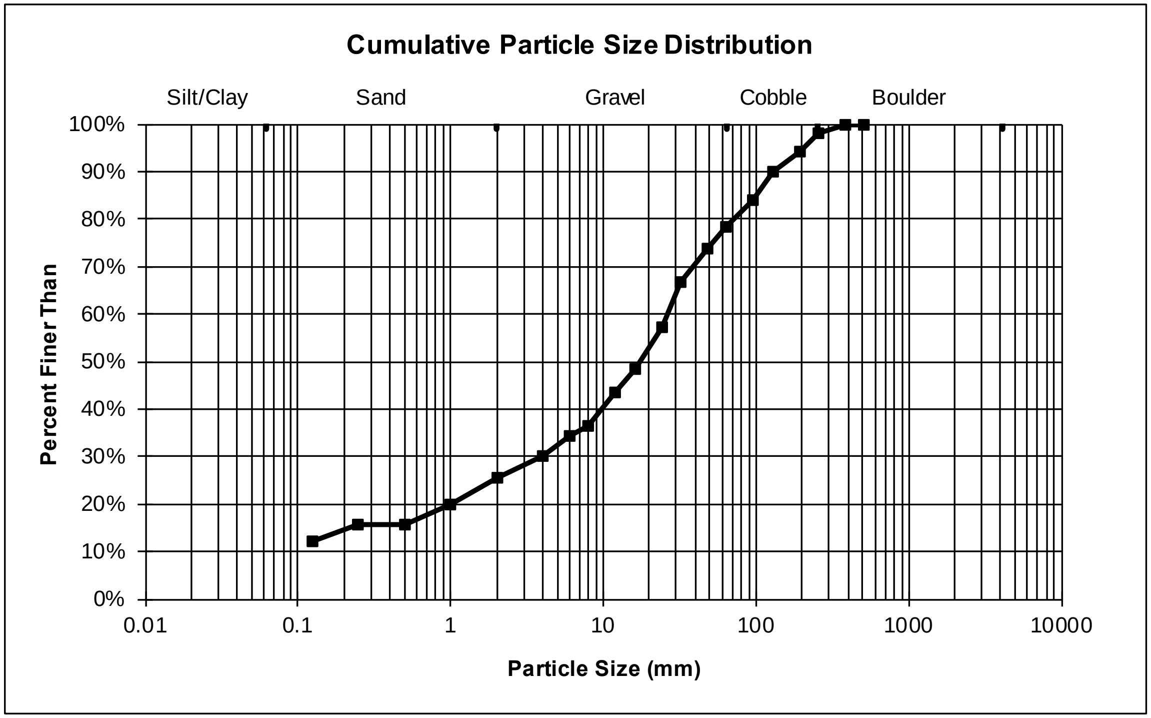
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	35	12.0%	
0.062 - 0.125	0	0.0%	12%
0.125 - 0.25	11	3.8%	16%
0.25 - .5	0	0.0%	16%
0.5 - 1.0	12	4.1%	20%
1 - 2	16	5.5%	25%
2 - 4	14	4.8%	30%
4 - 6	12	4.1%	34%
6 - 8	6	2.1%	36%
8 - 12	21	7.2%	44%
12 - 16	14	4.8%	48%
16 - 24	26	8.9%	57%
24 - 32	27	9.3%	67%
32 - 48	21	7.2%	74%
48 - 64	13	4.5%	78%
64 - 96	16	5.5%	84%
96 - 128	18	6.2%	90%
128 - 192	12	4.1%	94%
192 - 256	11	3.8%	98%
256 - 384	5	1.7%	100%
384 - 512	1	0.3%	100%
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	291.00		

COMMENTS: About 0.2 miles upstream from ERO Study Site.

STREAM NAME: Pikes Peak Highway - Ski Creek Reach 1
ID NUMBER: **SKIC1**
DATE: 8/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.216	6.557	17.163	96.677	204.705	490.0



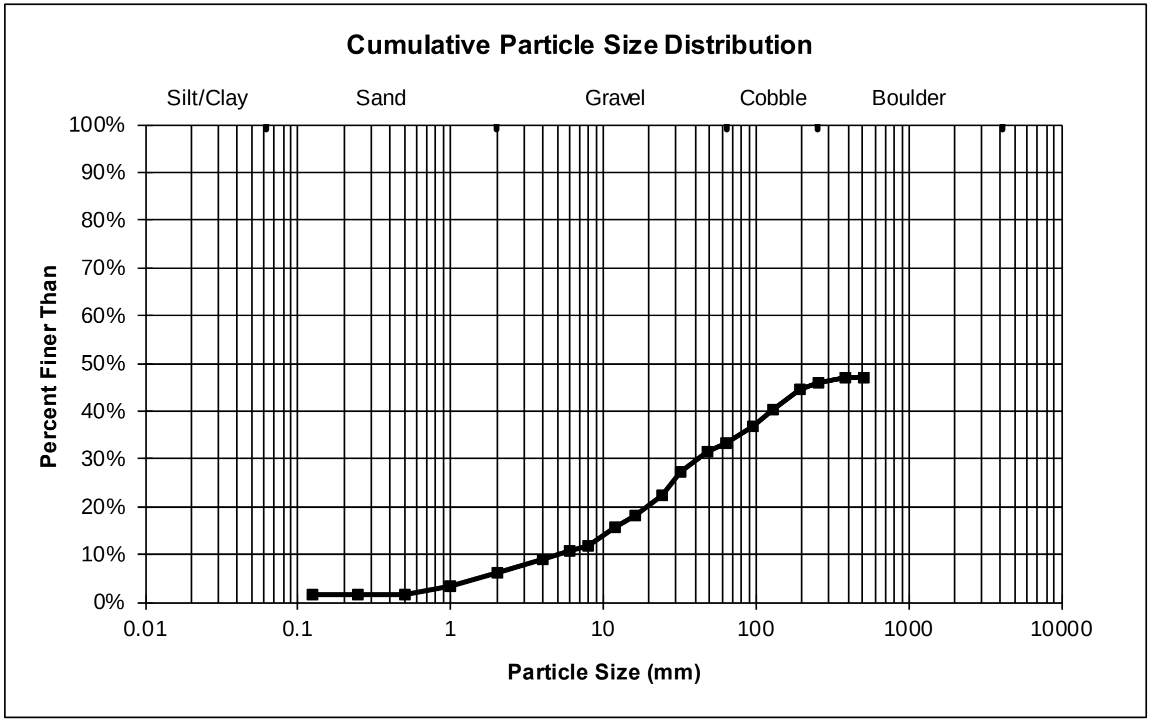
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	32	10.7%	
0.062 - 0.125	0	0.0%	2%
0.125 - 0.25	10	3.3%	2%
0.25 - .5	0	0.0%	2%
0.5 - 1.0	10	3.3%	4%
1 - 2	15	5.0%	6%
2 - 4	16	5.3%	9%
4 - 6	11	3.7%	11%
6 - 8	6	2.0%	12%
8 - 12	21	7.0%	16%
12 - 16	14	4.7%	18%
16 - 24	24	8.0%	22%
24 - 32	29	9.7%	27%
32 - 48	23	7.7%	32%
48 - 64	11	3.7%	33%
64 - 96	20	6.7%	37%
96 - 128	20	6.7%	40%
128 - 192	23	7.7%	45%
192 - 256	9	3.0%	46%
256 - 384	5	1.7%	47%
384 - 512	1	0.3%	47%
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

COMMENTS: Second reach near mile marker 10

STREAM NAME: Pikes Peak Highway - Ski Creek Reach 2
ID NUMBER: **SKIC2**
DATE: 9/8/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	11.151	76.500				490.0



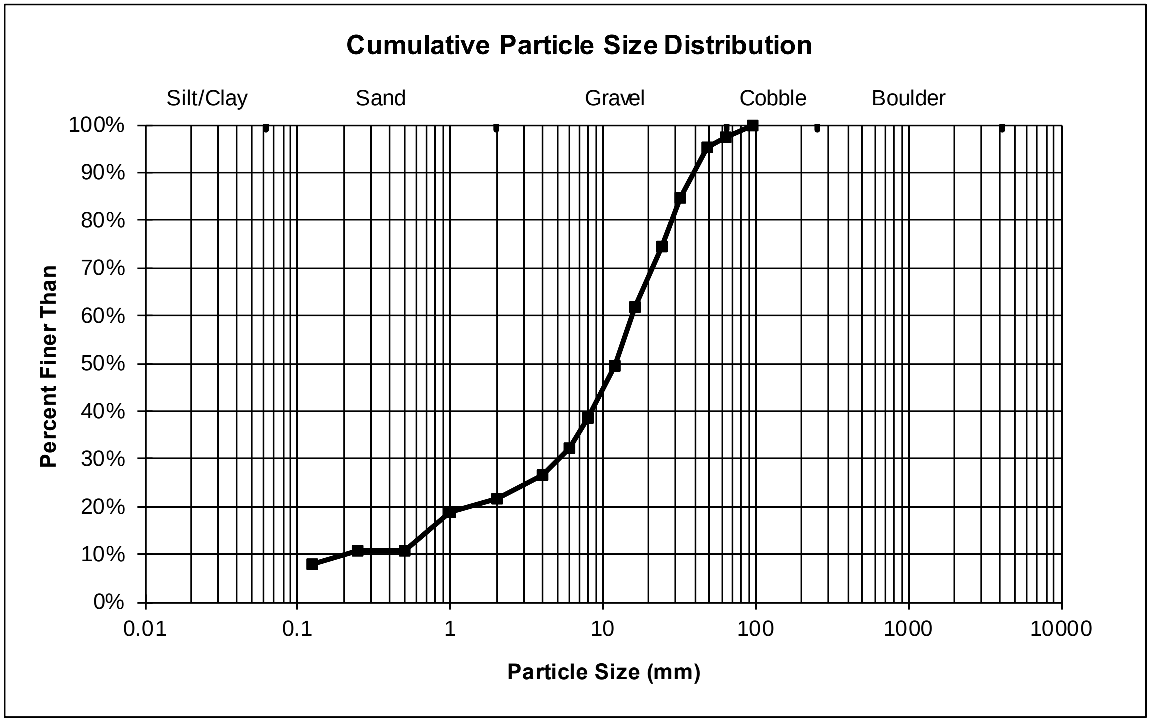
Pebble Count Worksheet

COMMENTS: ERO Study Site 1500-ft upstream from parking area.

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	24	8.0%	
0.062 - 0.125	0	0.0%	8%
0.125 - 0.25	8	2.7%	11%
0.25 - .5	0	0.0%	11%
0.5 - 1.0	25	8.3%	19%
1 - 2	8	2.7%	22%
2 - 4	15	5.0%	27%
4 - 6	17	5.7%	32%
6 - 8	19	6.3%	39%
8 - 12	32	10.7%	49%
12 - 16	37	12.3%	62%
16 - 24	38	12.7%	74%
24 - 32	31	10.3%	85%
32 - 48	32	10.7%	95%
48 - 64	6	2.0%	97%
64 - 96	8	2.7%	100%
96 - 128			
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 1
ID NUMBER: **SCAT1**
DATE: 8/4/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.717	6.773	12.188	31.412	47.396	96.0



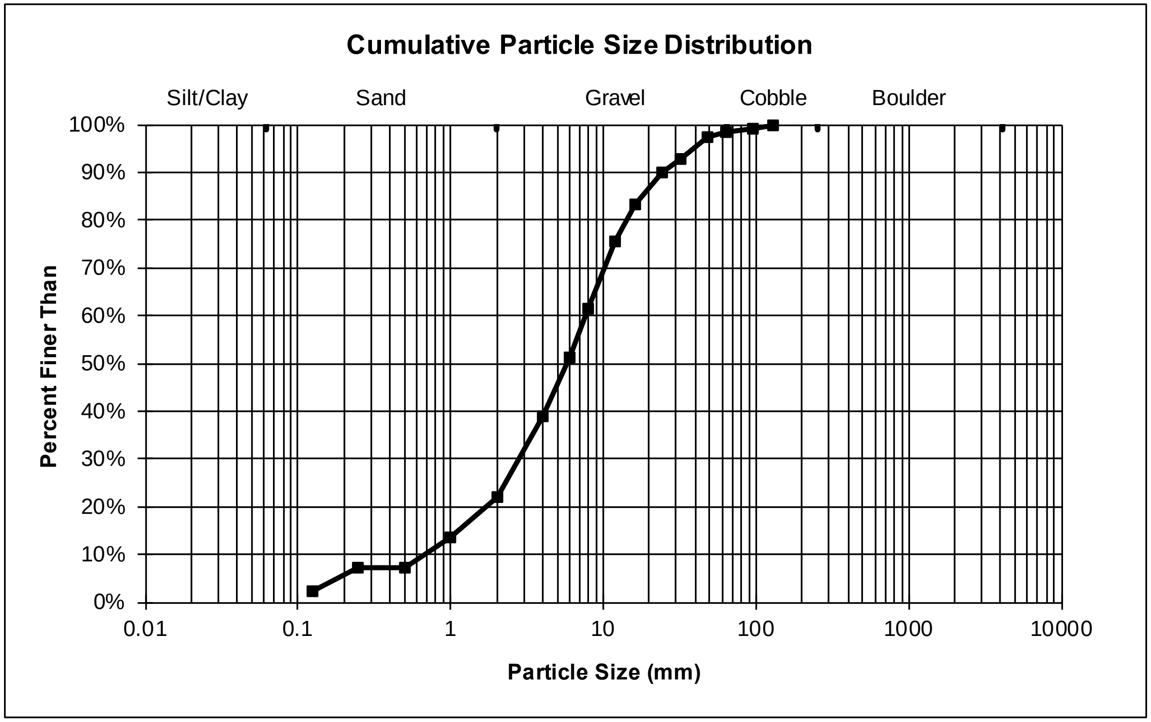
Pebble Count Worksheet

COMMENTS: Second reach 500-ft from ERO Study Site

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	7	2.3%	
0.062 - 0.125	0	0.0%	2%
0.125 - 0.25	15	5.0%	7%
0.25 - .5	0	0.0%	7%
0.5 - 1.0	19	6.3%	14%
1 - 2	25	8.3%	22%
2 - 4	51	17.0%	39%
4 - 6	37	12.3%	51%
6 - 8	30	10.0%	61%
8 - 12	43	14.3%	76%
12 - 16	23	7.7%	83%
16 - 24	20	6.7%	90%
24 - 32	8	2.7%	93%
32 - 48	14	4.7%	97%
48 - 64	3	1.0%	98%
64 - 96	2	0.7%	99%
96 - 128	3	1.0%	100%
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 2
ID NUMBER: **SCAT2**
DATE: 8/4/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.117	3.398	5.743	16.662	39.192	123.0



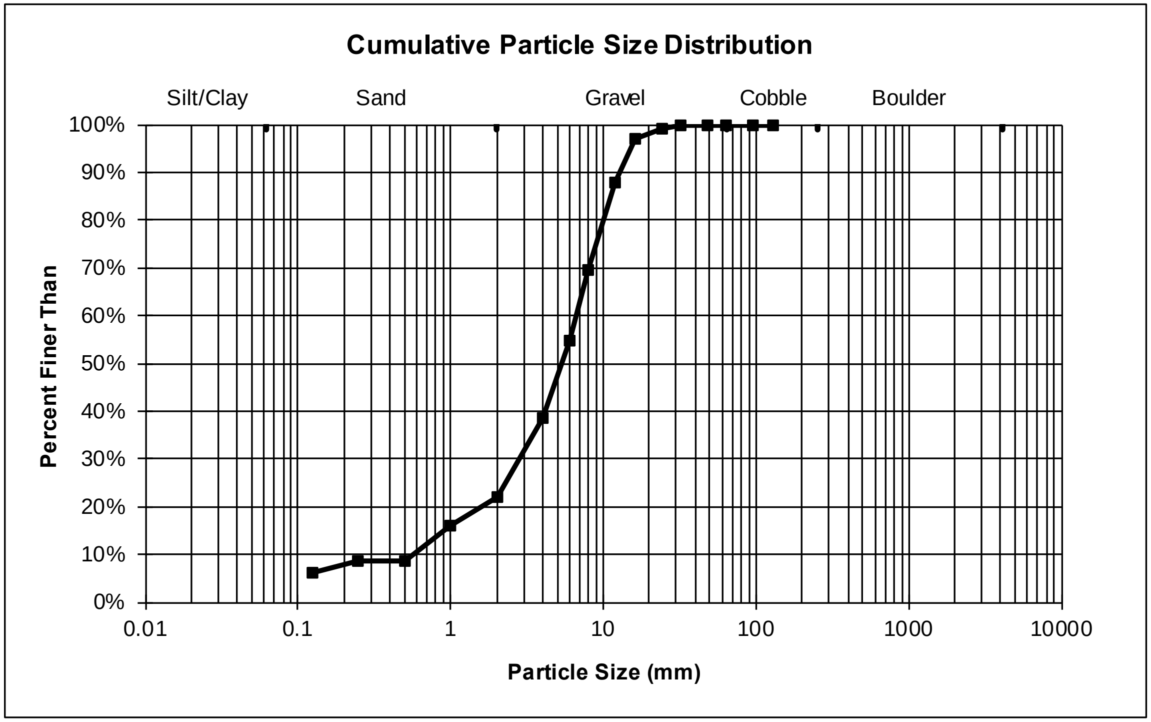
Pebble Count Worksheet

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	19	6.3%	
0.062 - 0.125	0	0.0%	6%
0.125 - 0.25	7	2.3%	9%
0.25 - .5	0	0.0%	9%
0.5 - 1.0	22	7.3%	16%
1 - 2	18	6.0%	22%
2 - 4	50	16.7%	39%
4 - 6	48	16.0%	55%
6 - 8	45	15.0%	70%
8 - 12	55	18.3%	88%
12 - 16	27	9.0%	97%
16 - 24	6	2.0%	99%
24 - 32	2	0.7%	100%
32 - 48	0	0.0%	100%
48 - 64	0	0.0%	100%
64 - 96	0	0.0%	100%
96 - 128	1	0.3%	100%
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

COMMENTS: Reach upstream from confluence with Glen Cove Creek because of the transbasin diversion installed in Ski Creek

STREAM NAME: Pikes Peak Highway - South Catamount Creek Reach 3
ID NUMBER: **SCAT3**
DATE: 8/26/2015
CREW: Karlsson, Saulsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.910	**3.434**	**5.331**	**10.984**	**15.009**	**104.0**



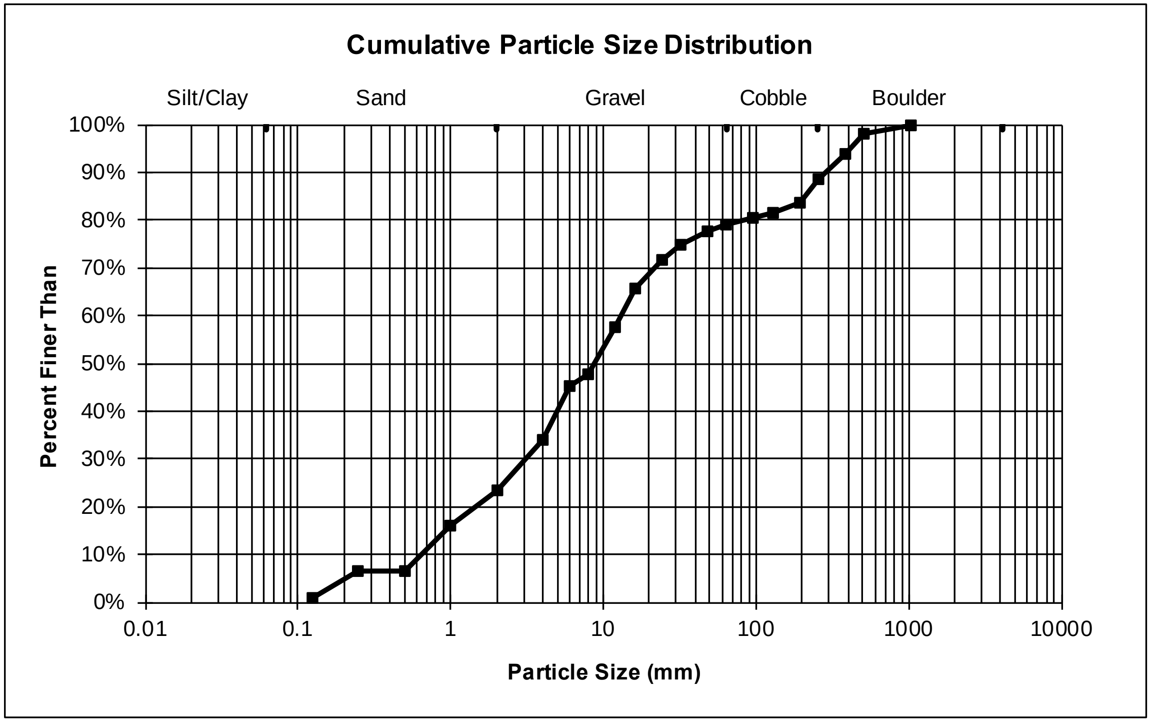
Pebble Count Worksheet

COMMENTS: ERO Reach 0.25 miles upstream of Cripple Creek Reservoir

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	3	1.0%	
0.062 - 0.125	0	0.0%	1%
0.125 - 0.25	17	5.7%	7%
0.25 - .5	0	0.0%	7%
0.5 - 1.0	28	9.4%	16%
1 - 2	22	7.4%	23%
2 - 4	32	10.7%	34%
4 - 6	33	11.0%	45%
6 - 8	8	2.7%	48%
8 - 12	29	9.7%	58%
12 - 16	24	8.0%	66%
16 - 24	18	6.0%	72%
24 - 32	10	3.3%	75%
32 - 48	8	2.7%	78%
48 - 64	4	1.3%	79%
64 - 96	5	1.7%	81%
96 - 128	3	1.0%	82%
128 - 192	6	2.0%	84%
192 - 256	15	5.0%	89%
256 - 384	16	5.4%	94%
384 - 512	12	4.0%	98%
512 - 1024	6	2.0%	100%
1024 - 2048			
2044 - 4096			
Total	299.00		

STREAM NAME: Pikes Peak Highway - West Fork Beaver Creek Reach 1
ID NUMBER: **WBVR1**
DATE: 9/16/2015
CREW: Karlsson, Saulsbury, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.000	**4.132**	**8.761**	**196.319**	**413.130**	**740.0**



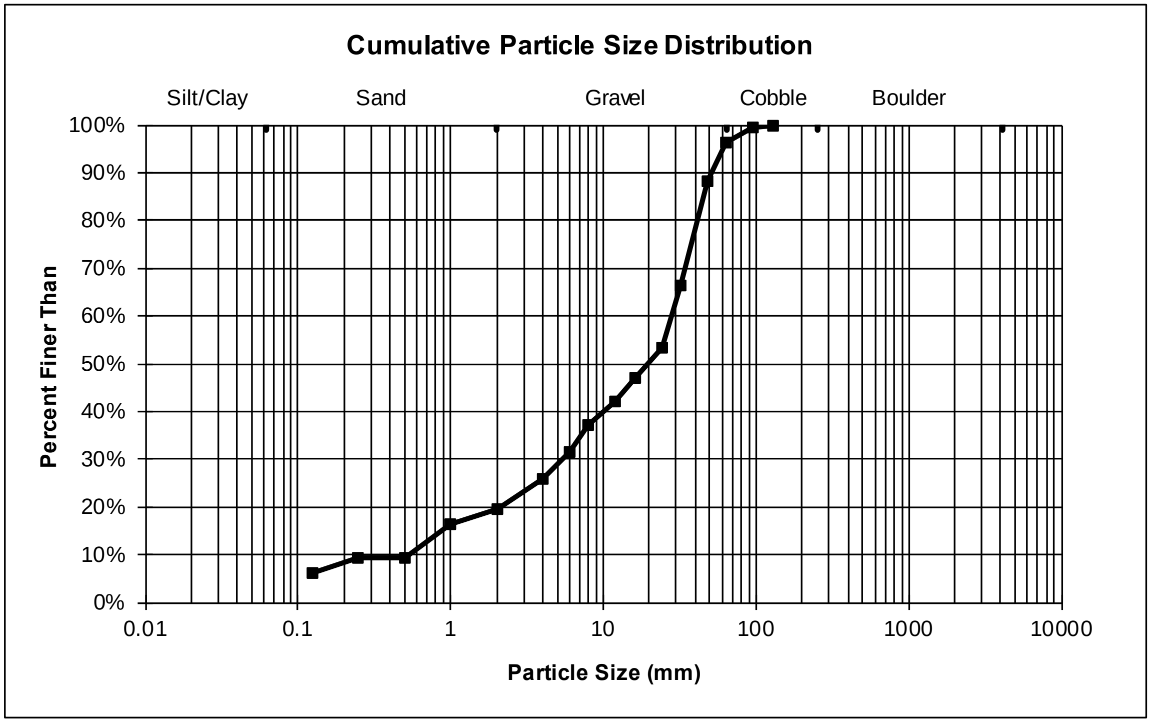
Pebble Count Worksheet

COMMENTS: Second reach 0.25 miles upstream of ERO Reach.

Particle Size (mm)	# in Size Class	% of Total	% Finer Than
<0.062	18	6.0%	
0.062 - 0.125	0	0.0%	6%
0.125 - 0.25	10	3.3%	9%
0.25 - .5	0	0.0%	9%
0.5 - 1.0	21	7.0%	16%
1 - 2	10	3.3%	20%
2 - 4	19	6.3%	26%
4 - 6	17	5.7%	32%
6 - 8	16	5.3%	37%
8 - 12	15	5.0%	42%
12 - 16	15	5.0%	47%
16 - 24	19	6.3%	53%
24 - 32	39	13.0%	66%
32 - 48	66	22.0%	88%
48 - 64	24	8.0%	96%
64 - 96	9	3.0%	99%
96 - 128	2	0.7%	100%
128 - 192			
192 - 256			
256 - 384			
384 - 512			
512 - 1024			
1024 - 2048			
2044 - 4096			
Total	300.00		

STREAM NAME: Pikes Peak Highway - West Fork Beaver Creek Reach 2
ID NUMBER: **WBVR2**
DATE: 9/16/2015
CREW: Karlsson, Saulsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.876	**7.182**	**19.388**	**44.316**	**61.004**	**103.0**



Appendix O

Stream Bar Sample

Particle Size Distribution Summary

and

Graphs

2015

Summary of Stream Channel Particle Size Distribution from Sieve Analysis of Bar Samples, Pikes Peak 2015

Site Name	Site ID	Date	Particle Size Distribution (mm)–Grab Samples 2015					
			D15	D35	D50	D84	D95	D100
Boehmer Creek Reach 1	BHMR1	9/30/2015	0.745	1.642	2.401	6.317	10.306	16.0
Boehmer Creek Reach 2	BHMR2	9/30/2015	0.849	4.751	22.626	50.761	56.945	60.0
Glen Cove Creek Reach 1	GLEN1	8/26/2015	0.641	2.231	3.646	12.462	22.975	27.0
North Catamount Creek Reach 1	NCAT1	9/9/2015	0.658	1.194	1.636	3.512	5.808	16.0
North Catamount Creek Reach 2	NCAT2	9/9/2015	0.953	2.993	4.449	8.219	10.461	12.0
Oil Creek Reach 1	OILC1	8/20/2015	2.025	8.422	14.608	30.505	36.120	39.0
South Catamount Creek Reach 1	SCAT1	8/4/2015	0.138	1.371	2.598	6.698	9.994	16.0
South Catamount Creek Reach 2	SCAT2	8/4/2015	0.556	2.033	3.678	10.542	19.902	30.0
South Catamount Creek Reach 3	SCAT3	8/26/2015	2.800	5.735	7.644	12.260	15.748	19.0
Ski Creek Reach 1	SKIC1	8/20/2015	1.014	4.329	7.161	12.903	15.639	19.0
Ski Creek Reach 2	SKIC2	9/8/2015	0.061	0.758	1.630	14.220	26.088	30.0
Severy Creek Reach 1	SVRY1	9/1/2015	0.014	0.081	0.298	1.931	3.203	6.0
Severy Creek Reach 2	SVRY2	9/1/2015	1.077	5.677	11.406	23.494	28.427	31.0
West Fork Beaver Creek Reach 1	WBVR1	9/16/2015	0.604	1.399	2.149	4.688	7.090	10.0
West Fork Beaver Creek Reach 2	WBVR2	9/16/2015	0.739	10.189	23.203	35.291	37.132	38.0

Sieve Analysis Worksheet

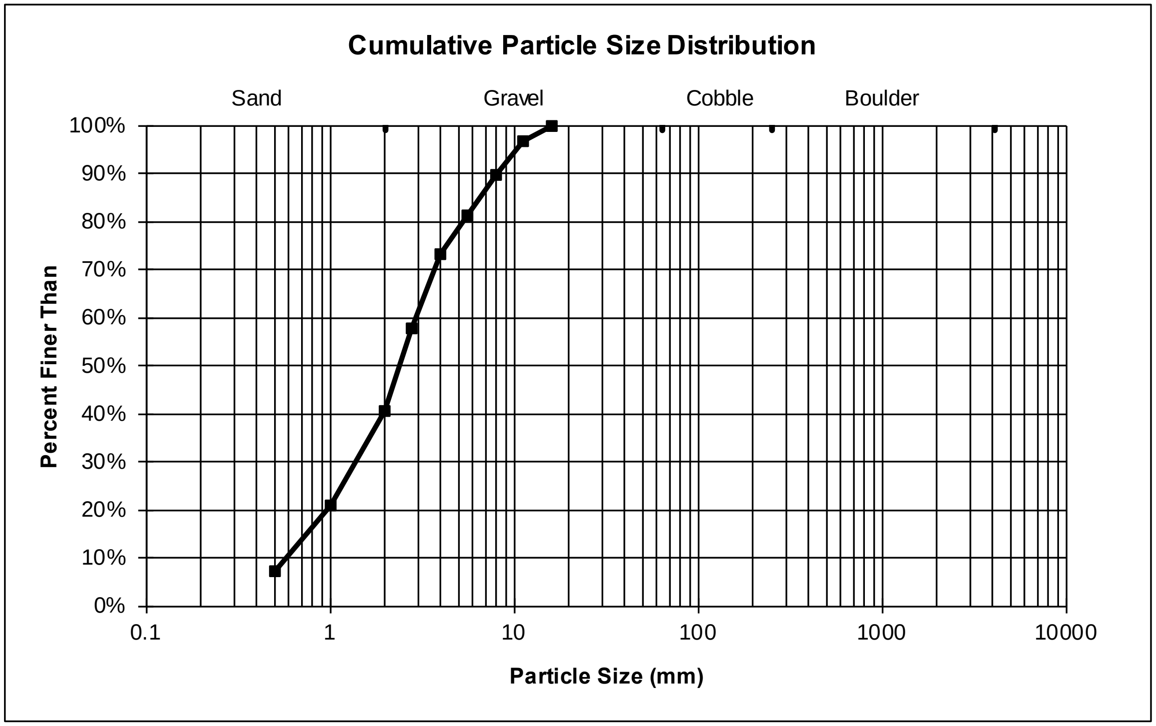
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	40.30	7.2%	
0.5	75.00	13.5%	7.2%
1.0	111.00	20.0%	20.7%
2.0	95.30	17.1%	40.7%
2.8	84.90	15.3%	57.8%
4.0	44.90	8.1%	73.1%
5.6	46.80	8.4%	81.2%
8.0	40.10	7.2%	89.6%
11.2	17.90	3.2%	96.8%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	556.20		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected downstream from cross section E

SITE NAME: Pikes Peak Highway - Boehmer Creek Reach 1
ID NUMBER: **BHMR1**
DATE: 9/28/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.745	1.642	2.401	6.317	10.306	16.0



Sieve Analysis Worksheet

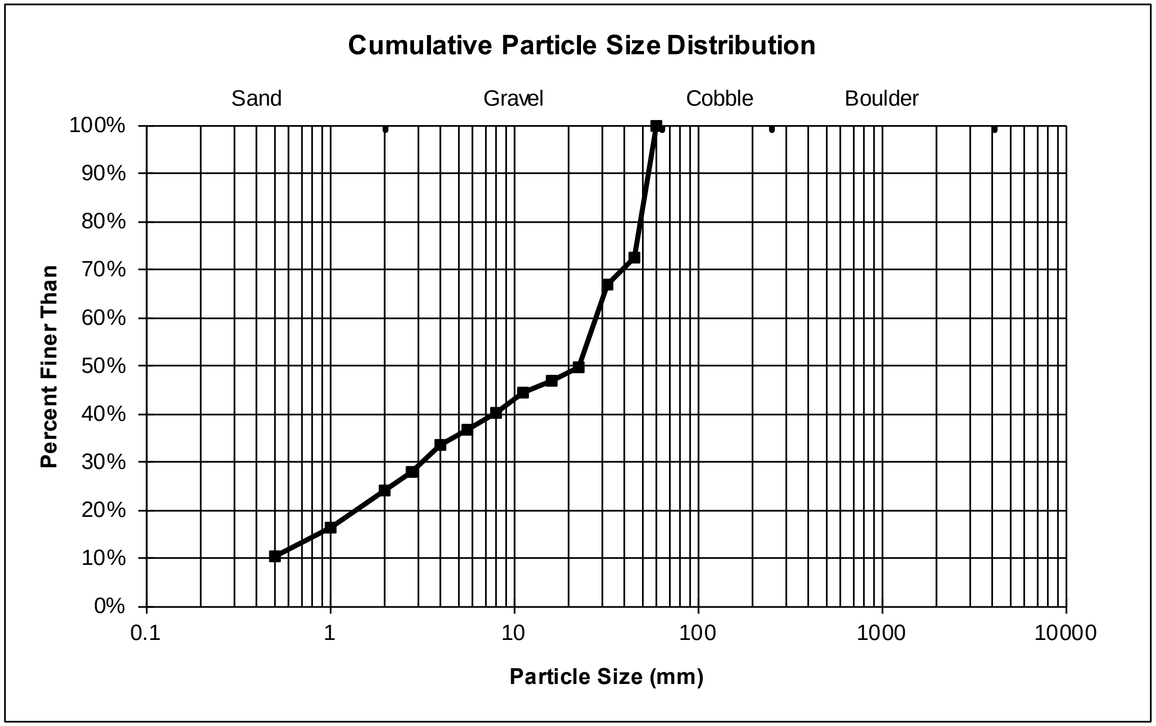
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	75.00	10.5%	
0.5	42.20	5.9%	10.5%
1.0	54.30	7.6%	16.4%
2.0	27.80	3.9%	24.0%
2.8	39.30	5.5%	27.9%
4.0	22.70	3.2%	33.4%
5.6	25.50	3.6%	36.6%
8.0	31.60	4.4%	40.1%
11.2	17.60	2.5%	44.5%
16.0	18.00	2.5%	47.0%
22.4	122.70	17.2%	49.5%
32.0	41.40	5.8%	66.7%
45.0	196.80	27.5%	72.5%
60.0	*		100.0%
90			-
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	714.90		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected 18-ft upstream from cross section B

SITE NAME: Pikes Peak Highway - Boehmer Creek Reach 2
ID NUMBER: **BHMR2**
DATE: 9/28/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.849	4.751	22.626	50.761	56.945	60.0



Sieve Analysis Worksheet

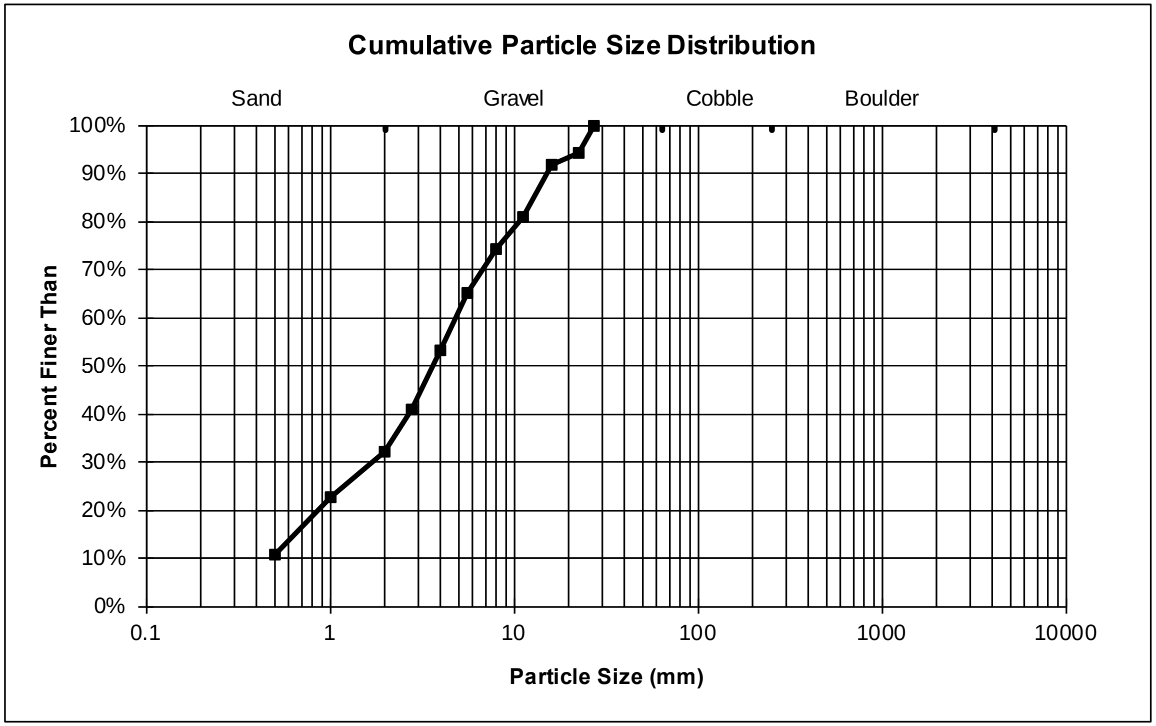
COMMENTS: Bar sample collected at cross section E right bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	75.40	10.7%	
0.5	84.70	12.0%	10.7%
1.0	66.50	9.4%	22.7%
2.0	62.20	8.8%	32.1%
2.8	86.20	12.2%	41.0%
4.0	84.40	12.0%	53.2%
5.6	64.40	9.1%	65.1%
8.0	45.70	6.5%	74.3%
11.2	76.40	10.8%	80.8%
16.0	18.50	2.6%	91.6%
22.4	40.80	5.8%	94.2%
27.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	705.20		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pikes Peak Highway - Glen Cove Creek Reach 1
ID NUMBER: **GLEN1**
DATE: 8/26/2015
CREW: Karlsson, Salsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.641	2.231	3.646	12.462	22.975	27.0



Sieve Analysis Worksheet

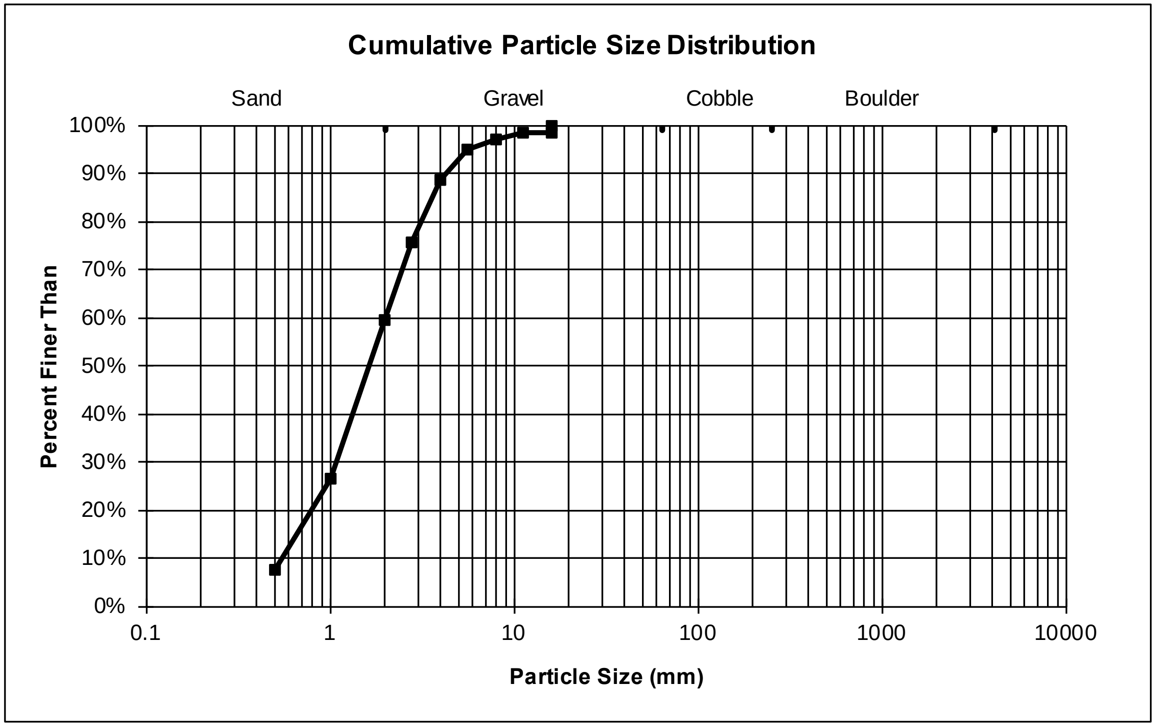
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	30.10	7.4%	
0.5	78.10	19.2%	7.4%
1.0	134.30	33.0%	26.6%
2.0	65.80	16.2%	59.6%
2.8	53.10	13.0%	75.7%
4.0	24.50	6.0%	88.8%
5.6	9.20	2.3%	94.8%
8.0	5.20	1.3%	97.0%
11.2	0.00	0.0%	98.3%
16.0	6.90	1.7%	98.3%
16.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	407.20		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected at XSC left bank

SITE NAME: Pikes Peak Highway - North Catamount Creek Reach 1
ID NUMBER: **NCAT1**
DATE: 9/9/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.658	**1.194**	**1.636**	**3.512**	**5.808**	**16.0**



Sieve Analysis Worksheet

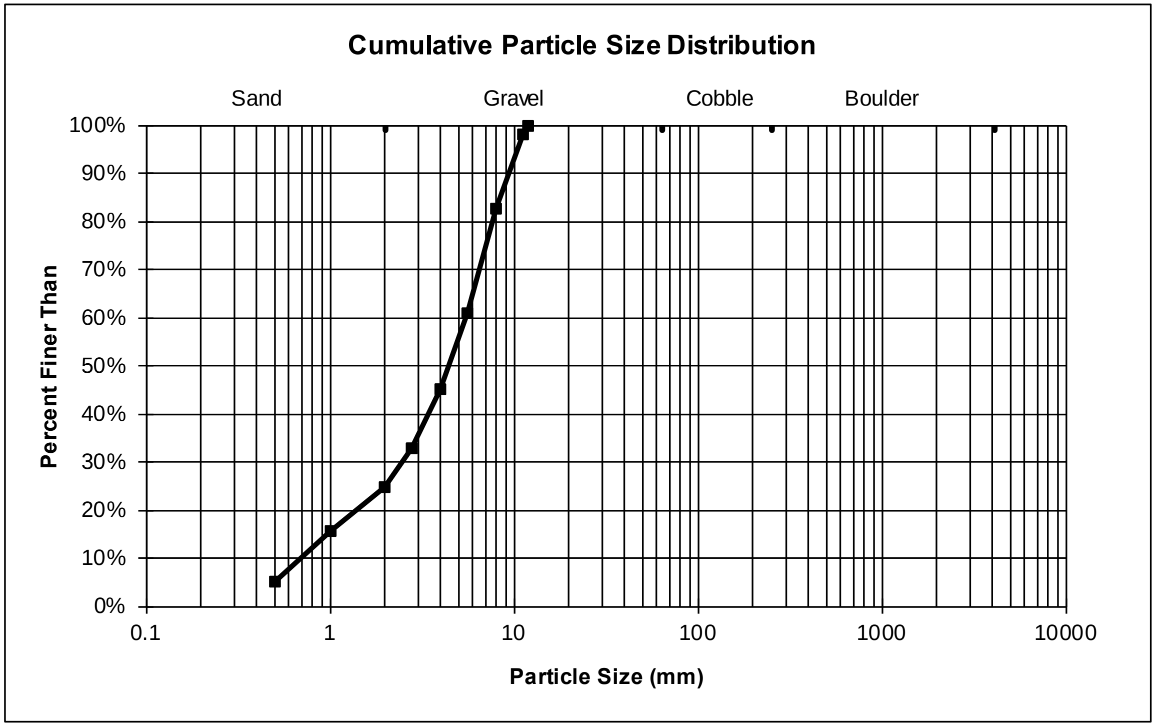
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	23.80	4.9%	
0.5	52.10	10.8%	4.9%
1.0	43.50	9.0%	15.8%
2.0	38.10	7.9%	24.8%
2.8	59.30	12.3%	32.7%
4.0	76.00	15.8%	45.0%
5.6	105.90	22.0%	60.8%
8.0	73.90	15.3%	82.8%
11.2	9.10	1.9%	98.1%
12.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	481.70		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected 2-ft downstream from cross section B

SITE NAME: North Catamount Creek - Reach 2
ID NUMBER: **NCAT2**
DATE: 9/9/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.953	2.993	4.449	8.219	10.461	12.0



Sieve Analysis Worksheet

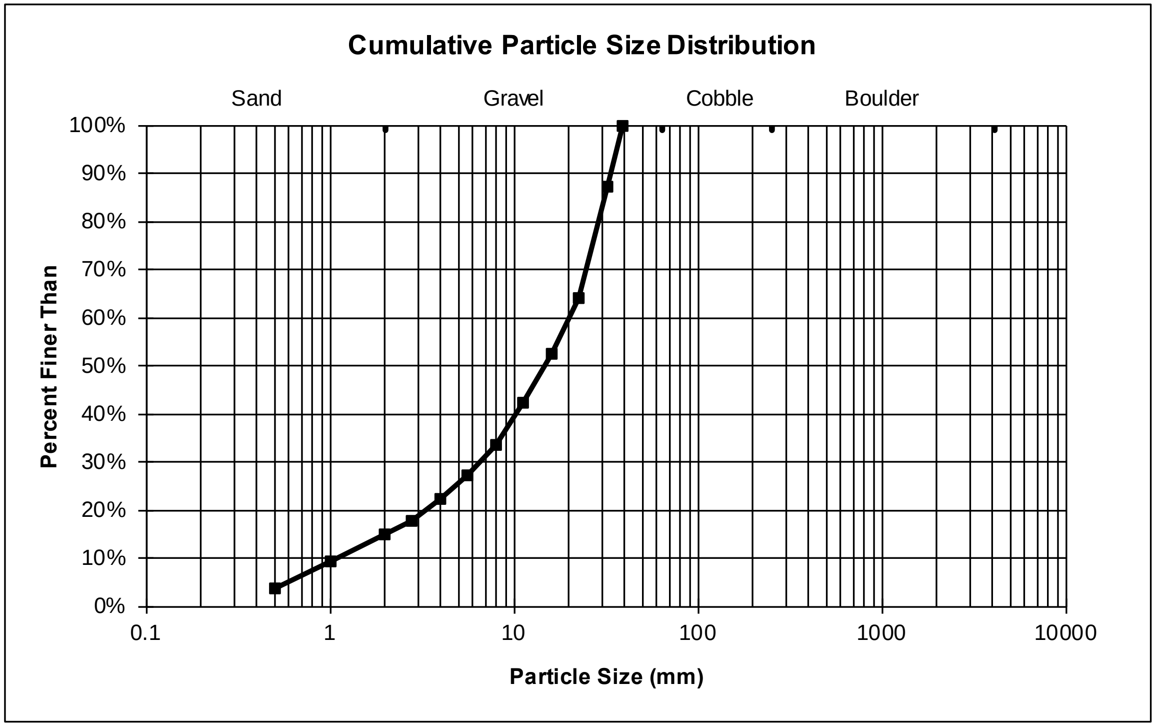
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	37.50	3.8%	
0.5	54.30	5.5%	3.8%
1.0	54.40	5.5%	9.3%
2.0	29.40	3.0%	14.9%
2.8	43.20	4.4%	17.9%
4.0	49.00	5.0%	22.3%
5.6	62.90	6.4%	27.3%
8.0	85.00	8.7%	33.7%
11.2	101.10	10.3%	42.3%
16.0	111.10	11.3%	52.6%
22.4	227.50	23.2%	63.9%
32.0	126.60	12.9%	87.1%
39.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	982.00		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected 15-ft downstream from cross section D

SITE NAME: Pikes Peak Highway - Oil Creek Reach 1
ID NUMBER: **OILC1**
DATE: 8/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.025	8.422	14.608	30.505	36.120	39.0



Sieve Analysis Worksheet

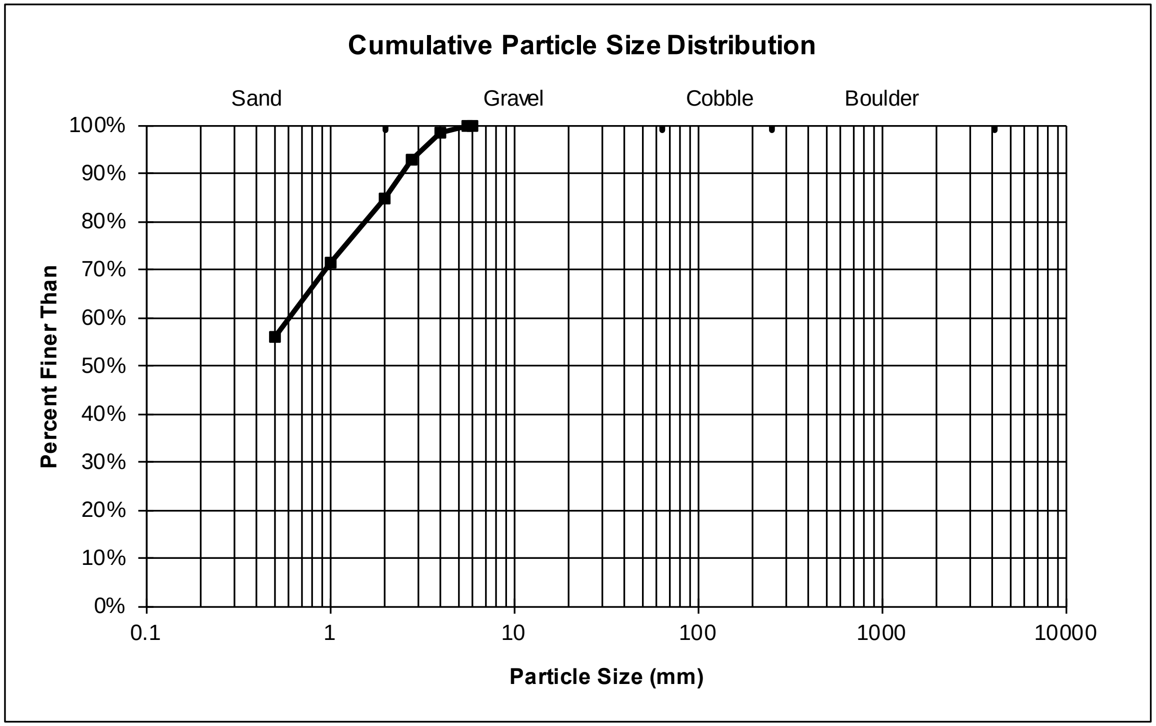
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	238.00	56.0%	
0.5	66.20	15.6%	56.0%
1.0	55.90	13.1%	71.5%
2.0	35.00	8.2%	84.7%
2.8	23.70	5.6%	92.9%
4.0	6.00	1.4%	98.5%
5.6	0.50	0.1%	99.9%
6.0	*		100.0%
11.2			-
16.0			
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	425.30		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected upstream from cross section A

SITE NAME: Pikes Peak Highway - Severy Creek Reach 1
ID NUMBER: **SVRY1**
DATE: 9/1/2015
CREW: Karlsson, VonLoh, Winkler

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.014	0.081	0.298	1.931	3.203	6.0



Sieve Analysis Worksheet

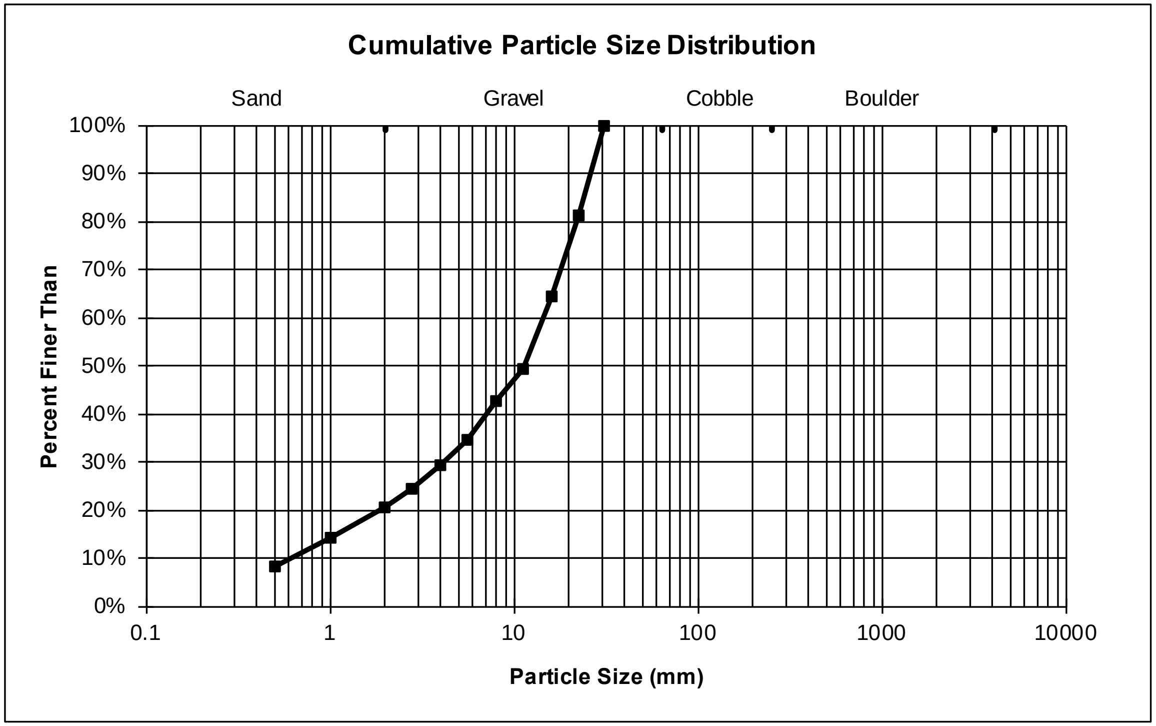
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	48.40	8.1%	
0.5	36.90	6.2%	8.1%
1.0	37.20	6.3%	14.3%
2.0	23.50	3.9%	20.6%
2.8	28.50	4.8%	24.5%
4.0	32.00	5.4%	29.3%
5.6	46.90	7.9%	34.7%
8.0	39.50	6.6%	42.6%
11.2	91.20	15.3%	49.2%
16.0	99.40	16.7%	64.5%
22.4	111.60	18.8%	81.2%
31.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	595.10		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample taken downstream from cross section E left bank

SITE NAME: Pikes Peak Highway - Severy Creek Reach 2
ID NUMBER: **SVRY2**
DATE: 9/1/2015
CREW: Karlsson, VonLoh, Winkler

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	1.077	**5.677**	**11.406**	**23.494**	**28.427**	**31.0**



Sieve Analysis Worksheet

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	66.90	10.0%	
0.5	32.80	4.9%	10.0%
1.0	46.70	7.0%	14.9%
2.0	30.90	4.6%	21.8%
2.8	44.60	6.6%	26.4%
4.0	55.20	8.2%	33.1%
5.6	84.70	12.6%	41.3%
8.0	147.50	22.0%	53.9%
11.2	136.90	20.4%	75.9%
16.0	24.80	3.7%	96.3%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	671.00		

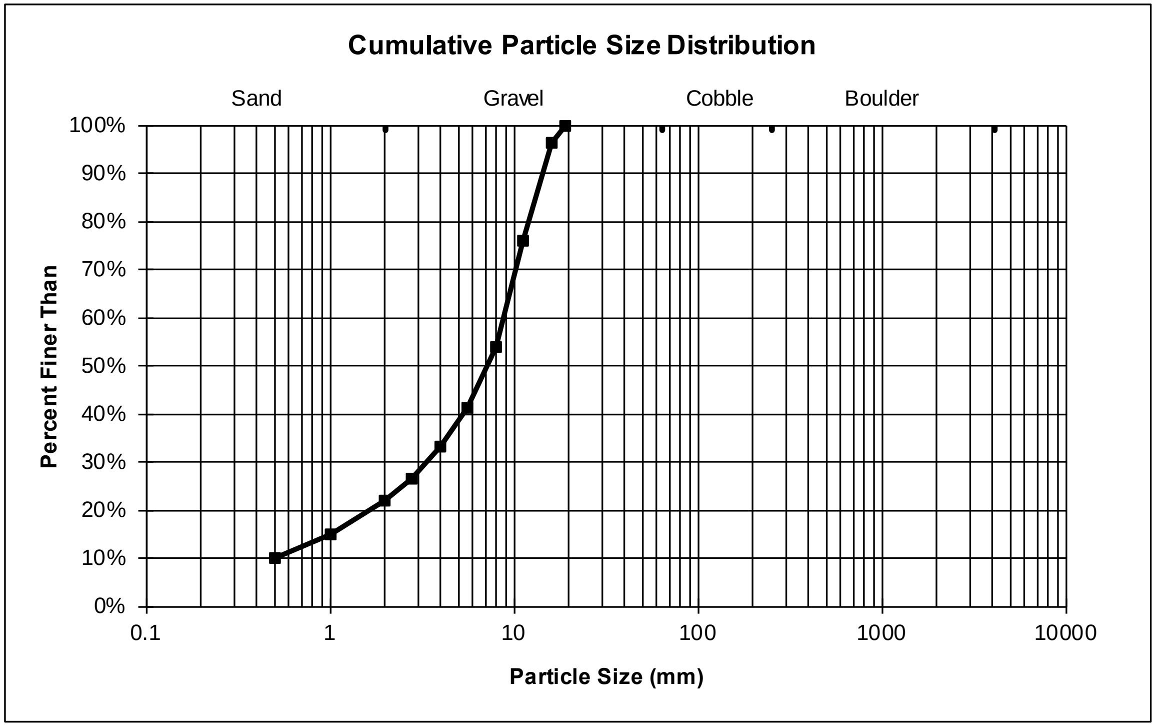
*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected downstream from cross section D left bank

SITE NAME: Pikes Peak Highway - Ski Creek Reach 1
ID NUMBER: **SKIC1**
DATE: 8/20/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)

D15	D35	D50	D84	D95	Lpart
1.014	4.329	7.161	12.903	15.639	19.0



Sieve Analysis Worksheet

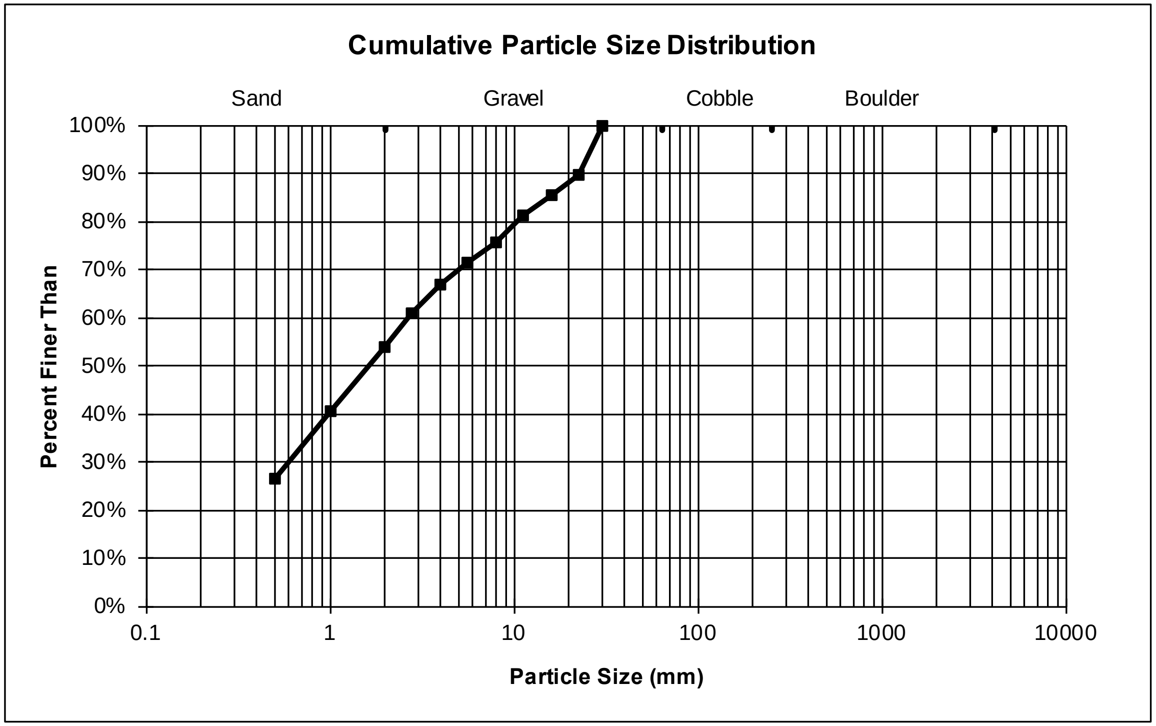
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	138.30	26.4%	
0.5	74.60	14.3%	26.4%
1.0	69.10	13.2%	40.7%
2.0	36.80	7.0%	53.9%
2.8	31.60	6.0%	60.9%
4.0	23.90	4.6%	67.0%
5.6	20.60	3.9%	71.5%
8.0	30.60	5.8%	75.5%
11.2	20.90	4.0%	81.3%
16.0	22.10	4.2%	85.3%
22.4	54.70	10.5%	89.5%
30.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	523.20		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected from cross section A left bank

SITE NAME: Pikes Peak Highway - Ski Creek Reach 2
ID NUMBER: **SKIC2**
DATE: 9/8/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.061	0.758	1.630	14.220	26.088	30.0



Sieve Analysis Worksheet

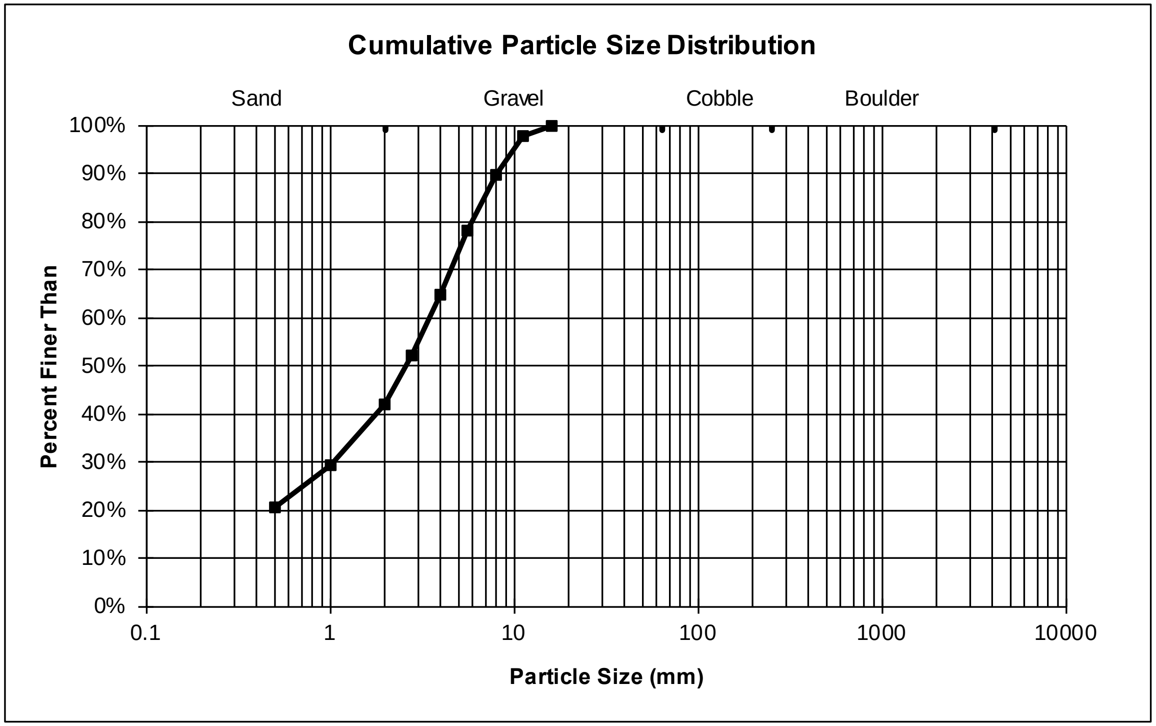
COMMENTS: Bar sample collected upstream from cross section B right bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	139.80	20.4%	
0.5	59.60	8.7%	20.4%
1.0	88.20	12.9%	29.1%
2.0	70.20	10.3%	42.0%
2.8	85.30	12.5%	52.3%
4.0	92.00	13.4%	64.7%
5.6	79.30	11.6%	78.2%
8.0	54.10	7.9%	89.8%
11.2	15.90	2.3%	97.7%
16.0	*		100.0%
22.4			-
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	684.40		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pikes Peak Highway - South Catamount Creek Reach 1
ID NUMBER: **SCAT1**
DATE: 8/4/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.138	**1.371**	**2.598**	**6.698**	**9.994**	**16.0**



Sieve Analysis Worksheet

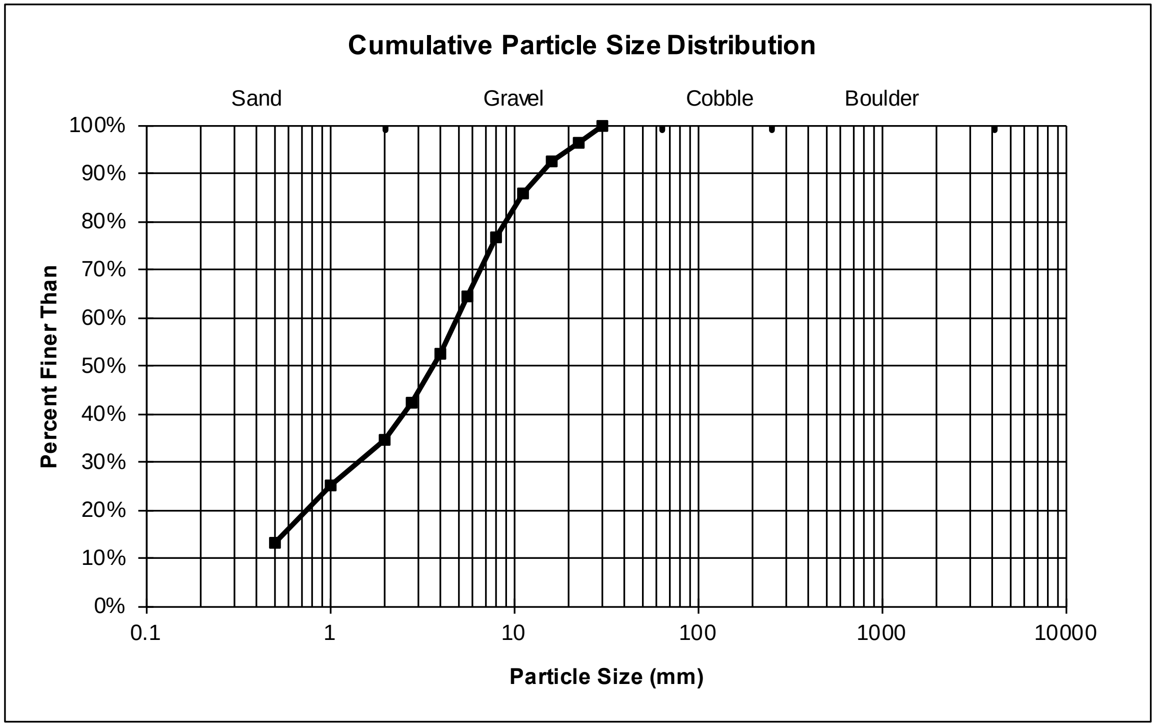
COMMENTS: Bar sample collected at cross section A right bank

Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	71.10	13.2%	
0.5	64.90	12.0%	13.2%
1.0	51.10	9.5%	25.2%
2.0	41.00	7.6%	34.6%
2.8	54.90	10.2%	42.2%
4.0	64.90	12.0%	52.4%
5.6	66.10	12.2%	64.4%
8.0	48.50	9.0%	76.6%
11.2	37.20	6.9%	85.6%
16.0	20.80	3.9%	92.5%
22.4	19.70	3.6%	96.4%
30.0	*		100.0%
45.0			-
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	540.20		

*Measured value of the largest particle in the sample and not a sieve weight

SITE NAME: Pikes Peak Highway - South Catamount Creek Reach 2
ID NUMBER: **SCAT2**
DATE: 8/4/2015
CREW: Karlsson, VonLoh

Particle Size Distribution (mm)	**D15**	**D35**	**D50**	**D84**	**D95**	**Lpart**
	0.556	**2.033**	**3.678**	**10.542**	**19.902**	**30.0**



Sieve Analysis Worksheet

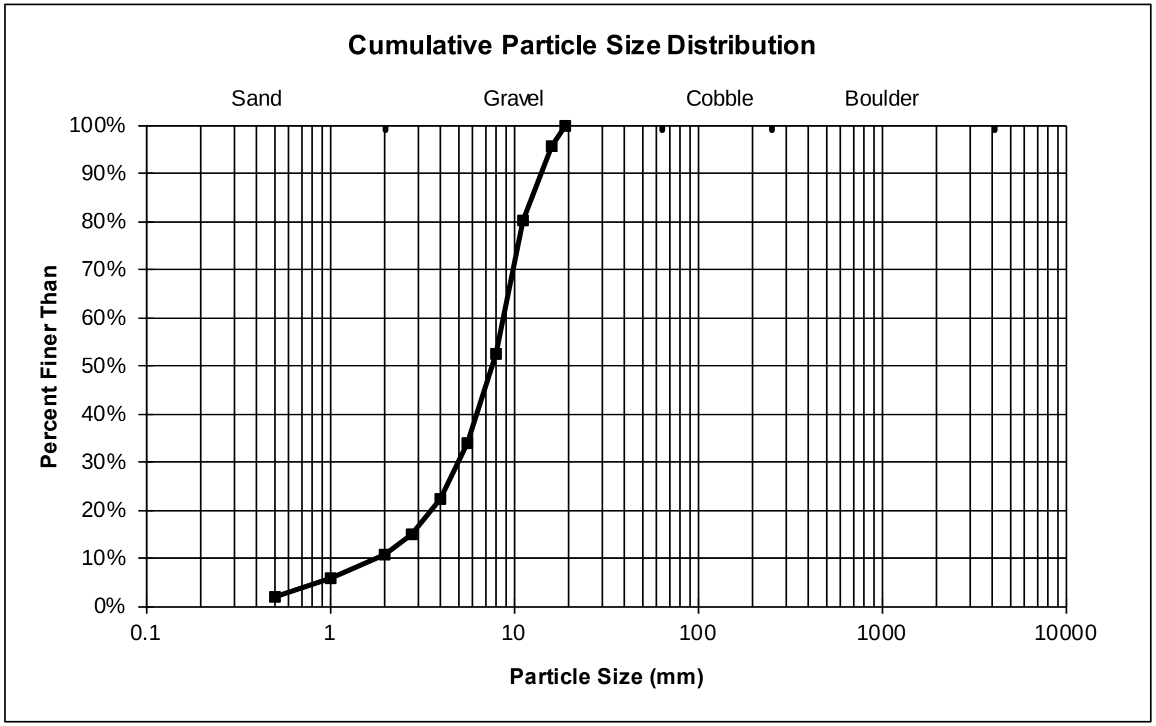
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	9.60	2.1%	
0.5	16.40	3.6%	2.1%
1.0	23.60	5.1%	5.7%
2.0	19.40	4.2%	10.8%
2.8	33.60	7.3%	15.0%
4.0	52.70	11.5%	22.3%
5.6	85.70	18.6%	33.8%
8.0	127.20	27.6%	52.4%
11.2	72.10	15.7%	80.0%
16.0	19.80	4.3%	95.7%
19.0	*		100.0%
32.0			-
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	460.10		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected downstream from cross section A right bank

SITE NAME: Pikes Peak Highway - South Catamount Creek Reach 3
ID NUMBER: **SCAT3**
DATE: 8/26/2015
CREW: Karlsson, Salsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	2.800	5.735	7.644	12.260	15.748	19.0



Sieve Analysis Worksheet

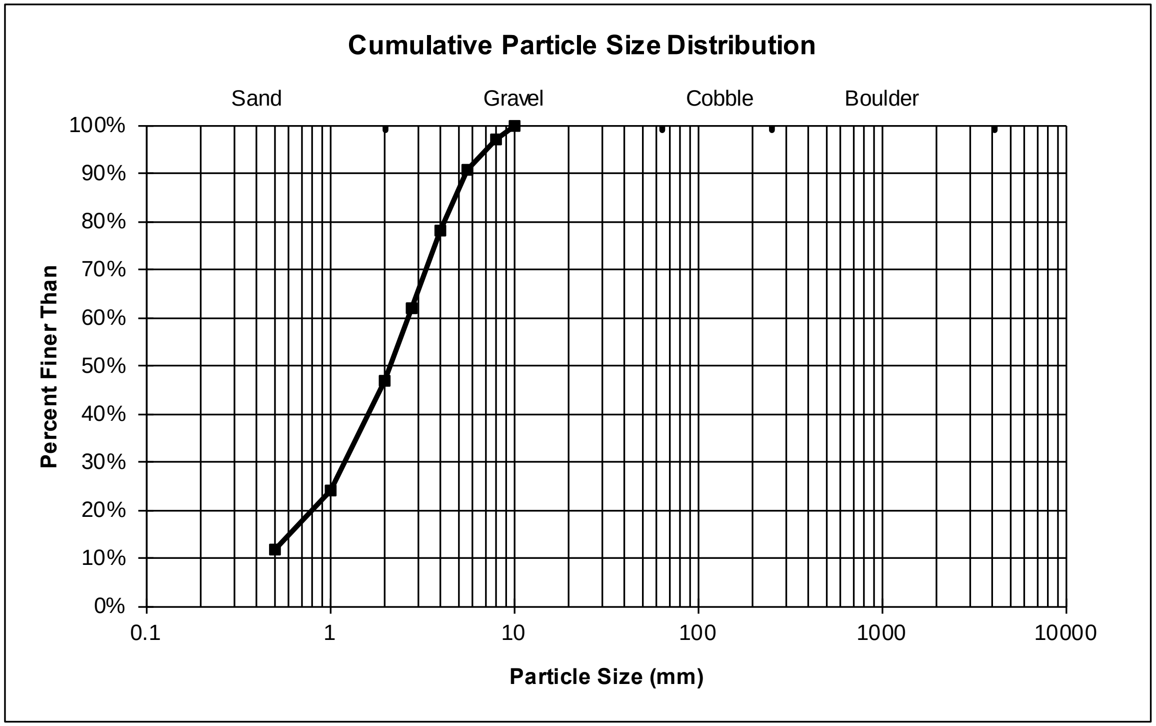
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	63.50	11.6%	
0.5	67.50	12.4%	11.6%
1.0	124.40	22.8%	24.0%
2.0	83.30	15.2%	46.7%
2.8	87.00	15.9%	62.0%
4.0	70.50	12.9%	77.9%
5.6	34.60	6.3%	90.8%
8.0	15.60	2.9%	97.1%
10.0	*		100.0%
16.0			-
22.4			
32.0			
45.0			
64.0			
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	546.40		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected at cross section D left bank

SITE NAME: Pikes Peak Highway - West Fork of Beaver Creek Reach 1
ID NUMBER: **WBVR1**
DATE: 9/16/2015
CREW: Karlsson, Salsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.604	1.399	2.149	4.688	7.090	10.0



Sieve Analysis Worksheet

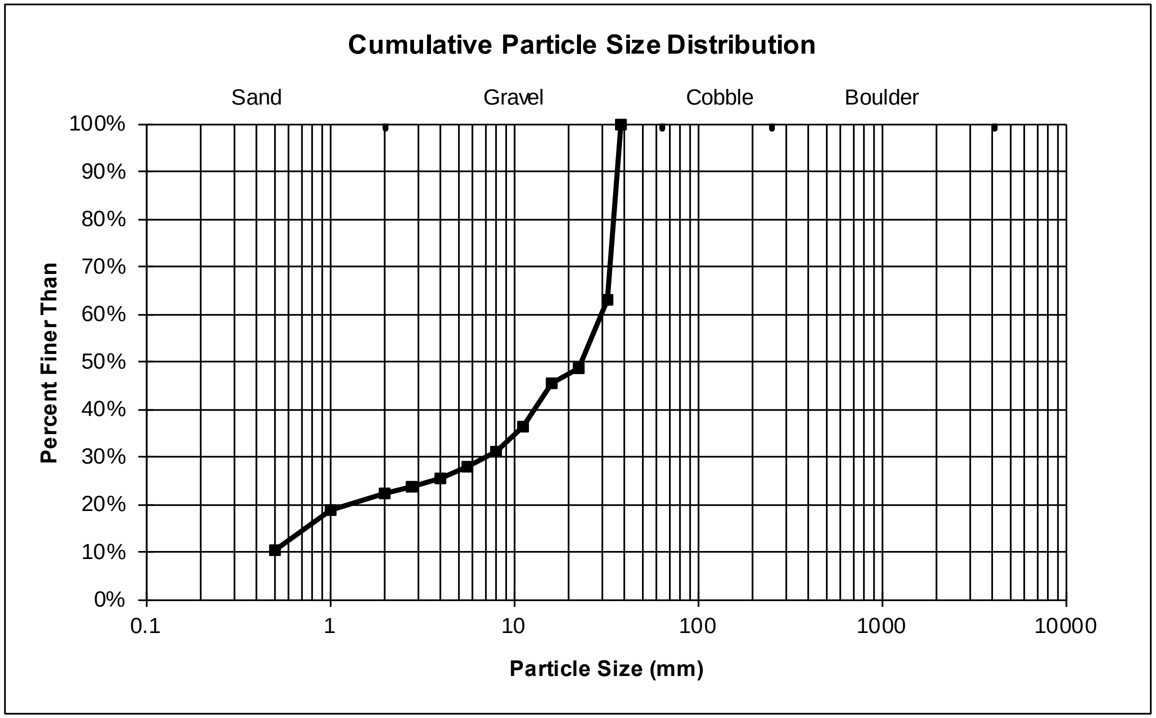
Size Finer Than (mm)	Wt. on Sieve	% of Total	% Finer Than
Pan	72.20	10.4%	
0.5	57.50	8.2%	10.4%
1.0	26.30	3.8%	18.6%
2.0	9.40	1.3%	22.4%
2.8	11.70	1.7%	23.7%
4.0	16.70	2.4%	25.4%
5.6	23.70	3.4%	27.8%
8.0	36.90	5.3%	31.2%
11.2	61.50	8.8%	36.5%
16.0	22.90	3.3%	45.3%
22.4	99.20	14.2%	48.6%
32.0	259.20	37.2%	62.8%
38.0	*		100.0%
64.0			-
90			
128			
181			
256			
362			
512			
1024			
2048			
4096			
Total	697.20		

*Measured value of the largest particle in the sample and not a sieve weight

COMMENTS: Bar sample collected between cross sections B and C left bank

SITE NAME: Pikes Peak Highway - West Fork of Beaver Creek Reach 2
ID NUMBER: **WBVR2**
DATE: 9/16/2015
CREW: Karlsson, Salsbury, VonLoh

Particle Size Distribution (mm)	D15	D35	D50	D84	D95	Lpart
	0.739	10.189	23.203	35.291	37.132	38.0



Appendix P

Riparian Vegetation Summary

2015

Riparian Vegetation Summary, Pikes Peak 2015

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
BHMR1	9/28/2015	Olympus Stylus 400	A (24.36)	Downstream from XSE	Left	11.2	14.0	30	Grass, Sedge, Forb
BHMR1			A		Right	13.4	10.5	35	Grass, Sedge
BHMR1			B (31.95)		Left	6.5	10.8	20	Grass, Sedge, Forb
BHMR1			B		Right	9.9	5.8	20	Grass, Sedge
BHMR1			C (16.81)		Left	8.2	13.0	15	Grass, Sedge, Forb
BHMR1			C		Right	11.8	7.5	20	Sedge, Forb
BHMR1			D (20.28)		Left	7.4	11.0	25	Grass, Sedge, Forb
BHMR1			D		Right	10.6	7.0	25	Grass, Sedge, Forb
BHMR1			E (34.42)		Left	21.8	27.0	35	Sedge, Forb
BHMR1			E		Right	27.6	22.5	30	Grass, Sedge
BHMR2	9/28/2015	Olympus Stylus 400	A (25.43)	18' upstream from XSB	Left	6.0	11.0	15	Sedge, Forb
BHMR2			A		Right	10.0	6.0	20	Sedge, Forb
BHMR2			B (17.59)		Left	6.9	10.0	25	Grass, Sedge, Forb
BHMR2			B		Right	10.0	6.0	20	Grass, Sedge, Forb
BHMR2			C (18.46)		Left	6.0	10.0	20	Sedge, Forb, Shrub
BHMR2			C		Right	9.4	6.0	15	Sedge, Forb
BHMR2			D (30.44)		Left	15.5	19.0	25	Grass, Sedge, Forb
BHMR2			D		Right	18.6	15.0	30	Sedge
BHMR2			E (43.02)		Left	11.0	16.0	15	Sedge, Forb
BHMR2			E		Right	14.7	11.5	20	Sedge
GLEN1	8/26/2015	Olympus Stylus 400	A (20.03)	At XSE right bank	Left	9.0	12.0	25	Grass, Sedge, Shrub
GLEN1			A		Right	13.0	8.5	65	Moss, Forb, Grass
GLEN1			B(16.57)		Left	6.3	9.5	5	Grass, Forb, Large Anthill
GLEN1			B		Right	9.0	5.7	15	Grass, Shrub, Forb
GLEN1			C (17.31)		Left	5.9	9.9	10	Grass, Forb
GLEN1			C		Right	9.6	6.0	15	Grass, Forb

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
GLEN1			D (49.99)		Left	16.5	21.0	10	Grass, Shrub, Forb
GLEN1			D		Right	29.0	27.2	20	Grass, Forb
GLEN1			E (24.29)		Left	8.0	15.5	20	Shrub, Grass, Moss
GLEN1			E		Right	17.0	12.0	10	Grass, Forb
NCAT1	9/9/2015	Olympus Stylus 400	A (57.53)	At XSC left bank	Left	12.0	17.0	15	Grass, Sedge, Forb
NCAT1			A		Right	16.5	12.0	20	Grass, Sedge, Forb
NCAT1			B (58.83)		Left	48.0	50.0	35	Grass, Sedge
NCAT1			B		Right	50.5	47.0	35	Grass, Sedge, Shrub
NCAT1			C (38.85)		Left	16.7	21.5	35	Grass, Sedge, Forb, Shrub
NCAT1			C		Right	30.3	26.0	20	Grass, Sedge, Forb
NCAT1			D (44.77)		Left	28.7	30.0	45	Forb, Sedge, Shrub
NCAT1			D		Right	32.5	29.3	50	Sedge, Shrub
NCAT1			E (60.78)		Left	42.8	47.0	35	Grass, Sedge, Shrub, Forb
NCAT1			E		Right	45.5	41.0	35	Moss, grass, Sedge
NCAT2	9/9/2015	Olympus Stylus 400	A (29.17)	2' downstream from XSB	Left	12.0	16.5	40	Sedge, Shrub, Forb, Moss
NCAT2			A		Right	16.2	12.0	35	Sedge, Shrub, Forb, Moss
NCAT2			B (40.59)		Left	8.8	13.0	35	Sedge, Forb
NCAT2			B		Right	11.8	8.0	30	Sedge, Forb, Shrub
NCAT2			C (42.34)		Left	12.4	17.0	35	Sedge, Forb, Grass
NCAT2			C		Right	16.4	11.5	30	Grass, Forb
NCAT2			D (29.78)		Left	6.0	10.5	35	Sedge, Forb, Moss
NCAT2			D		Right	9.7	5.0	25	Sedge, Forb
NCAT2			E (34.25)		Left	10.0	15.0	45	Forb, Moss, Sedge
NCAT2			E		Right	13.1	2.5	30	Forb, Moss, Sedge, Grass
NCRY1	8/5/2015	Olympus Stylus 400	A (54.53)	At XSA left bank	Left	35.5	39.0	15	Grass, Shrub, Forb
NCRY1			A		Right	38.8	36.0	10	Grass, Moss, Forb
NCRY1			B (51.31)		Left	38.8	42.0	10	Shrub, Forb, Moss, Tree

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
NCRY1			B		Right	41.5	38.0	20	Shrub, Forb, Moss, Grass
NCRY1			C (43.61)		Left	26.3	29.0	35	Shrub, Grass
NCRY1			C		Right	28.7	25.0	20	Grass, Forb, Shrub, Moss
NCRY1			D (41.53)		Left	29.6	32.8	5	Fungi, Tree, Grass, Forb
NCRY1			D		Right	31.5	29.5	0	Sediment
NCRY1			E (37.98)		Left	30.0	33.7	5	Shrub, Forb
NCRY1			E		Right	34.3	31.0	75	Moss, Lichen
NCRY2	8/5/2015	Olympus Stylus 400	A (24.23)	Upstream from XSE	Left	10.5	15.5	20	Grass, Tree, Forb, Moss
NCRY2			A		Right	20.6	15.0	10	Grass, Forb
NCRY2			B (35.00)		Left	21.4	25.0	15	Grass, Tree, Forb, Moss
NCRY2			B		Right	30.5	26.0	15	Grass, Shrub, Forb
NCRY2			C (33.82)		Left	19.3	24.0	35	Moss, Tree, Forb
NCRY2			C		Right	27.4	23.0	80	Moss, Forb, Grass, Tree
NCRY2			D (28.71)		Left	14.5	18.3	10	Grass
NCRY2			D		Right	22.9	19.3	10	Grass, Shrub
NCRY2			E (34.35)		Left	5.3	7.1	20	Grass
NCRY2			E		Right	18.4	15.6	100	Moss, Shrub, Grass
OILC1	8/20/2015	Olympus Stylus 400	A (48.75)	15' downstream from XSD	Left	5.4	11.0	40	Shrub, Moss, Forb, Grass
OILC1			A		Right	37.0	33.0	25	Sedge, Shrub
OILC1			B (41.34)		Left	3.5	6.0	20	Sedge, Grass
OILC1			B		Right	36.0	32.0	5	Sedge, Grass
OILC1			C (32.67)		Left	3.0	6.0	15	Sedge
OILC1			C		Right	31.0	26.0	40	Sedge
OILC1			D (45.68)		Left	3.5	6.0	10	Sediment, Grass
OILC1			D		Right	37.0	33.0	30	Sedge, Grass
OILC1			E (38.35)		Left	8.9	12.0	45	Sedge, Grass, Shrub
OILC1			E		Right	26.6	21.0	55	Sedge, Moss, Grass

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
SVRY1	9/1/2015	Olympus Stylus 400	A (13.70)	Upstream from XSA	Left	2.0	7.0	65	Grass, Moss, Forb
SVRY1			A		Right	7.8	4.0	40	Grass, Shrub, Forb
SVRY1			B (11.83)		Left	5.0	8.0	30	Grass, Forb, Shrub
SVRY1			B		Right	8.0	5.0	35	Grass, Shrub, Moss
SVRY1			C (14.82)		Left	4.9	8.0	30	Shrub, Forb, Grass
SVRY1			C		Right	7.8	5.0	40	Shrub, Grass, Forb
SVRY1			D (12.09)		Left	4.6	8.0	40	Grass, Shrub, Moss
SVRY1			D		Right	8.6	4.0	65	Moss, Forb, Grass, Sedge
SVRY1			E (9.57)		Left	2.7	7.0	30	Grass, Forb
SVRY1			E		Right	6.6	4.0	80	Moss, Grass, Forb
SVRY2	9/1/2015	Olympus Stylus 400	A (95.72)	Downstream from XSE left bank	Left	20.2	28.0	0	Sediment
SVRY2			A		Right	37.0	32.0	0	Sediment
SVRY2			B (116.96)		Left	29.5	35.0	0	Sediment
SVRY2			B		Right	47.2	41.0	0	Sediment
SVRY2			C (158.61)		Left	59.2	65.0	0	Sediment
SVRY2			C		Right	81.5	73.0	0	Sediment
SVRY2			D (156.58)		Left	74.8	79.0	0	Sediment
SVRY2			D		Right	95.0	87.0	0	Sediment
SVRY2			E (211.52)		Left	62.5	72.0	0	Sediment
SVRY2			E		Right	81.0	71.0	0	Sediment
SKIC1	8/11/2015	Olympus Stylus 400	A (15.04)	Downstream from XSD on left bank	Left	6.2	8.0	25	Moss, Forb, Shrub, Grass
SKIC1			A		Right	11.1	8.5	45	Moss, Forb, Grass
SKIC1			B (14.15)		Left	4.9	7.0	10	Moss, Forb
SKIC1			B		Right	10.5	7.5	25	Moss, Forb, Grass
SKIC1			C (16.60)		Left	4.1	7.0	50	Grass, Forb, Shrub, Tree
SKIC1			C		Right	11.0	9.0	40	Moss, Grass, Forb

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
SKIC1			D (33.57)		Left	16.0	19.5	45	Grass, Forb, Moss
SKIC1			D		Right	23.2	19.5	5	Forb, Grass
SKIC1			E (21.78)		Left	14.5	17.5	40	Grass, Forb, Moss
SKIC1			E		Right	19.2	15.0	55	Moss, Grass, Forb, Fungi
SKIC2	9/8/2015	Olympus Stylus 400	A (50.70)	XSA left bank	Left	32.8	36.0	20	Moss, Grass, Shrub, Forb
SKIC2			A		Right	40.7	35.0	30	Moss, Forb, Grass, Tree
SKIC2			B (46.73)		Left	28.5	35.5	45	Moss, Forb
SKIC2			B		Right	34.5	32.5	15	Moss, Grass, Forb
SKIC2			C (29.76)		Left	2.6	6.0	20	Shrub, Moss, Forb, Grass
SKIC2			C		Right	10.6	7.0	5	Forb
SKIC2			D (28.31)		Left	4.3	11.0	20	Moss, Forb
SKIC2			D		Right	12.5	8.0	5	Forb, Moss
SKIC2			E (41.90)		Left	24.9	31.0	20	Moss, Grass, Forb
SKIC2			E		Right	31.1	26.0	15	Moss, Grass, Forb
SCAT1	8/4/2015	Olympus Stylus 400	A (22.96)	Upstream from XSB right bank	Left	6.4	11.5	20	Grass, Forb, Moss
SCAT1			A		Right	11.2	8.9	60	Moss
SCAT1			B (20.83)		Left	10.0	14.0	75	Moss, Forb, Grass, Shrub
SCAT1			B		Right	18.3	14.0	25	Moss, Forb, Grass, Shrub
SCAT1			C (21.86)		Left	4.0	10.0	15	Grass, Forb, Tree
SCAT1			C		Right	13.7	9.6	30	Grass, Forb, Moss
SCAT1			D (18.12)		Left	5.5	12.0	40	Grass, Forb
SCAT1			D		Right	11.7	6.0	60	Grass, Forb
SCAT1			E (24.02)		Left	10.0	16.0	55	Grass, Forb, Shrub, Moss
SCAT1			E		Right	15.5	10.0	90	Moss, Grass, Forb
SCAT2	8/4/2015	Olympus Stylus 400	A (28.57)	XSA right bank	Left	3.9	9.0	10	Grass, Forb, Moss, Fungi
SCAT2			A		Right	15.0	9.5	15	Grass, Forb, Moss, Tree
SCAT2			B (17.05)		Left	3.0	7.0	5	Grass, Forb

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
SCAT2			B		Right	11.3	7.0	15	Grass, Forb, Shrub
SCAT2			C (19.81)		Left	4.0	6.0	20	Grass, Forb, Moss, Tree
SCAT2			C		Right	13.2	9.0	5	Forb, Grass
SCAT2			D (38.50)		Left	7.6	11.0	25	Moss, Grass, Forb
SCAT2			D		Right	15.4	12.7	25	Grass, Forb, Moss
SCAT2			E (18.95)		Left	3.3	7.0	90	Moss, Forb, Grass, Shrub
SCAT2			E		Right	11.2	8.0	100	Moss, Grass, Forb
SCAT3	8/26/2015	Olympus Stylus 400	A (44.32)	Downstream from XSA right bank	Left	26.0	29.4	20	Sedge, Forb, Grass
SCAT3			A		Right	29.2	25.2	25	Grass, Forb, Sedge, Tree
SCAT3			B (32.19)		Left	12.1	16.0	15	Grass, Moss, Forb, Tree
SCAT3			B		Right	15.5	12.7	20	Grass, Forb
SCAT3			C (15.79)		Left	2.6	6.8	20	Sedge, Forb, Shrub
SCAT3			C		Right	6.2	3.1	25	Sedge, Moss
SCAT3			D (19.60)		Left	8.0	11.6	15	Sedge, Grass
SCAT3			D		Right	10.0	8.1	20	Grass, Shrub, Sedge
SCAT3			E (18.48)		Left	4.6	8.2	65	Moss, Grass, Shrub, Forb
SCAT3			E		Right	6.5	3.8	40	Shrub, Sedge, Forb, Moss
WBVR1	9/16/2015	Olympus Stylus 400	A (36.64)	XSD left bank	Left	15.9	20.0	15	Grass, Sedge
WBVR1			A		Right	31.0	27.0	5	Grass, Sedge
WBVR1			B (20.98)		Left	4.3	10.0	20	Moss, Grass, Shrub
WBVR1			B		Right	15.5	11.0	10	Sedge, Grass
WBVR1			C (28.83)		Left	3.8	9.0	70	Moss, Grass, Sedge, Shrub
WBVR1			C		Right	17.0	11.0	30	Sedge, Shrub, Forb
WBVR1			D (34.18)		Left	9.0	14.0	30	Shrub, Moss
WBVR1			D		Right	25.0	20.0	20	Sedge
WBVR1			E (29.56)		Left	6.0	12.0	60	Moss, Forb, Shrub
WBVR1			E		Right	20.0	16.0	25	Grass, Sedge

Site ID	Date	Camera	Cross Section and Pin to Pin Distance in (ft)	Bar Sample	Bank	Bank Distance from LPIN (ft)	Camera Distance from LPIN (ft)	Percent Cover	Comments
WBVR2	9/16/2015	Olympus Stylus 400	A (44.40)	XSB <> XSC left bank	Left	9.7	16.0	5	Moss
WBVR2			A		Right	25.0	19.0	5	Grass, Shrub
WBVR2			B (90.60)		Left	14.0	21.0	5	Grass, Shrub
WBVR2			B		Right	42.3	37.0	0	Sediment
WBVR2			C (151.93)		Left	100.5	107.0	5	Shrub, Grass
WBVR2			C		Right	126.0	119.0	0	Sediment
WBVR2			D (149.43)		Left	97.0	108.0	5	Grass
WBVR2			D		Right	127.5	123.0	0	Sediment
WBVR2			E (96.25).		Left	32.2	38.0	45	Sedge, Shrub, Forb
WBVR2			E		Right	54.5	43.0	5	Grass