TA00

Los Alamos
NATIONAL LABORATORY
EST. 1943
Environmental Programs
P.O. Box 1663, MS M991
Los Alamos, New Mexico 87545
(505) 606-2337/FAX (505) 665-1812

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NMED Hazardous Waste Bureau

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National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-4255/FAX (505) 606-2132

Date: August 31, 2009
Refer To: EP2009-0419

James Bearzi, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Engineering Design Drawings for the DP Canyon and Pueblo Canyon Grade-Control Structures

Dear Mr. Bearzi:

Please find attached the engineering report and design drawings for the DP Canyon and Pueblo Canyon grade-control structures. This submittal fulfills the requirements in comments 9a and 9c of the Approval with Modifications Supplemental Interim Measures Work Plan (SIWP), dated February 20, 2009. The New Mexico Environment Department required drawings with sufficient detail to obtain the necessary permits and to identify construction materials and exact locations and footprints of the structures. The engineering package also includes hydraulic analyses for both structures. Design elements that relate to how the structures will pass floods are also included in the drawings.

If you have any questions, please contact Danny Katzman at (505) 667-6333 (katzman@lanl.gov) or Cheryl Rodriguez at (505) 665-5330 (crodriguez@doeal.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

31947

MG/DG/PH/DK:sm

Attachment: Two hard copies with electronic files – Engineering Report and Design Drawings for the DP Canyons and Pueblo Canyon Grade-Control Structures (LA-UR-09-5522)

Cy: (w/enc.)
Miguel B. Gabaldon, NMDOT, Santa Fe, NM
Regina Wheeler, Los Alamos County, NM
Neil Weber, San Ildefonso Pueblo
Cheryl Rodriguez, DOE-LASO, MS A316
Danny Katzman, EP-LWSP, MS M992
RPF, MS M707 (with two CDs)
Public Reading Room, MS M992

Cy: (Letter and CD and/or DVD only)
Laurie King, EPA Region 6, Dallas, TX
Steve Yanicak, NMED-OB, White Rock, NM
Kristine Smeltz, EP-WES, MS M992

Cy: (w/o enc.)
Tom Skibitski, NMED-OB, Santa Fe, NM
Keyana DeAguero, DOE-LASO (date-stamped letter emailed)
David McInroy, EP-CAP, MS M992
Paul Huber, EP-LWSP, MS M992
Michael J. Graham, ADEP, MS M991
Alison M. Dorries, EP-WES, MS M996
IRM-RMMSO, MS A150 (date-stamped letter emailed)

Los Alamos National Laboratory
Grade Control Structures
DP Canyon and Pueblo Canyon

Los Alamos, New Mexico

Prepared by:

PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, FL 34232

Prepared for:

Los Alamos National Laboratory
P.O. Box 1663
Los Alamos, NM 87545

LAUR-09-5522

August 28, 2009

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DP Canyon HEC-RAS Hydraulic Analysis

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Pueblo Canyon HEC-RAS Hydraulic Analysis

Existing Conditions

- Cross Section Plan
- Cross Sections
- Profile (5yr and 100yr)
- Profile Output Table (5yr and 100yr)

Proposed Conditions

- Cross Section Plan
- Cross Sections
- Gabion Structure
- Profile (5yr and 100yr)
- Profile Output Table (5yr and 100yr)

Proposed Conditions with Sediment

- Cross Section Plan
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- Gabion Structure
- Profile (5yr and 100yr)
- Profile Output Table (5yr and 100yr)

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Los Alamos Sediment Grade Control Structures
DP Canyon and Pueblo Canyon

Executive Summary

The following report was prepared by PBS&J for the Department of Energy's Los Alamos National Laboratory (LANL) to summarize the analysis and design efforts to assist LANL in implementation of mitigation actions in Delta Prime (DP) Canyon and Pueblo Canyon in the vicinity of Los Alamos, New Mexico.

The project consists of the construction of grade-control structures in DP Canyon and Pueblo Canyon. The approximate location of the proposed DP Canyon grade-control structure is down canyon from the 21-011(k) outfall at Technical Area 21 and near the site of the current E039 gaging station at the east end of reach DP-2. The approximate location of the proposed Pueblo Canyon grade control structure is 400 feet downstream of the current E060 gaging station.

The proposed structures are part of a number of mitigation actions taken to reduce the migration of contaminated sediment. The primary objectives of the structure in DP Canyon are to reduce erosive flow energy and to induce upstream aggradation (sediment deposition) that will fill the channel and partially bury the existing sediments in the floodplain.

The primary objectives of the structure in Pueblo Canyon are to reduce erosive flow energy and to induce upstream aggradation (sediment deposition) that will fill the channel, re-establish and extend the wetland down canyon and establish a new grade that provides stability to the channel headcuts near the E060 stream gage station. The new channel slope will help repair the degraded channel and prevent the further upstream migration of the headcuts. The headcut regions will be replaced with a broad aggraded wetland surface where floodwaters will spread and further increase sediment deposition.

Grade control structures were designed for both sites to accomplish these objectives. The following is a summary of each proposed structure for this project:

Pueblo Canyon

The proposed structure is composed of gabions with a 30-foot low flow weir width at 4 feet above the low point in the existing stream (thalweg) and a 171-foot overflow weir at 3 feet above the low flow weir. The 5-year flow was used to design a low flow notch.

The 100 year flow was used to determine the rest of the weir dimensions (the upper notch and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end sill heights.

The initial design crest of the low flow notch is 4 feet above the existing ground but can go as high as 8 feet. The structure will include a 350-foot earthen guide berm in the floodplain to prevent erosion caused by water as it is collected and funneled toward the structure opening. The elevations of the berm, as it projects upstream, are designed to capture all the flows up to the 100-year flood with the assumption that the ultimate sedimentation in the channel, due to the structure, has occurred.

A perforated and slotted riser pipe will be placed approximately 50 feet upstream of the structure to assist in releasing water stored upstream. This pipe is connected to another pipe that goes through the gabion structure and outlets to the stilling basin. Before the flow event occurs, the slot elevation is placed at the elevation of the low flow notch to assure that maximum water surface elevations are achieved to induce sediment settling. After the event, the perforations on the pipe allow dewatering. However, if the rate of dewatering is not sufficient to meet standards or the perforations are plugged by debris, the slots in the pipe can be removed as needed to accelerate the dewatering process.

DP Canyon

The proposed structure is composed of gabions with a 21-foot low flow weir width at 4 feet above the lowest elevation in the existing stream (thalweg) and a 54-foot overflow weir at 3 feet above the low flow weir. The 5-year flow was used to design the low flow notch. The 100-year flow was used to determine the rest of the weir dimensions (the upper notch and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end sill heights.

The initial design crest of the low-flow notch is 4 feet above the existing ground but can go as high as 7.5 feet.

A perforated and slotted riser pipe will be placed approximately 50 feet upstream of the structure to assist in releasing water stored upstream. This pipe is connected to an outfall pipe that goes through the gabion structure and outlets to the stilling basin or plunge pool. Before the flow event occurs, the slot elevation is placed at the elevation of the low-flow notch to assure that maximum water surface elevations are achieved to induce sediment settling. After the event, the perforations on the pipe allow dewatering. However, if the rate of dewatering is not sufficient to meet standards or the perforations are plugged by debris, the slots in the pipe can be removed as needed to accelerate the dewatering process.

General

A Technical Design Description narrative describing the objectives and design elements for each grade control structure is provided in Sections II and III of the following report. In addition to the analysis already conducted, geotechnical explorations were recently conducted at both sites confirming anticipated site conditions. To further refine our designs and capture a baseline for future site comparisons, an aerial topographic (LiDAR) and photographic survey will be performed prior to the start of construction. This high-resolution LiDAR survey may also reveal that the requirement for perforated and slotted riser pipes are no longer necessary because there will be sufficient soil excavated during the construction of the grade control structures, as well as downstream contaminated sediments, to create conditions similar to the eventual wetland grades. The HEC-RAS hydraulic modeling analysis performed in the design of the grade control structures is provided in Appendix A (on CD). Construction plans for the structures are provided in Appendix B.

Technical Design Description:
Pueblo Canyon Grade Control Structure

General Project Description

The project consists of the construction of a grade-control structure within the Department of Energy's Los Alamos National Laboratory (LANL) in the vicinity of Los Alamos, New Mexico. The structure is located within Pueblo Canyon and is referred to as the Pueblo Canyon grade control structure. The approximate location of the proposed Pueblo Canyon grade control structure is approximately 400 feet downstream of the current E060 gaging station.

The proposed structure is part of mitigation actions being implemented to reduce the migration of contaminated sediment.

Project Objectives

The primary objectives of the structure in Pueblo Canyon are to reduce erosive flow energy and to induce upstream aggradation (sediment deposition) that will re-establish and extend the existing wetland down canyon, and establish a new grade that provides stability to the channel headcuts near the existing E060 stream gage station. The new channel slope will help repair the degraded channel and prevent the further upstream migration of the headcuts. The headcut regions will be replaced with a broad aggraded wetland surface where floodwaters will spread and further increase sediment deposition. The proposed structure location is downstream of the current wetland headcut area and upstream of the channel constriction adjacent to the highway. These goals will be accomplished by establishing an adaptable base level above the existing channel elevation and close to the historic channel invert (wetland surface) before the headcutting began. A re-established and stable terminus of the wetland surface will reduce erosion of contaminated sediment and eliminate headcut formation. If possible, contaminated sediments that are located down canyon of the structure and are subject to erosion will be excavated and placed as fill material upgradient of the structure. This transfer of sediment will all occur within the footprint of the Area of Concern. Filling of the basin upgradient of the grade-control structure as part of the construction phase is expected to significantly accelerate re-establishment of the wetland and raising of the water table because low sediment delivery rates are expected in Pueblo Canyon due to wetland trapping efficiency.

Hydrology

Hydrologic analysis has been performed to provide design parameters for the proposed gabion drop control structure at Pueblo Canyon. This analysis is based on stream gage data, topographic information, a site visit and the geomorphic and climatologic conditions of the project area. The basin area is within the arid to semi-arid higher-elevation mountains of New Mexico and contains ephemeral stream systems. Flood flow frequency estimates for the drop structure location were based on applying statistical techniques to stream gage information within the project area and utilizing regional USGS regression formulas. The table below presents the flood frequency results for the project site. One column in the table is based upon the U.S. Army Corps of Engineers statistical computer program, HEC-FFA.

Pueblo Canyon Flood Frequencies			
Percent Chance Exceedance	**USGS Small**	**USGS Rural**	**FFA**
0.2 (500 yr)	4,690	6,340	5,200
1 (100 yr)	2,740	3,380	3,570
2 (50 yr)	2,060	2,440	2,970
10 (10 yr)	932	1,000	1,770
20 (5 yr)	593	591	1,320
50 (2 yr)	245	225	768

The gage data used for this analysis includes the most recent six years of record as a basis for estimating future runoff response to rainfall. In addition, the USGS regression formulas are based on regional analysis of gage data.

For this project site, there are two possible USGS regression sets of formulas to use. The USGS has established a set of equations for watersheds having drainage areas less than 10 square miles (Pueblo Canyon drainage area is approximately 8.4 square miles) and a mean basin elevation less than 7,500 feet, NGVD (Pueblo Canyon mean basin elevation is 7,340 feet, NGVD) (USGS Small); and a set of equations for rural watersheds within the Central Mountain Valley (USGS Rural). For this watershed, the USGS Small regression equations would appear to be the more appropriate, given the basin size. With regard to the FFA analysis, the Pueblo Canyon FFA is based on statistical analysis of a very short record base. Since the stream gage is located very near the proposed project location, no adjustments to the results were deemed necessary. However, although the FFA results are more conservative, the USGS Small regression results were adopted. To accommodate the uncertainty at the high flows and potential effects of additional runoff generated from development within the Los

Alamos town site, a safety factor was incorporated by raising the side walls of the structure above the design elevation required to contain the 100-yr flood.

Development of the HEC-RAS Hydraulic Models

To determine the hydraulic effects of the proposed structure, HEC-RAS models were developed. The HEC-RAS (Version 4.0) models were constructed using the most recent topographic data and GIS techniques for cross section development. An existing conditions model was constructed, calibrated to the best extent, and the water surface elevations for the 2-, 5-, 10-, 50-, and 100-year return interval peak flood discharges were simulated and plotted. All subsequent models utilized these peak flood discharges. A proposed conditions model (with grade control), without accumulated sedimentation behind the structure, was constructed, simulated and plotted. The HEC-RAS In-line weir option was used to model the grade control structure. A proposed condition model, with sedimentation, was created to simulate the change in the streambed elevations due to anticipated long term deposition of sediment (described in a later section) upstream of the grade control structure. These 3 conditions, existing, grade control structure without sediment deposits, and grade control structure with sediment deposits, were compared and analyzed. Results of the HEC-RAS hydraulic modeling analysis for the Pueblo Canyon structure are provided in Appendix A of this report.

Grade Control Structure Design

The structure will primarily be composed of gabions, which are relatively small rocks enclosed in wire baskets and generally consist of standard 3' x 3' x 6' gabions (2 attached 3' x 3' x 3' gabions). Since the gabion drop structure would initially be unsupported and act as a retaining structure, the gabion design requires sufficient mass to prevent slippage and/or overturning. The design of the structure required the raising of the water surface elevations for the more frequent flood events (5-year) such that the sediment deposition occurred immediately upstream of the structure yet minimizes the backwater effects of the rare flood events (50 to 100-year).

The gabion design included buttress structures upstream of the drop as well as founding the structure at least 3' below natural grade. The reason for the buttress gabions being upstream include: providing an uplift of the flow of water approaching the weir for better efficiency; and preventing constant attack of the buttress gabion structure from debris flow that may contain boulders, trees and other such objects. Buttress gabions in the downstream area will dissipate energy. However, the weirs in this area

are relatively low, being one gabion basket above the apron area. The top of the drop structure will have flow directed onto benches below the top elevation. With this flow directed to the stilling floor, energy will be dissipated through the benches.

The upstream face of each structure will be wrapped in a geotextile material (based on gradation analysis of the stream sediment) to minimize the transport of fine sediments during the early stages of operation as well as prevent water leaking though the structure. The material will be buried by backfill using streambed material to stabilize the geotextile and add impermeability. In addition, 3-inch concrete caps will be applied to the low flow weir crests to protect against potential damage from scouring and debris.

The 5-year flow was used to design a low flow notch (described in a later section). The 100 year flow was used to determine the rest of the weir dimensions (the upper notch and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end sill heights, utilizing the Corps of Engineers HEC hydraulic Design Chart 623. A 50 year design was considered but since the increase in design height to contain the 100 year event was less than 0.6 feet, the design was based upon the 100 year peak flood event. This resulted in minimal increase in cost as well as provided additional structural safety. Structural integrity of the grade control structures, with and without saturated sediment against the upstream face, was evaluated by a licensed structural engineer.

Structural measures are made to accommodate a stream gage with water quality sampling and coordinated with a stream gage and water quality sampling instrumentation professional.

Design of the Grade Control Low Flow Notch

A low flow rectangular notch was sized to induce the design volumes and location of deposition in the upstream areas. The width and depth of the notch was determined using regime equations and assuming that the 5-year discharge is a “channel forming” discharge; a common practice for arid to semi-arid regions. This notch is laterally placed where the natural thalweg of the stream is located. The height of the notch was determined by examining the design deposition slope (described in the next section) and adjusting it vertically to maximize deposition on the overbank sediments, safely pass the 100-year flood, and still be a stable structure. The initial height of the notch is 4 feet above the existing ground. This height can be varied as described in the Adaptive Management Feature section. The stilling basin below the low flow notch is designed to release the energy of the turbulent water flow resulting in low energy, laminar flows downstream of the structure.

Sediment Deposition Profile Analysis

The profile of the anticipated sedimentation behind the grade control structure was based upon equilibrium slope analyses and using engineering judgment to select an appropriate slope. The equilibrium slope is the theoretical slope which the stream

would eventually reach. This slope is projected upstream, starting at the low flow weir notch elevation, to determine the depths that will cover the contaminated sediments in the floodplain and the potential wetland extents. This deposition profile was used to adjust the cross section geometry in the HEC-RAS models to determine the water surface elevations for the various frequency floods. This predicts the water surface profiles for ultimate conditions.

Location of the Pueblo Canyon Grade Control Structure

In general, the orientation of the weir portion of the grade control structure will be perpendicular to the approach flow line and the downstream energy dissipation basin should exit into the relatively straight portion of the channel. Looking in plan view, the proposed structure location is very near a bend in the stream and the water approaching the weir portion of the structure will slightly deviate from the perpendicular to the orientation of the weir as is the traditional guidance. Also, the energy dissipation apron is placed downstream of the structure, and as the water exits, it will have to immediately make a slight turn to follow the natural path of the stream. Although the guidelines are not fully met, the structure was positioned to minimize these concerns, given the need to drown out the headcuts.

Guide Berm for the Pueblo Canyon Grade Control Structure

Looking in the upstream direction, the right side of the overbank area could easily capture the stream if a large flood occurred. This would result in bypassing the proposed grade control structure and defeating its purpose. Reinforcing this concern is the observation of headcuts (vertical streambed scour that progresses upstream) that were initiated downstream of the proposed structure that extend from the main channel into the right overbanks. If the headcut is fed flood flows from the overbank, it would progress upstream, reconnect with the main stream upstream of the structure, and eventually bypassing the grade control structure. To address this concern, an interception berm is designed that starts at the right side of the grade control structure (looking in the upstream direction) and starting at the same top elevation of the structure. This berm will extend laterally until it encounters the valley wall. The berm will be embedded into the floodplain to prevent erosion caused by water as it is collected and funneled toward the structure opening. The elevations of the berm, as it projects upstream, are designed to capture all the flows up to the 100 year flood with the assumption that the ultimate sedimentation in the channel, due to the structure, has occurred. Because the upstream side of the berm would be subject to toe scour as the water is directed toward

the grade control structure, the berm's bottom elevation at the structure is as the bottom elevation of the structure and tapers up and laterally for about 100 feet until it reaches the design berm embedment depths in the overbanks.

Adaptive Management Features

Predictions of the sediment deposition in the upstream overbank areas can vary from the design due to variations in the stream flow, changes in the sediment characteristics and other factors. To add design flexibility, an additional vertical column of gabions is added to the structure. This will add a thicker upper weir foundation that would enable adjustment of the low notch weir crest utilizing addition of row(s) of gabions or gabion mattresses (also called Reno mattresses), up to the crest of the 100-year overflow weir. This gives opportunities to accelerate the deposition and to increase or decrease the sediment deposition elevations in the areas upstream of the structures. For the Pueblo Canyon structure, the initial design crest of the low flow notch is 4 feet above the existing ground but can go as high as 8 feet. This additional column of weirs does not affect the structural integrity of the structures and will, in fact, increase it.

When a flow event occurs, the structure will cause an impoundment of the water allowing settling of suspended sediment. After the event has receded and the majority of the suspended sediment has settled, the standing water must be released downstream. To assist in this, a perforated and slotted riser pipe will be placed approximately 50 feet upstream of the structure. This pipe is connected to another pipe that goes through the gabion structure and outlets to the stilling basin. Before the flow event occurs, the slot elevation is placed at the elevation of the low flow notch to assure that maximum water surface elevations are achieved to induce sediment settling. After the event, the perforations on the pipe will allow dewatering. However, if the rate of dewatering is not sufficient to meet standards or the perforations get plugged by debris, the slots in the pipe can be removed, one at a time as needed, to accelerate the dewatering process.

Storm Water Pollution Prevention Plans (SWPPP)

Storm Water Pollution Prevention Plans (SWPPP) and erosion control plans have been prepared to assure the use of Best Management Practices (BMP's) and maximum protection to the environment during and after construction. Erosion and sediment control measures are in accordance with the New Mexico Environment Department requirements and the Watershed Protection Section's work plan guidelines. The design team has worked closely with LANL's environmental specialists to provide a plan that is sensitive to the environment and provides maximum protection against the offsite transport of pollutants with particular attention to the protection of adjacent wetlands. The protocols of the SWPPPs conform to the LANL's format. These plans were prepared under the direction of Dr. Williams, who is a Certified Professional in Erosion and Sediment Control (CPESC).

Technical Design Description:
DP Grade Control Structure

General Project Description

The project consists of the construction of a grade stabilization structure within the Department of Energy's Los Alamos National Laboratory (LANL) in the vicinity of Los Alamos, New Mexico. The structure will be located within DP Canyon and is referred to as the DP Canyon grade control structure. The approximate location of the proposed DP Canyon grade control structure is down canyon from the outfall at Technical Area 21 and near the site of the current E039 gaging station at the east end of reach DP-2.

The proposed structure is part of remedial actions taken to reduce the migration of contaminated sediment. A beneficial result of the grade control is the expansion and enhancement of wetland areas upstream of the structure.

Project Objectives

The primary objectives of the structure in DP Canyon are to reduce erosive flow energy and to induce upstream aggradation (sediment deposition) that will fill the channel and partially bury the existing sediments in the floodplain. This goal will be accomplished by establishing an adaptable base level above the existing channel elevation. Aggradation within the channel upstream of the structure will reduce erosion of contaminated stream banks and overbank areas during significant discharge events. A sediment-filled channel will cause flood flows to spill into the overbank more frequently. Overbank flows will contain sediments originating from reaches upstream and through deposition, bury existing contaminated floodplain deposits. These actions will also result in enhanced conditions for additional wetlands establishment and sustainability.

The New Mexico dam safety law, contained in New Mexico Statutes Annotated Chapter 72, 1985 Repl. Pamphlet, originally enacted in 1907, stipulates the conditions for declaring a hydraulic structure as a dam. Regulations related to dam safety are found in the Manual of Rules and Regulations Governing the Appropriation and Use of Surface Waters of the State of New Mexico (Manual), last revised in 1987. Under these rules and regulations, dams are declared as such when the structure is more than 10 feet in height (measured from original invert to the top of the low spillway) or are capable of impounding more than 10 acre-feet of water. The DP Canyon grade control

structure does not exceed either of these limitations and therefore is not classified as a dam. This releases the requirements for further analyses for dam safety.

Hydrology

Hydrologic analysis has been performed to provide design parameters for the proposed gabion drop control structure at the DP Canyon. This analysis is based on stream gage data, topographic information, a site visit and the geomorphic and climatologic conditions of the project area. The basin area is within the arid to semi-arid higher-elevation mountains of New Mexico and contains ephemeral stream systems. While the upper portion of the DP Basin is almost entirely developed, the lower portion of the DP basin, within the Canyon, is not. Flood flow frequency estimates for the drop structure location were based on applying statistical techniques to stream gage information within the project area and using regional USGS regression formulas. The table below presents the flood frequency results for the project site. Two columns in the table are based upon the U.S. Army Corps of Engineers statistical computer program, HEC-FFA.

DP Canyon Flood Frequencies			
Percent Chance Exceedance	**FFA at Gage E038**	**FFA Extended to Project Site**	**USGS Regression**
0.2 (500 yr)	372	523	998
1 (100 yr)	333	465	601
2 (50 yr)	316	438	468
10 (10 yr)	274	374	226
20 (5 yr)	253	343	149
50 (2 yr)	218	289	68

The gage data used for this analysis includes the most recent six years of record as a basis for estimating future runoff response to rainfall. In addition, the USGS regression formulas are based on regional analysis of gage data.

The DP Canyon stream gage (Gage E038) is located upstream of the proposed drop structure site. Therefore, the FFA results were modified to reflect the larger drainage basin at the project location (From the table above, FFA Extended to Project Site). This was done by multiplying the results by the ratio of the drainage area at the project site to the drainage area at the gage location to the power of the drainage area factor as recommended by the USGS for this region. In review of the results, the FFA extended discharge-frequencies are higher for the more frequent events (2 to 10 year floods) and becoming smaller for the more rare events (50 to 500 year floods). This may be explained by the fact that this watershed has a large area that has become urbanized. The USGS regression equation generally accounts for rural or undeveloped areas and

thus would miss the higher runoff from more frequent rainfall events that would not produce runoff in undeveloped arid and semi-arid conditions. The FFA results are based on just a few years of information that do not contain a rare event flood and thus misses the higher end of the frequency range (higher flows). Since the geomorphic design for DP Canyon is based upon the more frequent lower flow, the FFA was adopted. The higher flows (50 to 100 year) are used to assure that the structure can safely pass these flows. To accommodate the uncertainty at the high flows, a safety factor was incorporated by raising the side walls of the structure above the design elevation required to contain the 100-yr flood.

Development of the HEC-RAS Hydraulic Models

To determine the hydraulic effects of the proposed structure, HEC-RAS models were developed. The HEC-RAS (Version 4.0) models were constructed using the most recent topographic data and GIS techniques for cross section development. An existing conditions model was constructed, calibrated to the best extent, and the water surface elevations for the 2-, 5-, 10-, 50-, and 100-year peak flood discharges were simulated and plotted. All subsequent models utilized these peak flood discharges. A proposed conditions model (with grade control), without accumulated sedimentation behind the structure, was constructed, simulated and plotted. The HEC-RAS In-line weir option was used to model the grade control structure. A proposed condition model, with sedimentation, was created to simulate the change in the streambed elevations due to anticipated long term deposition of sediment (described in a later section) upstream of the grade control structure. These 3 conditions, existing, grade control structure without sediment deposits, and grade control structure with sediment deposits, were compared and analyzed. Results of the HEC-RAS hydraulic modeling analysis for the Pueblo Canyon structure are provided in Appendix A of this report.

Grade Control Structure Design

The structure will primarily be composed of gabions, which are relatively small rocks enclosed in wire baskets and generally consist of standard 3’ x 3’ x 6’ gabions (2 attached 3’ x 3’ x 3’ gabions). Since the gabion drop structure would initially be unsupported and act as a retaining structure, the gabion design requires sufficient mass to prevent slippage and/or overturning. The design of the structure required the raising of the water surface elevations for the more frequent flood events (5-year) such that the sediment deposition occurred immediately upstream of the structure yet minimizes the backwater effects of the rare flood events (50 to 100-year).

The gabion design included buttress structures upstream of the drop as well as founding the structure at least below natural grade. The reason for the buttress gabions being upstream include: providing an uplift of the flow of water approaching the weir for better efficiency; and preventing constant attack of the buttress gabion structure from debris flow that may contain boulders, trees and other such objects. Buttress gabions in the downstream area will dissipate energy. However, the weirs in this area are relatively low, being one gabion basket above the apron area. The top of the drop structure will have flow directed onto benches below the top elevation. With this flow directed to the stilling floor, energy will be dissipated through the benches.

The upstream face of each structure will be wrapped in a geotextile material (based on gradation analysis of the stream sediment) to minimize the transport of fine sediments during the early stages of operation as well as prevent water leaking though the structure. The material will be buried by backfill using streambed material to stabilize the geotextile and add impermeability. In addition, 3-inch concrete caps will be applied to the low flow weir crests to protect against potential damage from scouring and debris.

The 5-year flow was used to design a low flow notch (described in a later section). The 100 year flow was used to determine the rest of the weir dimensions (the upper notch and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end sill heights, utilizing the Corps of Engineers HEC hydraulic Design Chart 623. A 50 year design was considered but since the increase in design height to contain the 100 year event was less than 0.1 feet, the design was based upon the 100 year peak flood event. This resulted in minimal increase in cost as well as provided additional structural safety. Structural integrity of the grade control structures, with and without saturated sediment against the upstream face, was evaluated by a licensed structural engineer.

Structural measures are made to accommodate a stream gage with water quality sampling and coordinated with a stream gage and water quality sampling instrumentation professional.

Design of the Grade Control Low Flow Notch

A low flow rectangular notch was sized to induce the design volumes and location of deposition in the upstream areas. The width and depth of the notch was determined using regime equations and assuming that the 5-year discharge is a “channel forming” discharge; a common practice for arid to semi-arid regions. This notch is laterally placed where the natural thalweg of the stream is located. The height of the notch was determined by examining the design deposition slope (described in the next section) and adjusting it vertically to maximize deposition on the overbank sediments, safely pass the 100-year flood, and still be a stable structure. The initial height of the notch is 4 feet above the existing ground. This height can be varied as described in the Adaptive Management Feature section. The plunge pool below the low flow notch is

designed to release the energy of the turbulent water flow resulting in low energy, laminar flows downstream of the structure.

Sediment Deposition Profile Analysis

The profile of the anticipated sedimentation behind the grade control structure was based upon equilibrium slope analyses and using engineering judgment to select an appropriate slope. The equilibrium slope is the theoretical slope which the stream would eventually reach. This slope is projected upstream, starting at the low flow weir notch elevation, to determine the depths that would cover the contaminated sediments in the floodplain and the potential wetland extents. This deposition profile was used to adjust the cross section geometry in the HEC-RAS models to determine the water surface elevations for the various frequency floods. This predicts the water surface profiles for ultimate conditions.

Adaptive Management Features

Predictions of the sediment deposition in the upstream overbank areas can vary from the design due to variations in the stream flow, changes in the sediment characteristics and other factors. To add design flexibility, an additional vertical column of gabions is added to the structure. This will add a thicker upper weir foundation that will enable adjustment of the low notch weir crest utilizing additional row(s) of gabions or gabion mattresses (also called Reno mattresses), up to the crest of the 100-year overflow weir. This gives opportunities to accelerate the deposition and to increase or decrease the sediment deposition elevations in the areas upstream of the structures. For the DP structure, the initial design crest of the low flow notch is 4 feet above the existing ground but can go as high as 7.5 feet. This additional column of weirs does not affect the structural integrity of the structures and will, in fact, increase it.

When a flow event occurs, the structure will cause an impoundment of the water allowing settling of suspended sediment. After the event has receded and the majority of the suspended sediment has settled, the standing water must be released downstream. To assist in this, a perforated and slotted riser pipe is place approximately 50 feet upstream of the structure. This pipe is connected to an outfall pipe that goes through the gabion structure and outlets to the stilling basin or plunge pool. Before the flow event occurs, the slot elevation is placed at the elevation of the low flow notch to assure that maximum water surface elevations are achieved to induce sediment settling. After the event, the perforations on the pipe will allow dewatering. However, if the rate of dewatering is not sufficient to meet standards or the perforations get plugged by debris, the slots in the pipe can be removed, one at a time as needed, to accelerate the dewatering process.

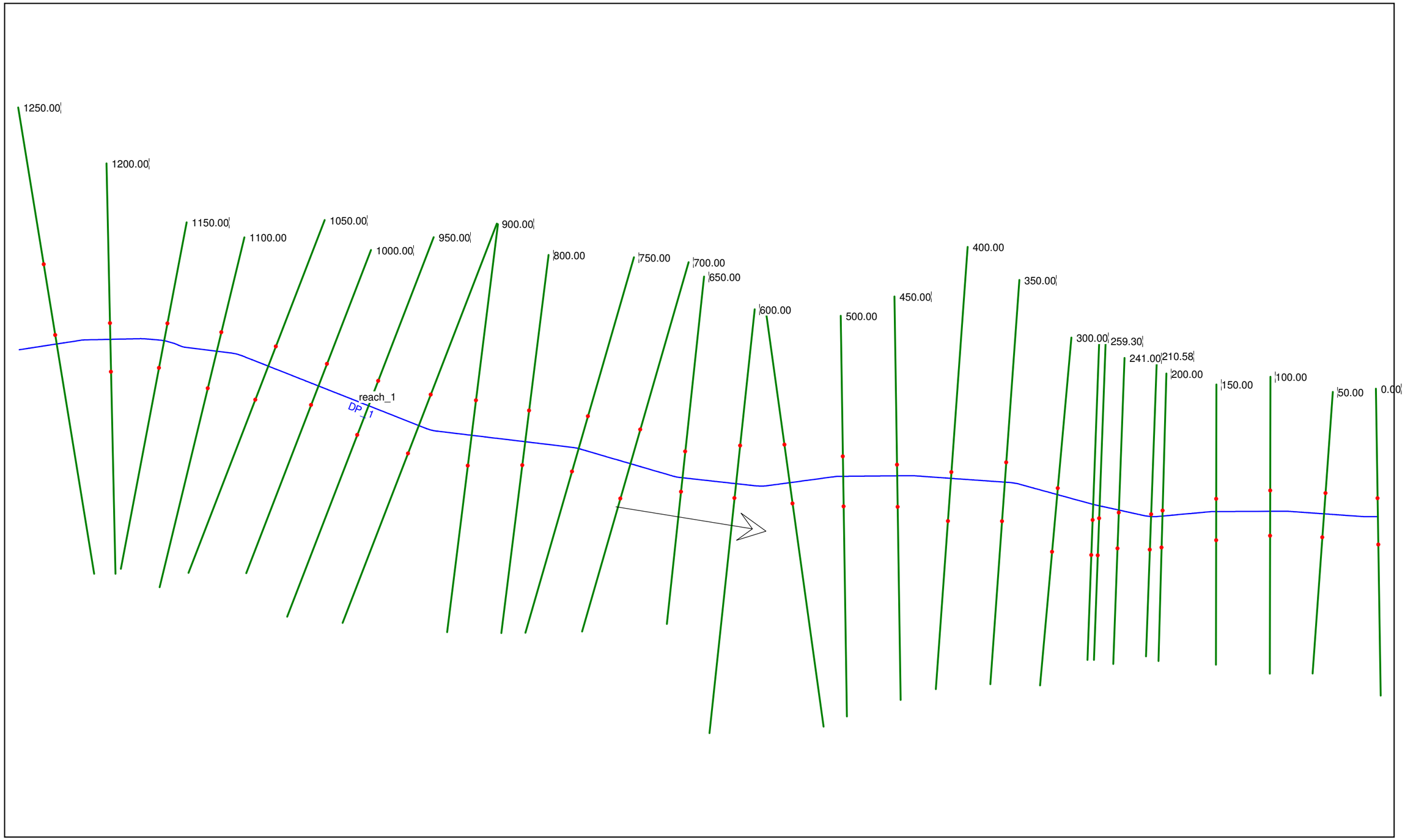
Storm Water Pollution Prevention Plans (SWPPP)

Storm Water Pollution Prevention Plans (SWPPP) and erosion control plans have been prepared to assure the use of Best Management Practices (BMP's) and maximum protection to the environment during and after construction. Erosion and sediment control measures are in accordance with the New Mexico Environment Department requirements and the Watershed Protection Section's work plan guidelines. The design team has worked closely with LANL's environmental specialists to provide a plan that is sensitive to the environment and provides maximum protection against the offsite transport of pollutants with particular attention to the protection of adjacent wetlands. The protocols of the SWPPPs conform to the LANL's format. These plans were prepared under the direction of Dr. Williams, who is a Certified Professional in Erosion and Sediment Control (CPESC).

Appendix A

DP Canyon

Existing Conditions


1250.00
1200.00
1150.00
1100.00
1050.00
1000.00
950.00
900.00
800.00
750.00
700.00
650.00
600.00
500.00
450.00
400.00
350.00
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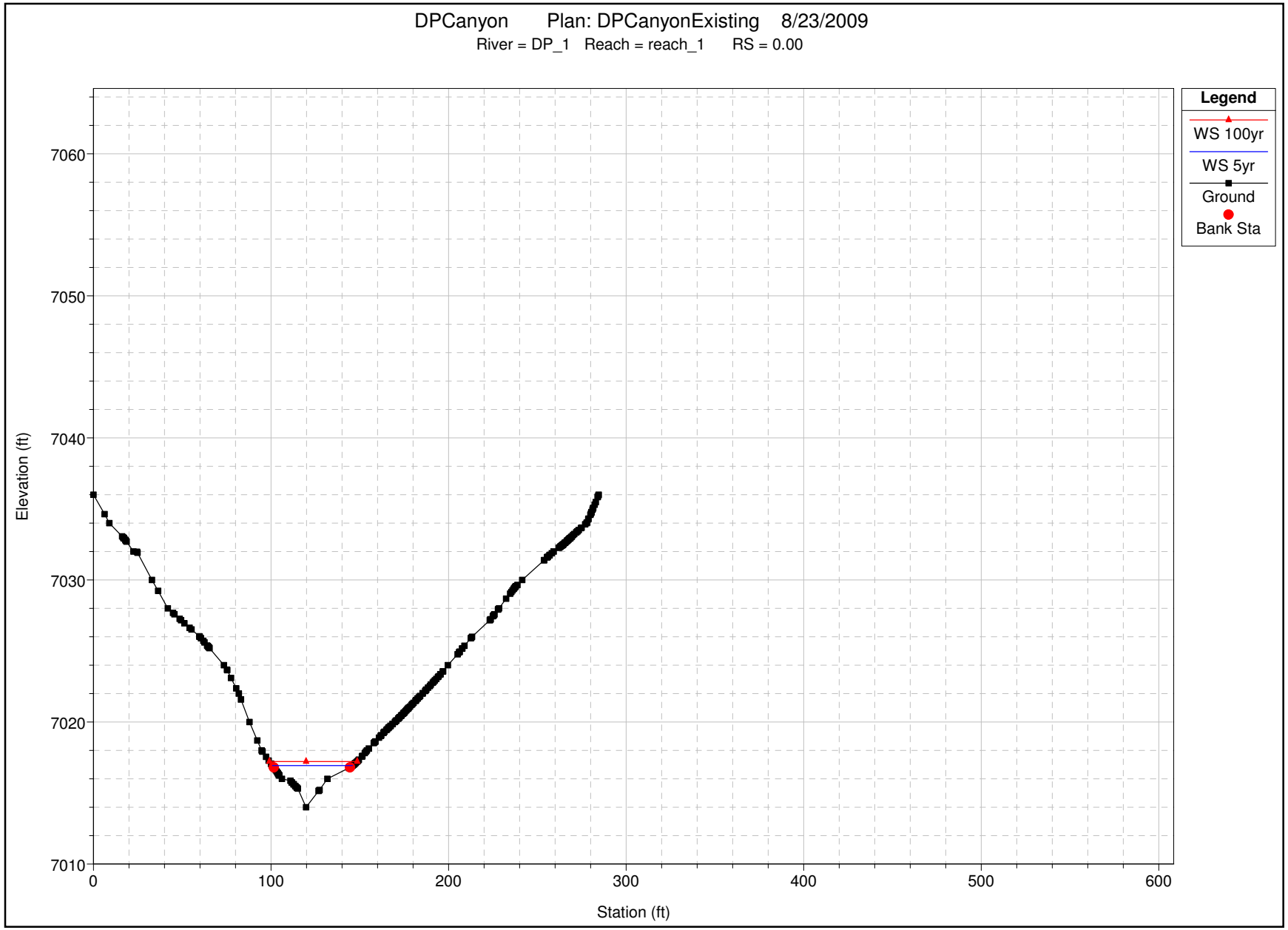
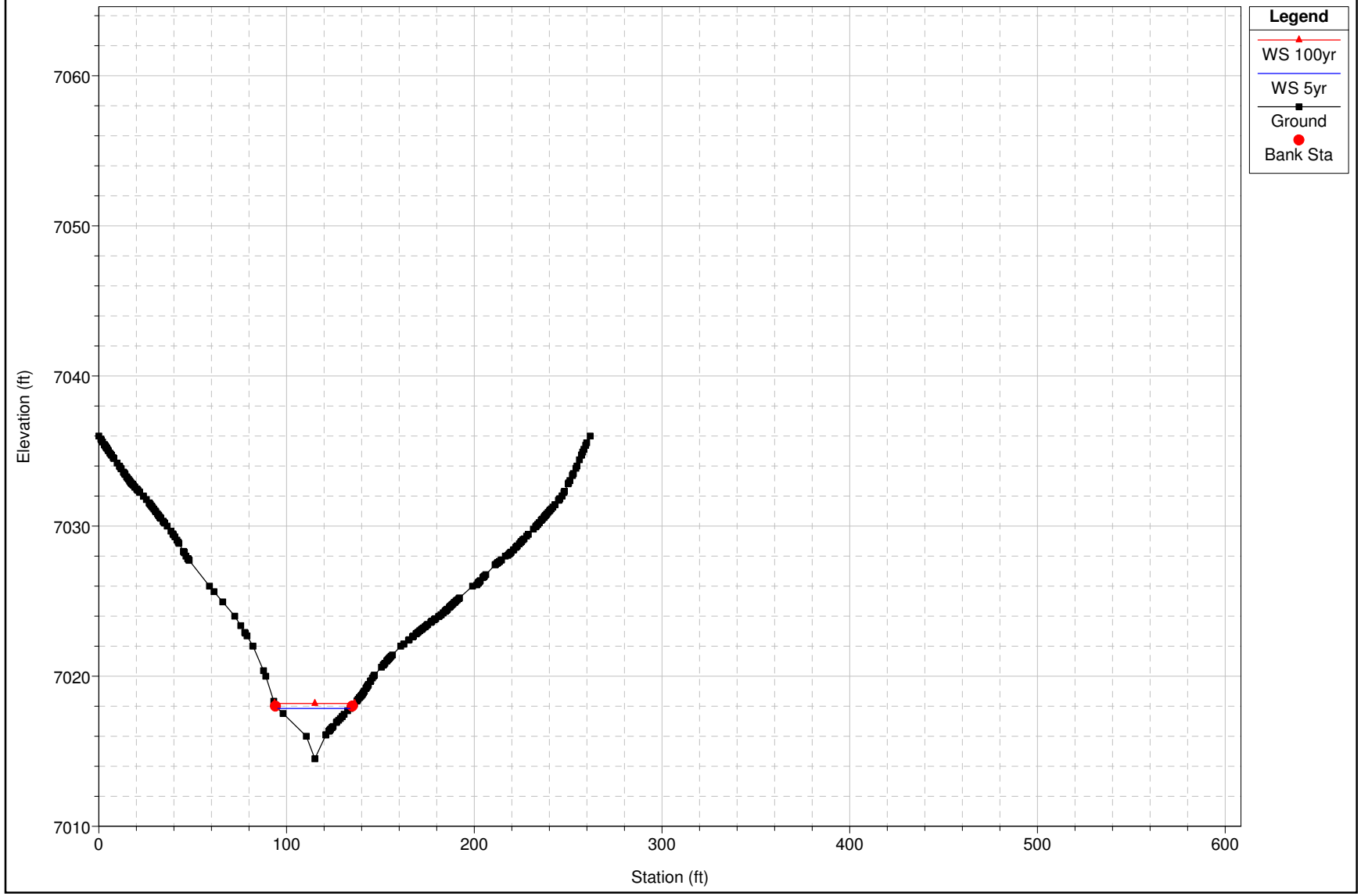
200.00
150.00
100.00
50.00
0.00
reach_1
DP_1



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

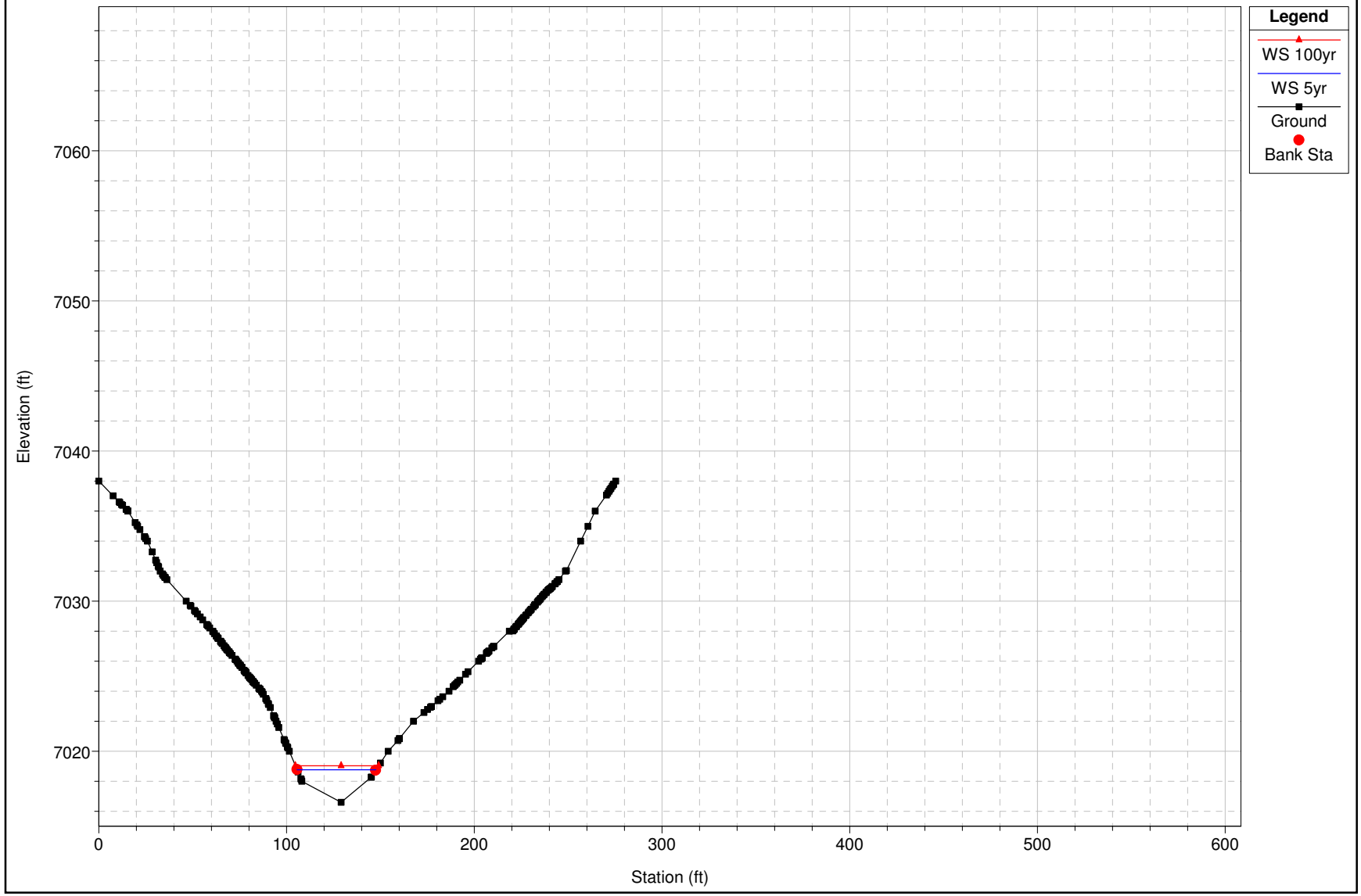
River = DP_1 Reach = reach_1 RS = 50.00 coordinates at station 115 interpolated from topo



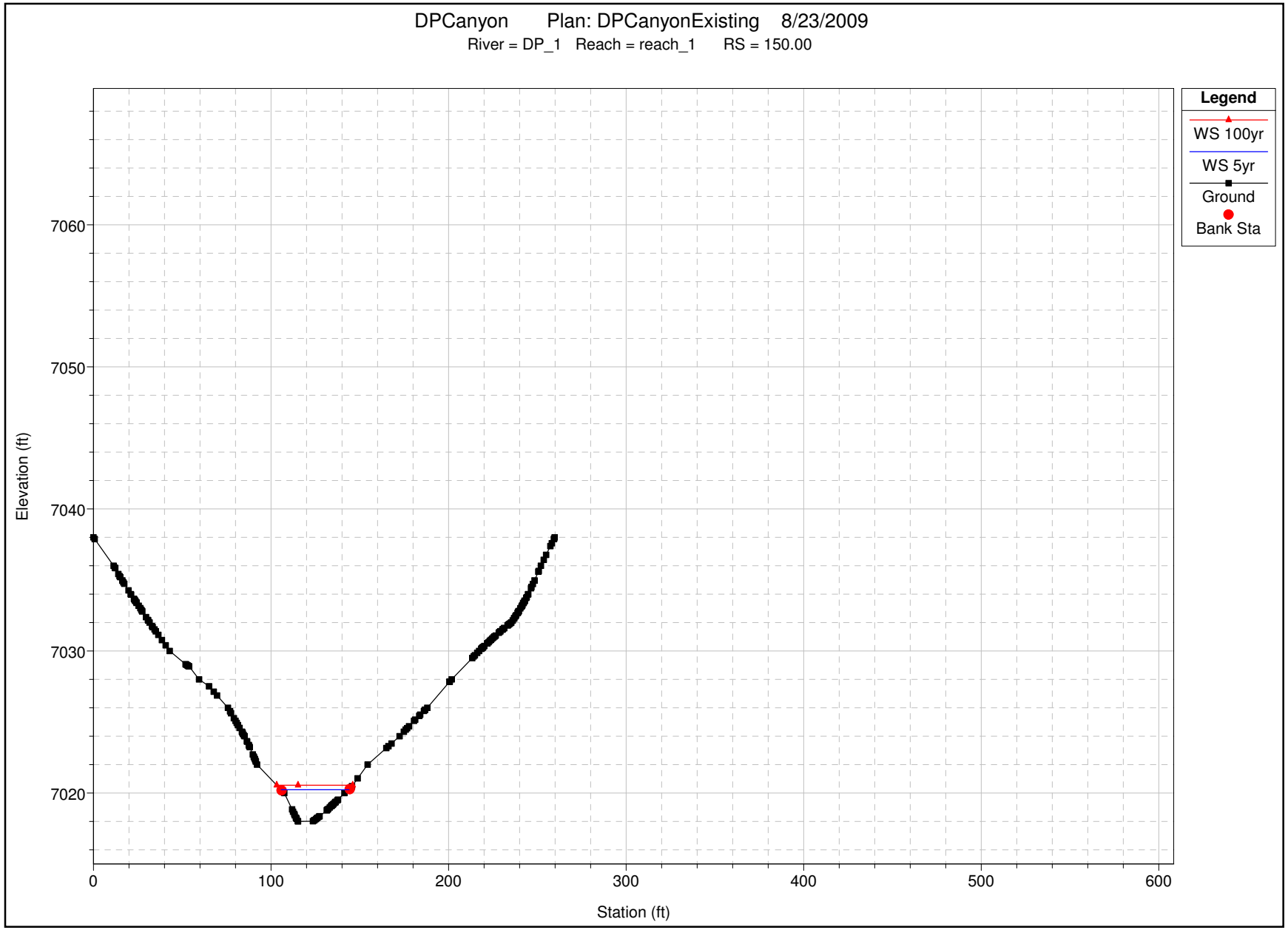
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

River = DP_1 Reach = reach_1 RS = 100.00 coordinates at station 129 interpolated from topo



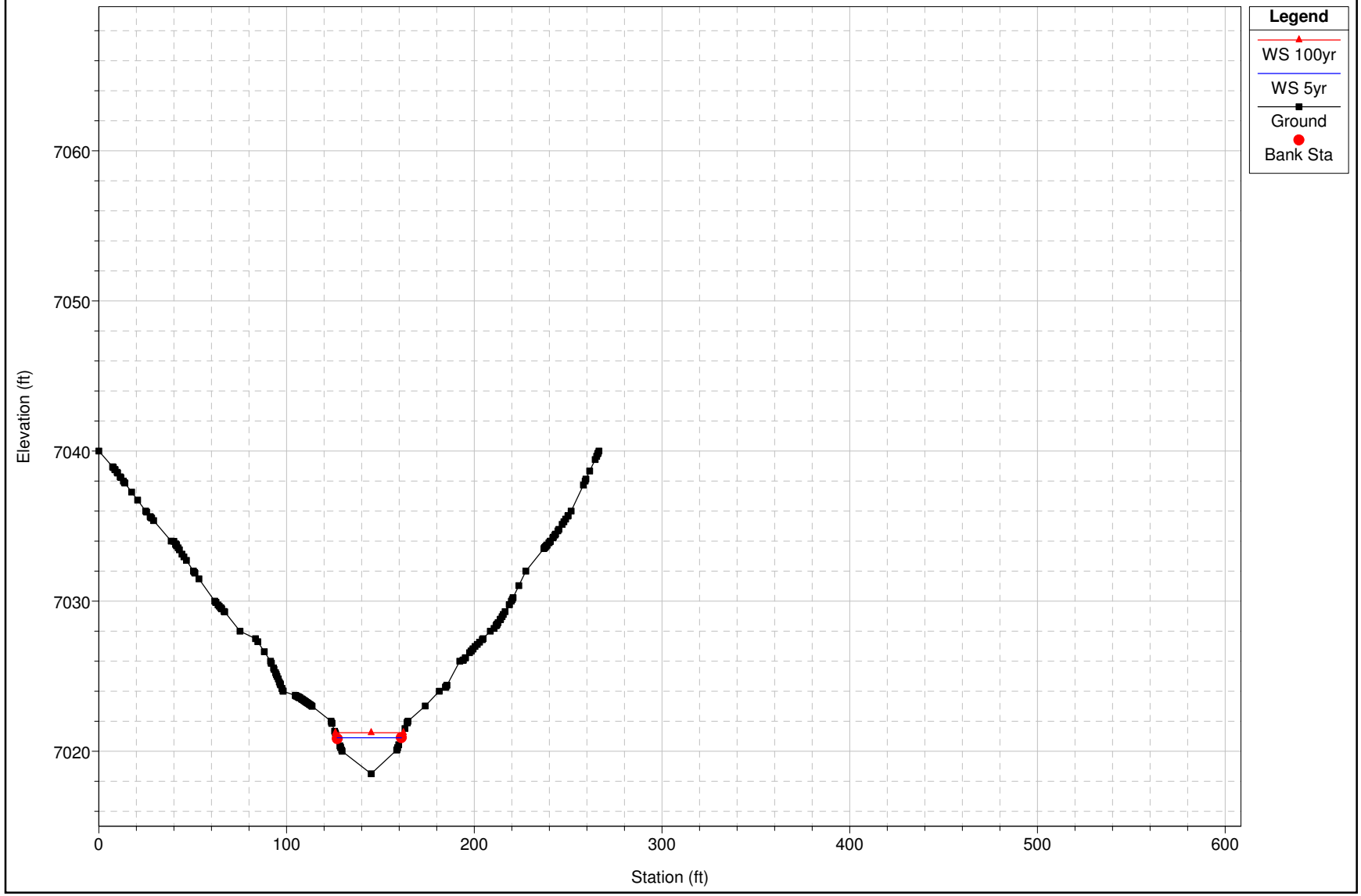
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

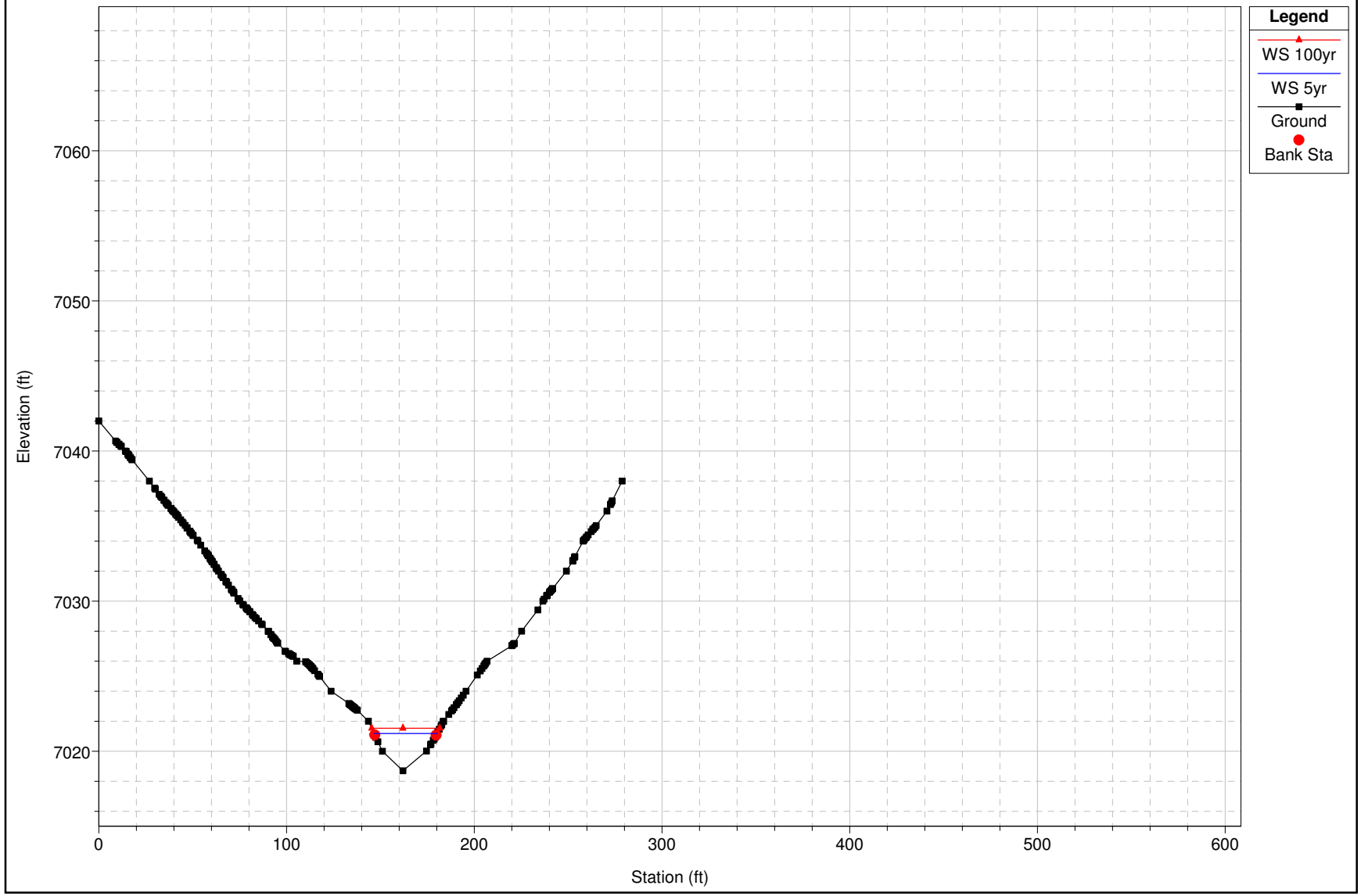
River = DP_1 Reach = reach_1 RS = 200.00 coordinates at station 145 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

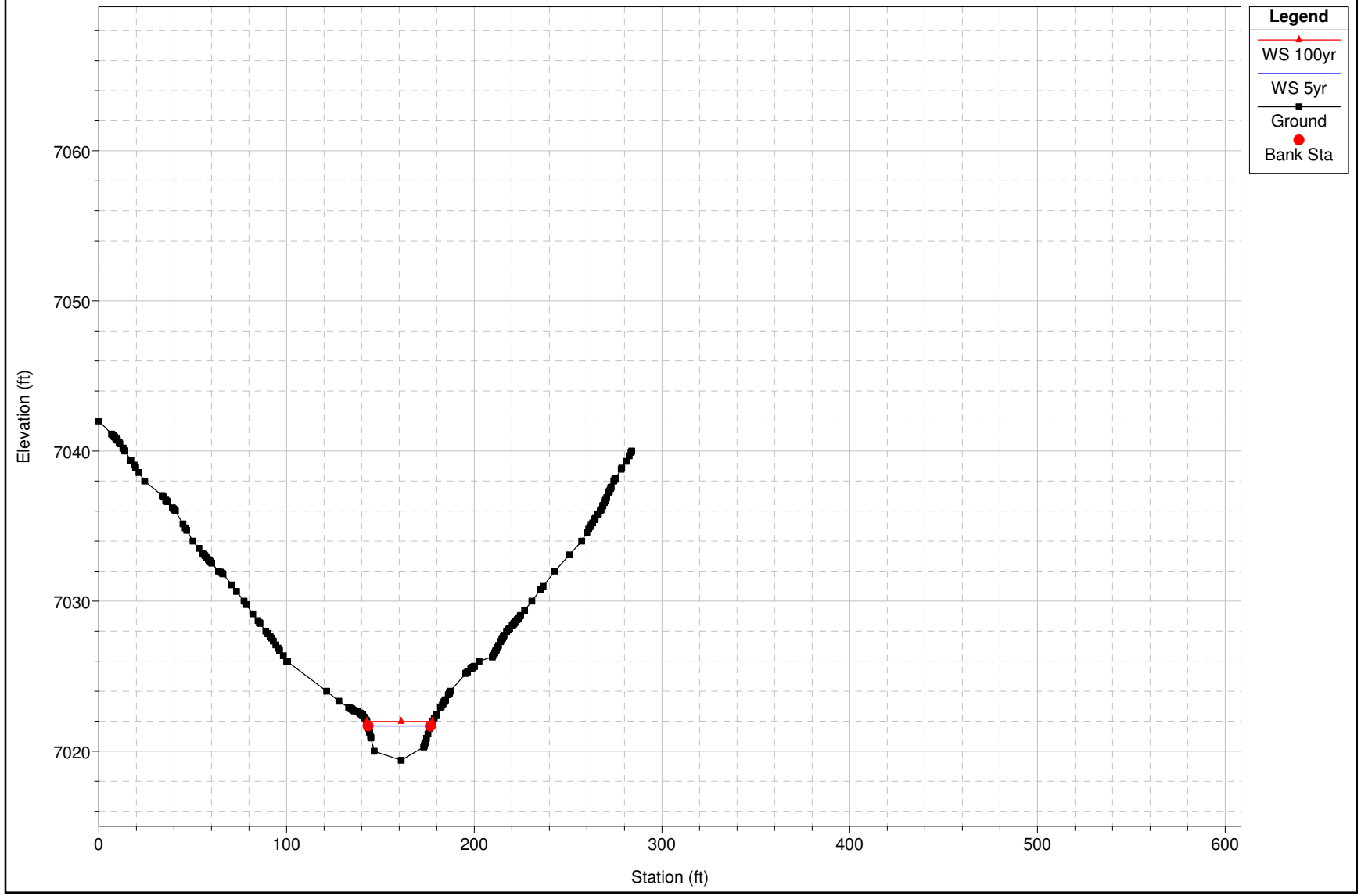
River = DP_1 Reach = reach_1 RS = 210.58 coordinates at station 162 interpolated from topo



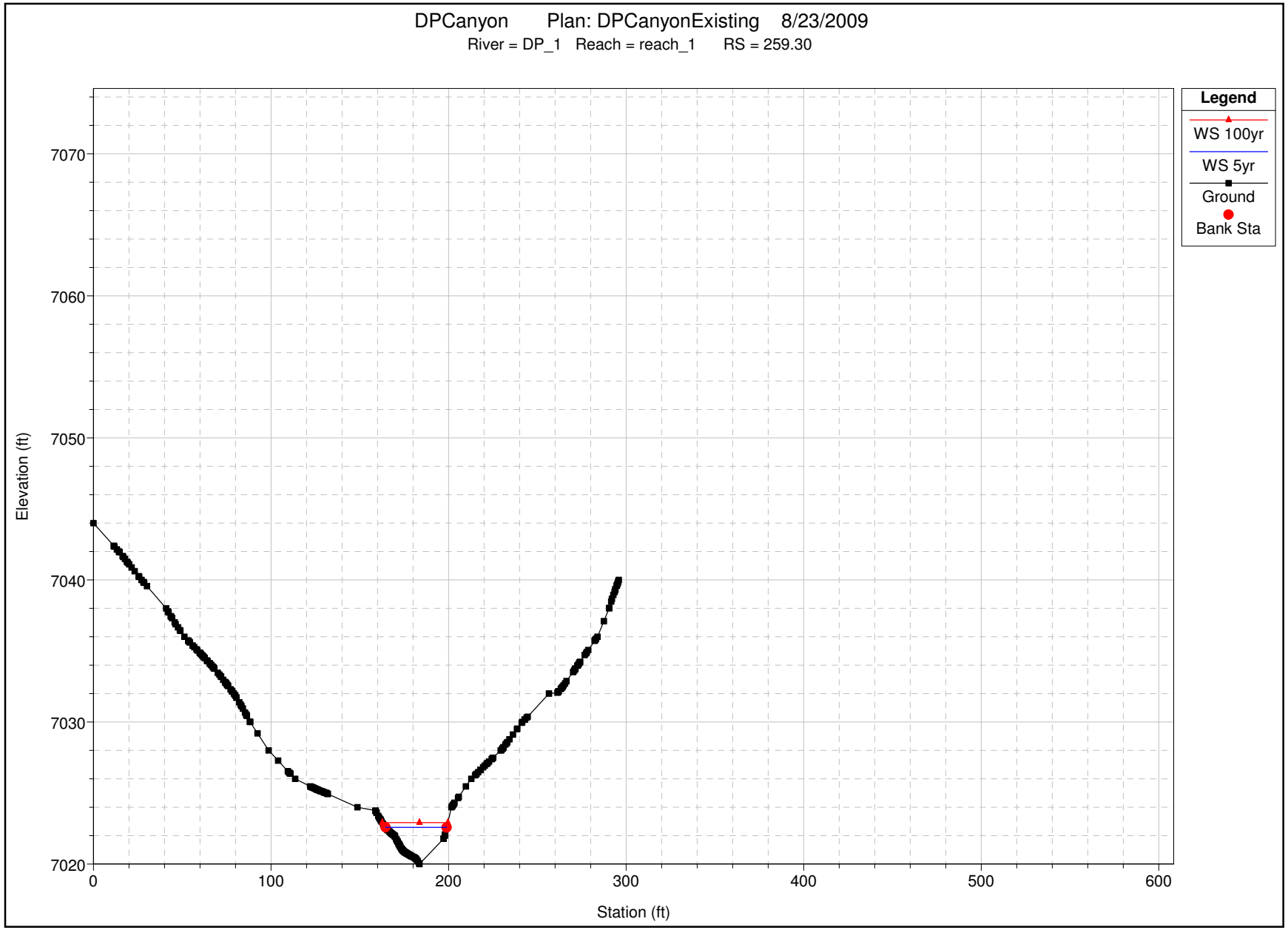
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

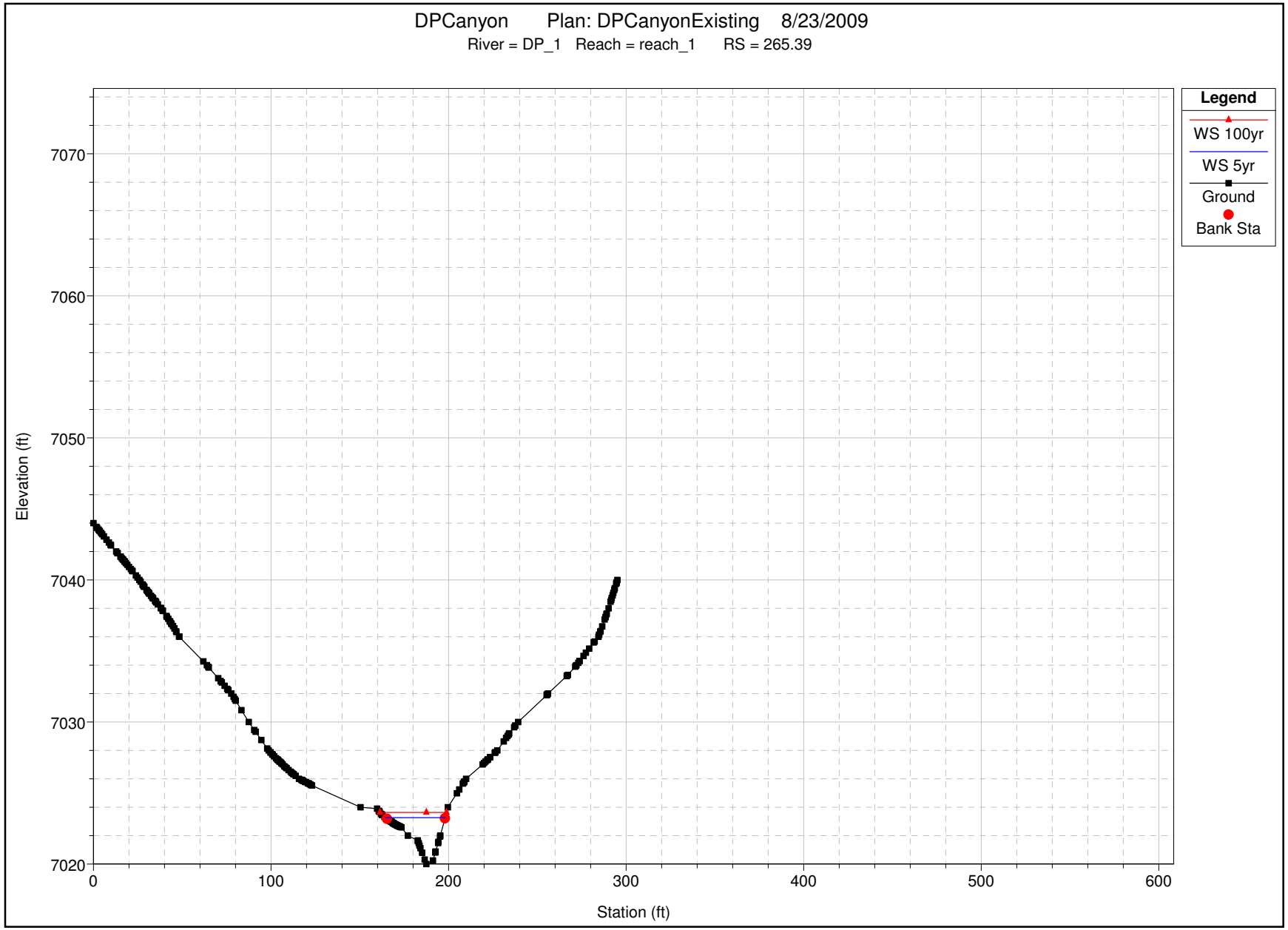
River = DP_1 Reach = reach_1 RS = 241.00 coordinates at station 161 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



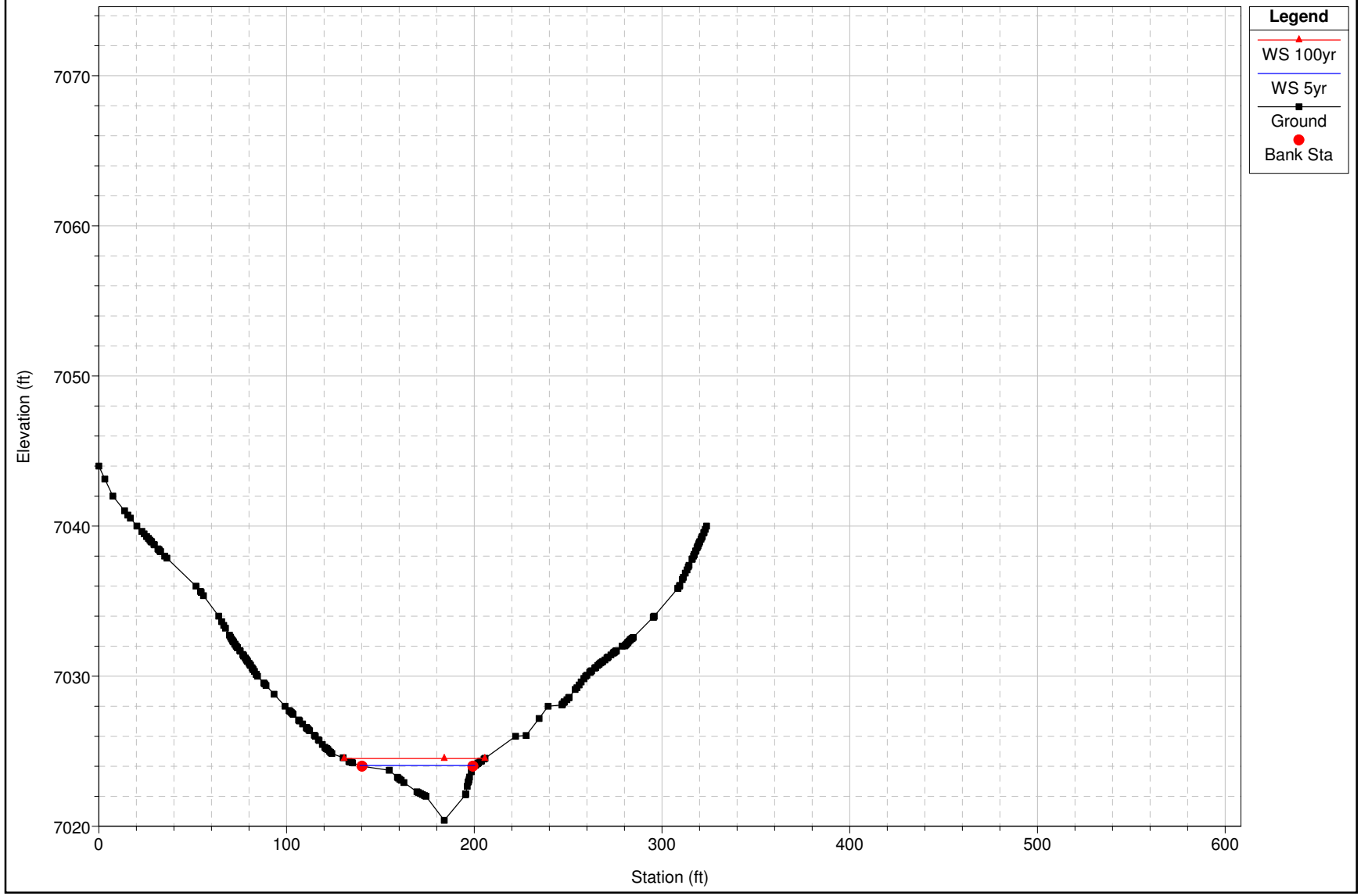
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



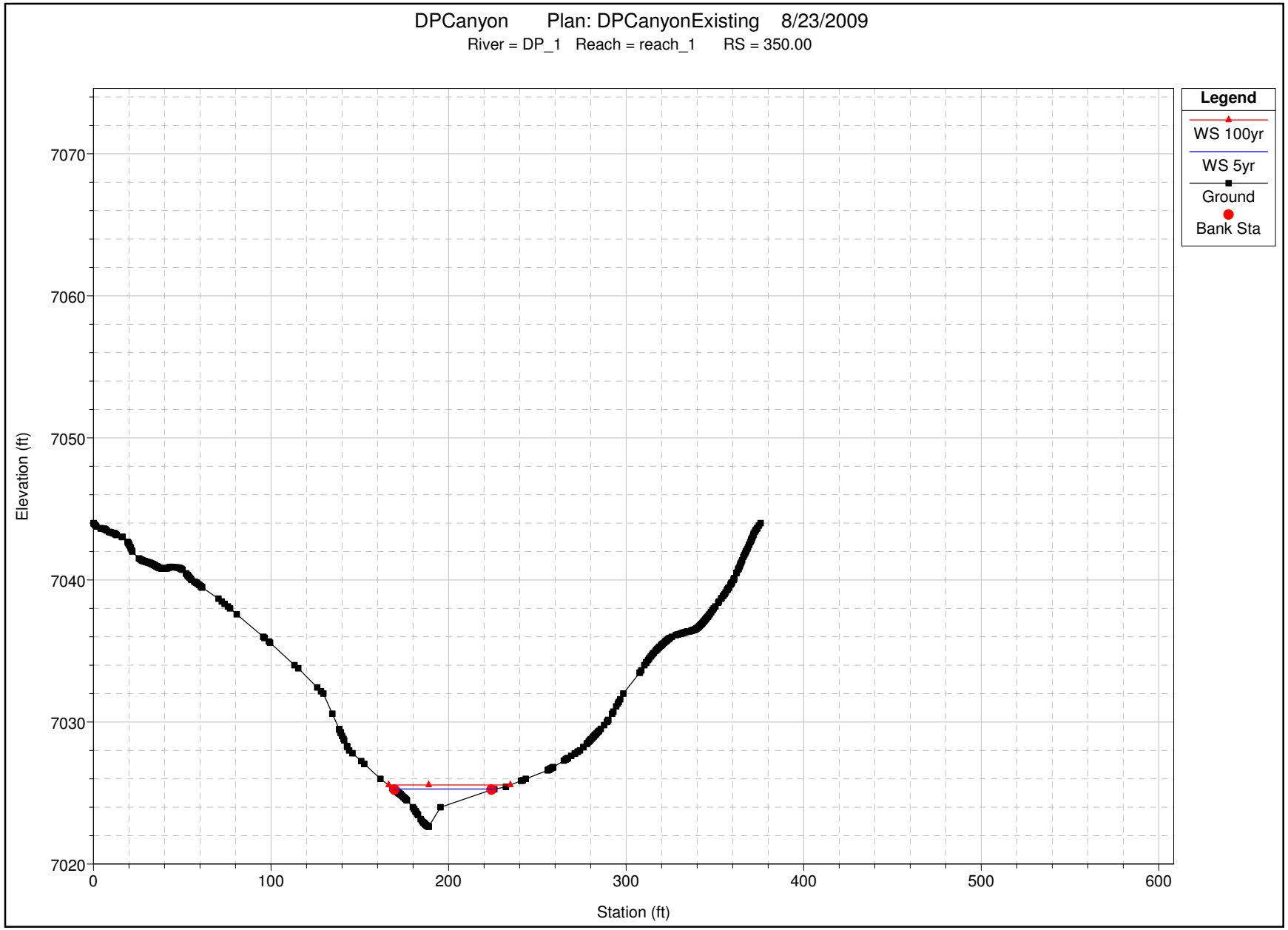
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

River = DP_1 Reach = reach_1 RS = 300.00 coordinates at station 184 interpolated from topo



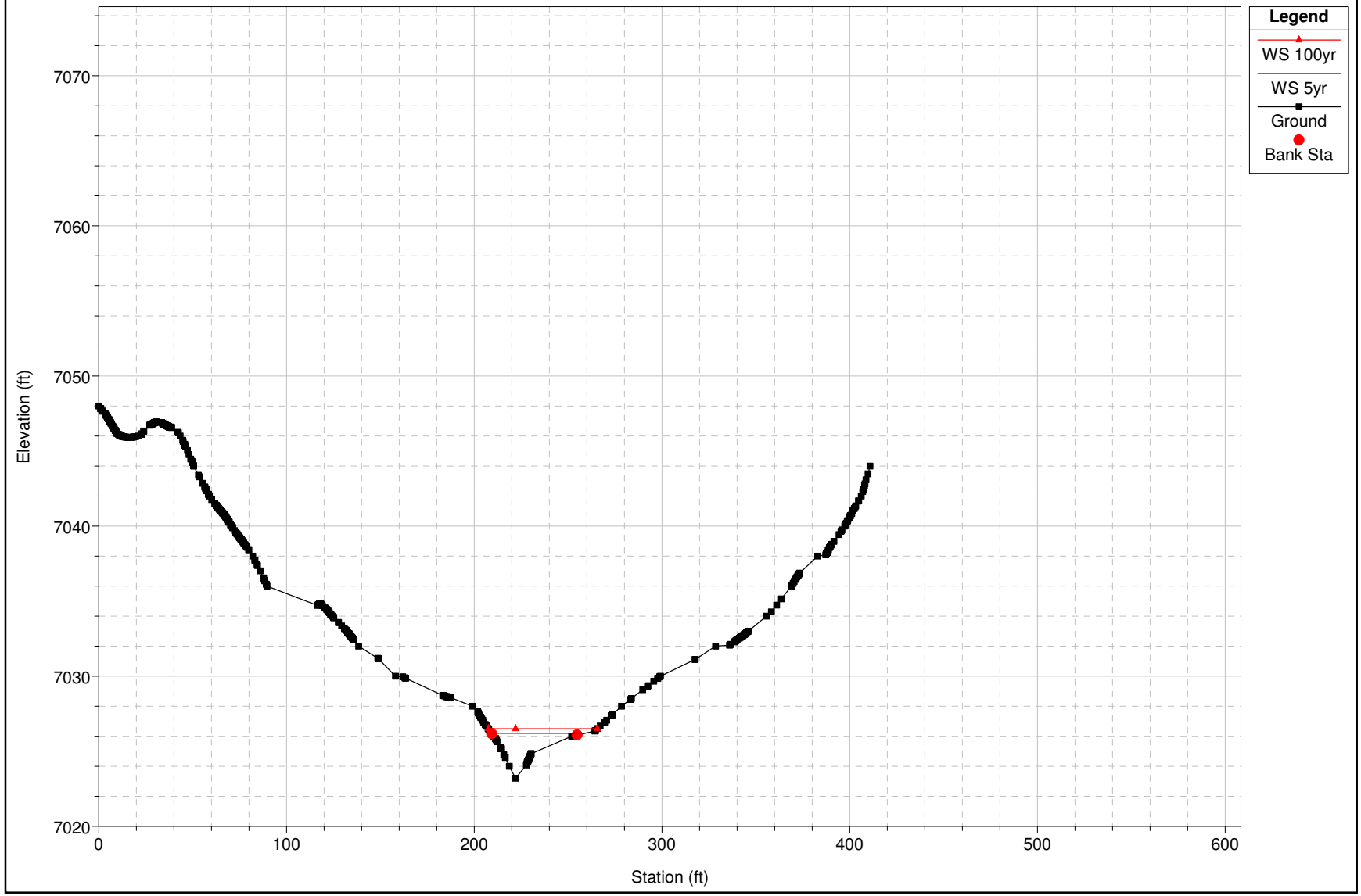
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

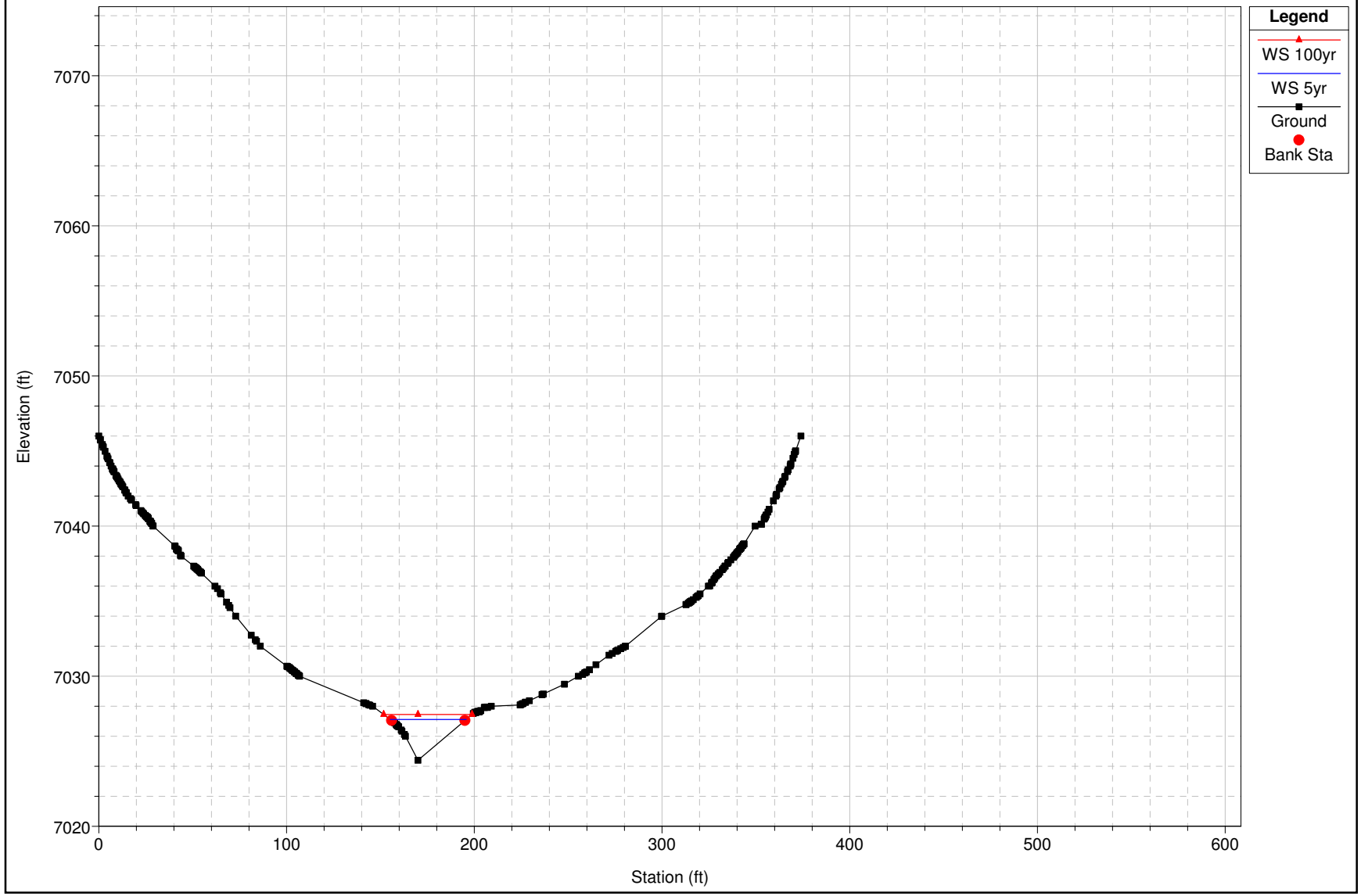
River = DP_1 Reach = reach_1 RS = 400.00 coordinates at station 222 interpolated from topo



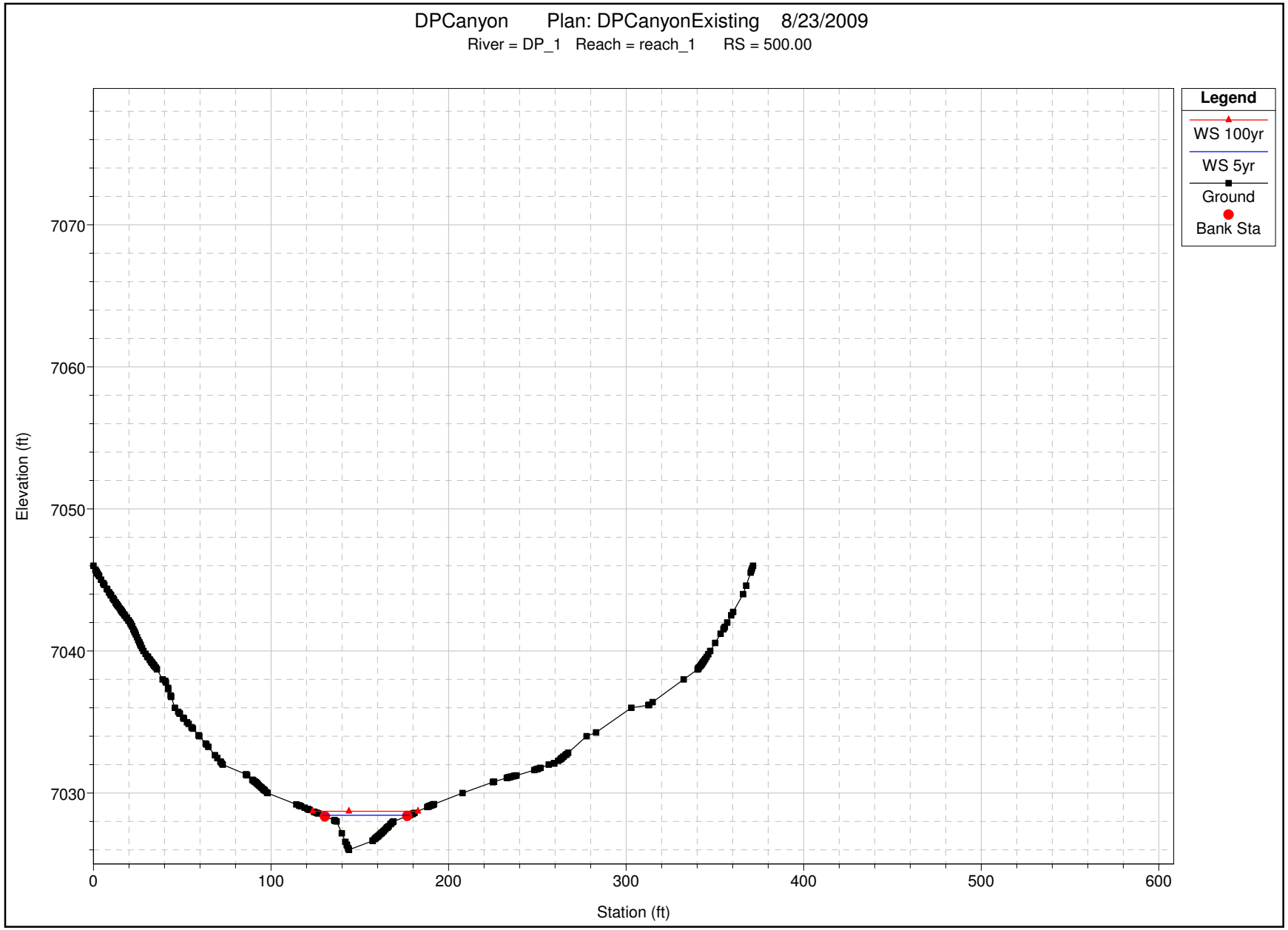
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

River = DP_1 Reach = reach_1 RS = 450.00 coordinates at station 170 interpolated from topo



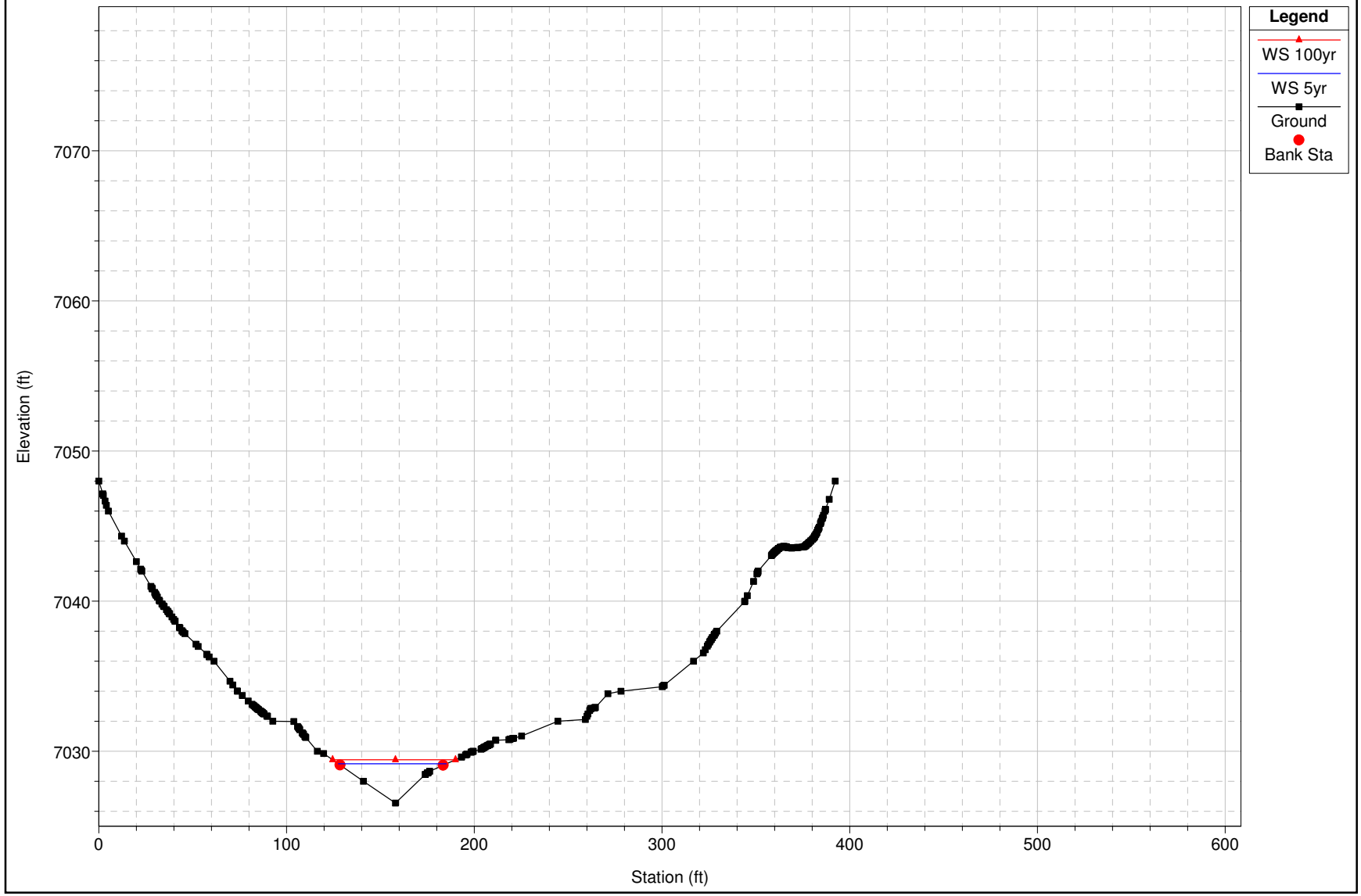
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

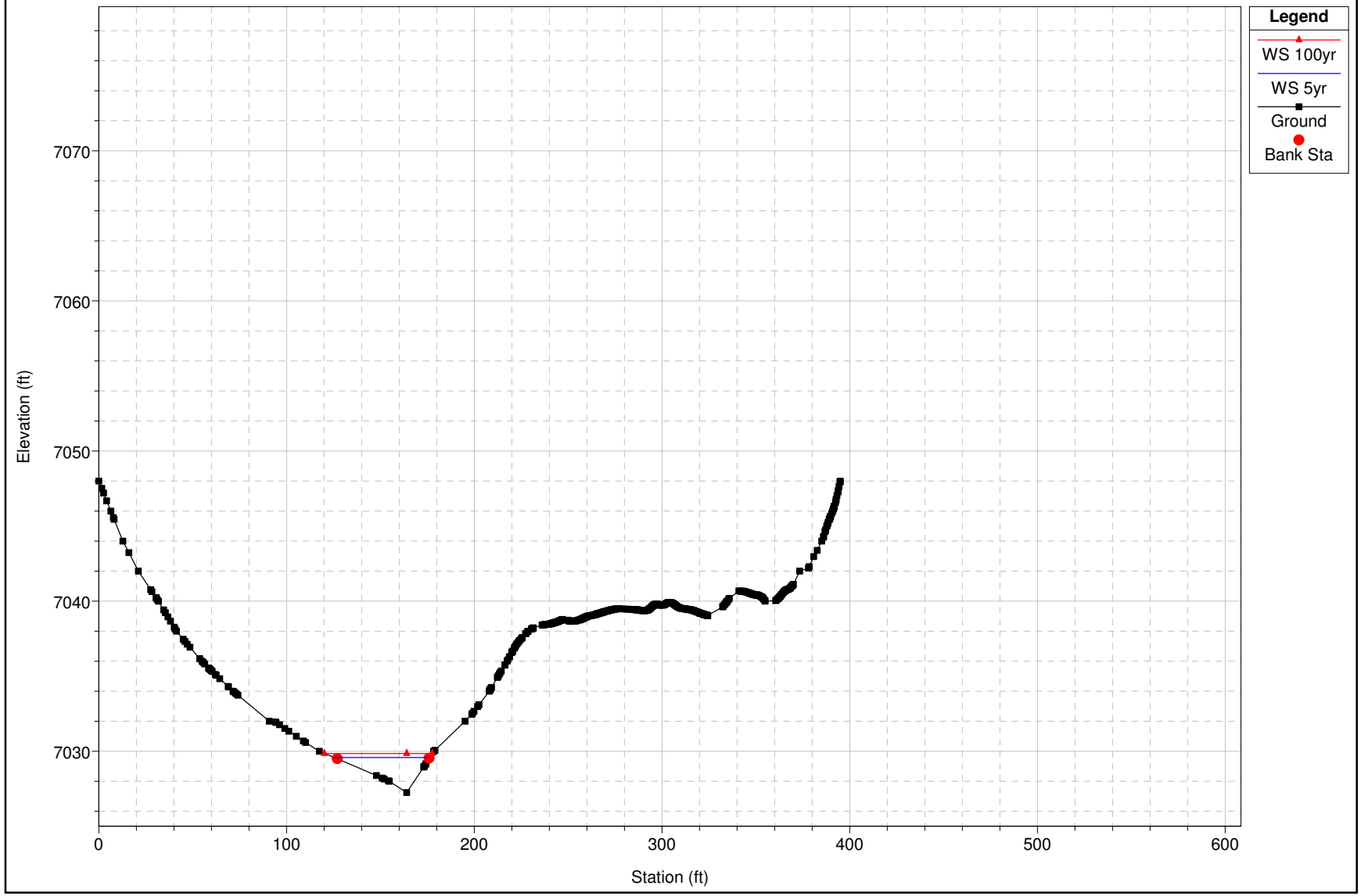
River = DP_1 Reach = reach_1 RS = 550.00 coordinates at station 158 interpolated from topo



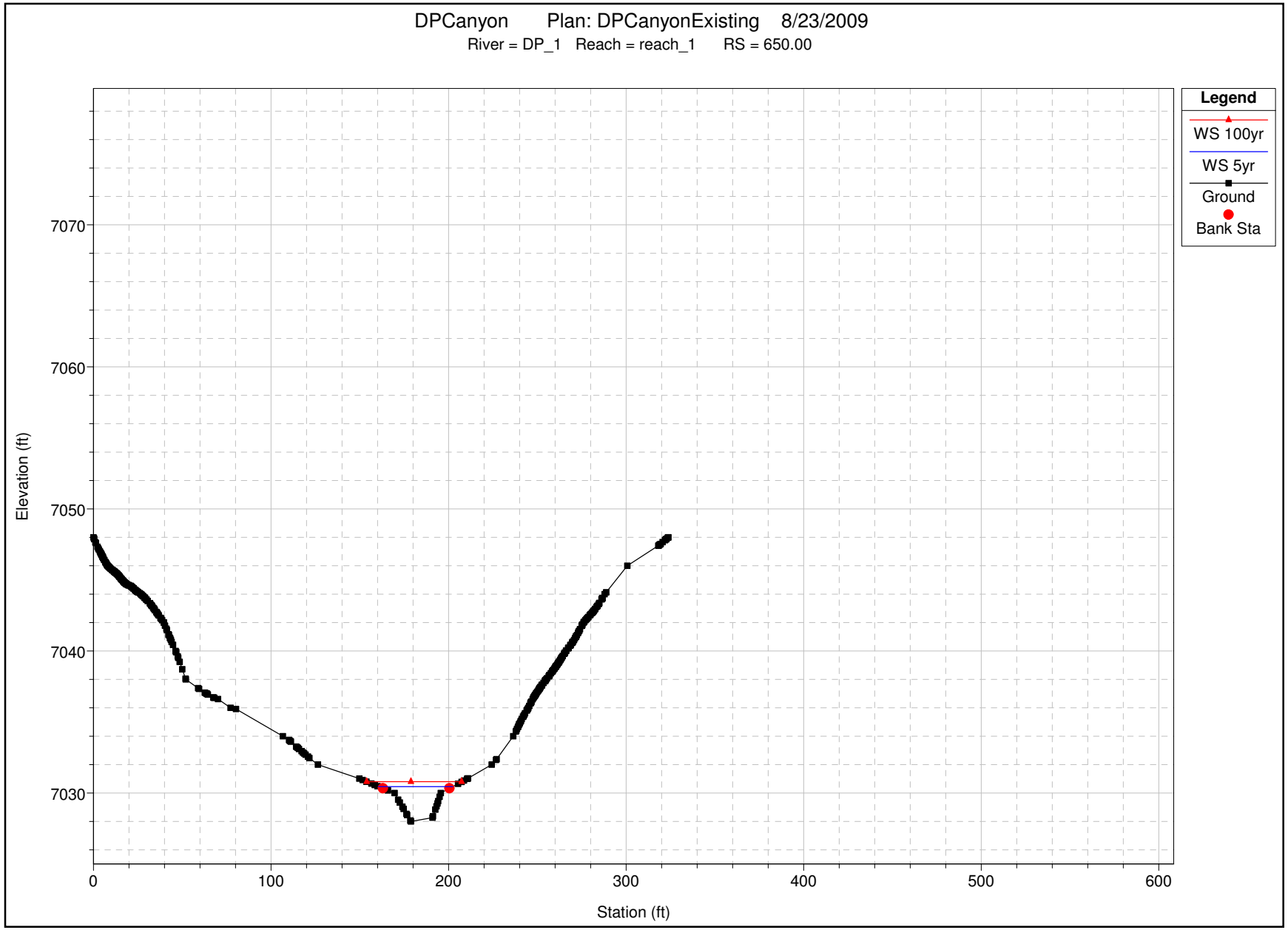
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

River = DP_1 Reach = reach_1 RS = 600.00 coordinates at station 164 interpolated from topo



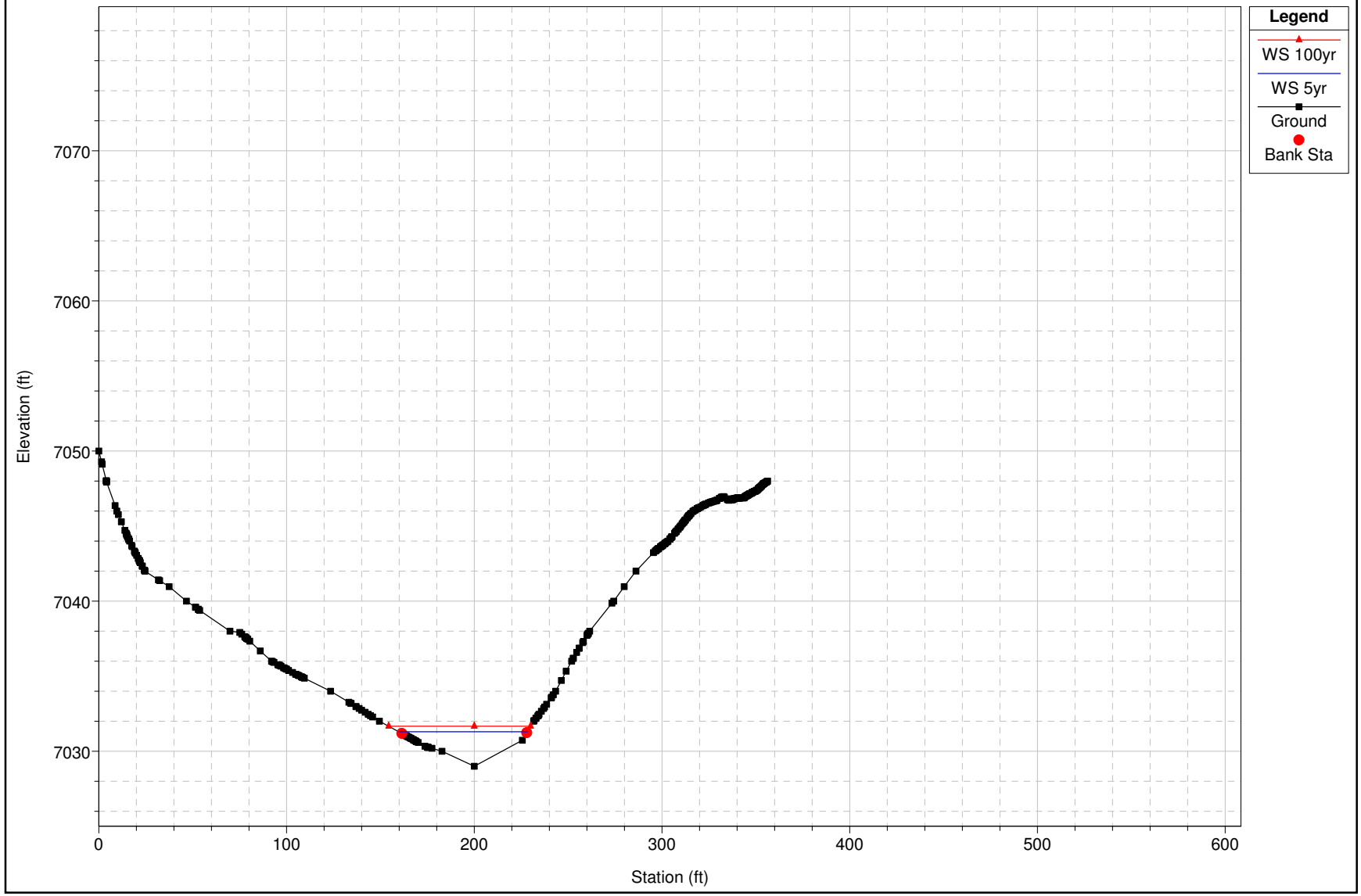
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



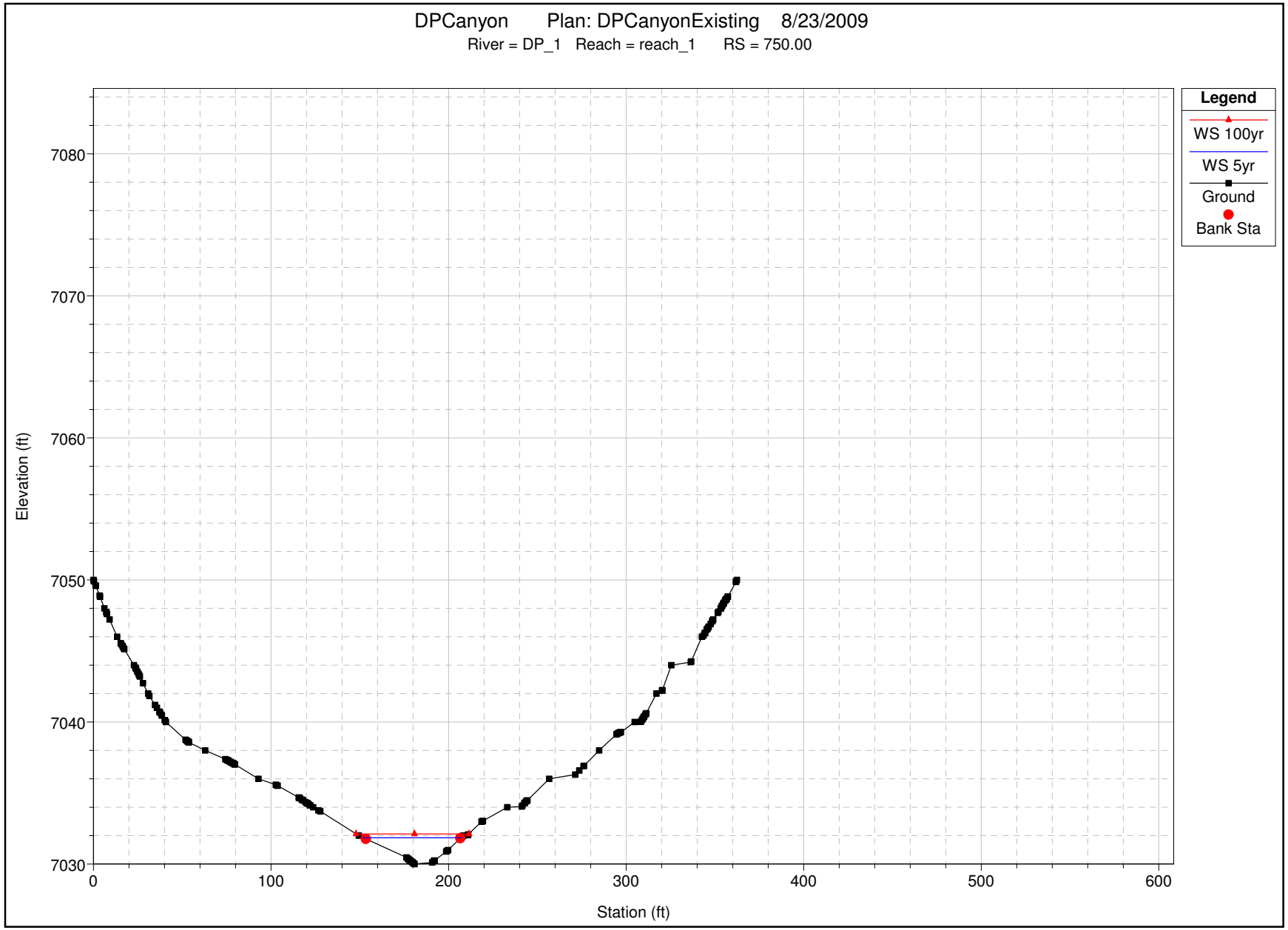
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

River = DP_1 Reach = reach_1 RS = 700.00 coordinates at station 200 interpolated from topo



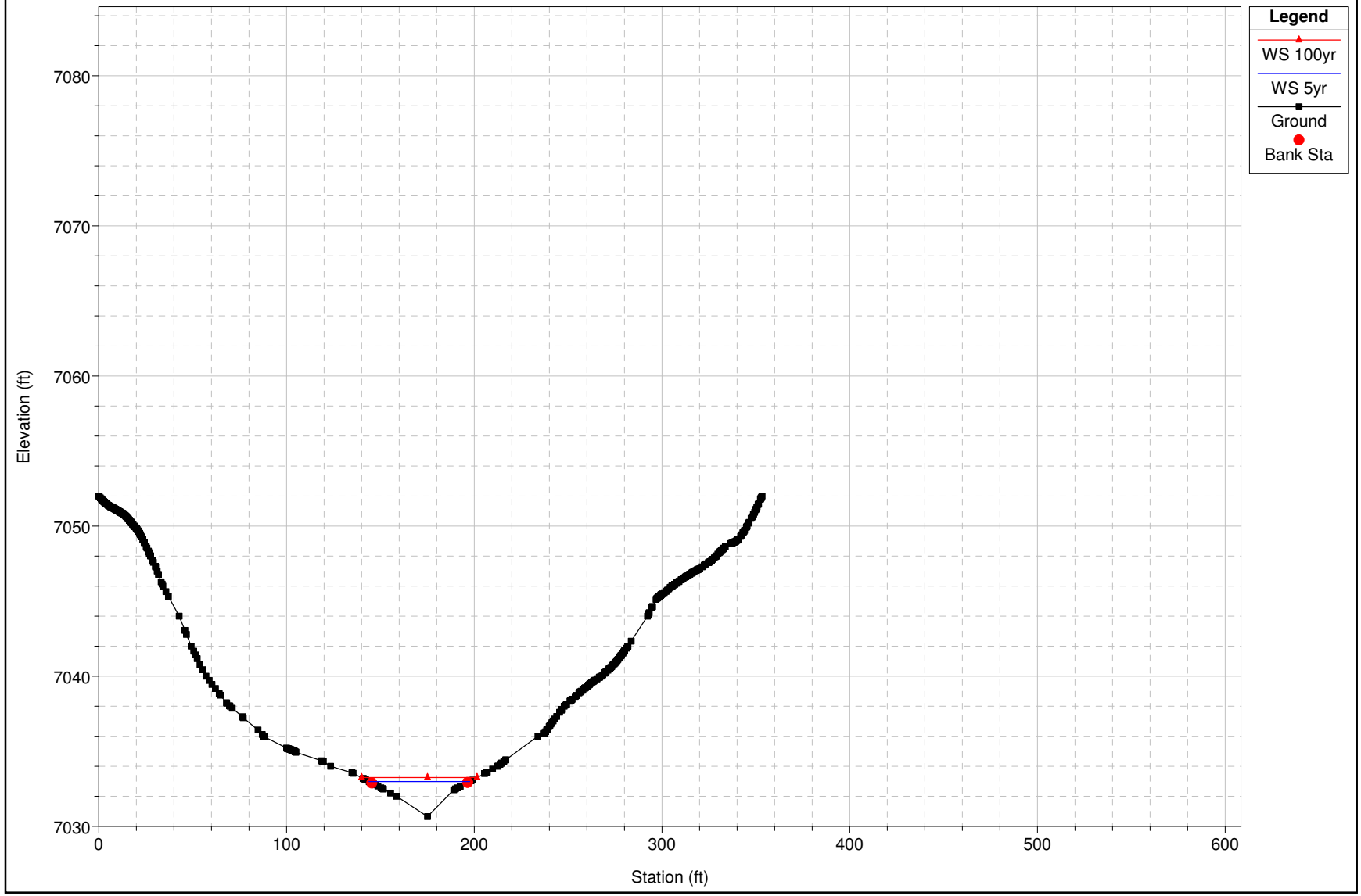
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

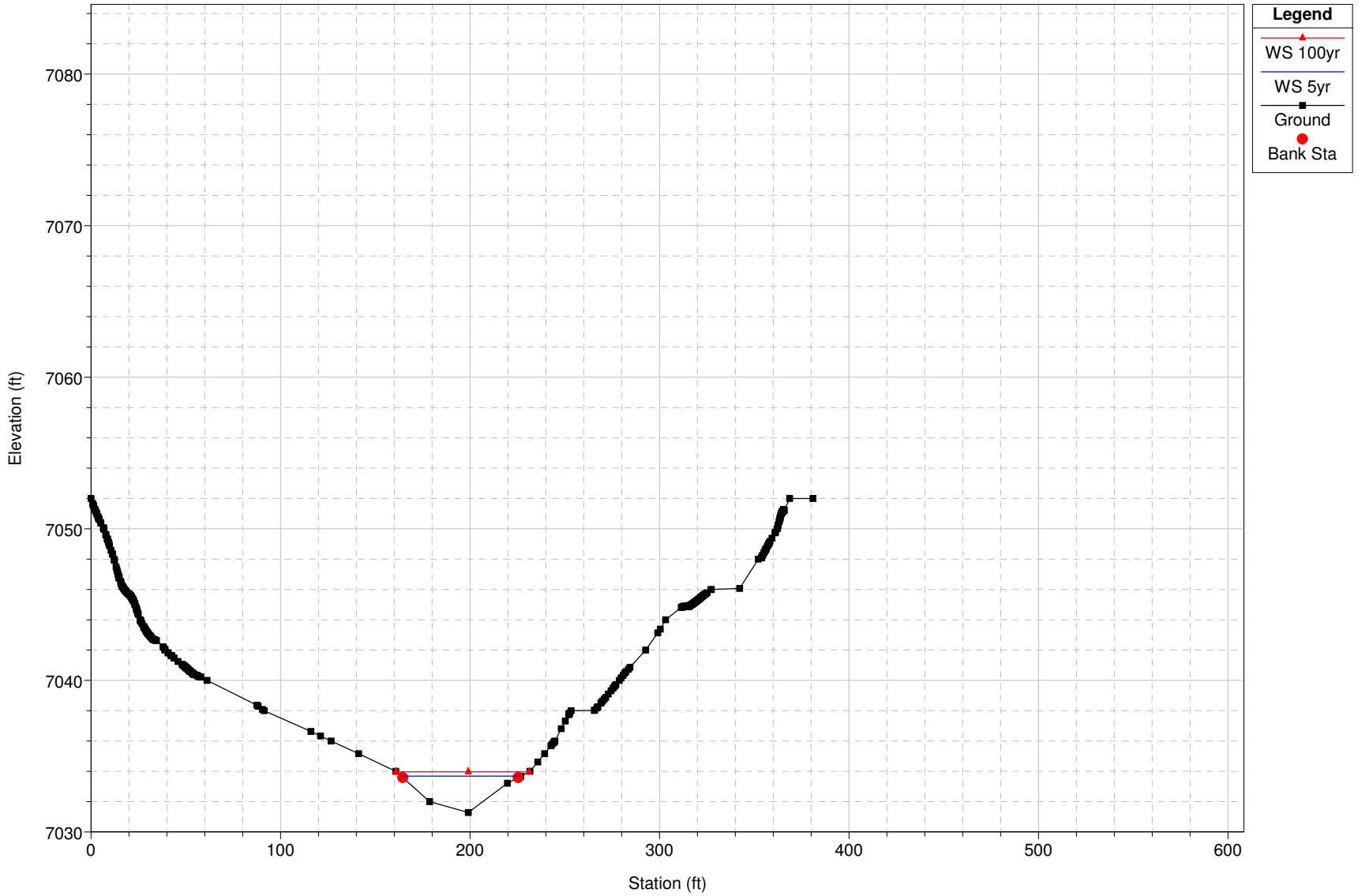
River = DP_1 Reach = reach_1 RS = 800.00 coordinates at station 175 interpolated from topo



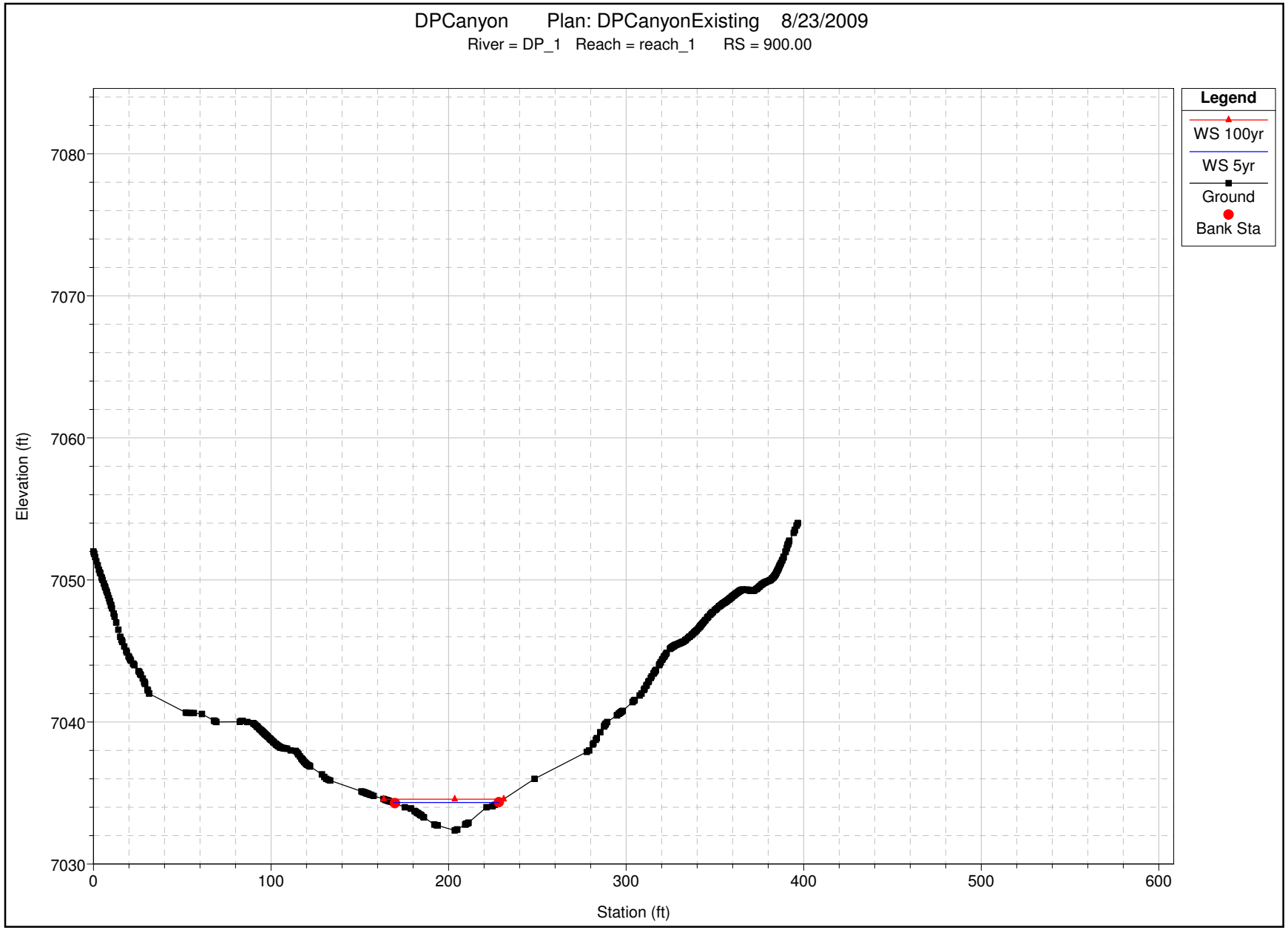
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

River = DP_1 Reach = reach_1 RS = 850.00 coordinates at station 199 interpolated from topo



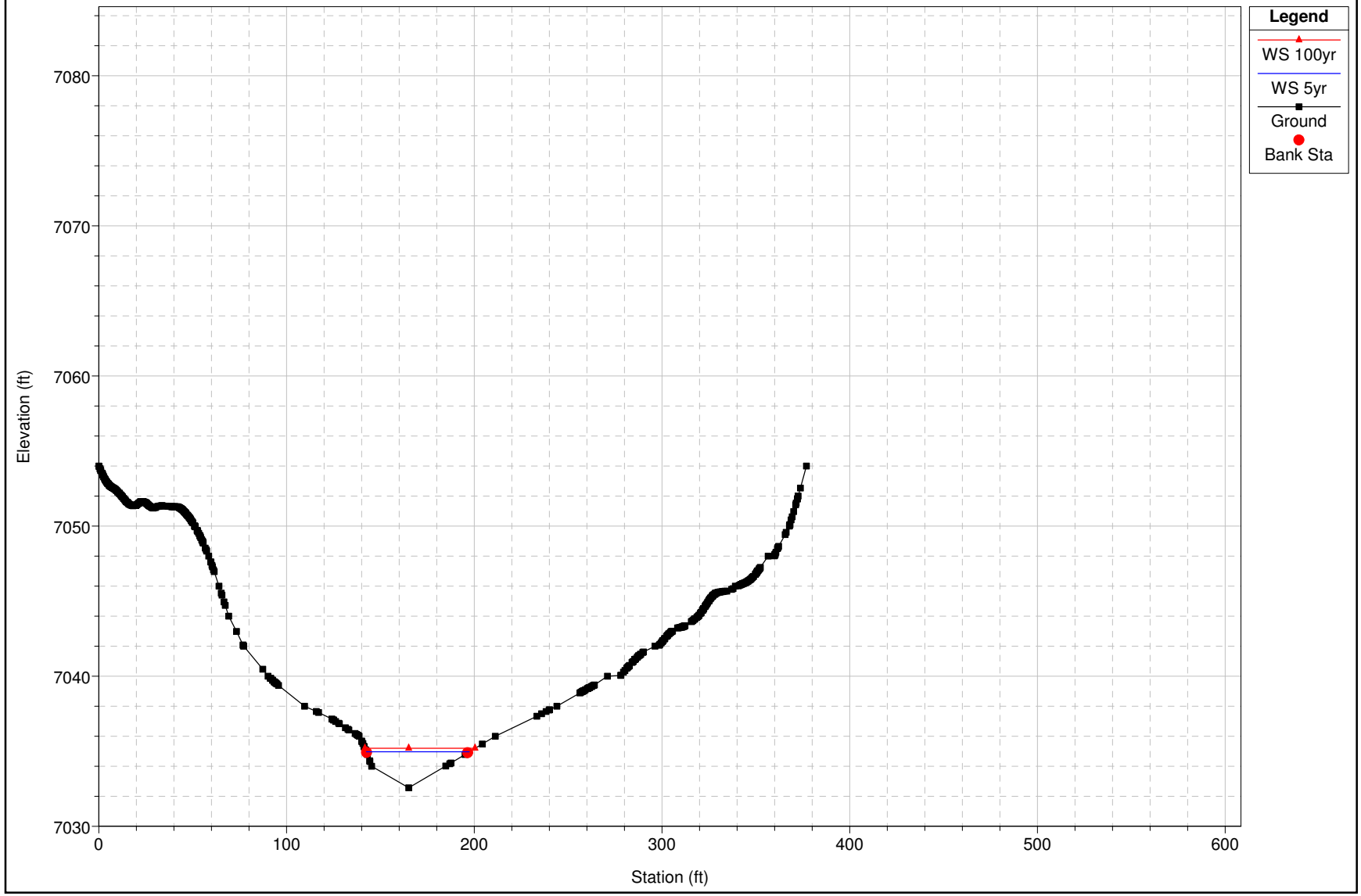
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

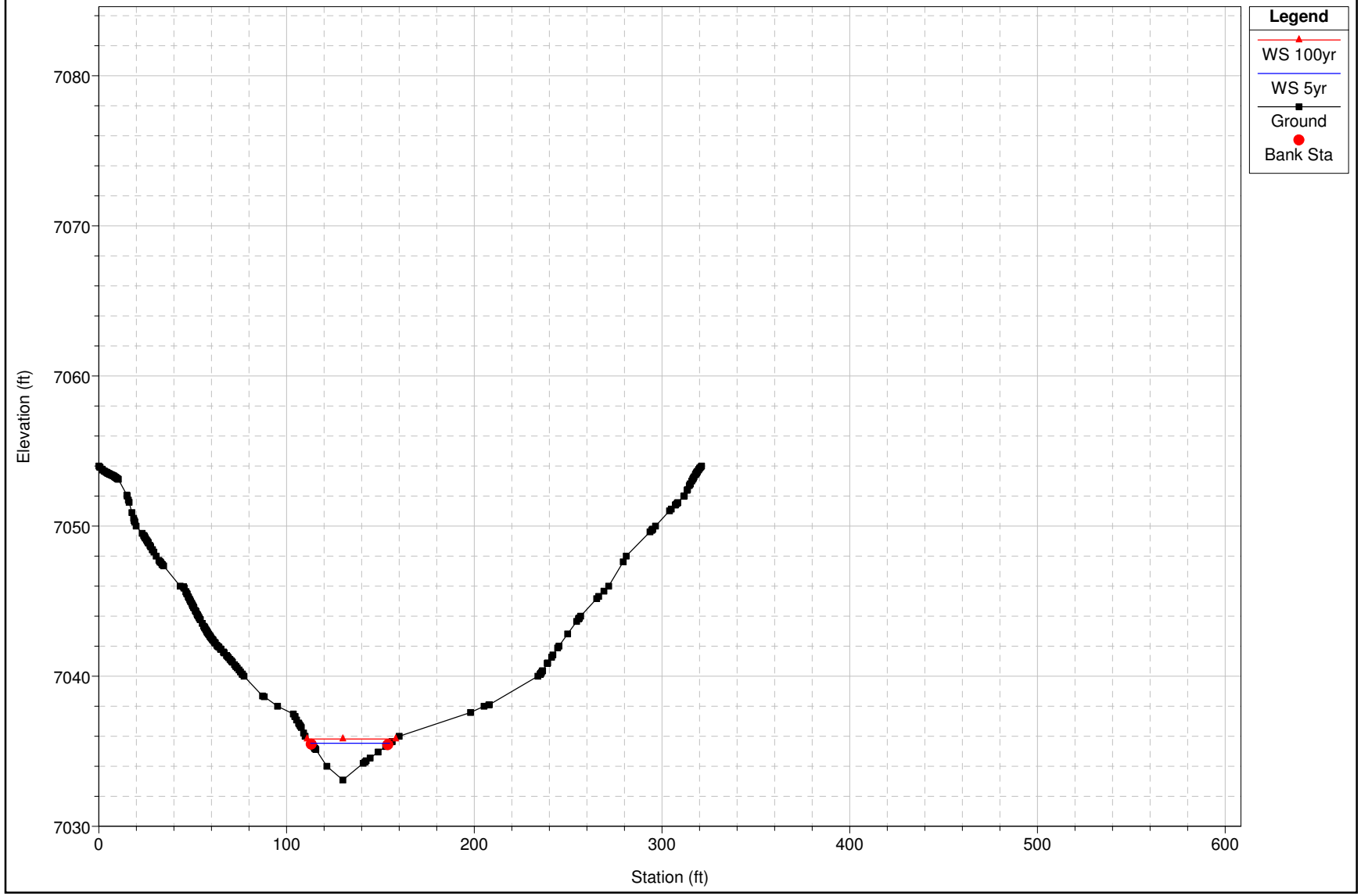
River = DP_1 Reach = reach_1 RS = 950.00 coordinates at station 165 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

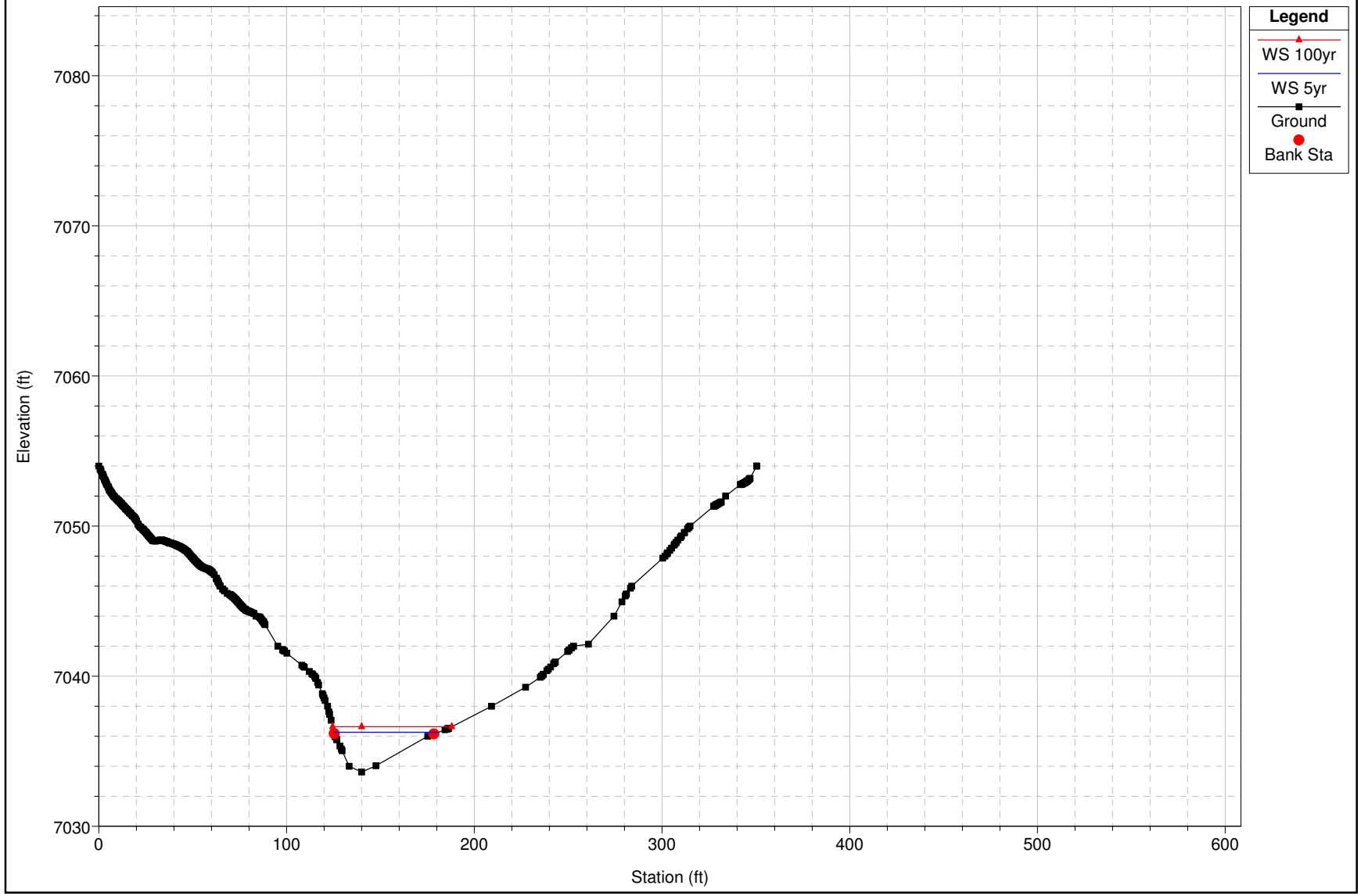
River = DP_1 Reach = reach_1 RS = 1000.00 coordinates at station 130 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

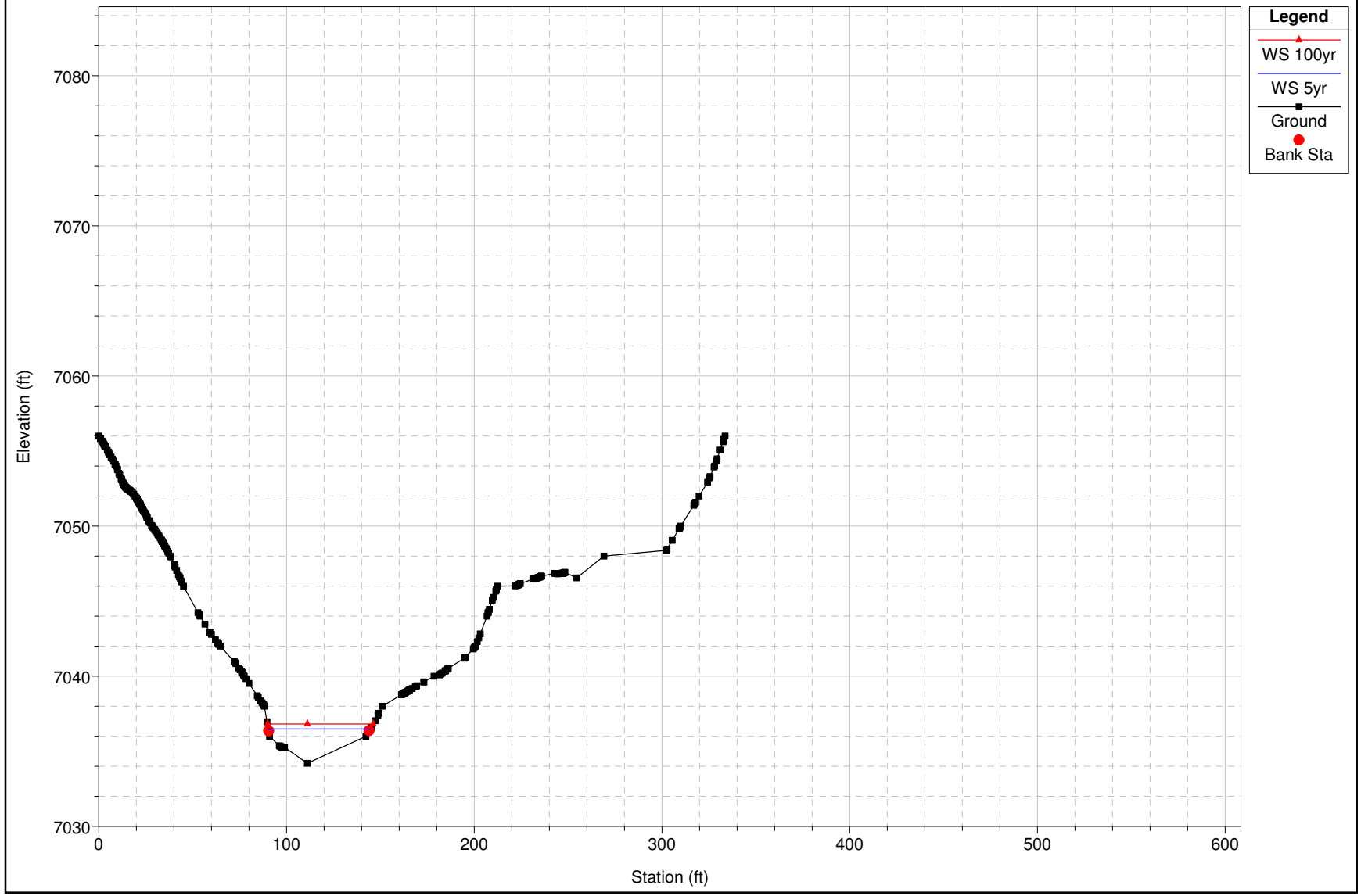
River = DP_1 Reach = reach_1 RS = 1050.00 coordinates at station 140 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

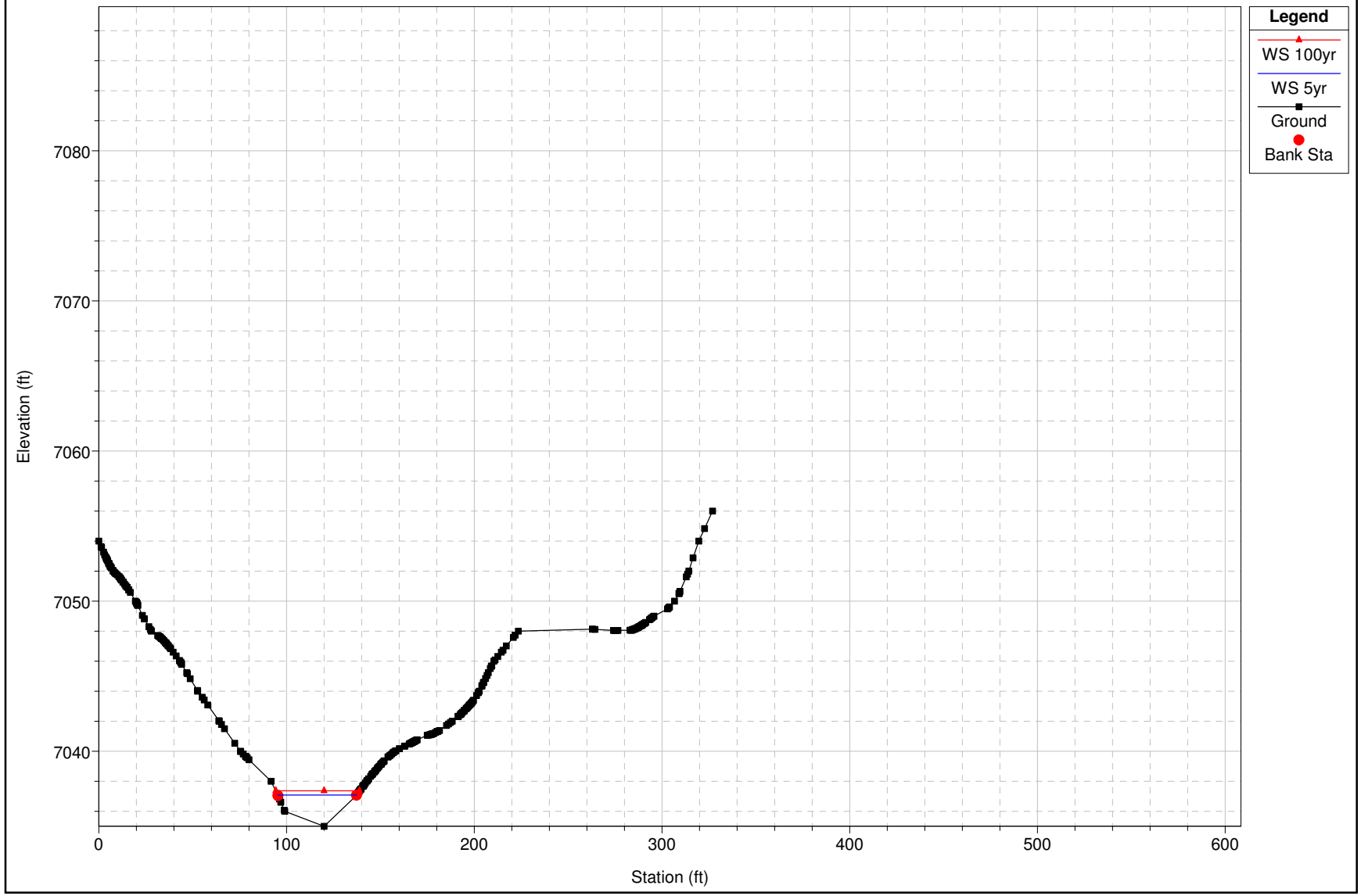
River = DP_1 Reach = reach_1 RS = 1100.00 coordinates at station 111 interpolated from topo



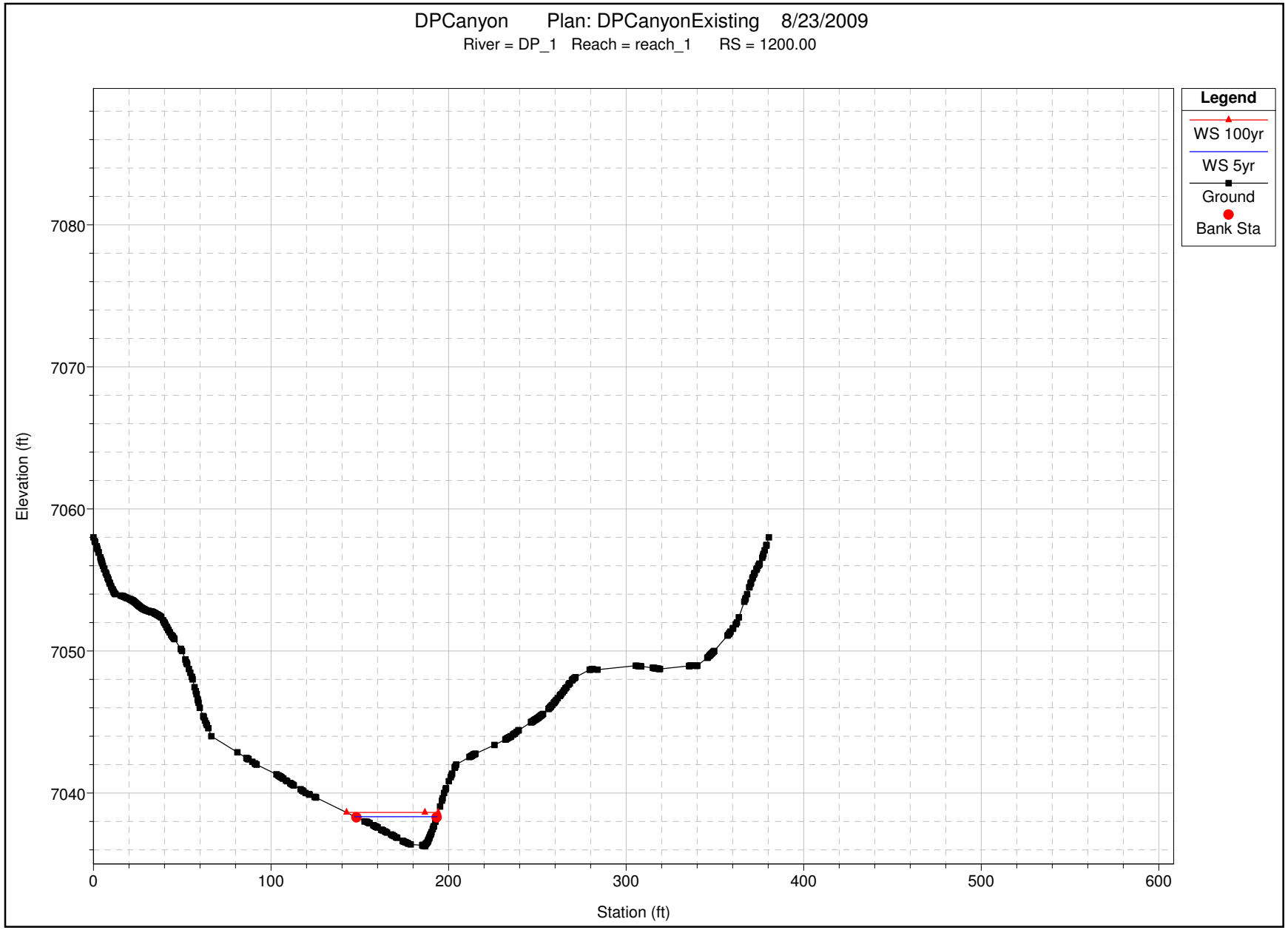
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonExisting 8/23/2009

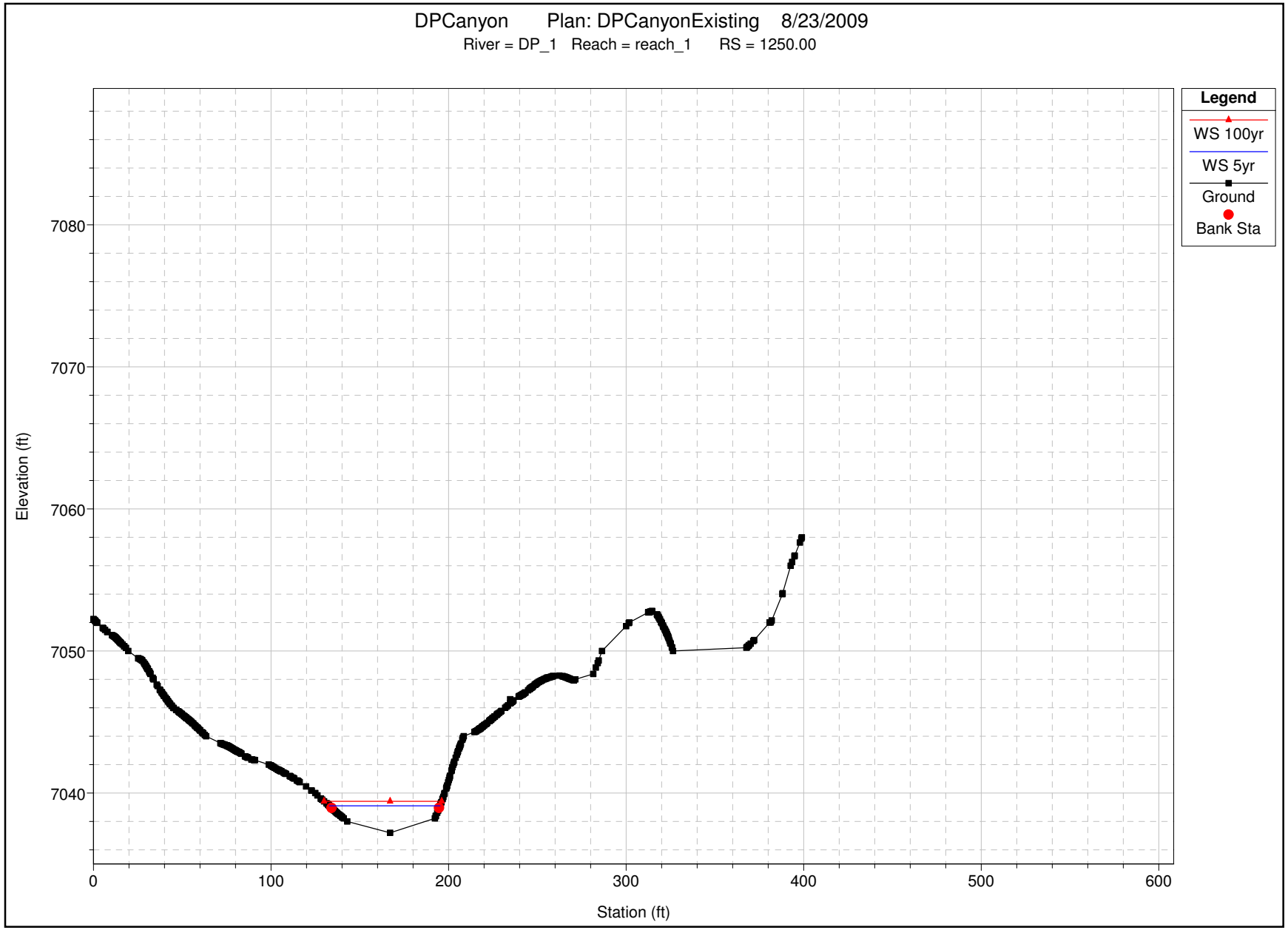
River = DP_1 Reach = reach_1 RS = 1150.00 coordinates at station 120 interpolated from topo



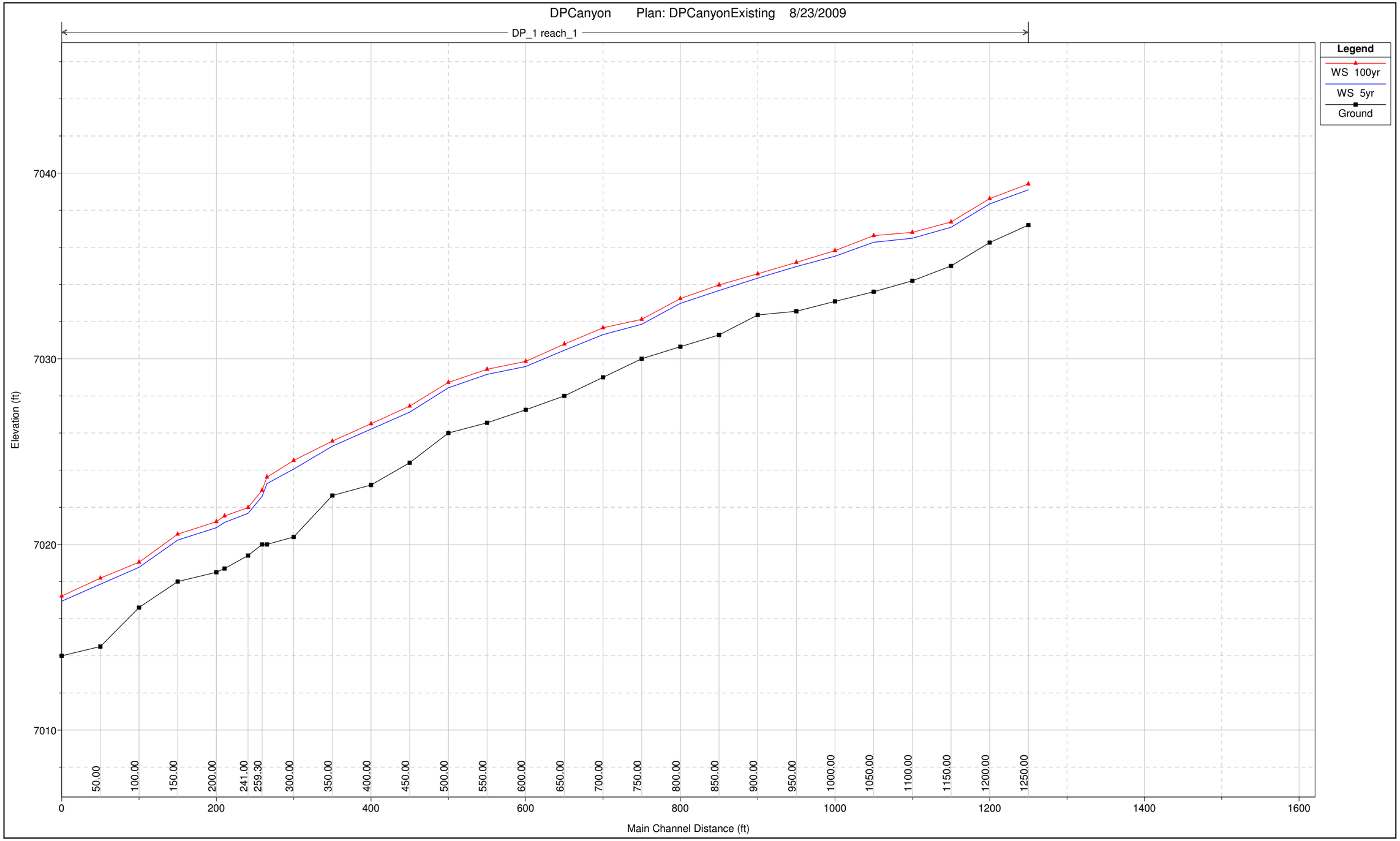
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 120 ft 1 in Vert. = 5 ft

HEC-RAS Plan: DPCanyonExist River: DP_1 Reach: reach_1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	1250.00	2yr	289.00	7037.20	7038.95		7039.22	0.006109	4.21	68.72	60.49	0.70
reach_1	1250.00	5yr	343.00	7037.20	7039.10		7039.40	0.005640	4.40	78.16	62.23	0.68
reach_1	1250.00	10yr	374.00	7037.20	7039.18		7039.50	0.005450	4.50	83.33	63.17	0.68
reach_1	1250.00	50yr	438.00	7037.20	7039.35		7039.69	0.005094	4.70	94.02	65.31	0.67
reach_1	1250.00	100yr	465.00	7037.20	7039.41		7039.77	0.004992	4.78	98.32	66.19	0.67
reach_1	1200.00	2yr	289.00	7036.26	7038.21	7038.21	7038.76	0.012964	5.99	48.28	43.76	1.00
reach_1	1200.00	5yr	343.00	7036.26	7038.34	7038.34	7038.96	0.012809	6.31	54.40	46.29	1.01
reach_1	1200.00	10yr	374.00	7036.26	7038.42	7038.42	7039.07	0.012475	6.48	57.88	47.67	1.01
reach_1	1200.00	50yr	438.00	7036.26	7038.56	7038.56	7039.28	0.011928	6.81	65.02	50.39	1.01
reach_1	1200.00	100yr	465.00	7036.26	7038.63	7038.63	7039.37	0.011560	6.91	68.35	51.61	1.00
reach_1	1150.00	2yr	289.00	7035.00	7036.92	7036.92	7037.52	0.012814	6.17	46.84	40.30	1.01
reach_1	1150.00	5yr	343.00	7035.00	7037.08	7037.08	7037.72	0.012405	6.45	53.21	42.06	1.01
reach_1	1150.00	10yr	374.00	7035.00	7037.15	7037.15	7037.84	0.012447	6.68	56.03	42.63	1.02
reach_1	1150.00	50yr	438.00	7035.00	7037.31	7037.31	7038.06	0.011705	6.98	62.96	44.01	1.01
reach_1	1150.00	100yr	465.00	7035.00	7037.37	7037.37	7038.15	0.011519	7.12	65.71	44.58	1.00
reach_1	1100.00	2yr	289.00	7034.20	7036.33		7036.64	0.006468	4.50	64.26	53.29	0.72
reach_1	1100.00	5yr	343.00	7034.20	7036.49		7036.83	0.006065	4.72	72.77	54.26	0.71
reach_1	1100.00	10yr	374.00	7034.20	7036.57		7036.94	0.005904	4.84	77.35	54.77	0.71
reach_1	1100.00	50yr	438.00	7034.20	7036.74		7037.14	0.005578	5.07	86.77	55.82	0.70
reach_1	1100.00	100yr	465.00	7034.20	7036.81		7037.22	0.005478	5.16	90.58	56.23	0.70
reach_1	1050.00	2yr	289.00	7033.61	7036.10		7036.36	0.004518	4.08	70.78	51.74	0.62
reach_1	1050.00	5yr	343.00	7033.61	7036.27		7036.56	0.004376	4.29	80.13	55.82	0.62
reach_1	1050.00	10yr	374.00	7033.61	7036.37		7036.67	0.004262	4.40	85.41	58.00	0.61
reach_1	1050.00	50yr	438.00	7033.61	7036.56		7036.89	0.004010	4.60	96.83	62.09	0.61
reach_1	1050.00	100yr	465.00	7033.61	7036.63		7036.97	0.003937	4.69	101.52	63.40	0.60
reach_1	1000.00	2yr	289.00	7033.09	7035.37	7035.37	7035.97	0.012829	6.22	46.43	39.44	1.01
reach_1	1000.00	5yr	343.00	7033.09	7035.53	7035.53	7036.18	0.012222	6.48	52.95	42.09	1.00
reach_1	1000.00	10yr	374.00	7033.09	7035.61	7035.61	7036.30	0.011911	6.66	56.36	43.43	1.00
reach_1	1000.00	50yr	438.00	7033.09	7035.76	7035.76	7036.52	0.011605	7.04	62.98	46.00	1.00
reach_1	1000.00	100yr	465.00	7033.09	7035.82	7035.82	7036.61	0.011332	7.15	66.07	47.13	1.00
reach_1	950.00	2yr	289.00	7032.56	7034.83		7035.13	0.005636	4.33	66.69	52.74	0.68
reach_1	950.00	5yr	343.00	7032.56	7034.96	7034.62	7035.30	0.005905	4.67	73.52	54.79	0.70
reach_1	950.00	10yr	374.00	7032.56	7035.03	7034.71	7035.40	0.005964	4.85	77.30	55.90	0.71
reach_1	950.00	50yr	438.00	7032.56	7035.15	7034.85	7035.58	0.006264	5.24	84.08	57.88	0.74
reach_1	950.00	100yr	465.00	7032.56	7035.19	7034.91	7035.65	0.006424	5.40	86.67	58.64	0.75
reach_1	900.00	2yr	289.00	7032.36	7034.21	7034.21	7034.69	0.013737	5.57	51.92	55.15	1.01
reach_1	900.00	5yr	343.00	7032.36	7034.34	7034.34	7034.86	0.013307	5.77	59.44	59.40	1.01
reach_1	900.00	10yr	374.00	7032.36	7034.39	7034.39	7034.95	0.013305	5.97	62.77	61.50	1.02
reach_1	900.00	50yr	438.00	7032.36	7034.52	7034.52	7035.13	0.012540	6.25	70.86	65.97	1.01
reach_1	900.00	100yr	465.00	7032.36	7034.58	7034.58	7035.20	0.012194	6.34	74.45	67.66	1.00
reach_1	850.00	2yr	289.00	7031.28	7033.52		7033.75	0.004286	3.81	75.90	59.46	0.59
reach_1	850.00	5yr	343.00	7031.28	7033.68		7033.93	0.004257	4.03	85.24	63.26	0.60
reach_1	850.00	10yr	374.00	7031.28	7033.75		7034.02	0.004219	4.16	90.26	65.10	0.60
reach_1	850.00	50yr	438.00	7031.28	7033.91		7034.21	0.004179	4.42	100.31	68.65	0.61
reach_1	850.00	100yr	465.00	7031.28	7033.97		7034.29	0.004104	4.50	105.03	70.25	0.61
reach_1	800.00	2yr	289.00	7030.65	7032.85	7032.85	7033.37	0.013435	5.76	50.15	49.65	1.01
reach_1	800.00	5yr	343.00	7030.65	7032.99	7032.99	7033.55	0.012974	6.04	56.88	53.66	1.01
reach_1	800.00	10yr	374.00	7030.65	7033.05	7033.05	7033.65	0.012637	6.20	60.62	55.74	1.01
reach_1	800.00	50yr	438.00	7030.65	7033.20	7033.20	7033.85	0.011730	6.46	69.06	60.19	0.99
reach_1	800.00	100yr	465.00	7030.65	7033.24	7033.24	7033.92	0.011856	6.64	71.70	61.49	1.00
reach_1	750.00	2yr	289.00	7030.00	7031.74	7031.74	7032.24	0.013466	5.65	51.11	52.22	1.01
reach_1	750.00	5yr	343.00	7030.00	7031.86	7031.86	7032.42	0.013407	6.00	57.21	55.16	1.02
reach_1	750.00	10yr	374.00	7030.00	7031.94	7031.94	7032.51	0.012499	6.08	61.77	57.25	1.00
reach_1	750.00	50yr	438.00	7030.00	7032.07	7032.07	7032.70	0.012096	6.41	69.32	62.38	1.00
reach_1	750.00	100yr	465.00	7030.00	7032.12	7032.12	7032.78	0.011751	6.51	72.95	63.55	0.99
reach_1	700.00	2yr	289.00	7029.00	7031.12		7031.36	0.005395	3.94	73.34	64.91	0.65
reach_1	700.00	5yr	343.00	7029.00	7031.30		7031.55	0.004711	4.01	85.59	68.47	0.62
reach_1	700.00	10yr	374.00	7029.00	7031.39		7031.65	0.004449	4.08	91.96	70.25	0.61
reach_1	700.00	50yr	438.00	7029.00	7031.59		7031.86	0.003880	4.17	106.34	74.12	0.59
reach_1	700.00	100yr	465.00	7029.00	7031.67		7031.94	0.003727	4.22	112.07	75.60	0.58
reach_1	650.00	2yr	289.00	7028.00	7030.30	7030.30	7030.93	0.012523	6.37	45.40	36.33	1.00
reach_1	650.00	5yr	343.00	7028.00	7030.46	7030.46	7031.15	0.012144	6.67	51.66	41.93	1.00
reach_1	650.00	10yr	374.00	7028.00	7030.56	7030.56	7031.27	0.011382	6.77	56.05	45.34	0.98
reach_1	650.00	50yr	438.00	7028.00	7030.72	7030.72	7031.50	0.011040	7.14	63.67	50.87	0.99

HEC-RAS Plan: DPCanyonExist River: DP_1 Reach: reach_1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	650.00	100yr	465.00	7028.00	7030.79	7030.79	7031.60	0.010609	7.22	67.72	53.50	0.97
reach_1	600.00	2yr	289.00	7027.25	7029.46	7029.46	7029.99	0.013296	5.82	49.69	48.08	1.01
reach_1	600.00	5yr	343.00	7027.25	7029.58	7029.58	7030.17	0.013280	6.18	55.59	50.89	1.02
reach_1	600.00	10yr	374.00	7027.25	7029.67	7029.67	7030.27	0.012283	6.25	60.18	52.98	1.00
reach_1	600.00	50yr	438.00	7027.25	7029.81	7029.81	7030.48	0.011769	6.57	67.70	56.23	0.99
reach_1	600.00	100yr	465.00	7027.25	7029.86	7029.86	7030.56	0.011777	6.73	70.47	57.38	1.00
reach_1	550.00	2yr	289.00	7026.55	7029.00		7029.35	0.007595	4.74	60.97	52.75	0.78
reach_1	550.00	5yr	343.00	7026.55	7029.16		7029.54	0.007242	4.92	69.80	57.47	0.77
reach_1	550.00	10yr	374.00	7026.55	7029.23		7029.63	0.007206	5.09	73.85	59.51	0.78
reach_1	550.00	50yr	438.00	7026.55	7029.38	7029.13	7029.82	0.006987	5.37	82.82	63.79	0.78
reach_1	550.00	100yr	465.00	7026.55	7029.43	7029.18	7029.90	0.006961	5.49	86.39	65.41	0.78
reach_1	500.00	2yr	289.00	7026.00	7028.29	7028.29	7028.84	0.012776	5.99	48.24	43.18	1.00
reach_1	500.00	5yr	343.00	7026.00	7028.43	7028.43	7029.04	0.012965	6.27	54.82	48.61	1.02
reach_1	500.00	10yr	374.00	7026.00	7028.51	7028.51	7029.14	0.012362	6.39	58.86	51.67	1.00
reach_1	500.00	50yr	438.00	7026.00	7028.66	7028.66	7029.35	0.011728	6.70	66.78	56.96	0.99
reach_1	500.00	100yr	465.00	7026.00	7028.72	7028.72	7029.43	0.011344	6.79	70.56	59.36	0.99
reach_1	450.00	2yr	289.00	7024.40	7026.97	7026.97	7027.59	0.012586	6.31	45.82	37.48	1.01
reach_1	450.00	5yr	343.00	7024.40	7027.12	7027.12	7027.81	0.012507	6.64	51.74	40.53	1.02
reach_1	450.00	10yr	374.00	7024.40	7027.22	7027.22	7027.93	0.011805	6.75	55.67	42.44	1.00
reach_1	450.00	50yr	438.00	7024.40	7027.39	7027.39	7028.16	0.011133	7.06	63.06	45.81	0.99
reach_1	450.00	100yr	465.00	7024.40	7027.45	7027.45	7028.25	0.010970	7.20	66.05	47.10	0.99
reach_1	400.00	2yr	289.00	7023.20	7026.05	7026.05	7026.62	0.013318	6.01	48.08	44.00	1.01
reach_1	400.00	5yr	343.00	7023.20	7026.20	7026.20	7026.81	0.012677	6.26	55.05	49.98	1.01
reach_1	400.00	10yr	374.00	7023.20	7026.29	7026.29	7026.92	0.012051	6.38	59.34	53.33	0.99
reach_1	400.00	50yr	438.00	7023.20	7026.44	7026.44	7027.12	0.011287	6.65	67.89	57.29	0.98
reach_1	400.00	100yr	465.00	7023.20	7026.50	7026.50	7027.21	0.011164	6.79	71.13	58.08	0.98
reach_1	350.00	2yr	289.00	7022.63	7025.17	7025.17	7025.67	0.013697	5.67	50.99	52.38	1.01
reach_1	350.00	5yr	343.00	7022.63	7025.29	7025.29	7025.84	0.013765	5.98	57.48	57.68	1.03
reach_1	350.00	10yr	374.00	7022.63	7025.38	7025.38	7025.94	0.012558	6.02	62.64	61.72	0.99
reach_1	350.00	50yr	438.00	7022.63	7025.51	7025.51	7026.12	0.011848	6.29	71.24	66.87	0.98
reach_1	350.00	100yr	465.00	7022.63	7025.56	7025.56	7026.20	0.011615	6.40	74.85	68.52	0.98
reach_1	300.00	2yr	289.00	7020.40	7023.80		7024.02	0.003114	3.75	77.16	48.18	0.52
reach_1	300.00	5yr	343.00	7020.40	7024.06		7024.28	0.003307	3.76	91.16	61.23	0.53
reach_1	300.00	10yr	374.00	7020.40	7024.18		7024.40	0.003050	3.80	98.85	65.31	0.52
reach_1	300.00	50yr	438.00	7020.40	7024.42		7024.66	0.002642	3.88	115.66	72.63	0.50
reach_1	300.00	100yr	465.00	7020.40	7024.52		7024.76	0.002504	3.91	123.01	74.96	0.49
reach_1	265.39	2yr	289.00	7020.00	7023.08	7023.08	7023.78	0.012548	6.73	42.92	31.16	1.01
reach_1	265.39	5yr	343.00	7020.00	7023.27	7023.27	7024.03	0.011913	6.97	49.23	33.77	1.00
reach_1	265.39	10yr	374.00	7020.00	7023.37	7023.37	7024.16	0.011629	7.17	52.38	34.84	1.00
reach_1	265.39	50yr	438.00	7020.00	7023.55	7023.55	7024.43	0.011043	7.51	59.03	36.74	0.99
reach_1	265.39	100yr	465.00	7020.00	7023.63	7023.63	7024.53	0.010824	7.65	61.83	37.43	0.99
reach_1	259.30	2yr	289.00	7020.00	7022.40	7022.40	7023.08	0.012489	6.61	43.70	33.00	1.01
reach_1	259.30	5yr	343.00	7020.00	7022.59	7022.59	7023.32	0.011988	6.87	49.91	34.56	1.01
reach_1	259.30	10yr	374.00	7020.00	7022.68	7022.68	7023.45	0.011611	7.05	53.12	35.28	1.00
reach_1	259.30	50yr	438.00	7020.00	7022.85	7022.85	7023.71	0.011269	7.44	59.15	36.58	1.00
reach_1	259.30	100yr	465.00	7020.00	7022.92	7022.92	7023.81	0.011148	7.59	61.65	37.03	1.00
reach_1	241.00	2yr	289.00	7019.40	7021.50		7022.02	0.007884	5.79	49.94	32.44	0.82
reach_1	241.00	5yr	343.00	7019.40	7021.68		7022.26	0.007981	6.16	55.72	33.25	0.84
reach_1	241.00	10yr	374.00	7019.40	7021.75	7021.56	7022.39	0.008299	6.45	58.03	33.57	0.86
reach_1	241.00	50yr	438.00	7019.40	7021.92	7021.74	7022.65	0.008249	6.85	64.04	34.43	0.87
reach_1	241.00	100yr	465.00	7019.40	7021.98	7021.81	7022.75	0.008368	7.05	66.17	34.74	0.88
reach_1	210.58	2yr	289.00	7018.70	7021.02	7021.02	7021.70	0.012293	6.64	43.49	32.30	1.01
reach_1	210.58	5yr	343.00	7018.70	7021.18	7021.18	7021.95	0.012038	7.03	48.83	33.56	1.02
reach_1	210.58	10yr	374.00	7018.70	7021.29	7021.29	7022.08	0.011354	7.15	52.47	34.37	1.00
reach_1	210.58	50yr	438.00	7018.70	7021.46	7021.46	7022.34	0.011119	7.57	58.38	35.69	1.00
reach_1	210.58	100yr	465.00	7018.70	7021.54	7021.54	7022.45	0.010818	7.68	61.23	36.32	1.00
reach_1	200.00	2yr	289.00	7018.50	7020.73	7020.73	7021.40	0.012391	6.58	43.93	33.32	1.01
reach_1	200.00	5yr	343.00	7018.50	7020.90	7020.90	7021.64	0.012044	6.91	49.63	34.35	1.01
reach_1	200.00	10yr	374.00	7018.50	7020.98	7020.98	7021.77	0.011837	7.12	52.59	34.86	1.01
reach_1	200.00	50yr	438.00	7018.50	7021.17	7021.17	7022.03	0.011116	7.44	59.12	35.96	1.00
reach_1	200.00	100yr	465.00	7018.50	7021.23	7021.23	7022.13	0.011192	7.63	61.26	36.30	1.01
reach_1	150.00	2yr	289.00	7018.00	7020.04	7020.04	7020.69	0.012365	6.48	44.60	34.58	1.01
reach_1	150.00	5yr	343.00	7018.00	7020.23	7020.23	7020.92	0.012103	6.64	51.63	38.26	1.00

HEC-RAS Plan: DPCanyonExist River: DP_1 Reach: reach_1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	150.00	10yr	374.00	7018.00	7020.31	7020.31	7021.04	0.012128	6.85	54.65	39.54	1.01
reach_1	150.00	50yr	438.00	7018.00	7020.48	7020.48	7021.27	0.011289	7.14	61.77	41.87	1.00
reach_1	150.00	100yr	465.00	7018.00	7020.55	7020.55	7021.37	0.011054	7.27	64.66	42.79	0.99
reach_1	100.00	2yr	289.00	7016.60	7018.60	7018.60	7019.19	0.012929	6.17	46.85	40.63	1.01
reach_1	100.00	5yr	343.00	7016.60	7018.76	7018.76	7019.40	0.012255	6.42	53.41	41.97	1.00
reach_1	100.00	10yr	374.00	7016.60	7018.83	7018.83	7019.52	0.012338	6.66	56.21	42.53	1.01
reach_1	100.00	50yr	438.00	7016.60	7018.99	7018.99	7019.74	0.011508	6.94	63.31	43.94	1.00
reach_1	100.00	100yr	465.00	7016.60	7019.04	7019.04	7019.83	0.011644	7.14	65.49	44.36	1.01
reach_1	50.00	2yr	289.00	7014.50	7017.66	7017.66	7018.31	0.012865	6.48	44.61	35.36	1.02
reach_1	50.00	5yr	343.00	7014.50	7017.85	7017.85	7018.54	0.012459	6.64	51.67	38.57	1.01
reach_1	50.00	10yr	374.00	7014.50	7017.96	7017.96	7018.66	0.012202	6.71	55.71	40.28	1.01
reach_1	50.00	50yr	438.00	7014.50	7018.11	7018.11	7018.88	0.011908	7.05	62.20	42.08	1.01
reach_1	50.00	100yr	465.00	7014.50	7018.18	7018.18	7018.98	0.011618	7.17	65.04	42.67	1.00
reach_1	0.00	2yr	289.00	7014.00	7016.78	7016.78	7017.36	0.013665	6.13	47.11	42.72	1.03
reach_1	0.00	5yr	343.00	7014.00	7016.94	7016.94	7017.57	0.012359	6.36	54.07	45.11	1.00
reach_1	0.00	10yr	374.00	7014.00	7017.01	7017.01	7017.68	0.012216	6.56	57.33	46.28	1.00
reach_1	0.00	50yr	438.00	7014.00	7017.17	7017.17	7017.90	0.011402	6.84	64.98	48.71	0.99
reach_1	0.00	100yr	465.00	7014.00	7017.21	7017.21	7017.98	0.011638	7.05	67.16	49.35	1.00

Proposed Conditions

1250.00
1200.00
1150.00
1100.00
1050.00
1000.00
950.00
900.00
800.00
750.00
700.00
650.00
600.00
500.00
450.00
400.00
350.00
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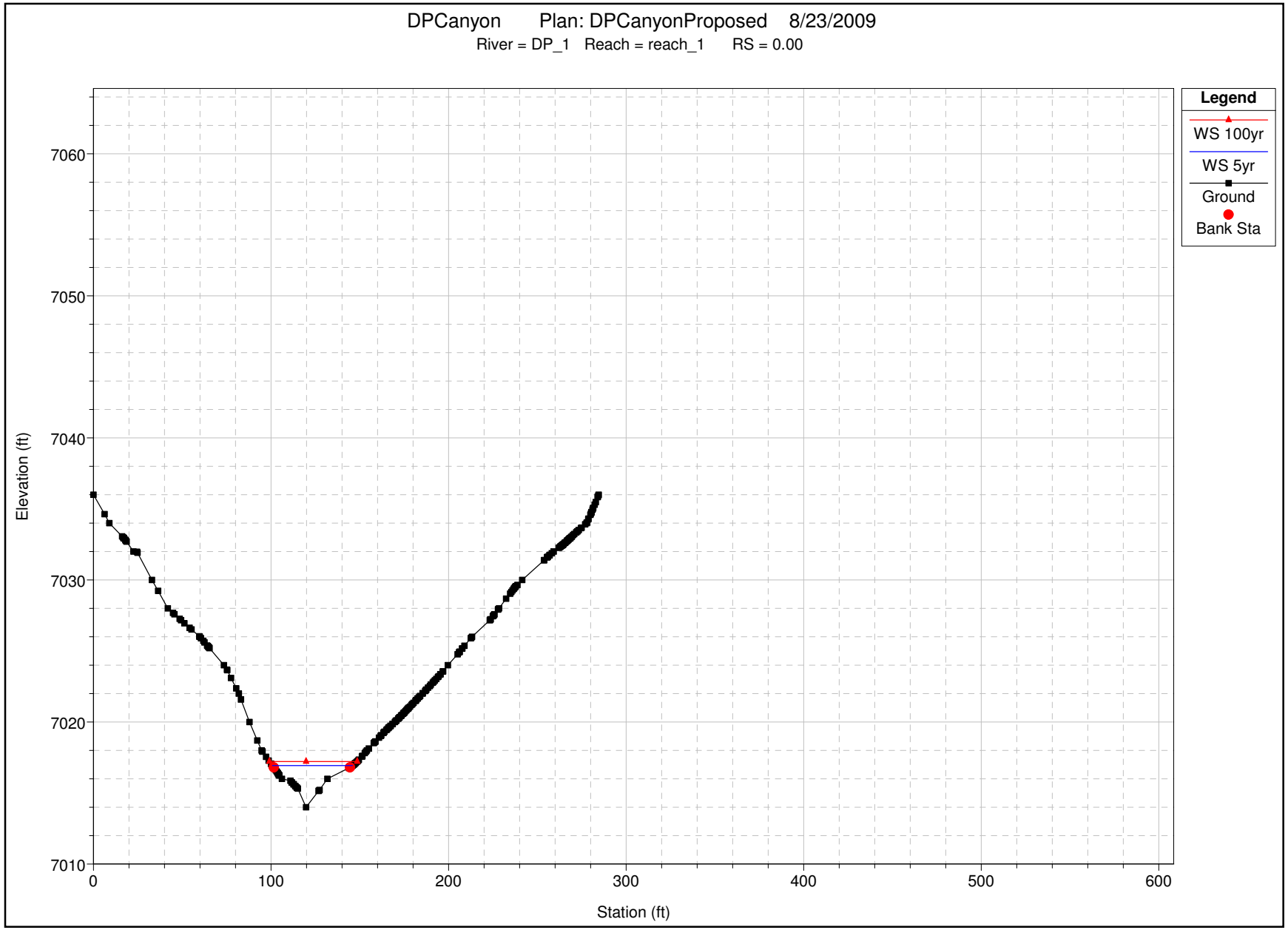
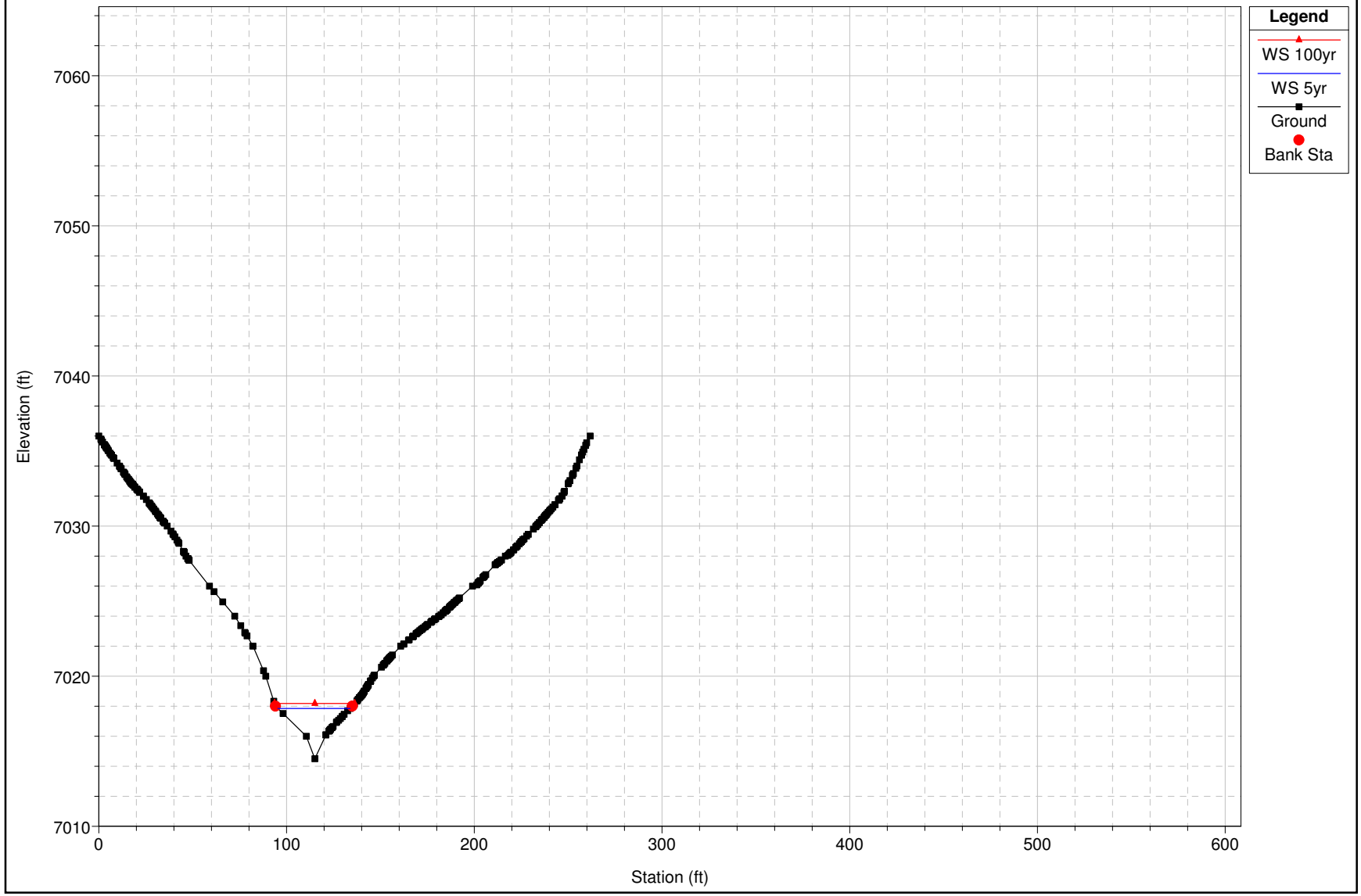
200.00
150.00
100.00
50.00
0.00
reach_1
DP_1



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

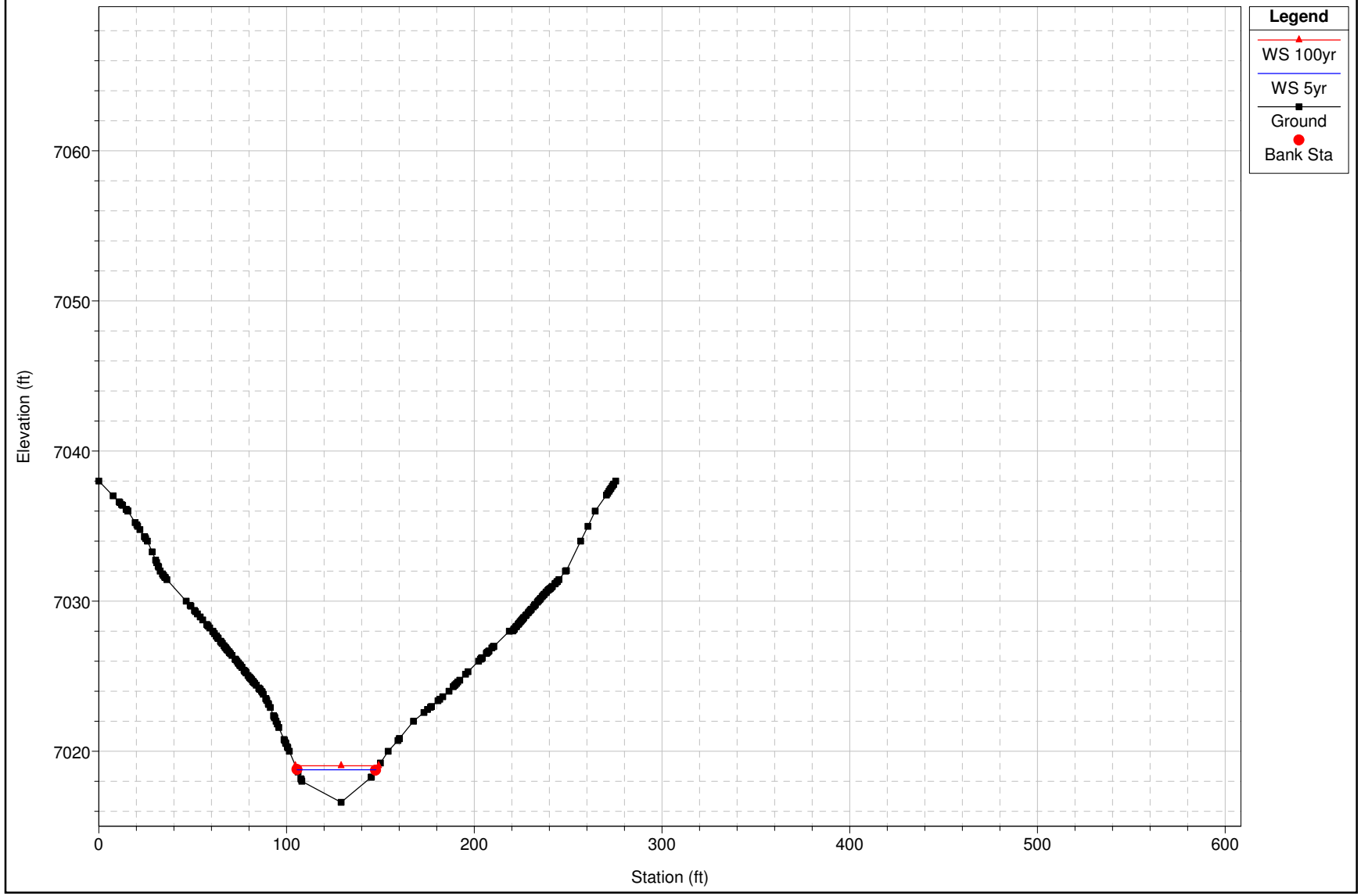
River = DP_1 Reach = reach_1 RS = 50.00 coordinates at station 115 interpolated from topo



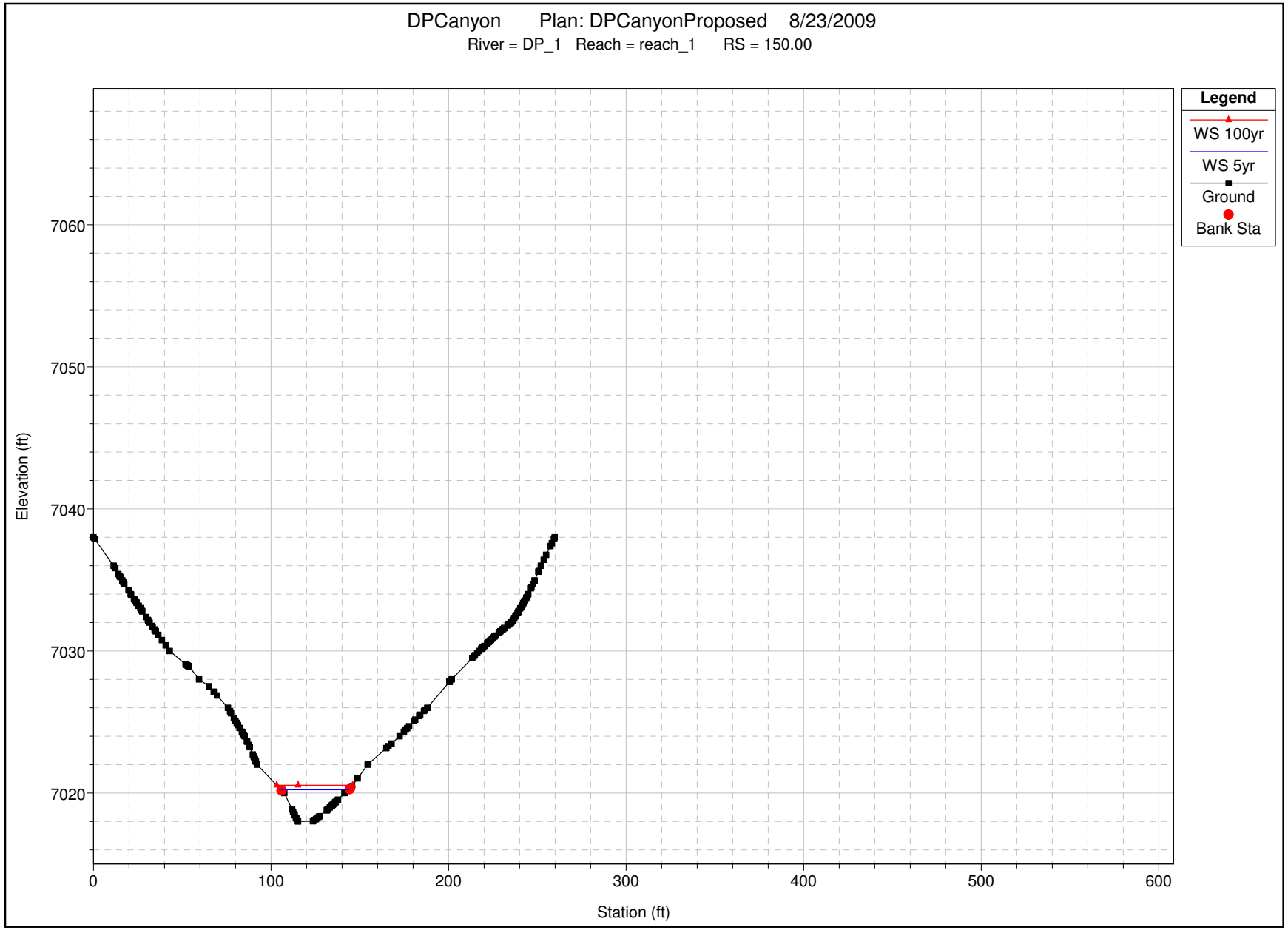
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

River = DP_1 Reach = reach_1 RS = 100.00 coordinates at station 129 interpolated from topo



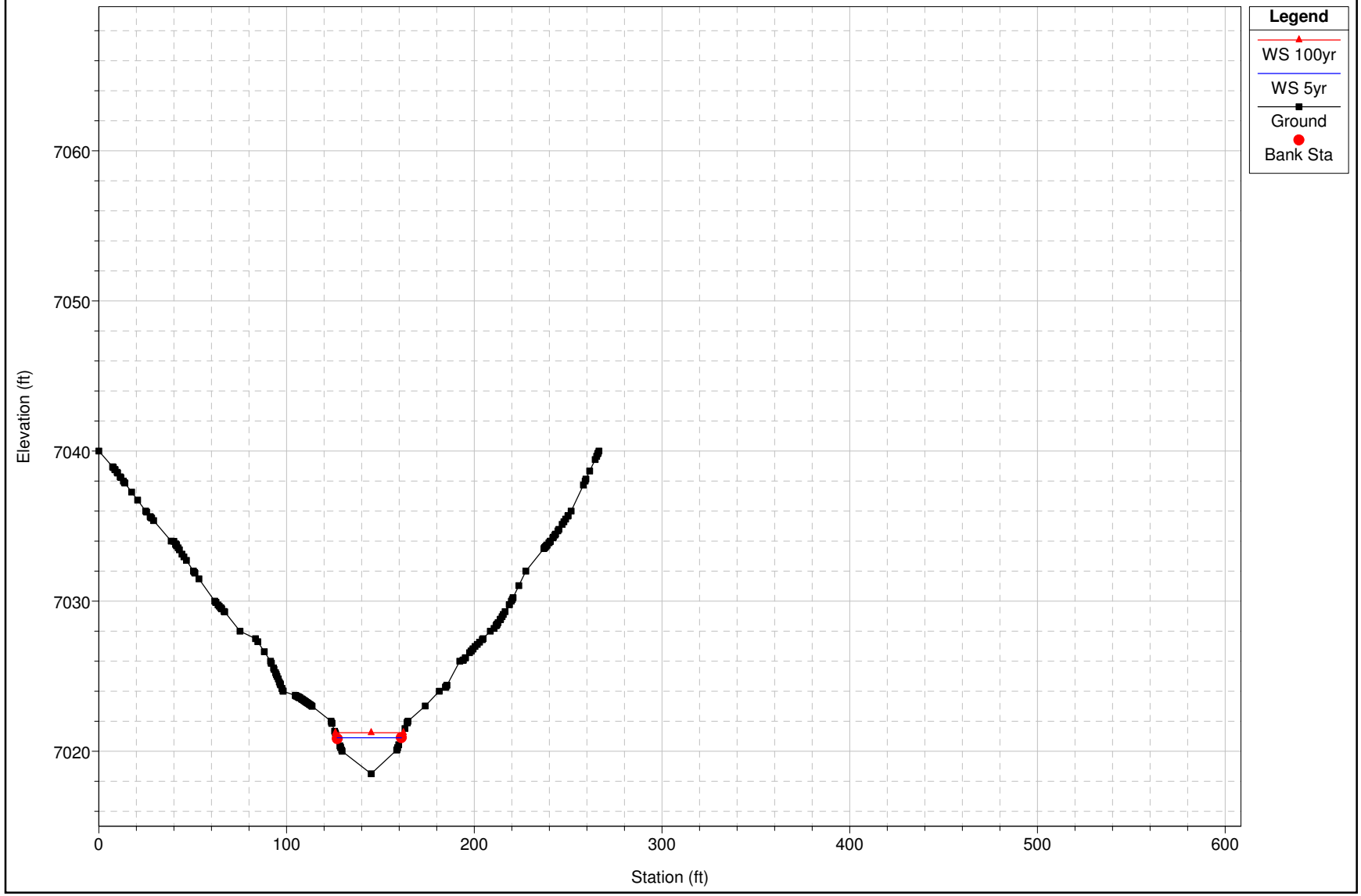
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

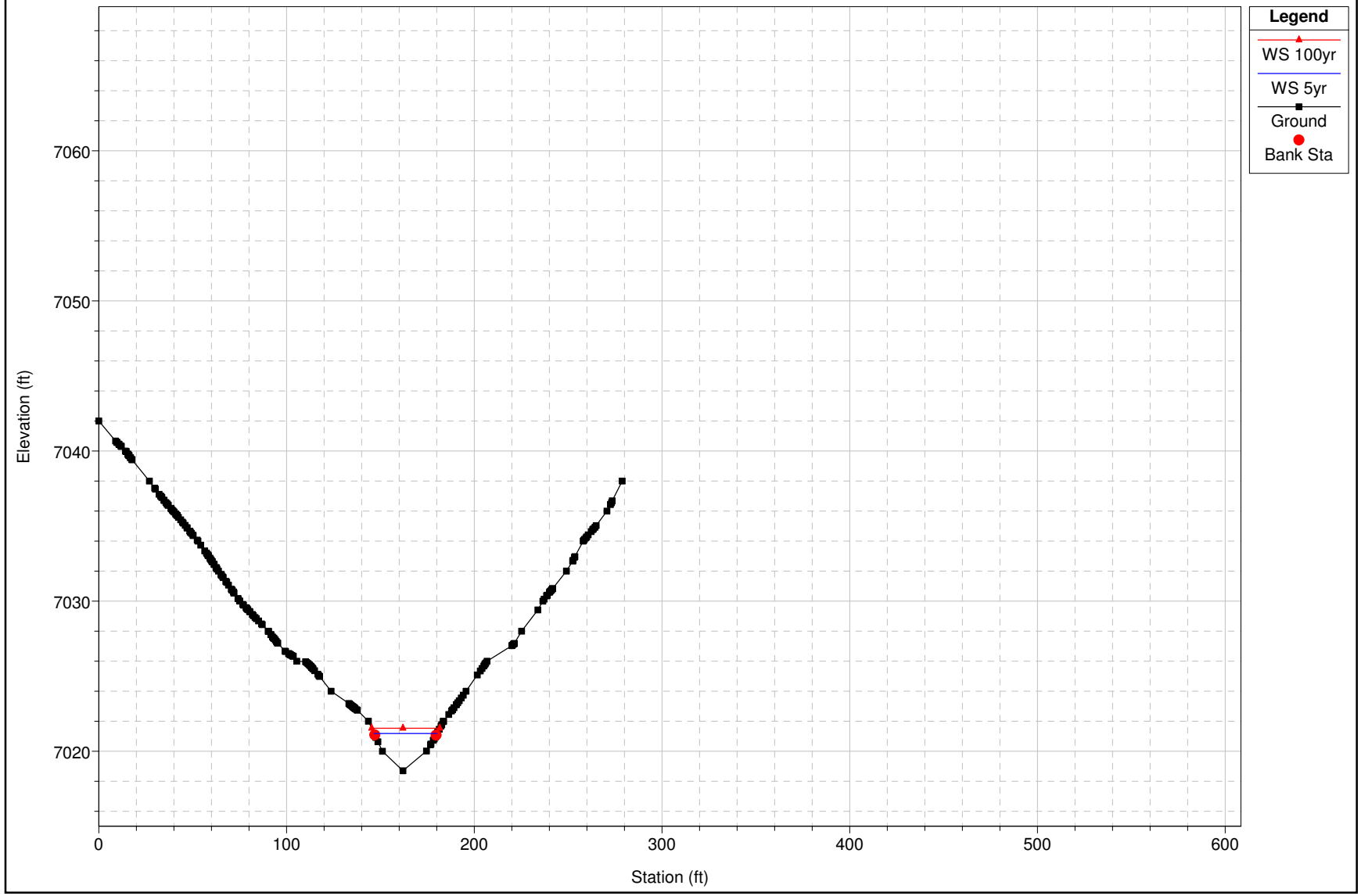
River = DP_1 Reach = reach_1 RS = 200.00 coordinates at station 145 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

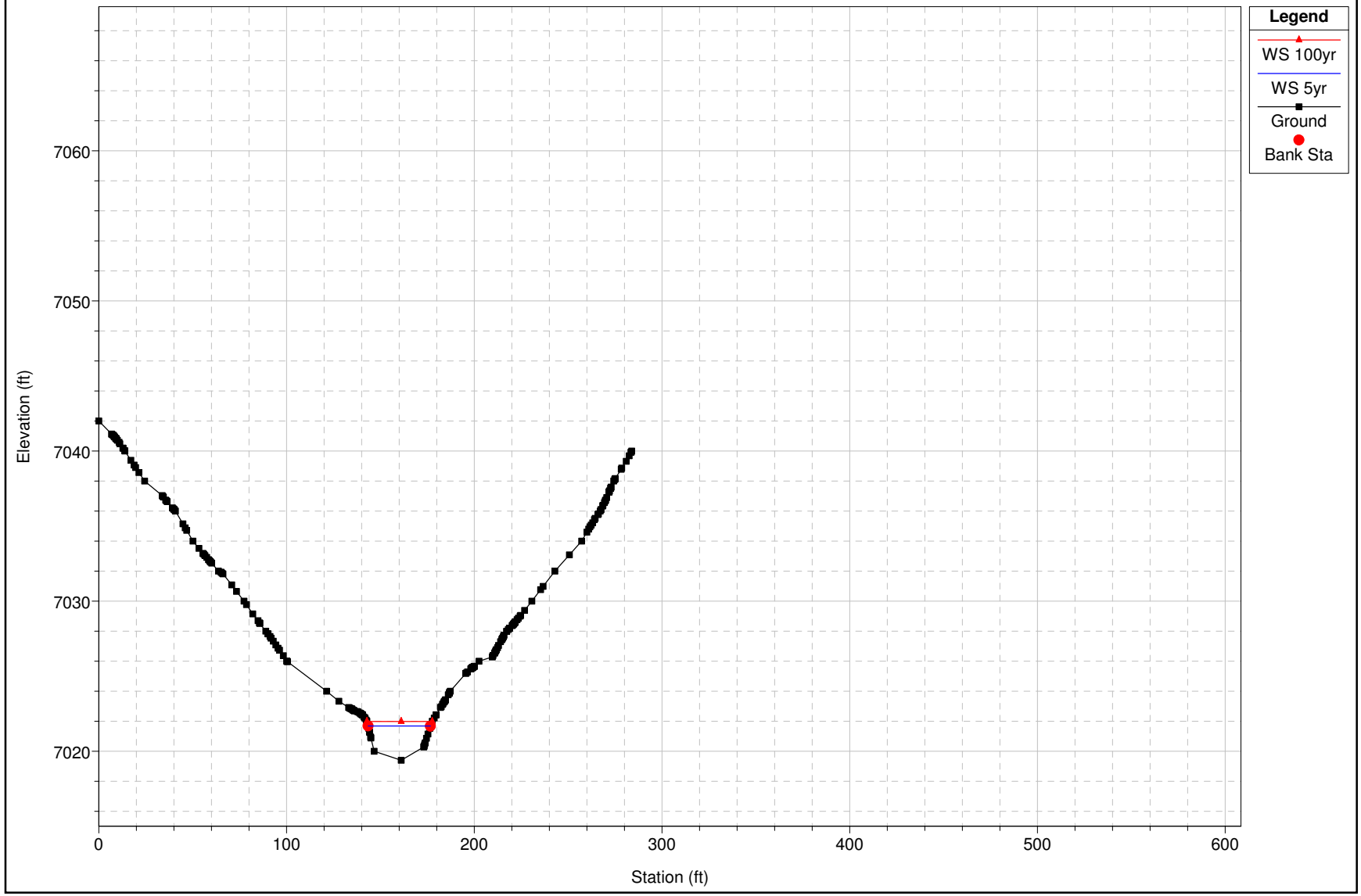
River = DP_1 Reach = reach_1 RS = 210.58 coordinates at station 162 interpolated from topo



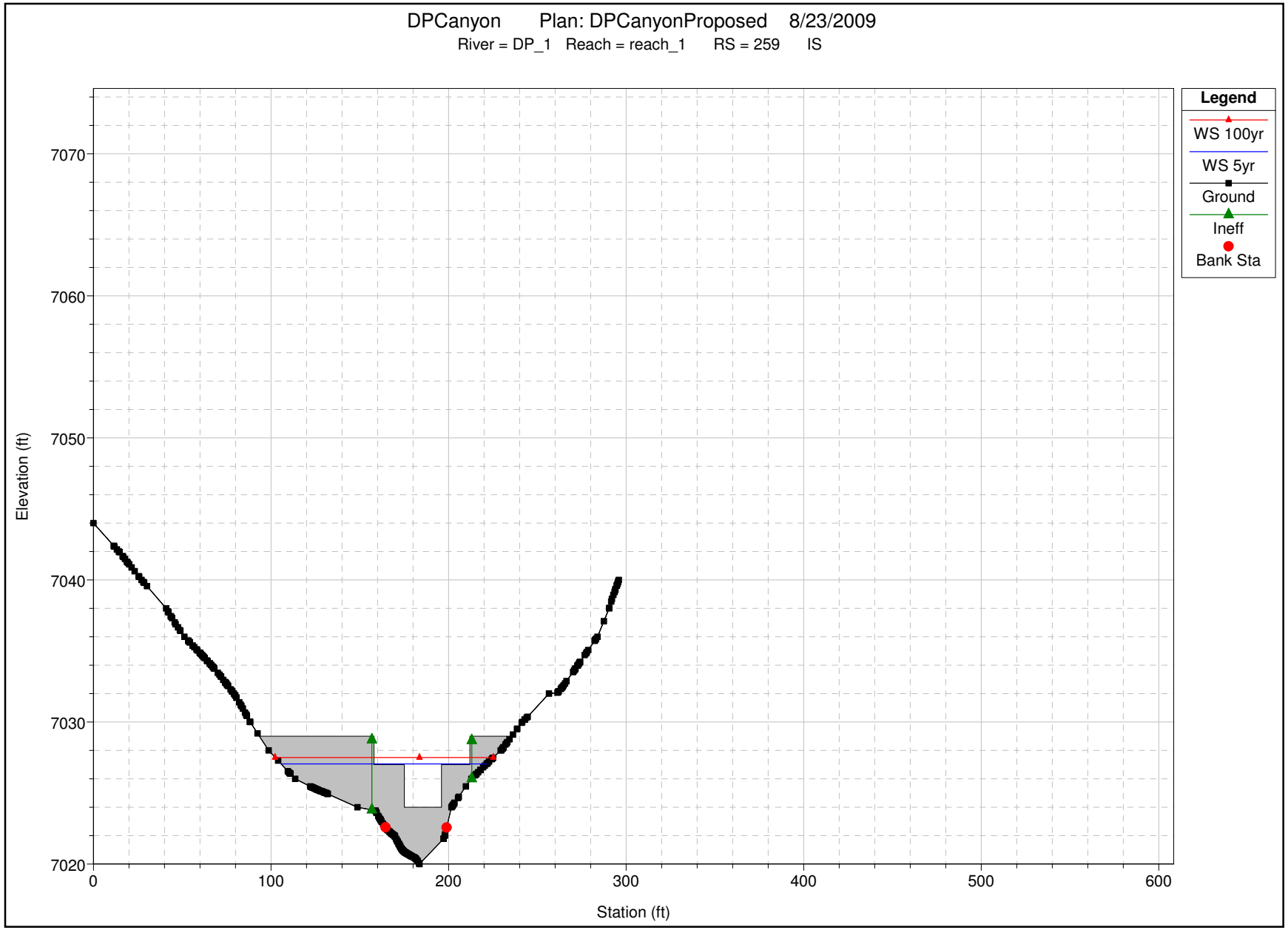
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

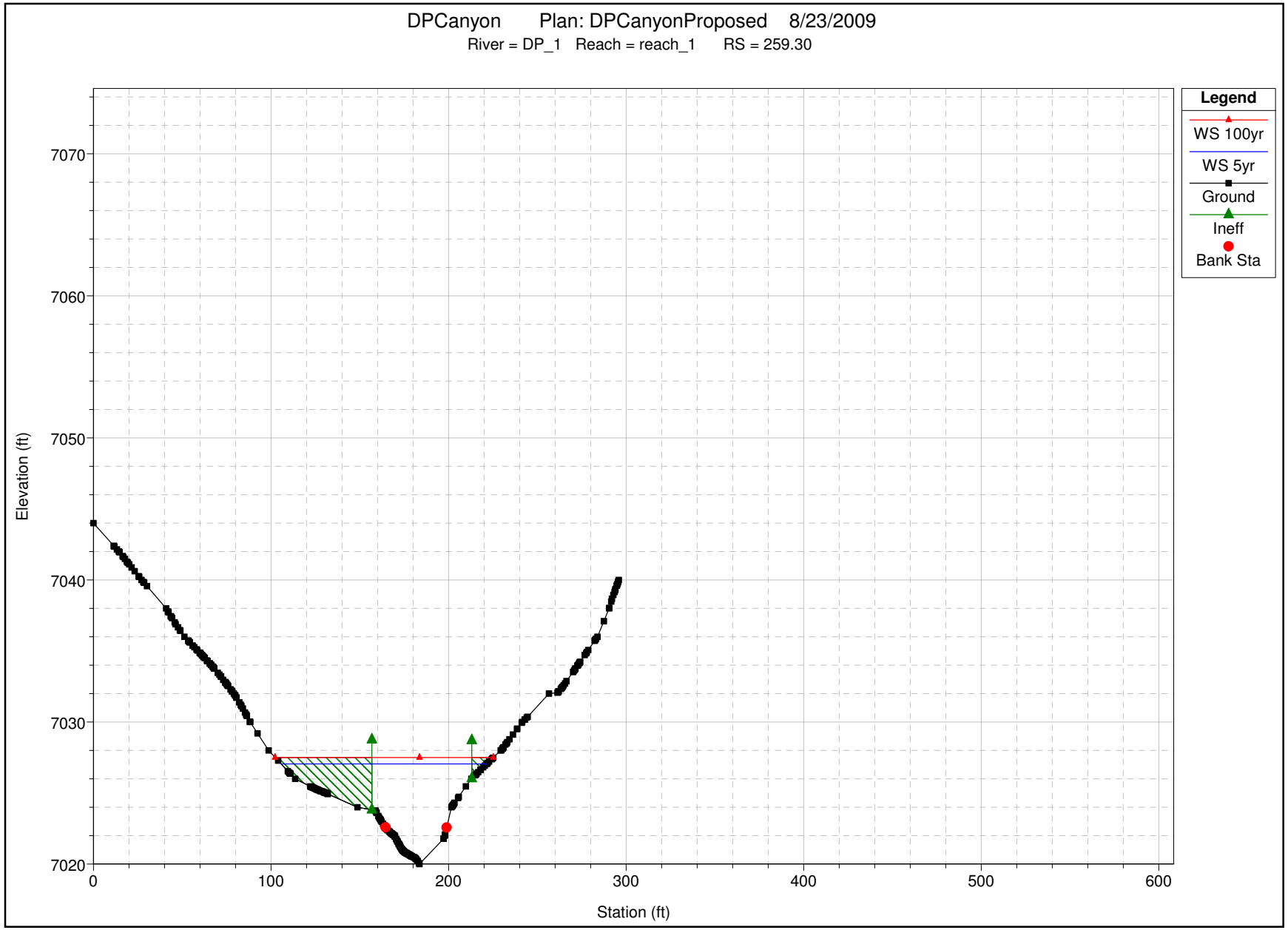
River = DP_1 Reach = reach_1 RS = 241.00 coordinates at station 161 interpolated from topo



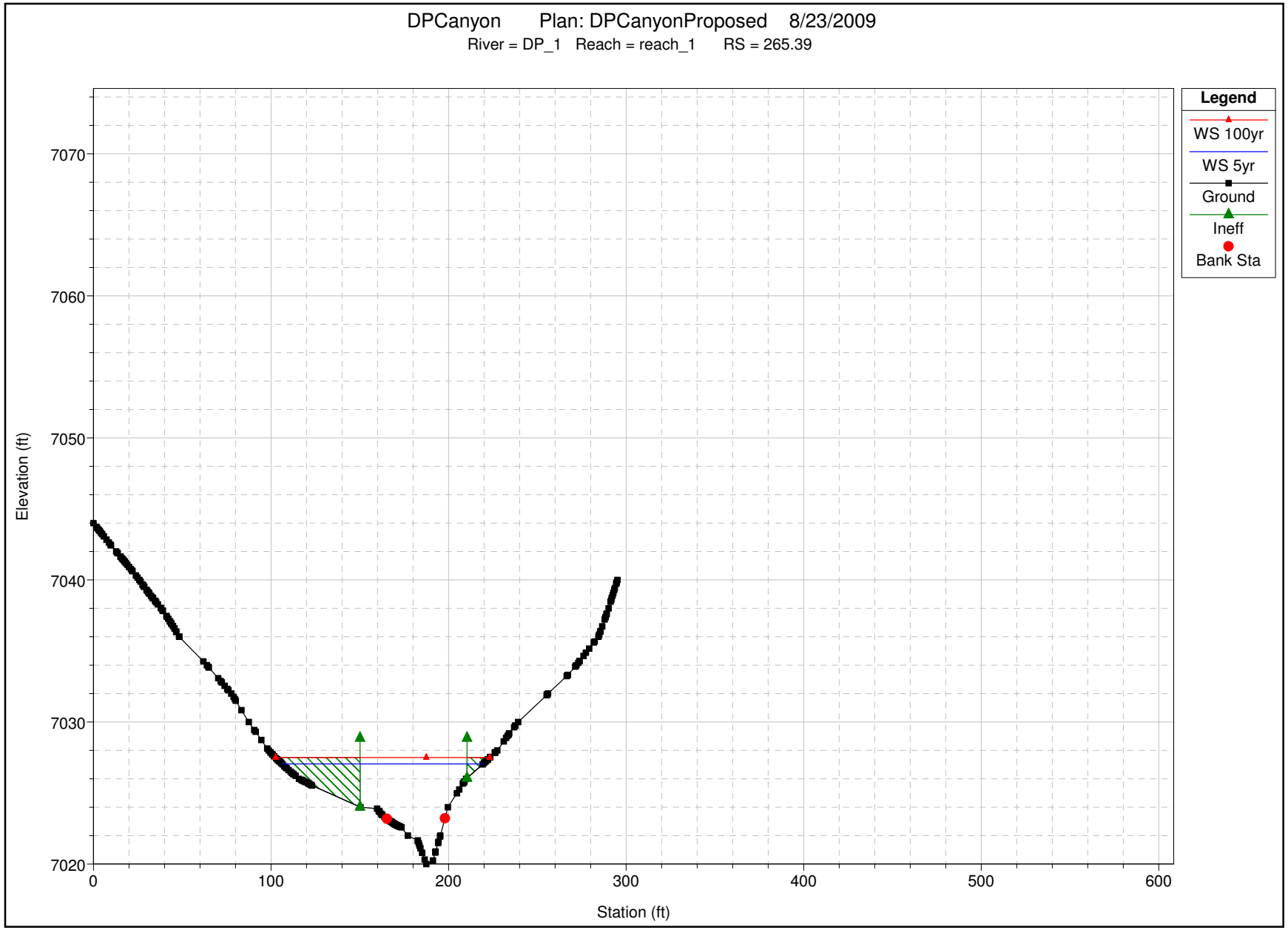
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



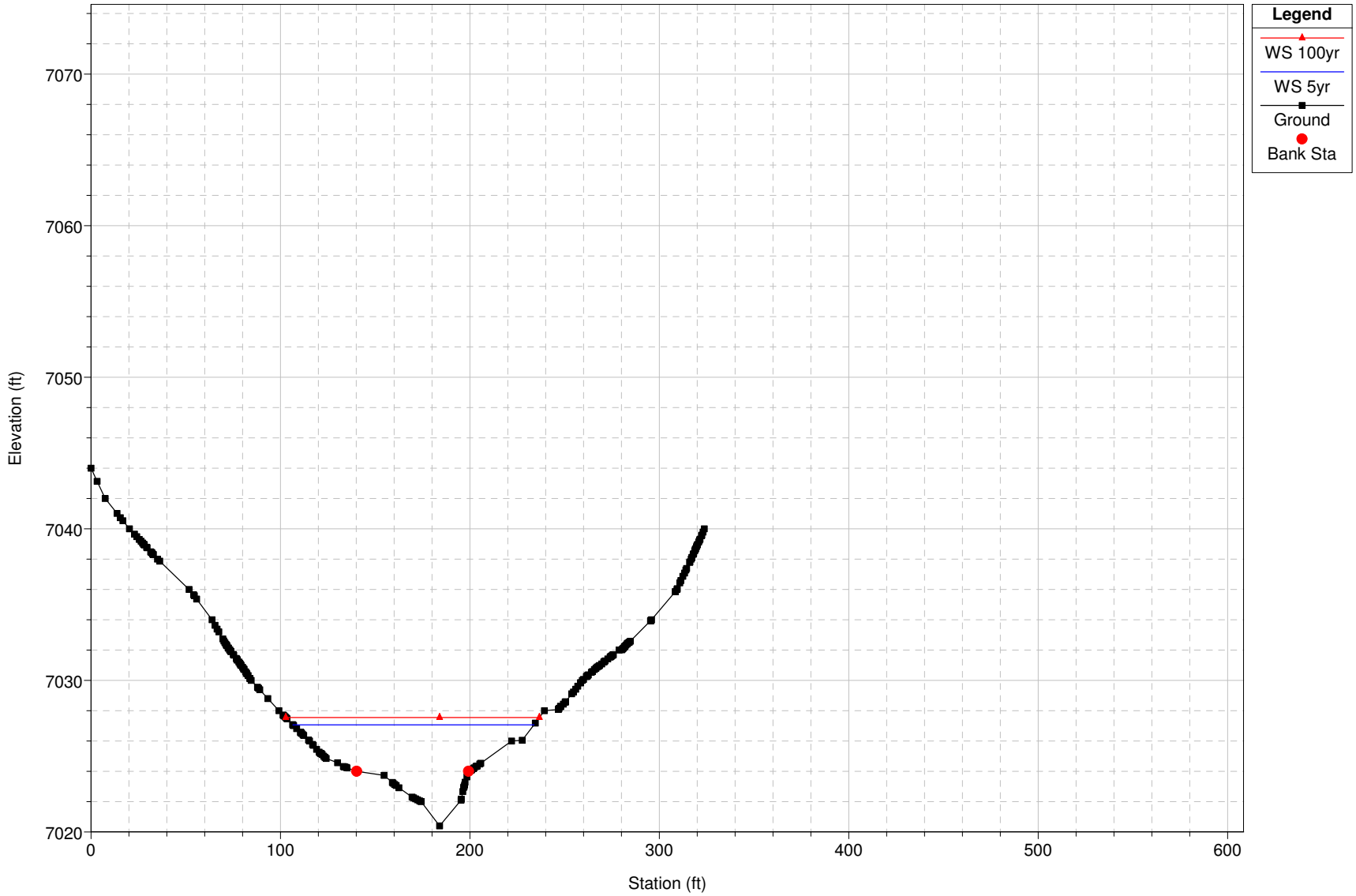
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



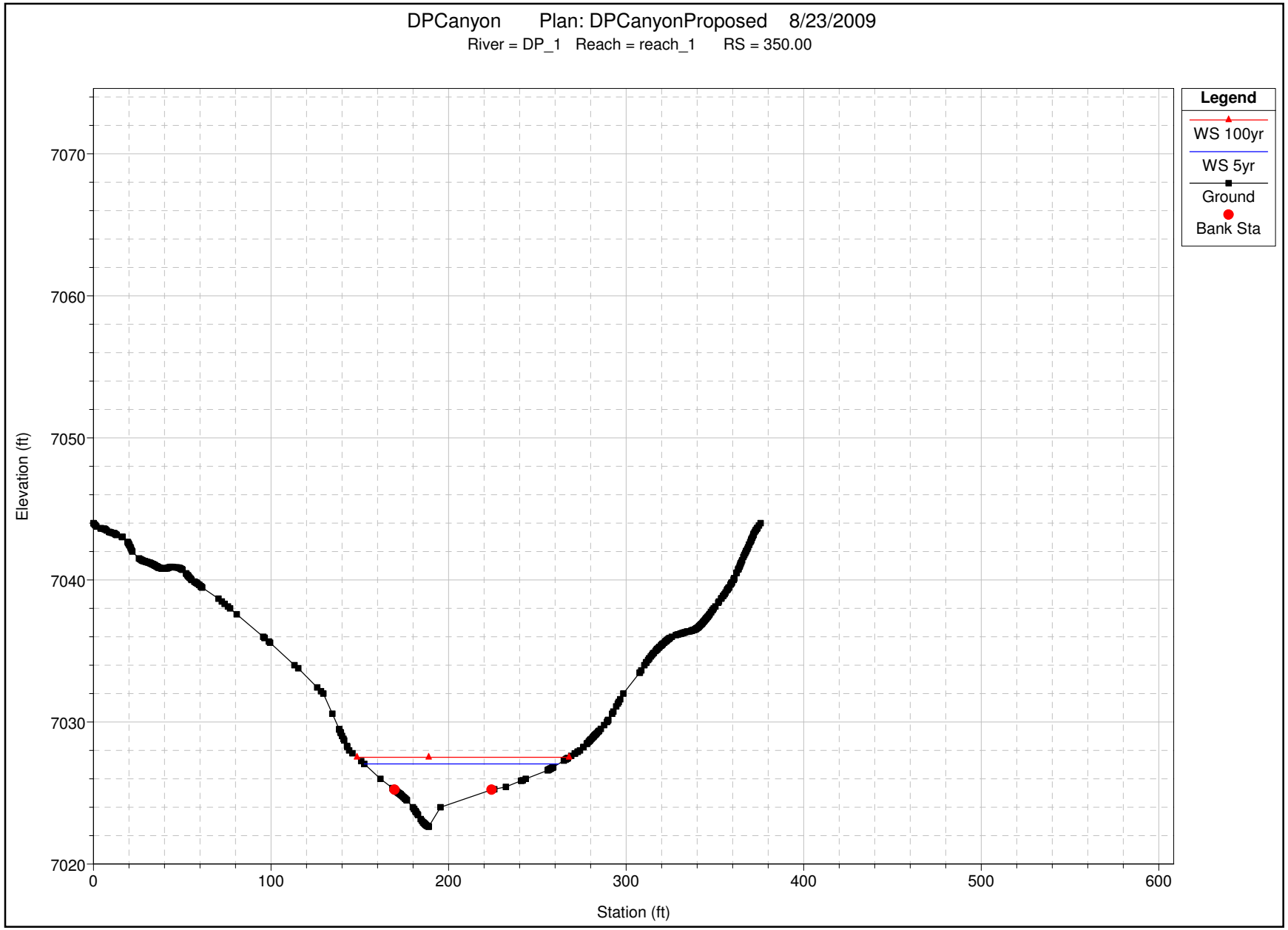
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

River = DP_1 Reach = reach_1 RS = 300.00 coordinates at station 184 interpolated from topo



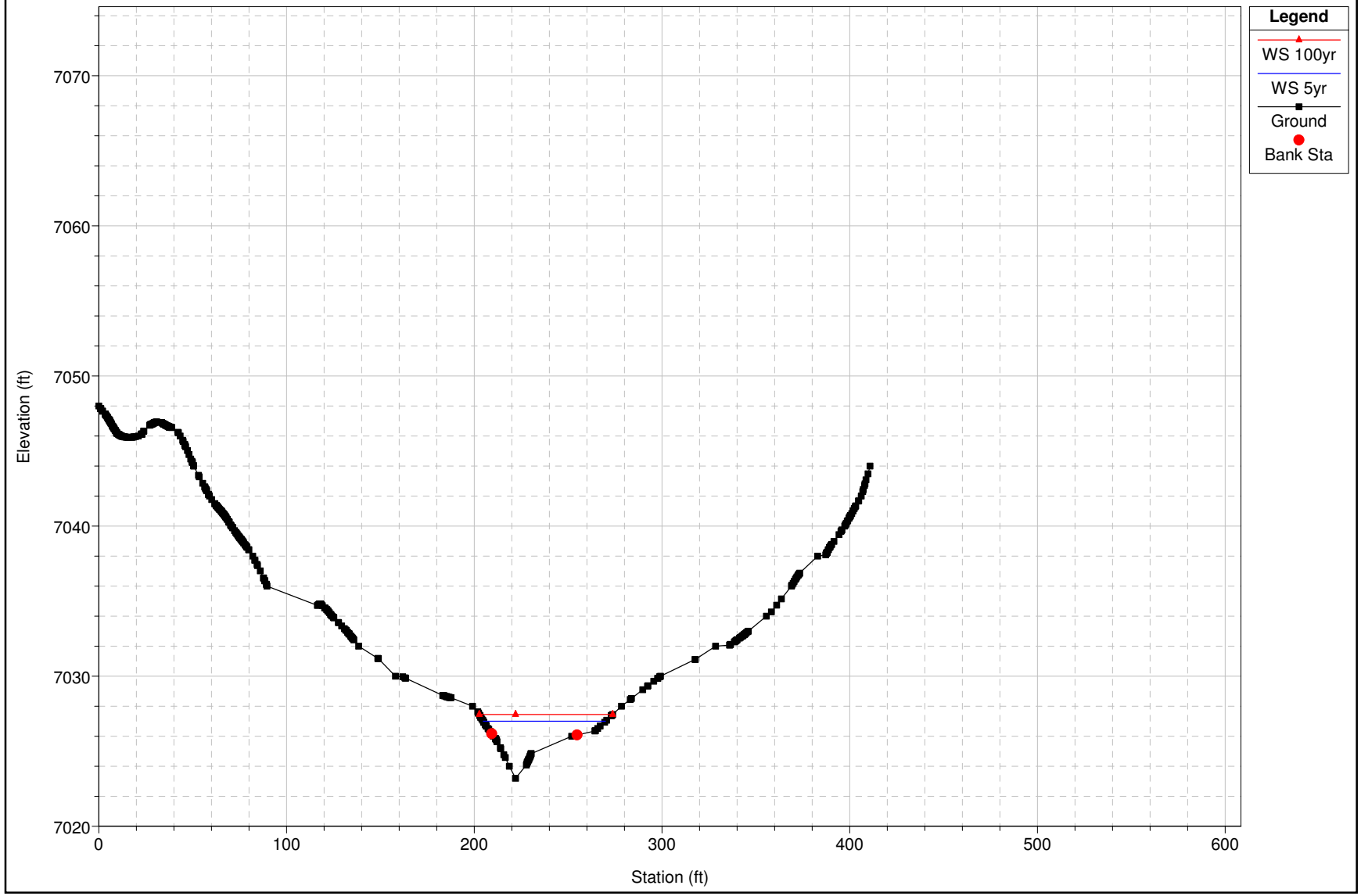
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

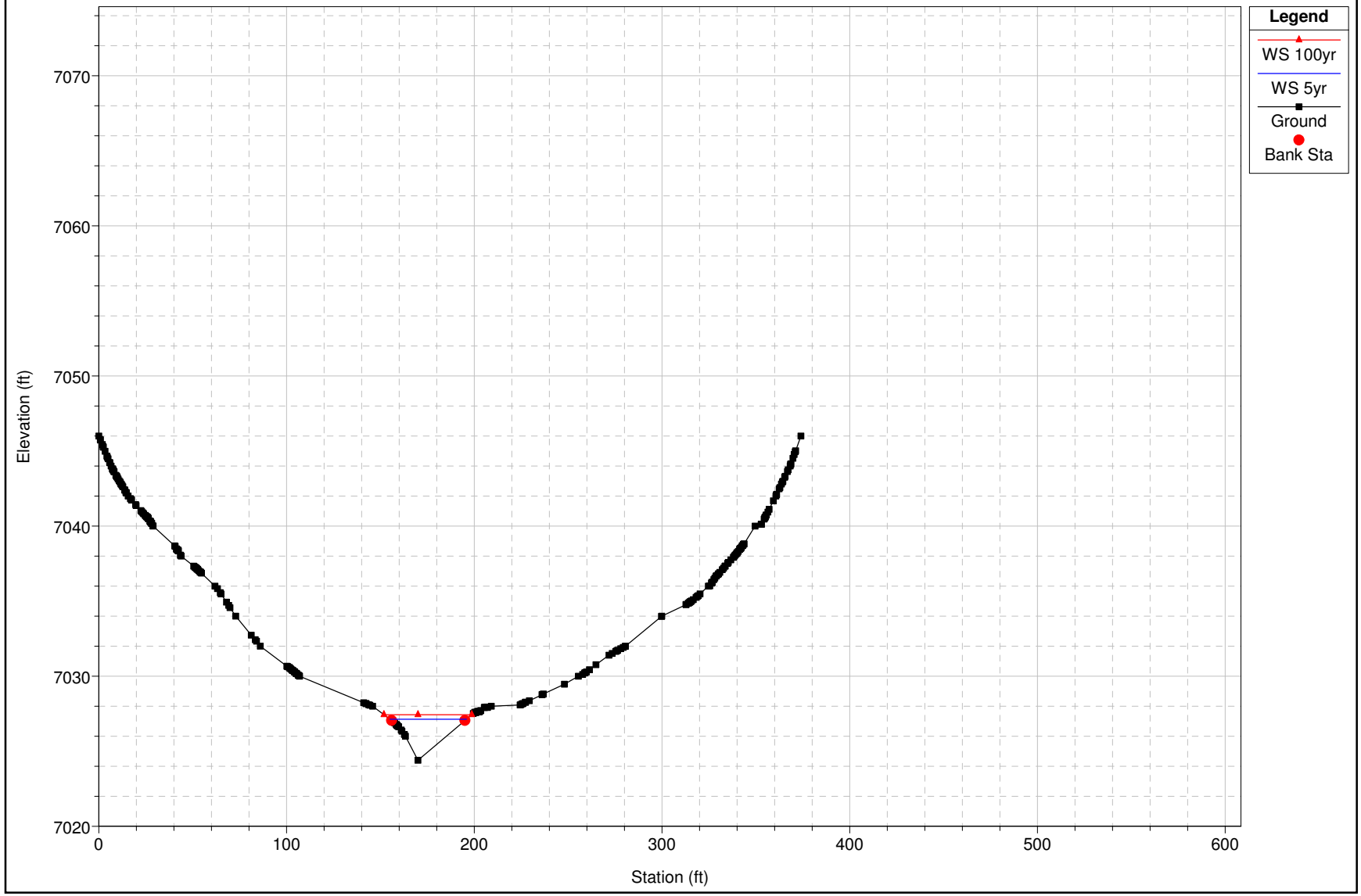
River = DP_1 Reach = reach_1 RS = 400.00 coordinates at station 222 interpolated from topo



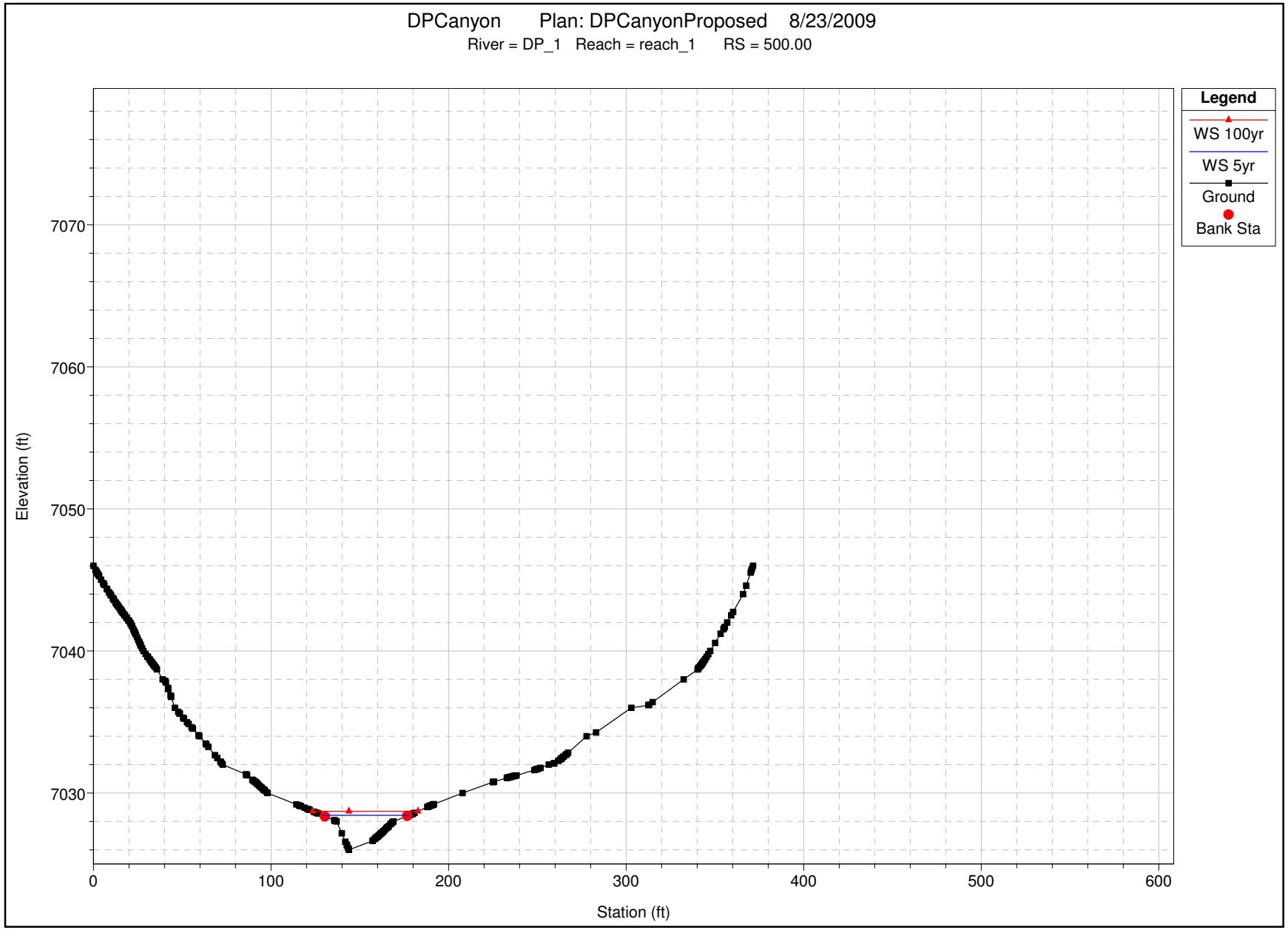
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

River = DP_1 Reach = reach_1 RS = 450.00 coordinates at station 170 interpolated from topo



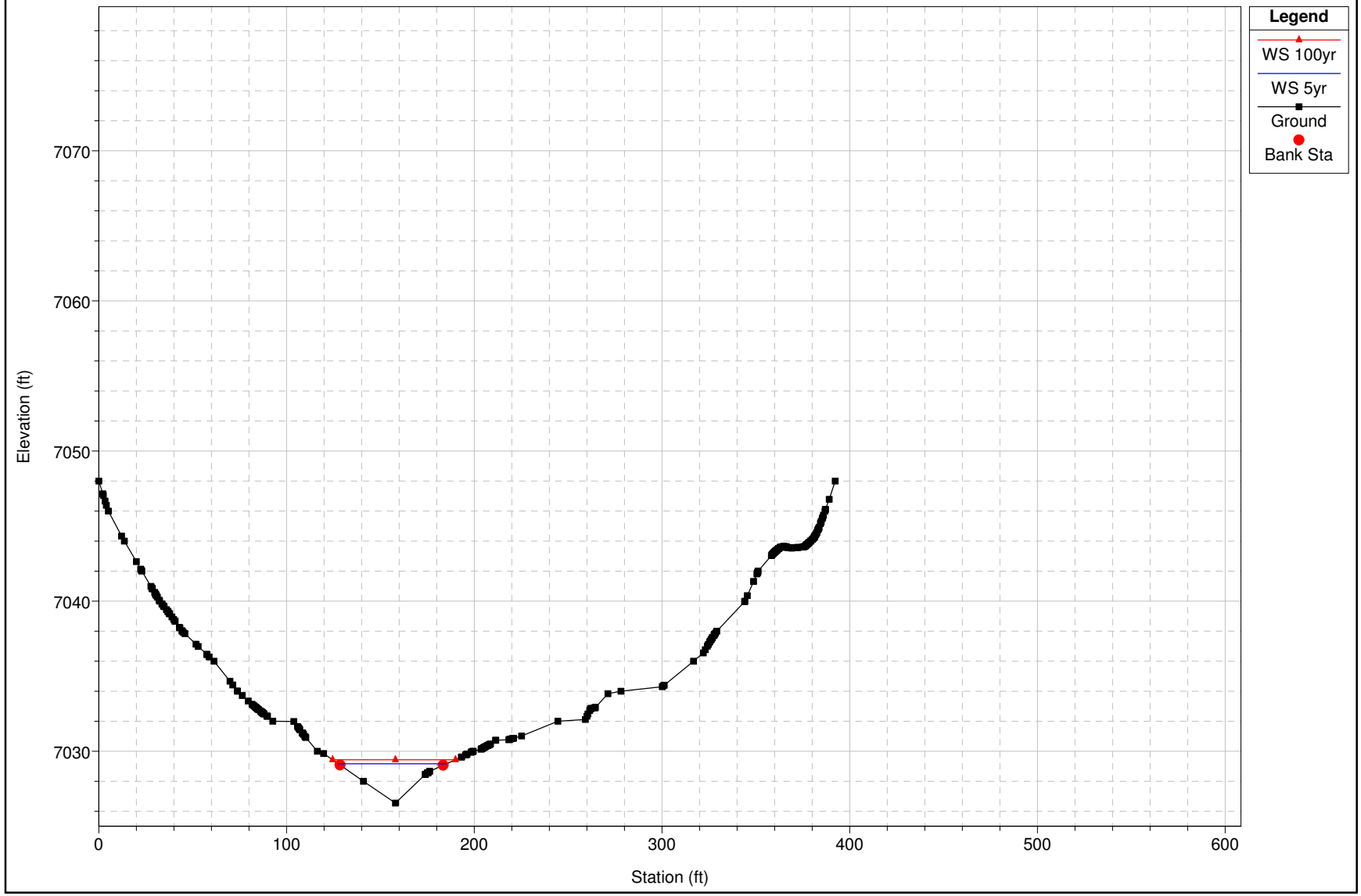
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

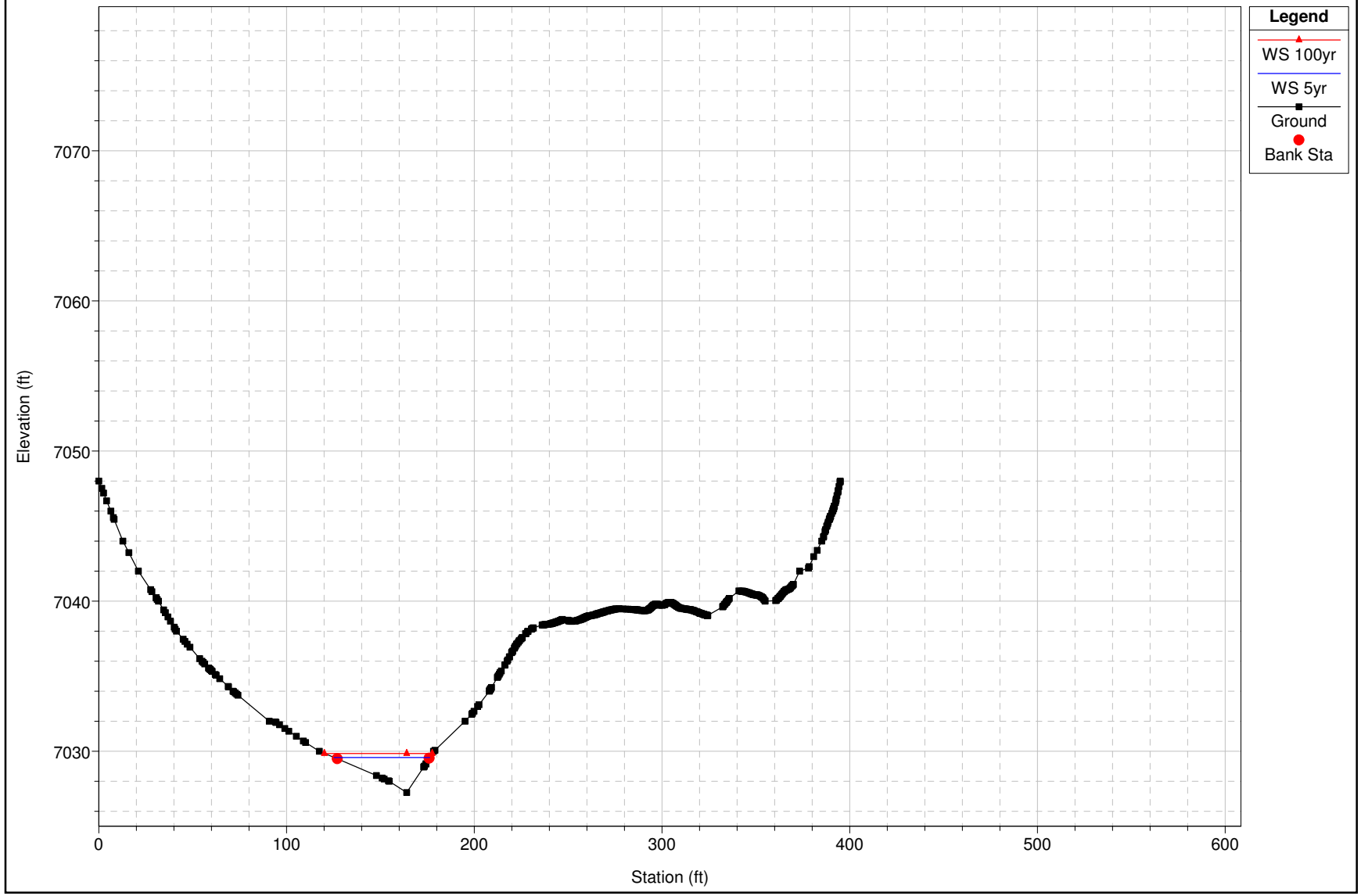
River = DP_1 Reach = reach_1 RS = 550.00 coordinates at station 158 interpolated from topo



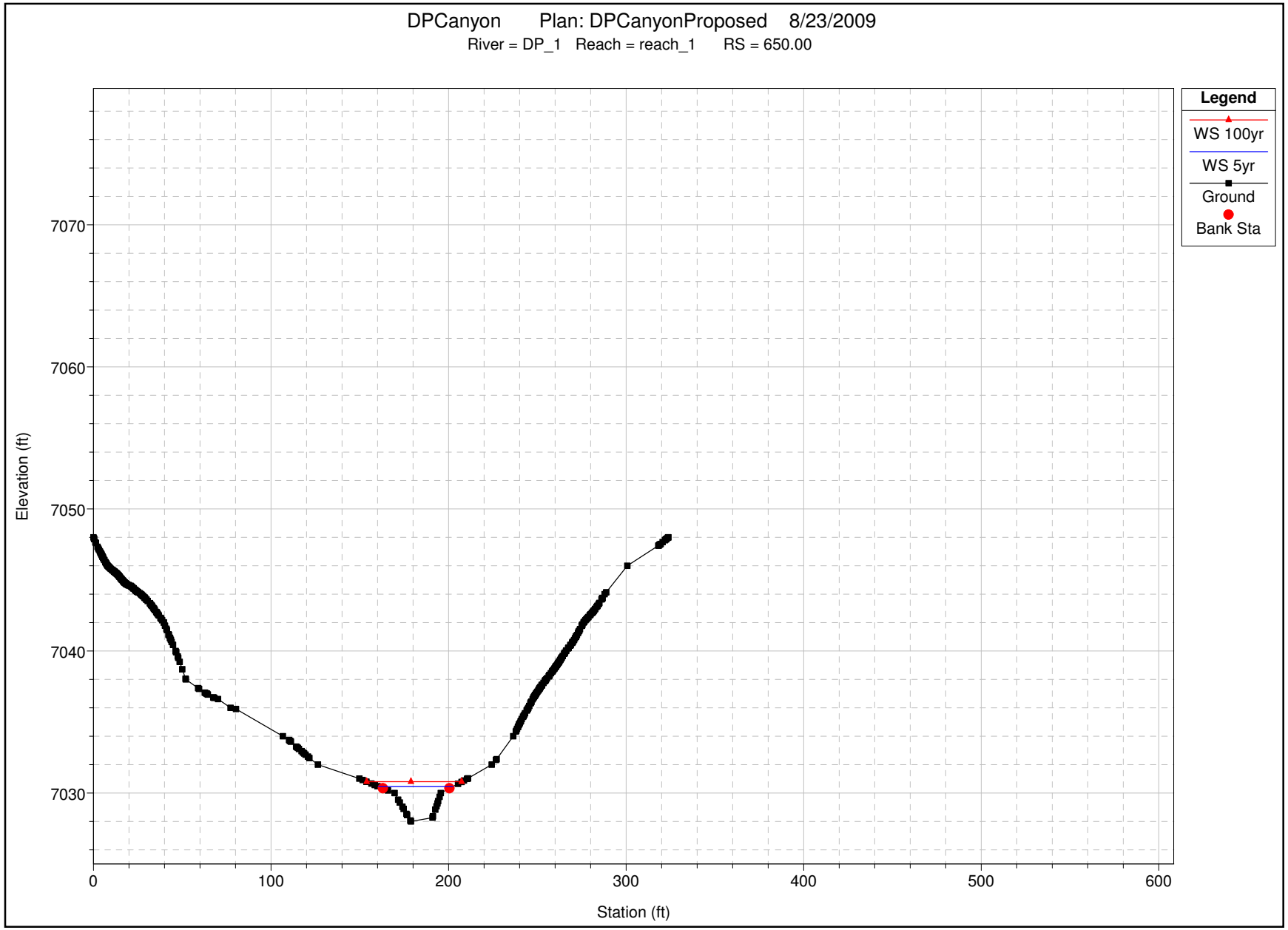
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

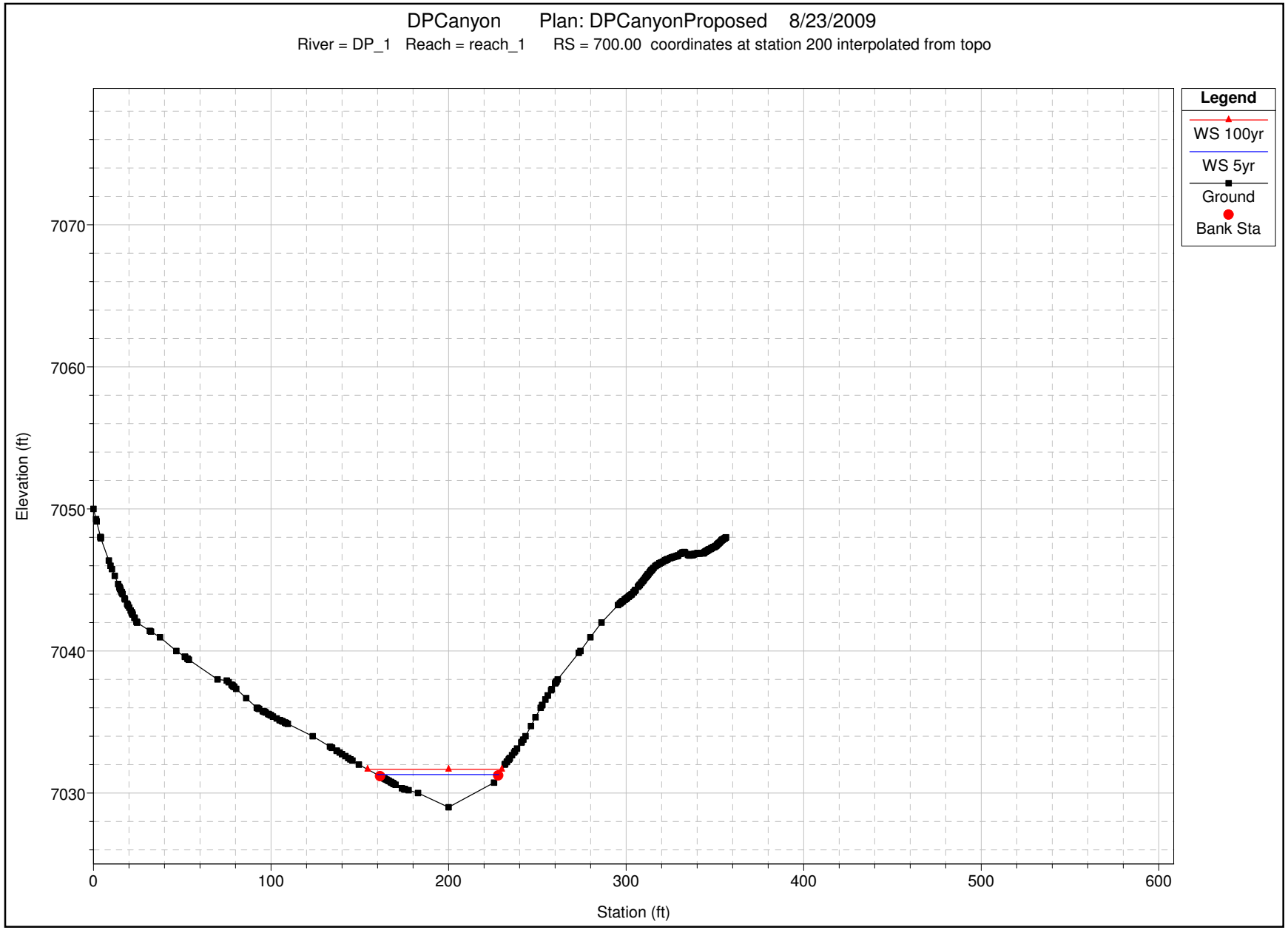
River = DP_1 Reach = reach_1 RS = 600.00 coordinates at station 164 interpolated from topo



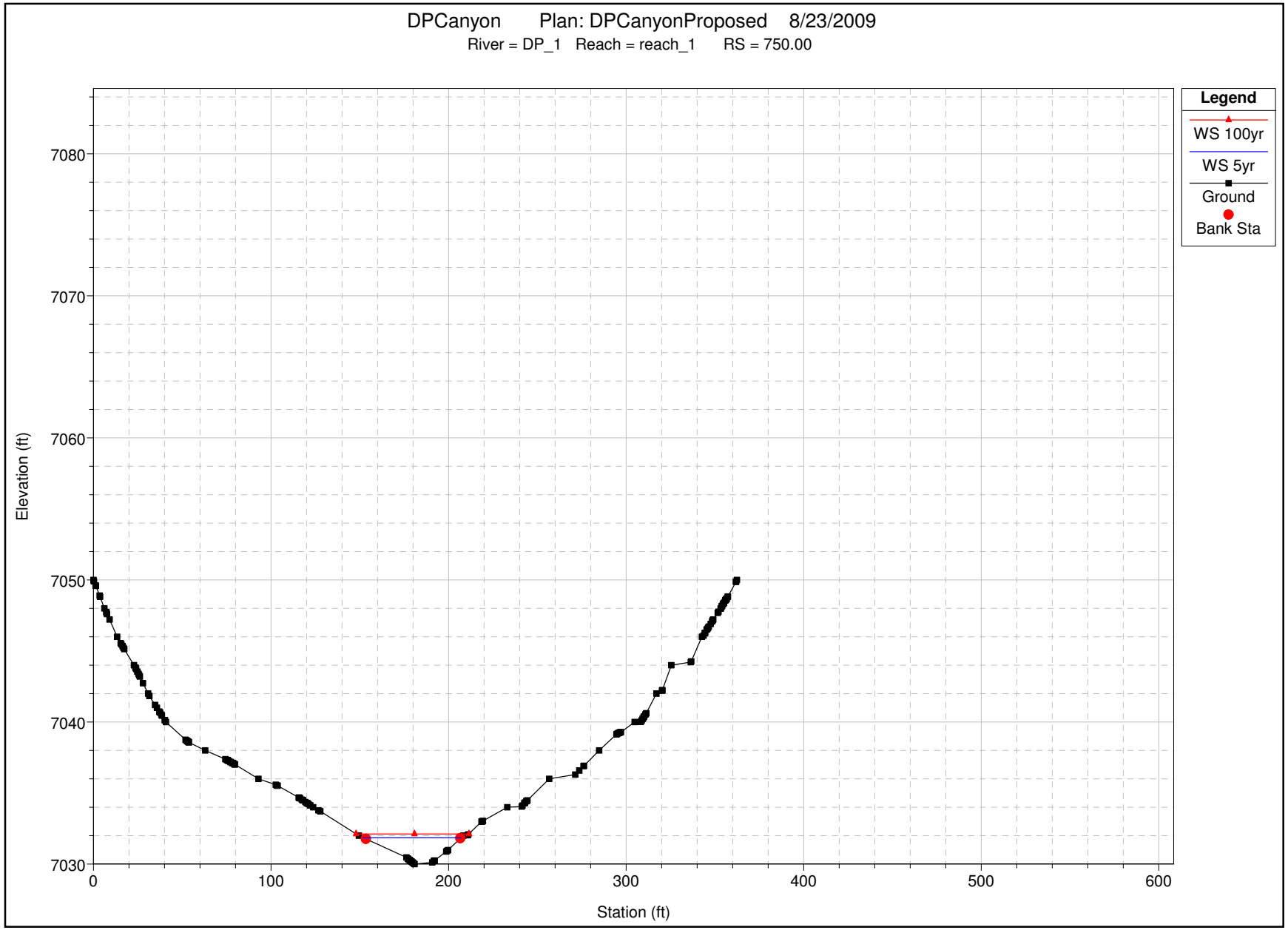
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



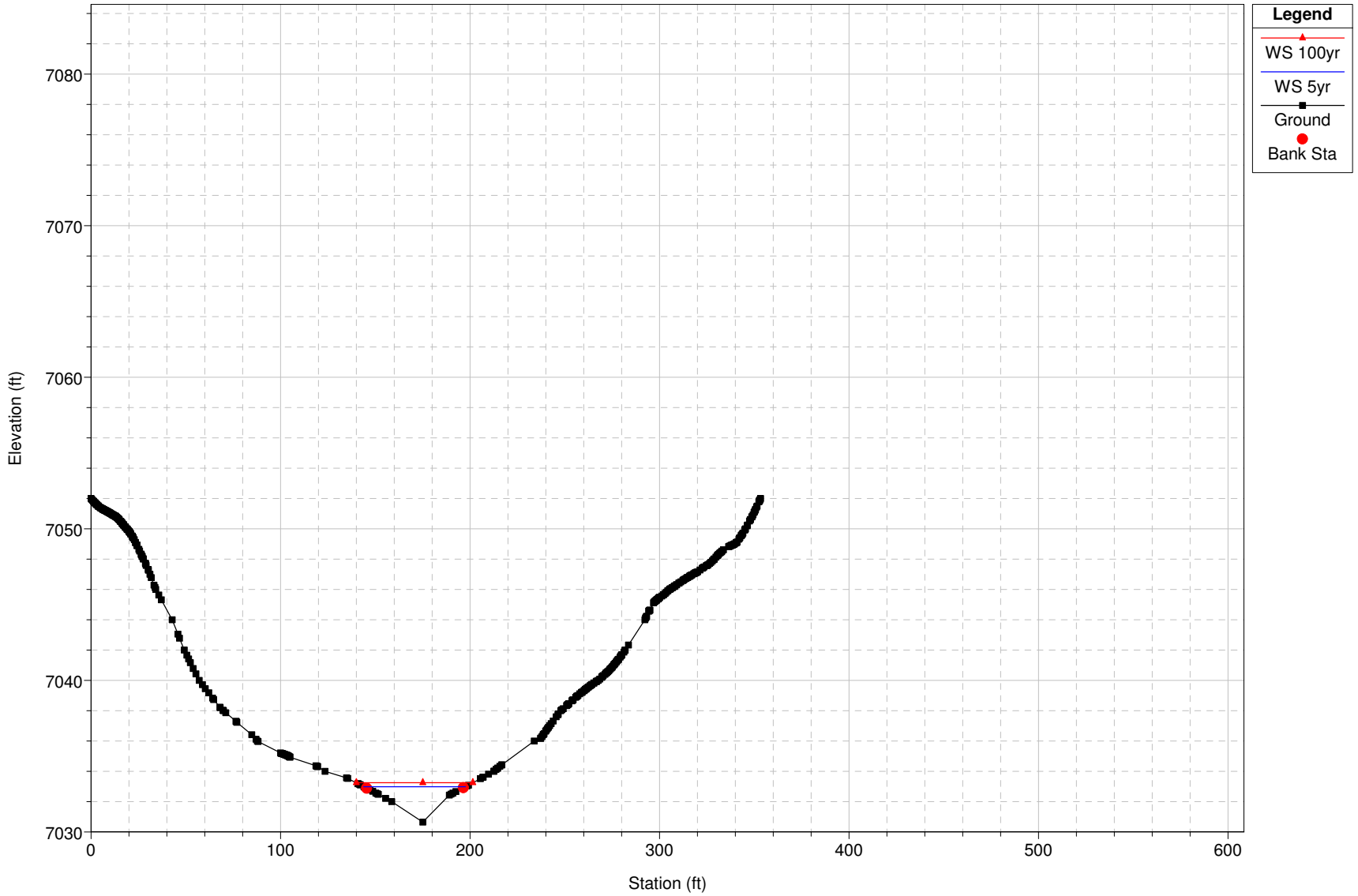
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

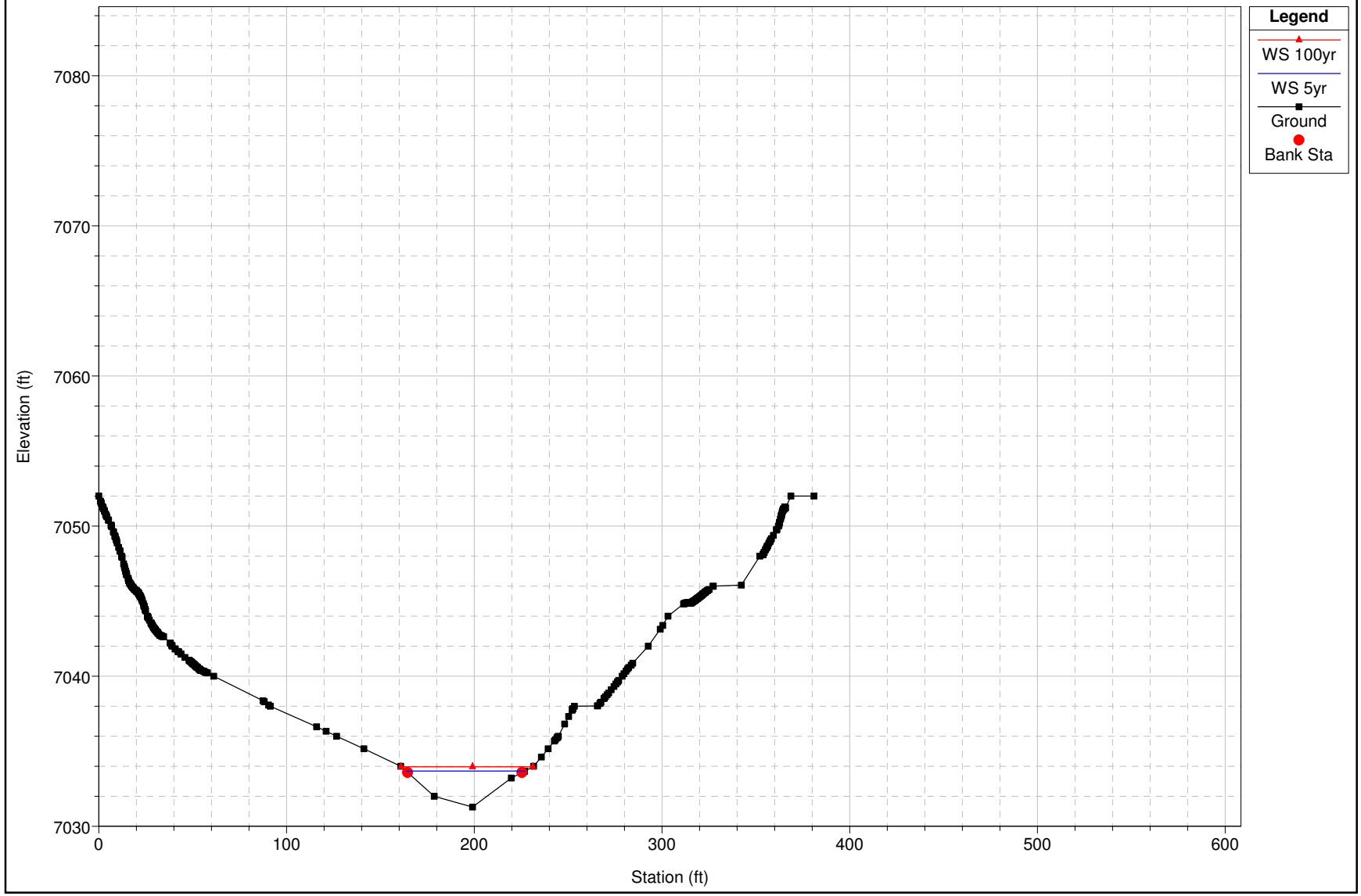
River = DP_1 Reach = reach_1 RS = 800.00 coordinates at station 175 interpolated from topo



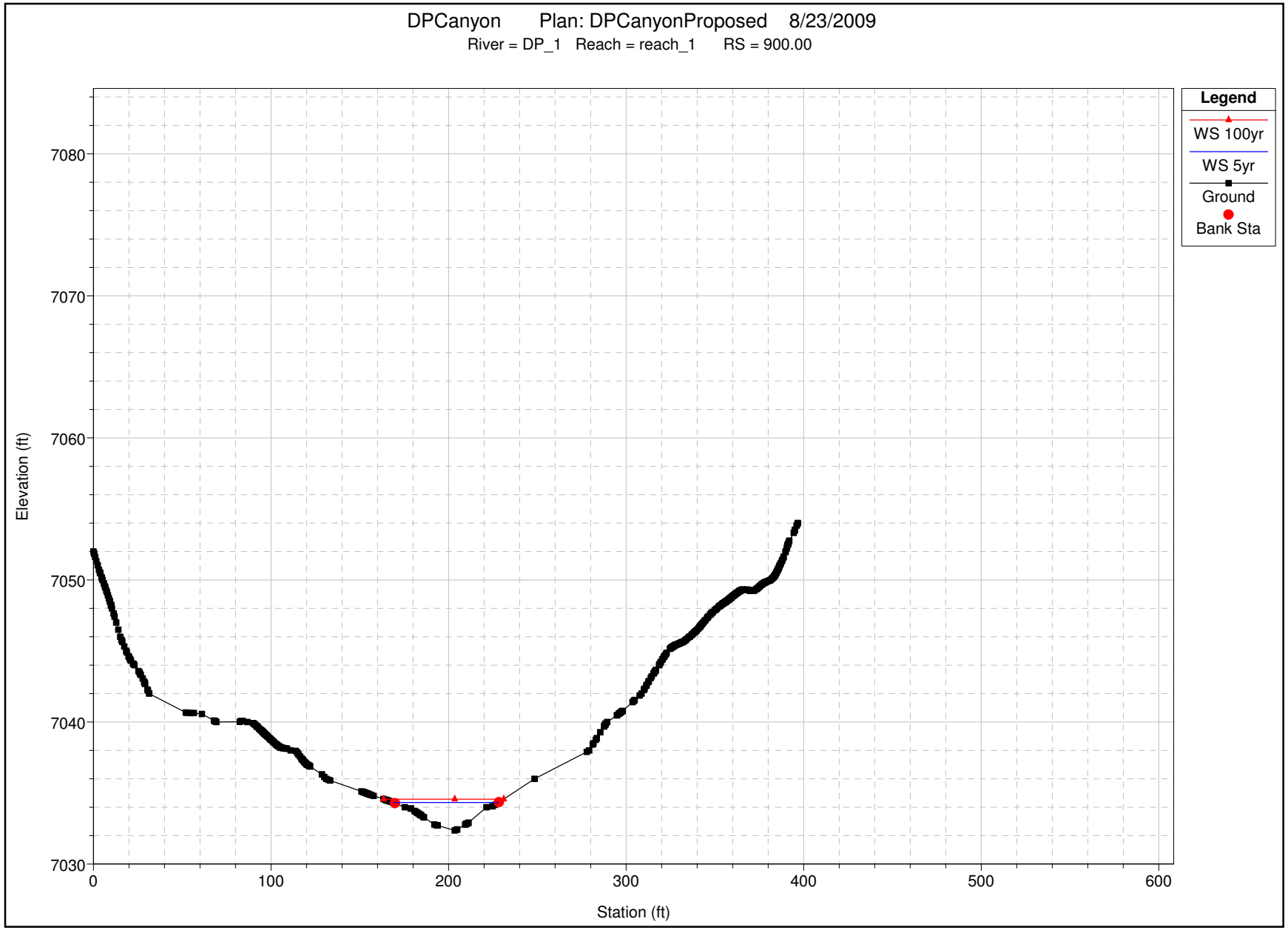
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

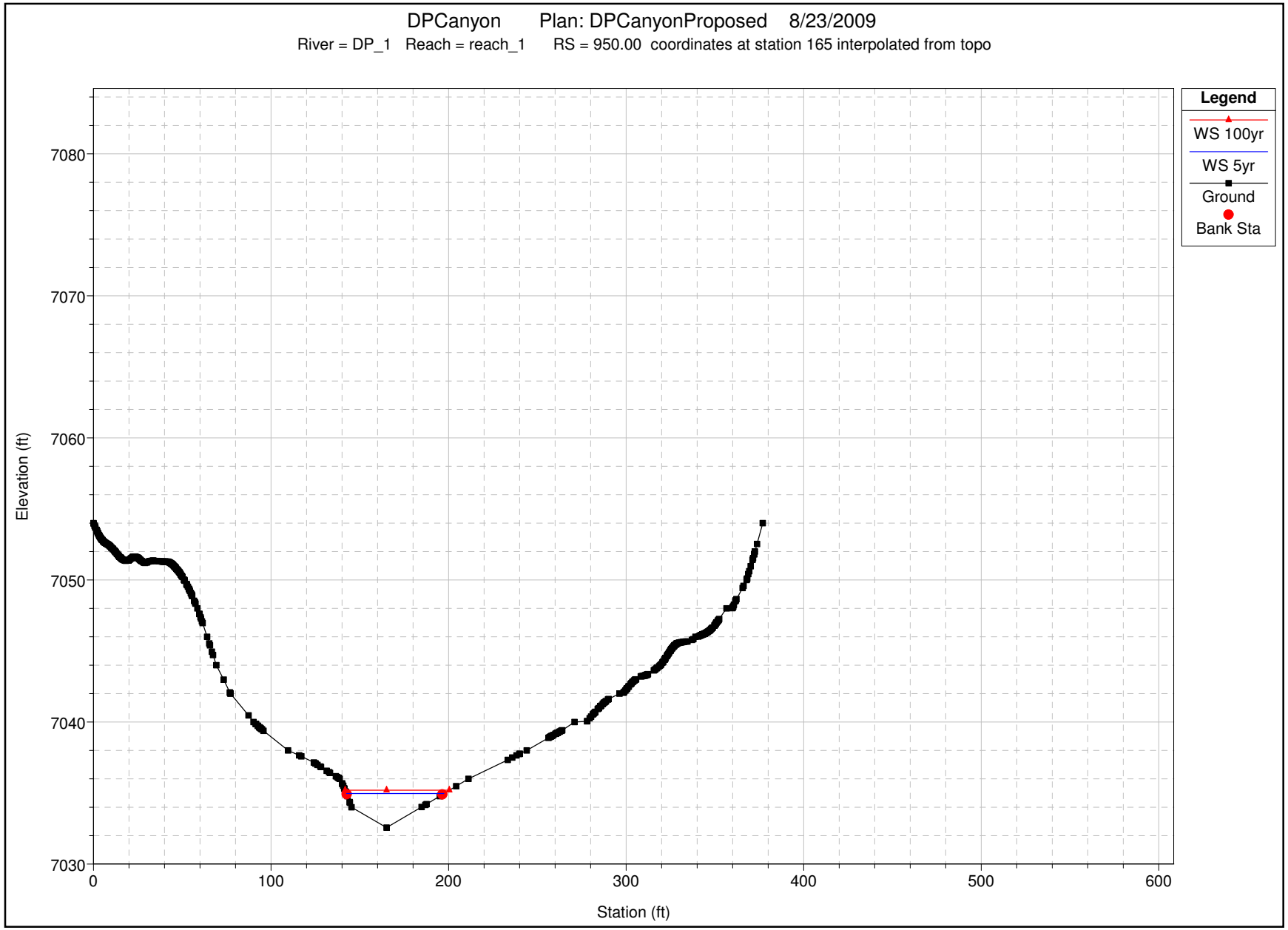
River = DP_1 Reach = reach_1 RS = 850.00 coordinates at station 199 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



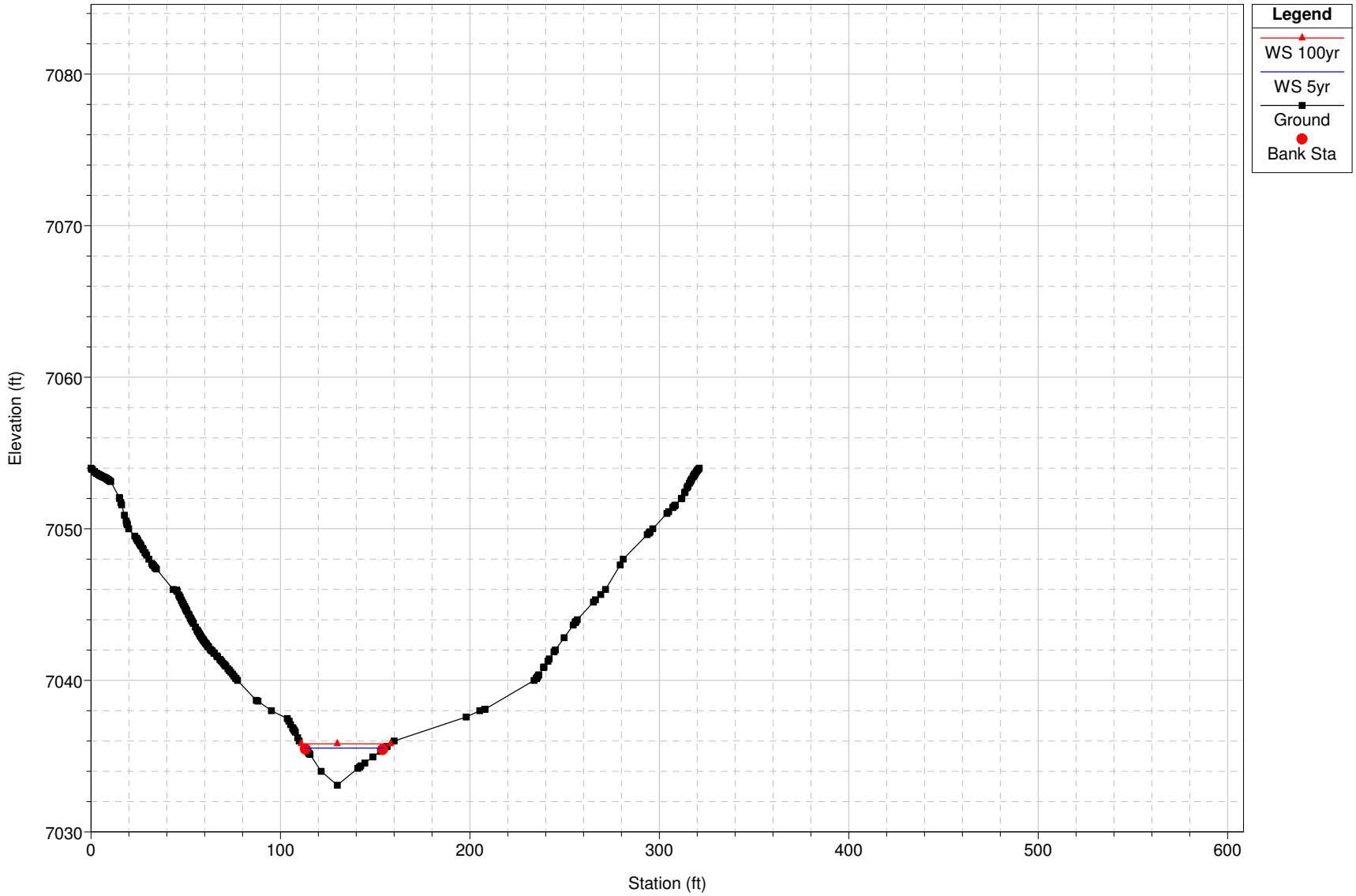
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

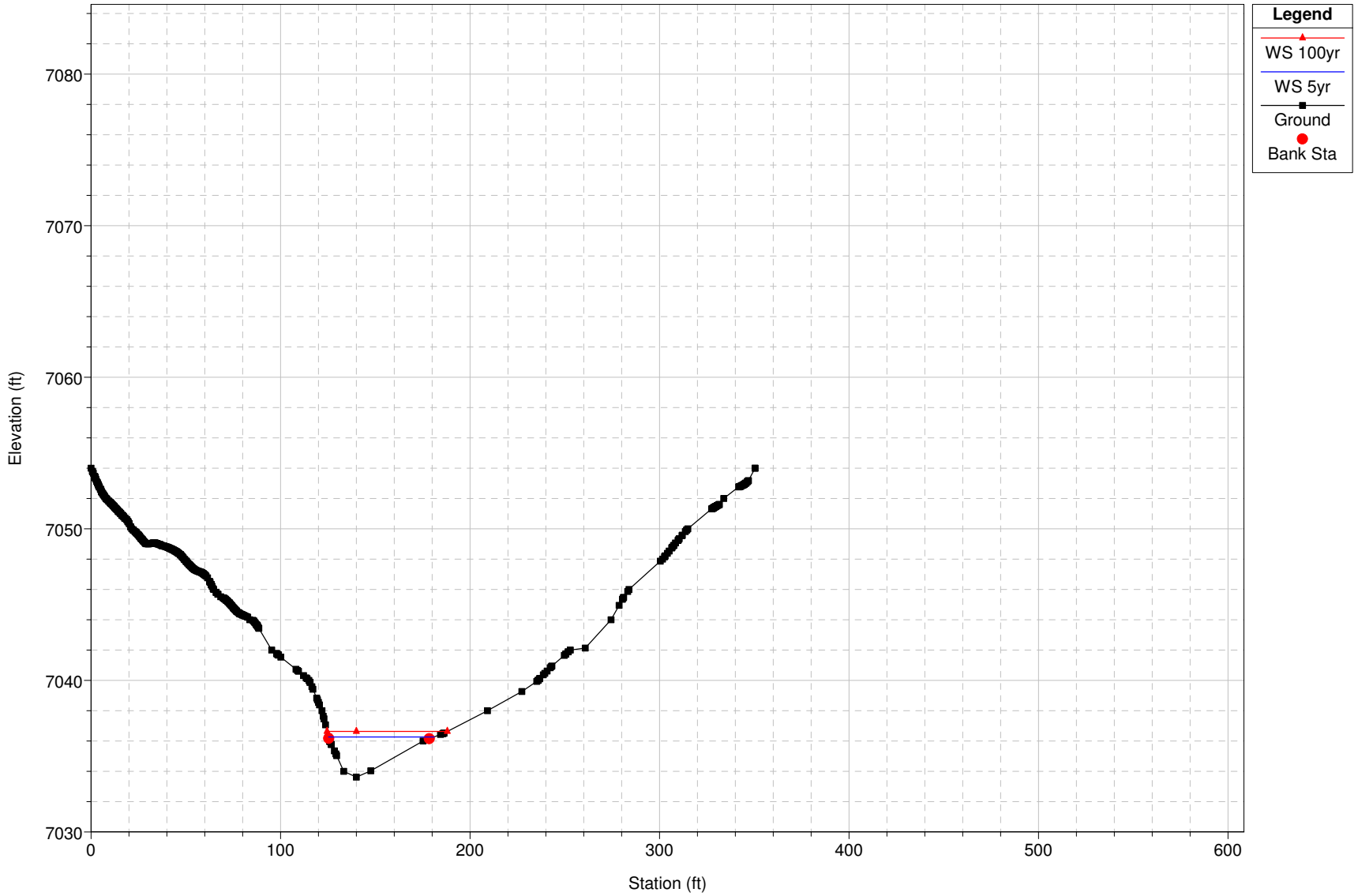
River = DP_1 Reach = reach_1 RS = 1000.00 coordinates at station 130 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

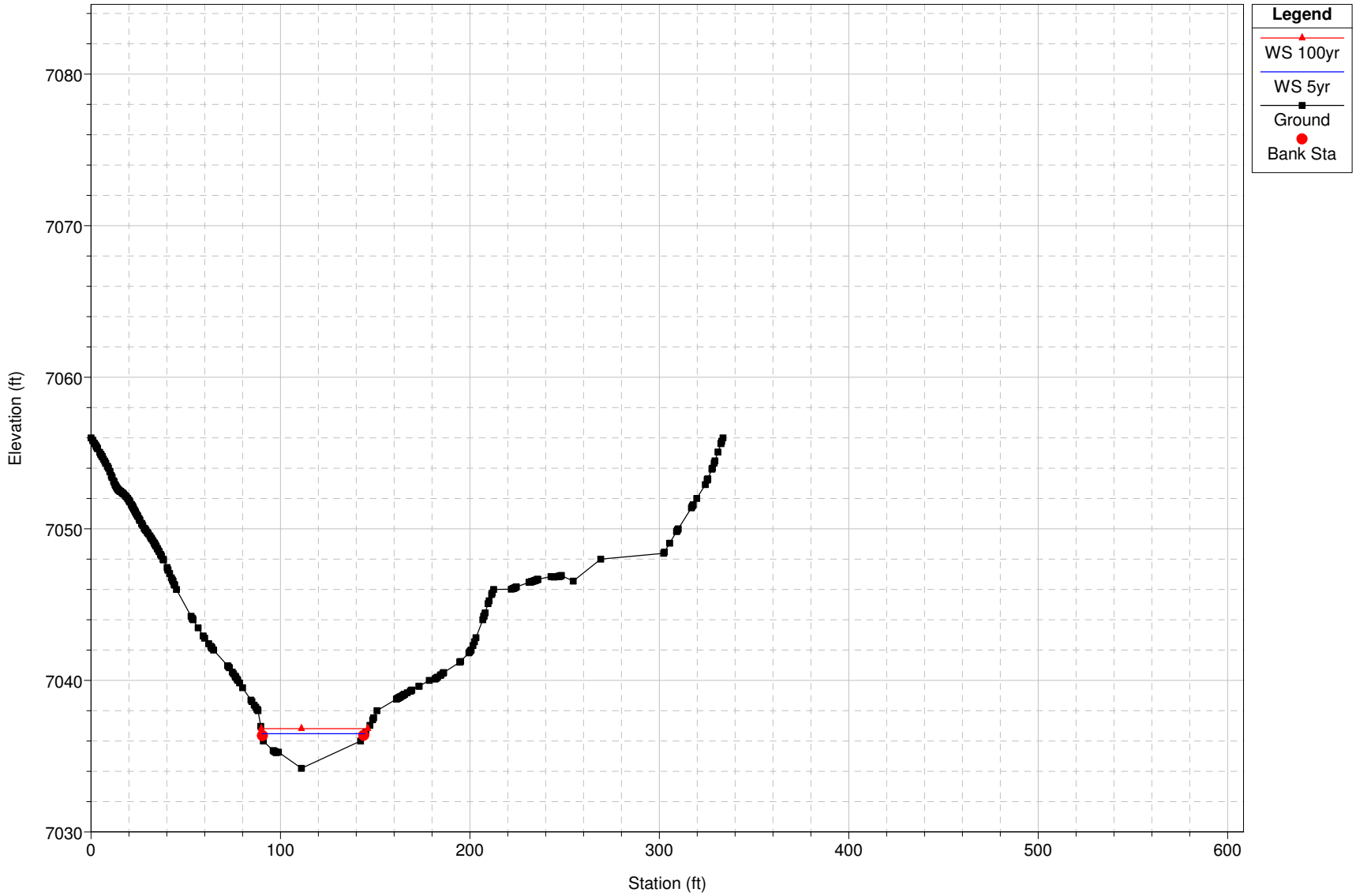
River = DP_1 Reach = reach_1 RS = 1050.00 coordinates at station 140 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

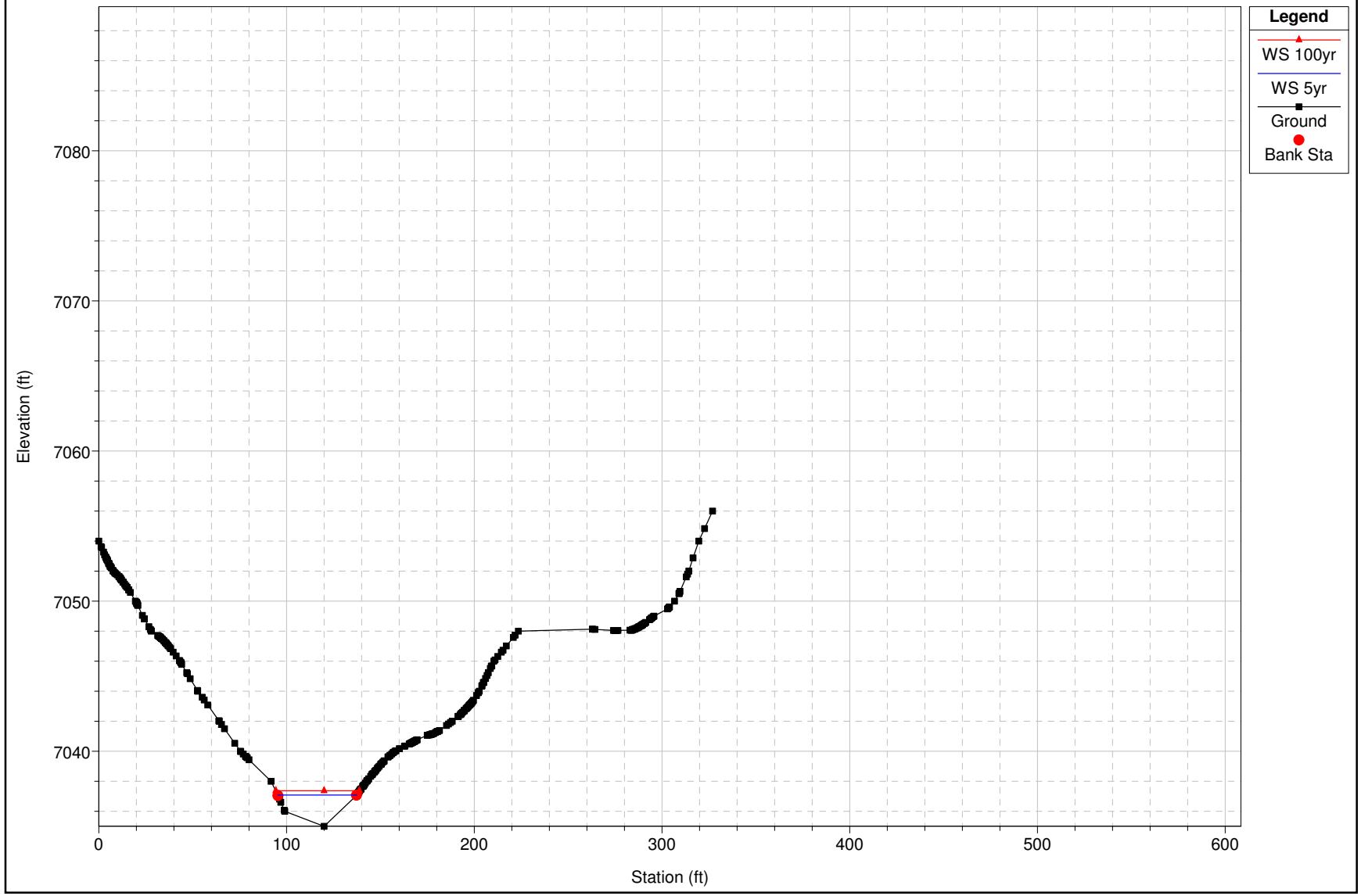
River = DP_1 Reach = reach_1 RS = 1100.00 coordinates at station 111 interpolated from topo



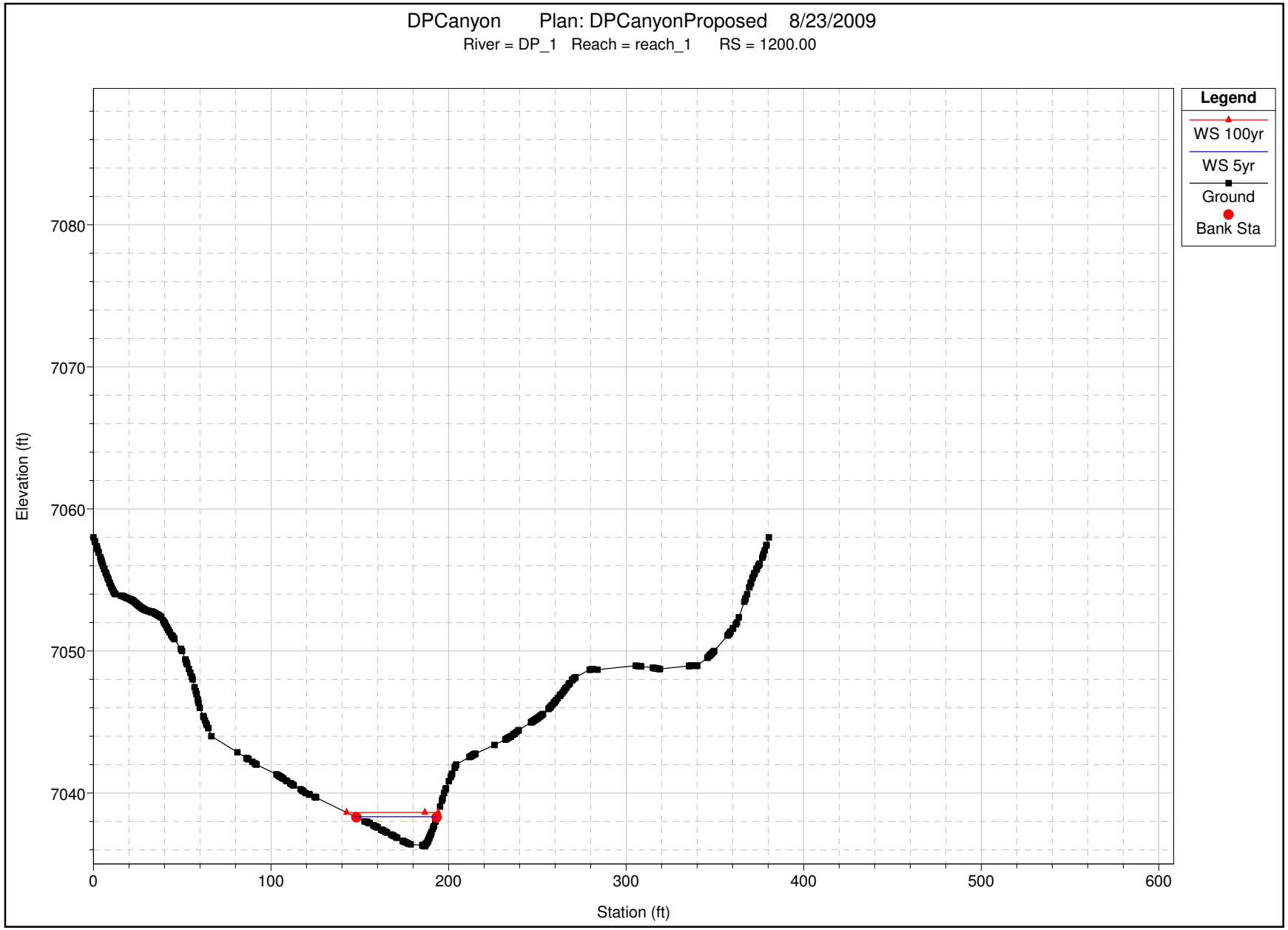
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed 8/23/2009

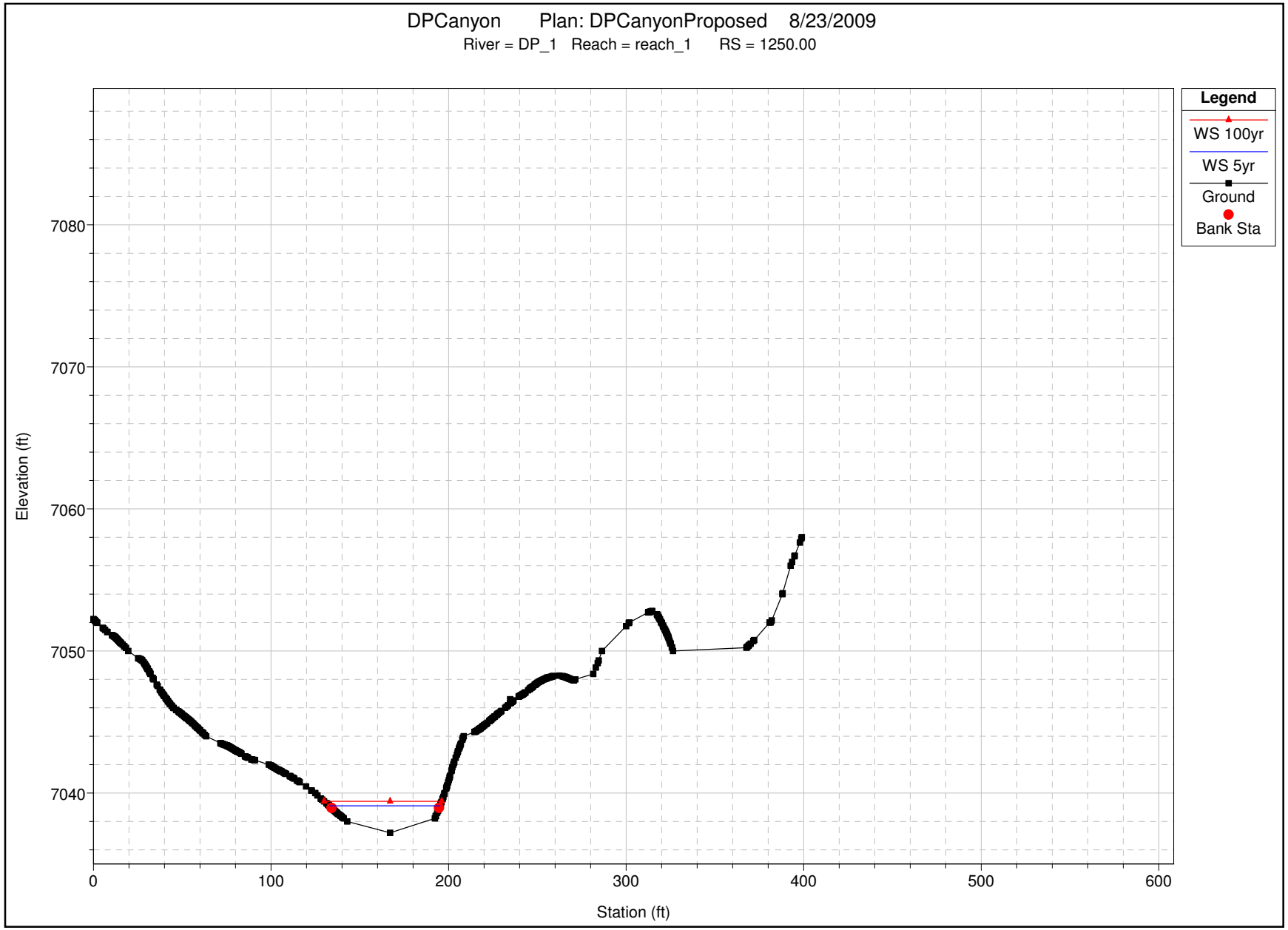
River = DP_1 Reach = reach_1 RS = 1150.00 coordinates at station 120 interpolated from topo



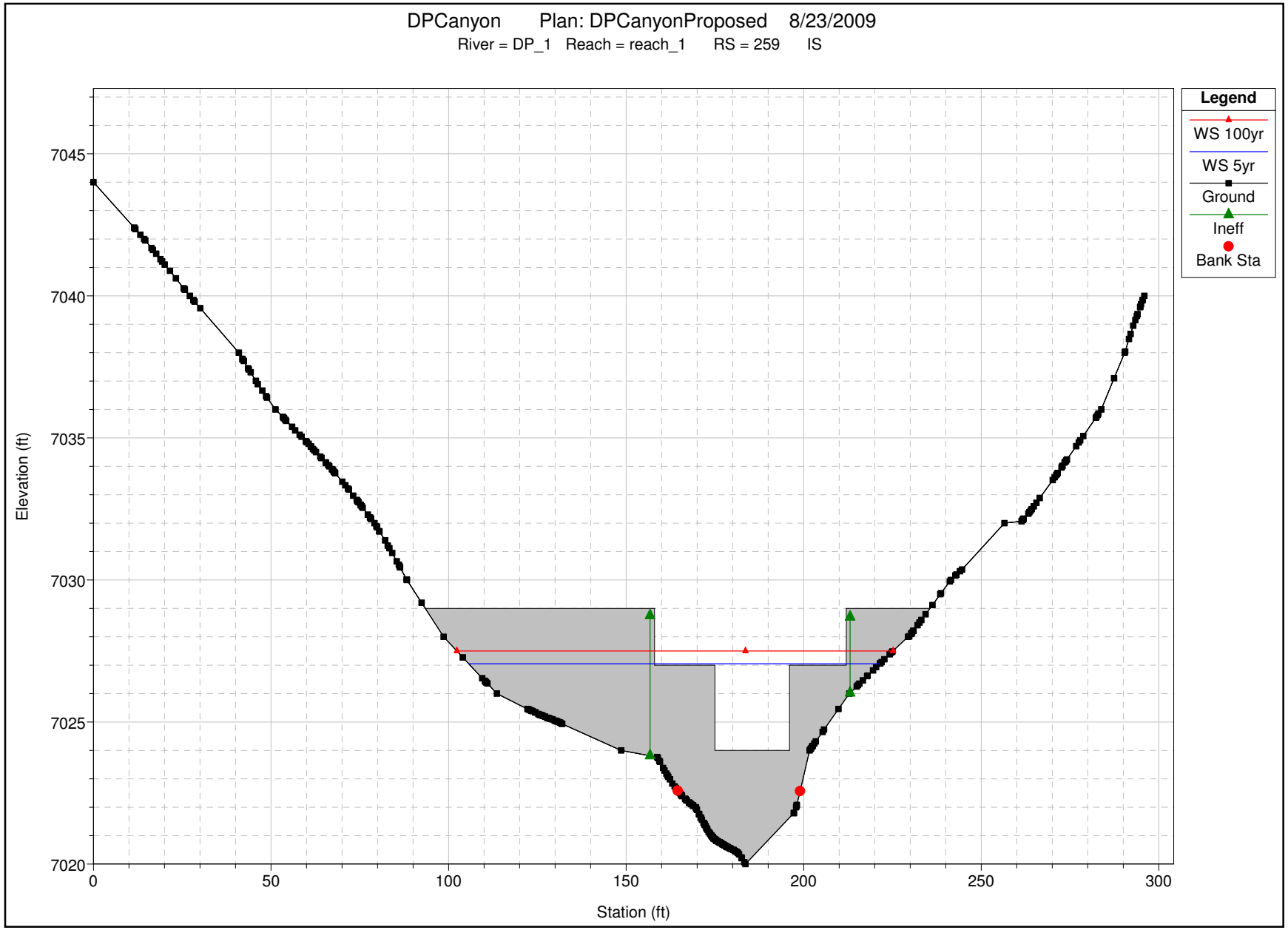
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



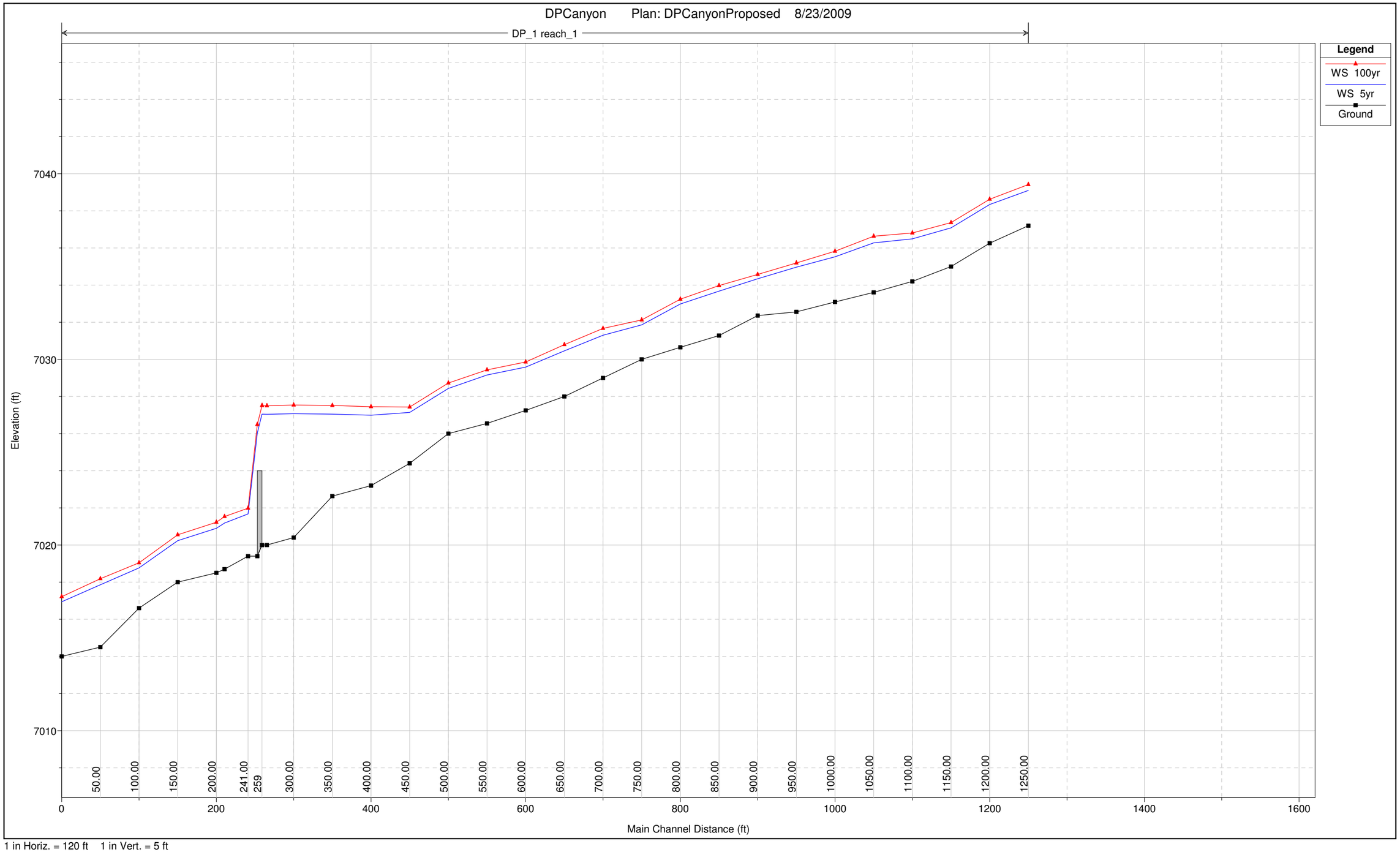
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 40 ft 1 in Vert. = 5 ft



1 in Horiz. = 120 ft 1 in Vert. = 5 ft

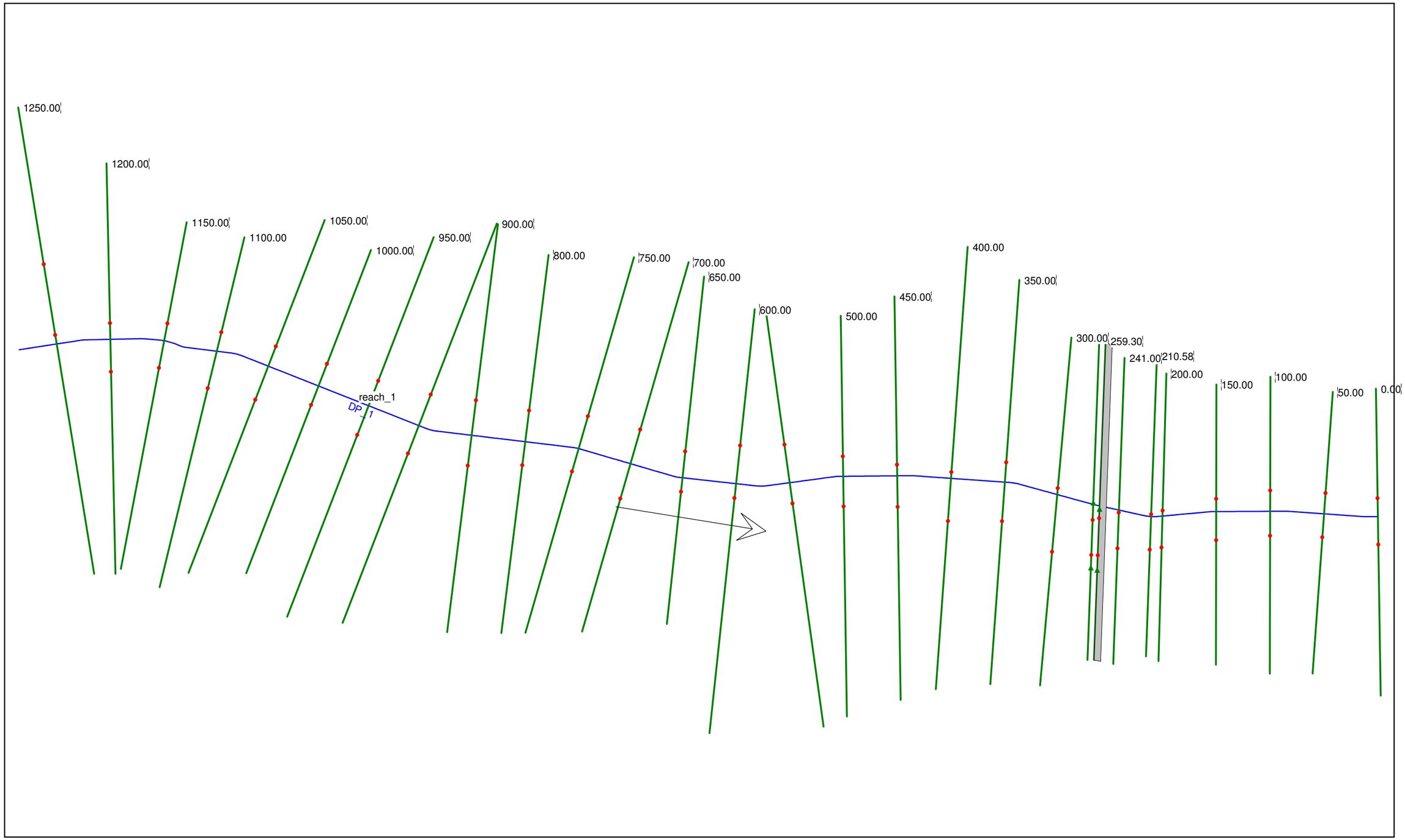
HEC-RAS Plan: DPCanyonProp River: DP_1 Reach: reach_1

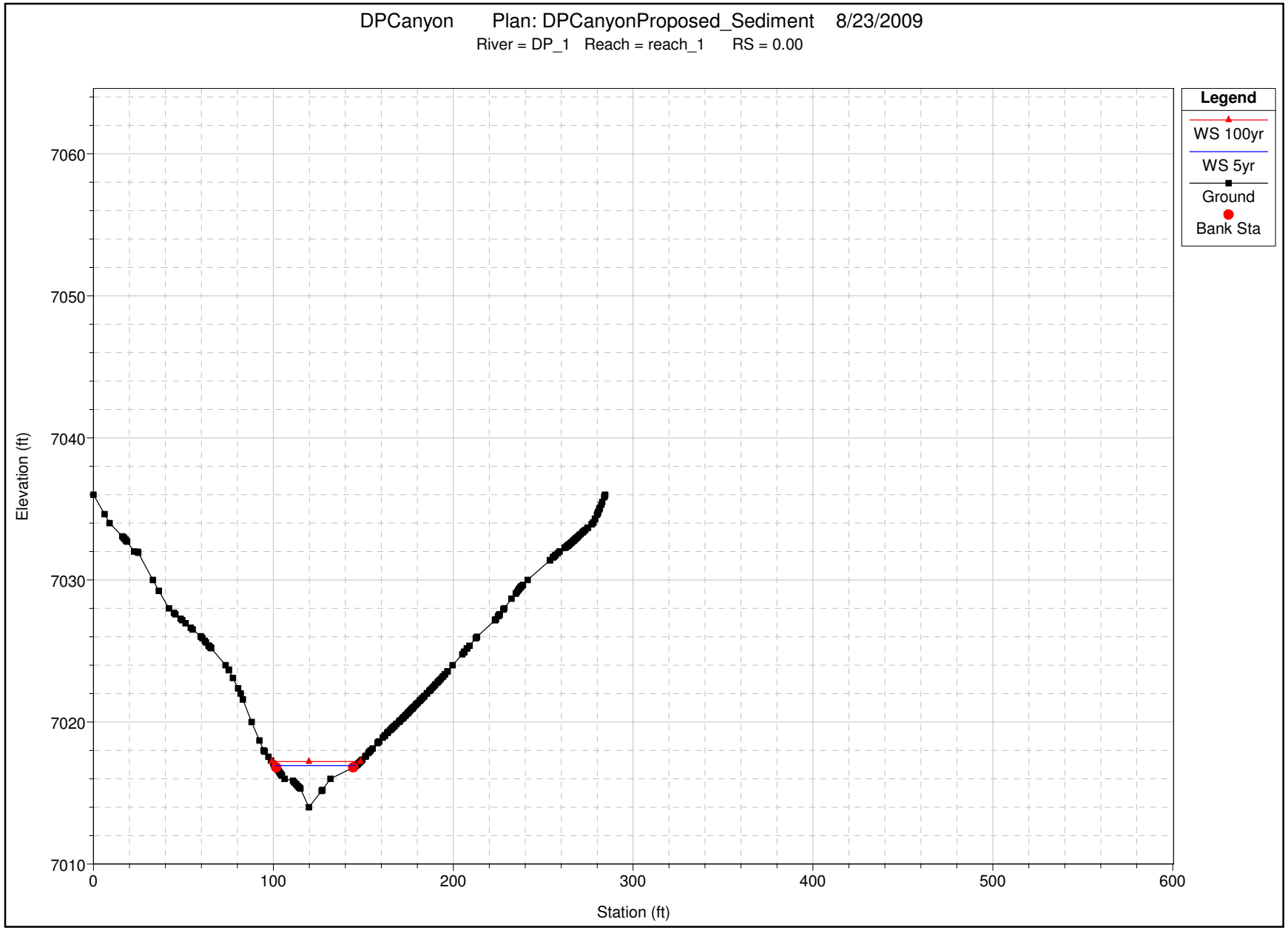
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	1250.00	5yr	343.00	7037.20	7039.10		7039.40	0.005640	4.40	78.16	62.23	0.68
reach_1	1250.00	100yr	465.00	7037.20	7039.41		7039.77	0.004992	4.78	98.32	66.19	0.67
reach_1	1200.00	5yr	343.00	7036.26	7038.34	7038.34	7038.96	0.012809	6.31	54.40	46.29	1.01
reach_1	1200.00	100yr	465.00	7036.26	7038.63	7038.63	7039.37	0.011560	6.91	68.35	51.61	1.00
reach_1	1150.00	5yr	343.00	7035.00	7037.08	7037.08	7037.72	0.012405	6.45	53.21	42.06	1.01
reach_1	1150.00	100yr	465.00	7035.00	7037.37	7037.37	7038.15	0.011519	7.12	65.71	44.58	1.00
reach_1	1100.00	5yr	343.00	7034.20	7036.49		7036.83	0.006065	4.72	72.77	54.26	0.71
reach_1	1100.00	100yr	465.00	7034.20	7036.81		7037.22	0.005478	5.16	90.58	56.23	0.70
reach_1	1050.00	5yr	343.00	7033.61	7036.27		7036.56	0.004376	4.29	80.13	55.82	0.62
reach_1	1050.00	100yr	465.00	7033.61	7036.63		7036.97	0.003937	4.69	101.52	63.40	0.60
reach_1	1000.00	5yr	343.00	7033.09	7035.53	7035.53	7036.18	0.012222	6.48	52.95	42.09	1.00
reach_1	1000.00	100yr	465.00	7033.09	7035.82	7035.82	7036.61	0.011332	7.15	66.07	47.13	1.00
reach_1	950.00	5yr	343.00	7032.56	7034.96	7034.62	7035.30	0.005905	4.67	73.52	54.79	0.70
reach_1	950.00	100yr	465.00	7032.56	7035.19	7034.91	7035.65	0.006424	5.40	86.67	58.64	0.75
reach_1	900.00	5yr	343.00	7032.36	7034.34	7034.34	7034.86	0.013307	5.77	59.44	59.40	1.01
reach_1	900.00	100yr	465.00	7032.36	7034.58	7034.58	7035.20	0.012194	6.34	74.45	67.66	1.00
reach_1	850.00	5yr	343.00	7031.28	7033.68		7033.93	0.004257	4.03	85.24	63.26	0.60
reach_1	850.00	100yr	465.00	7031.28	7033.97		7034.29	0.004104	4.50	105.03	70.25	0.61
reach_1	800.00	5yr	343.00	7030.65	7032.99	7032.99	7033.55	0.012974	6.04	56.88	53.66	1.01
reach_1	800.00	100yr	465.00	7030.65	7033.24	7033.24	7033.92	0.011856	6.64	71.70	61.49	1.00
reach_1	750.00	5yr	343.00	7030.00	7031.86	7031.86	7032.42	0.013407	6.00	57.21	55.16	1.02
reach_1	750.00	100yr	465.00	7030.00	7032.12	7032.12	7032.78	0.011751	6.51	72.95	63.55	0.99
reach_1	700.00	5yr	343.00	7029.00	7031.30		7031.55	0.004711	4.01	85.59	68.47	0.62
reach_1	700.00	100yr	465.00	7029.00	7031.67		7031.94	0.003727	4.22	112.07	75.60	0.58
reach_1	650.00	5yr	343.00	7028.00	7030.46	7030.46	7031.15	0.012144	6.67	51.66	41.93	1.00
reach_1	650.00	100yr	465.00	7028.00	7030.79	7030.79	7031.60	0.010609	7.22	67.72	53.50	0.97
reach_1	600.00	5yr	343.00	7027.25	7029.58	7029.58	7030.17	0.013280	6.18	55.59	50.89	1.02
reach_1	600.00	100yr	465.00	7027.25	7029.86	7029.86	7030.56	0.011777	6.73	70.47	57.38	1.00
reach_1	550.00	5yr	343.00	7026.55	7029.16		7029.54	0.007242	4.92	69.80	57.47	0.77
reach_1	550.00	100yr	465.00	7026.55	7029.43	7029.18	7029.90	0.006961	5.49	86.39	65.41	0.78
reach_1	500.00	5yr	343.00	7026.00	7028.43	7028.43	7029.04	0.012965	6.27	54.82	48.61	1.02
reach_1	500.00	100yr	465.00	7026.00	7028.72	7028.72	7029.43	0.011344	6.79	70.56	59.36	0.99
reach_1	450.00	5yr	343.00	7024.40	7027.14	7027.14	7027.81	0.012056	6.56	52.34	40.83	1.00
reach_1	450.00	100yr	465.00	7024.40	7027.44	7027.44	7028.25	0.011294	7.26	65.39	46.82	1.00
reach_1	400.00	5yr	343.00	7023.20	7026.99		7027.20	0.002254	3.69	101.82	65.11	0.46
reach_1	400.00	100yr	465.00	7023.20	7027.45		7027.69	0.002028	4.02	132.58	71.05	0.45
reach_1	350.00	5yr	343.00	7022.63	7027.05		7027.11	0.000443	2.07	209.35	109.49	0.22
reach_1	350.00	100yr	465.00	7022.63	7027.52		7027.59	0.000464	2.34	262.51	119.49	0.23
reach_1	300.00	5yr	343.00	7020.40	7027.07		7027.09	0.000073	1.16	388.31	127.34	0.10
reach_1	300.00	100yr	465.00	7020.40	7027.54		7027.57	0.000094	1.40	449.47	133.84	0.11
reach_1	265.39	5yr	343.00	7020.00	7027.04	7023.29	7027.09	0.000144	1.77	248.87	113.06	0.14
reach_1	265.39	100yr	465.00	7020.00	7027.50	7023.64	7027.56	0.000196	2.18	276.12	120.69	0.16
reach_1	259.30	5yr	343.00	7020.00	7027.05	7022.61	7027.08	0.000094	1.56	265.88	115.68	0.11
reach_1	259.30	100yr	465.00	7020.00	7027.50	7022.94	7027.56	0.000133	1.94	291.42	122.87	0.14
reach_1	259		Inl Struct									
reach_1	241.00	5yr	343.00	7019.40	7021.68		7022.26	0.007981	6.16	55.72	33.25	0.84
reach_1	241.00	100yr	465.00	7019.40	7021.98	7021.81	7022.75	0.008368	7.05	66.17	34.74	0.88
reach_1	210.58	5yr	343.00	7018.70	7021.18	7021.18	7021.95	0.012038	7.03	48.83	33.56	1.02
reach_1	210.58	100yr	465.00	7018.70	7021.54	7021.54	7022.45	0.010818	7.68	61.23	36.32	1.00
reach_1	200.00	5yr	343.00	7018.50	7020.90	7020.90	7021.64	0.012044	6.91	49.63	34.35	1.01
reach_1	200.00	100yr	465.00	7018.50	7021.23	7021.23	7022.13	0.011192	7.63	61.26	36.30	1.01

HEC-RAS Plan: DPCanyonProp River: DP_1 Reach: reach_1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	150.00	5yr	343.00	7018.00	7020.23	7020.23	7020.92	0.012103	6.64	51.63	38.26	1.00
reach_1	150.00	100yr	465.00	7018.00	7020.55	7020.55	7021.37	0.011054	7.27	64.66	42.79	0.99
reach_1	100.00	5yr	343.00	7016.60	7018.76	7018.76	7019.40	0.012255	6.42	53.41	41.97	1.00
reach_1	100.00	100yr	465.00	7016.60	7019.04	7019.04	7019.83	0.011644	7.14	65.49	44.36	1.01
reach_1	50.00	5yr	343.00	7014.50	7017.85	7017.85	7018.54	0.012459	6.64	51.67	38.57	1.01
reach_1	50.00	100yr	465.00	7014.50	7018.18	7018.18	7018.98	0.011618	7.17	65.04	42.67	1.00
reach_1	0.00	5yr	343.00	7014.00	7016.94	7016.94	7017.57	0.012359	6.36	54.07	45.11	1.00
reach_1	0.00	100yr	465.00	7014.00	7017.21	7017.21	7017.98	0.011638	7.05	67.16	49.35	1.00

Proposed Conditions
With Sediment

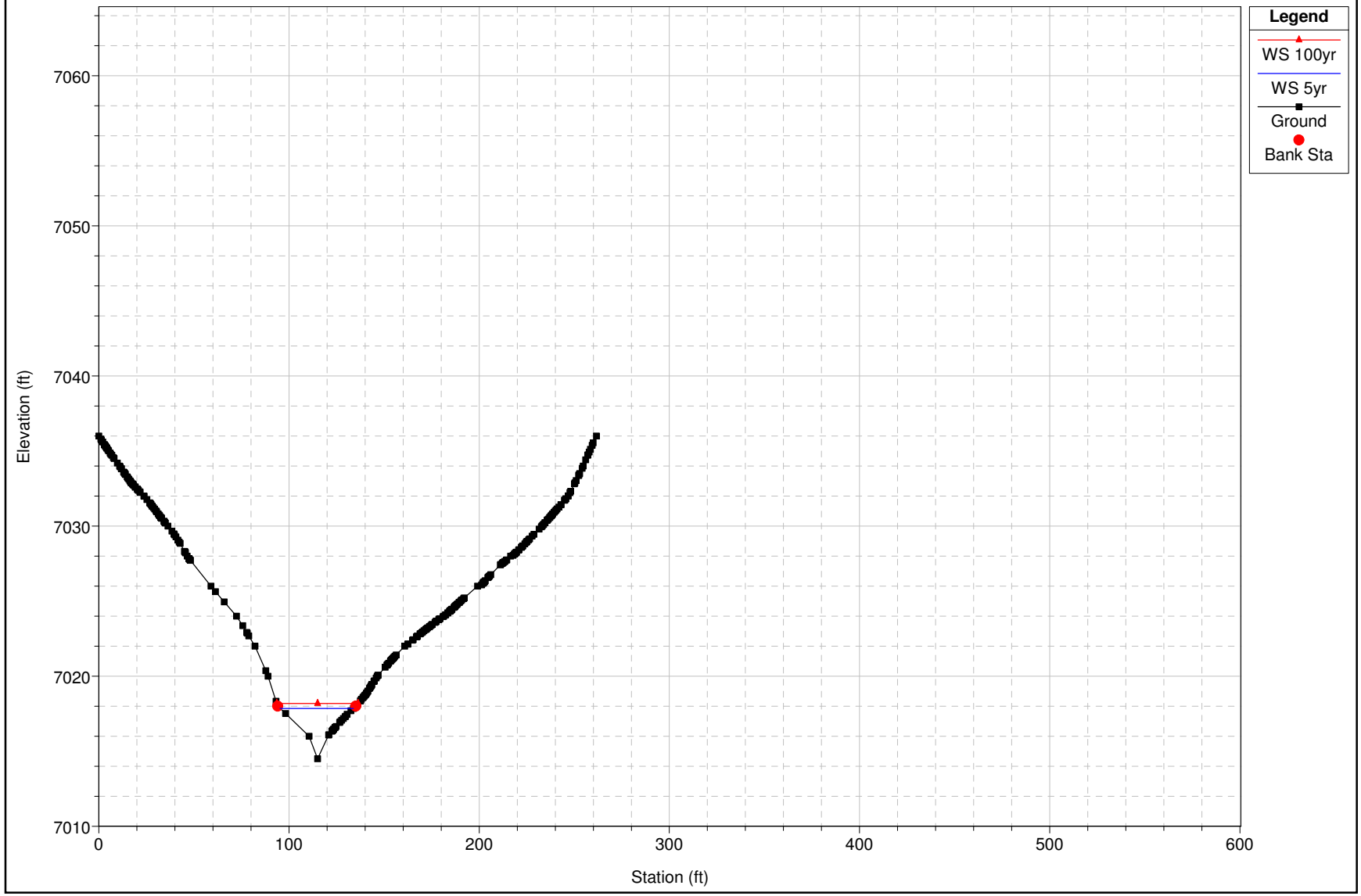

1250.00
1200.00
1150.00
1100.00
1050.00
1000.00
950.00
900.00
800.00
750.00
700.00
650.00
600.00
500.00
450.00
400.00
350.00
300.00
259.30
241.00
210.58
200.00
150.00
100.00
50.00
0.00
reach_1
DP_1



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

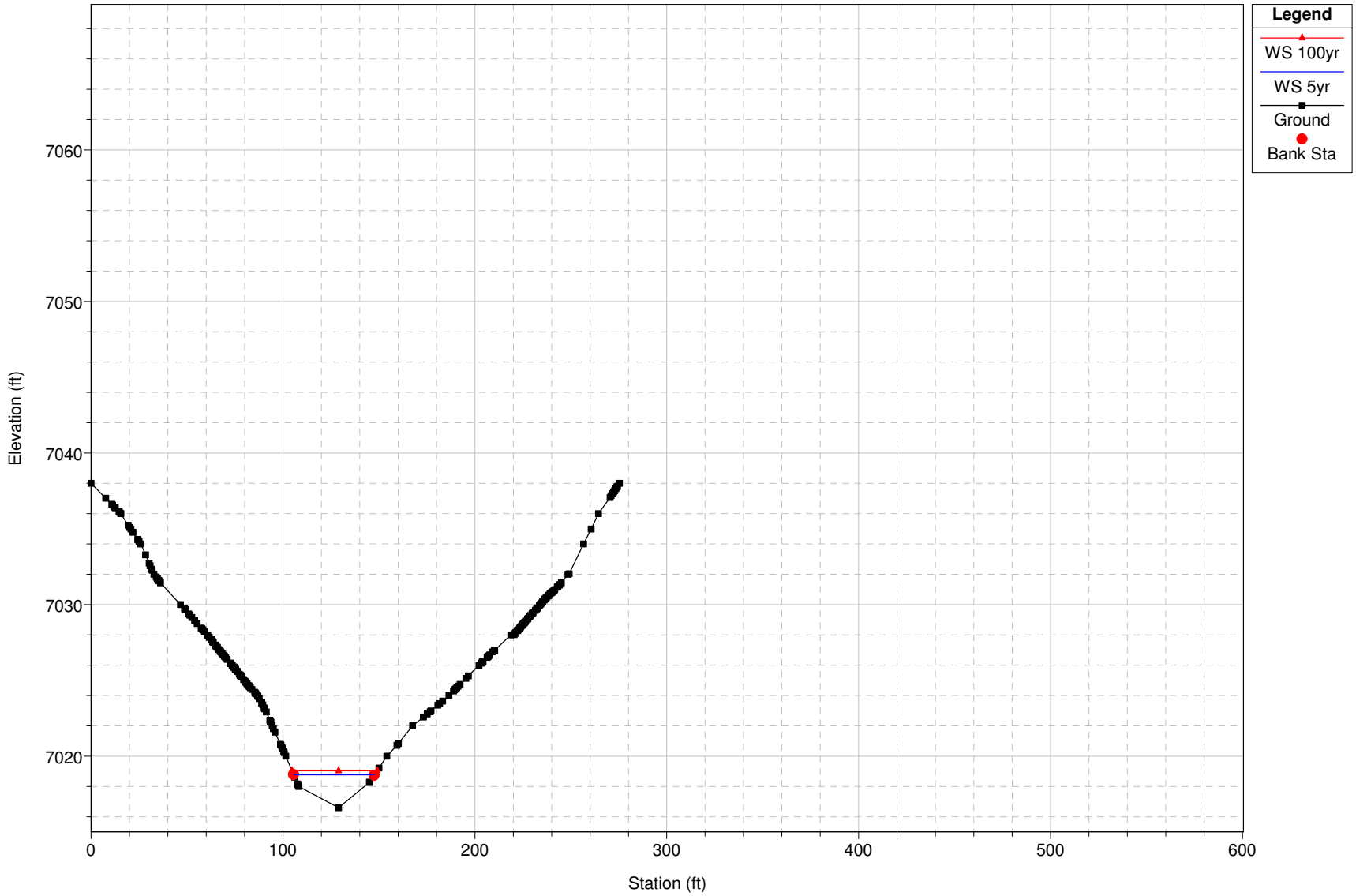
River = DP_1 Reach = reach_1 RS = 50.00 coordinates at station 115 interpolated from topo



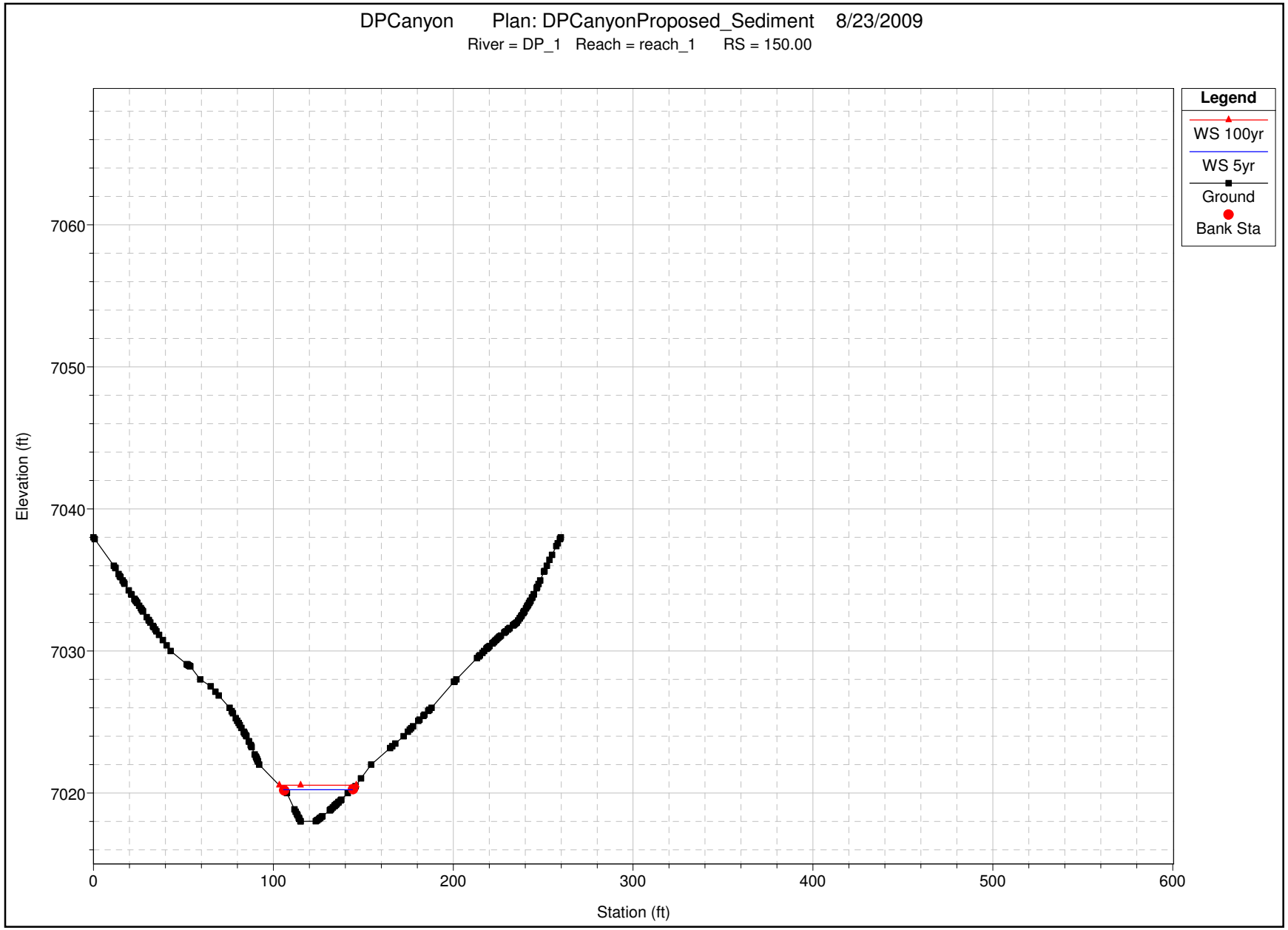
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

River = DP_1 Reach = reach_1 RS = 100.00 coordinates at station 129 interpolated from topo



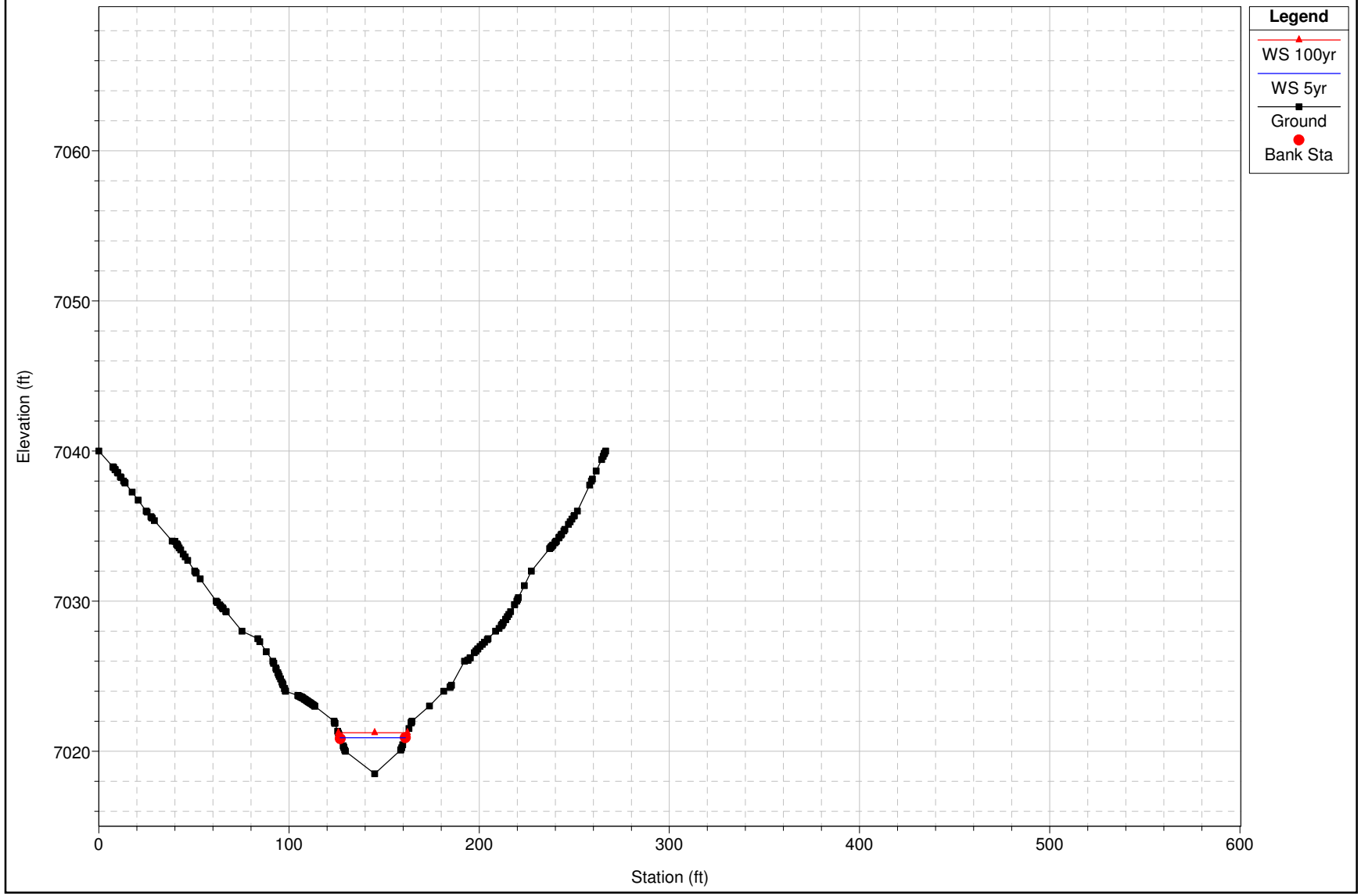
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

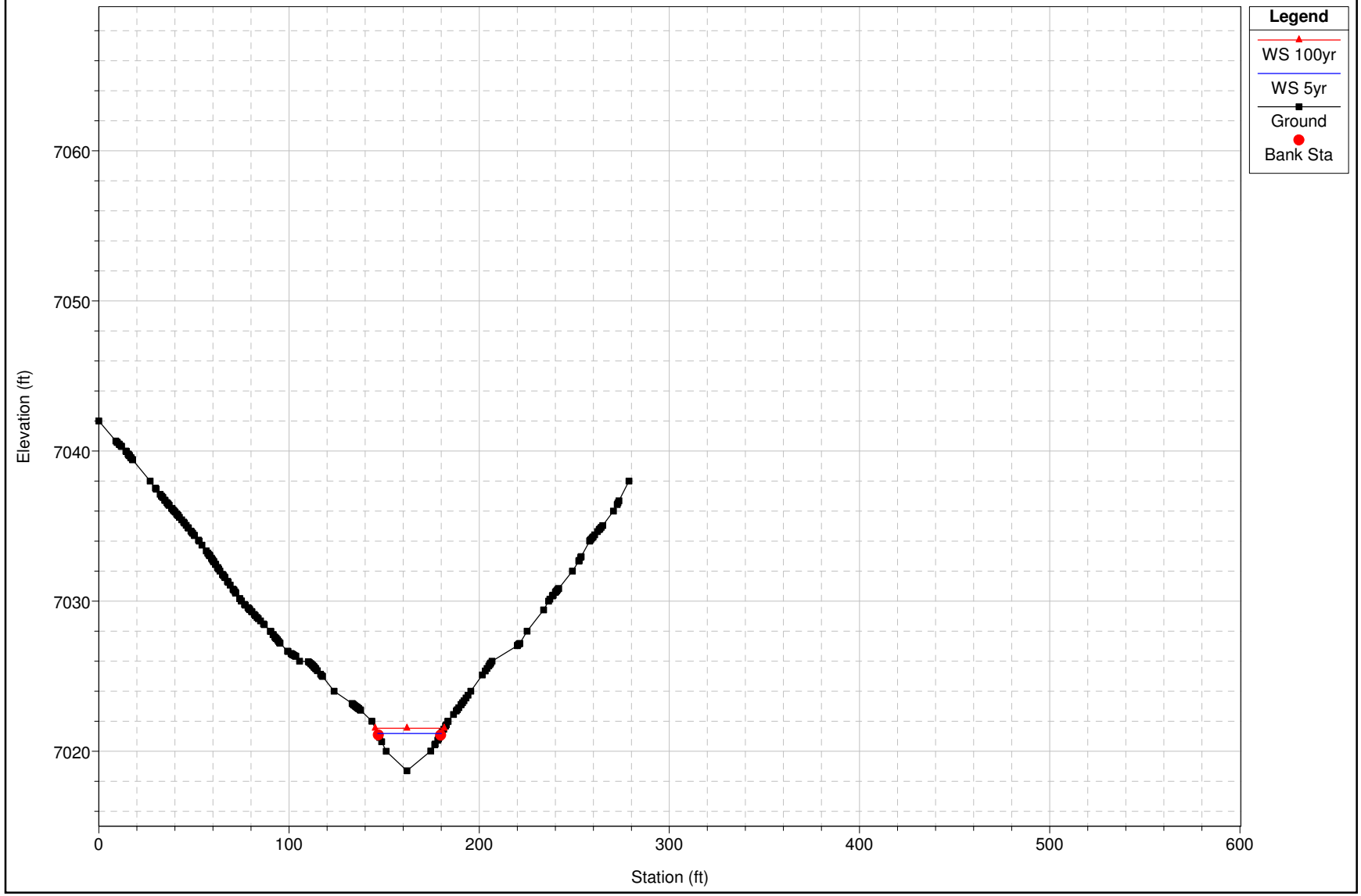
River = DP_1 Reach = reach_1 RS = 200.00 coordinates at station 145 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

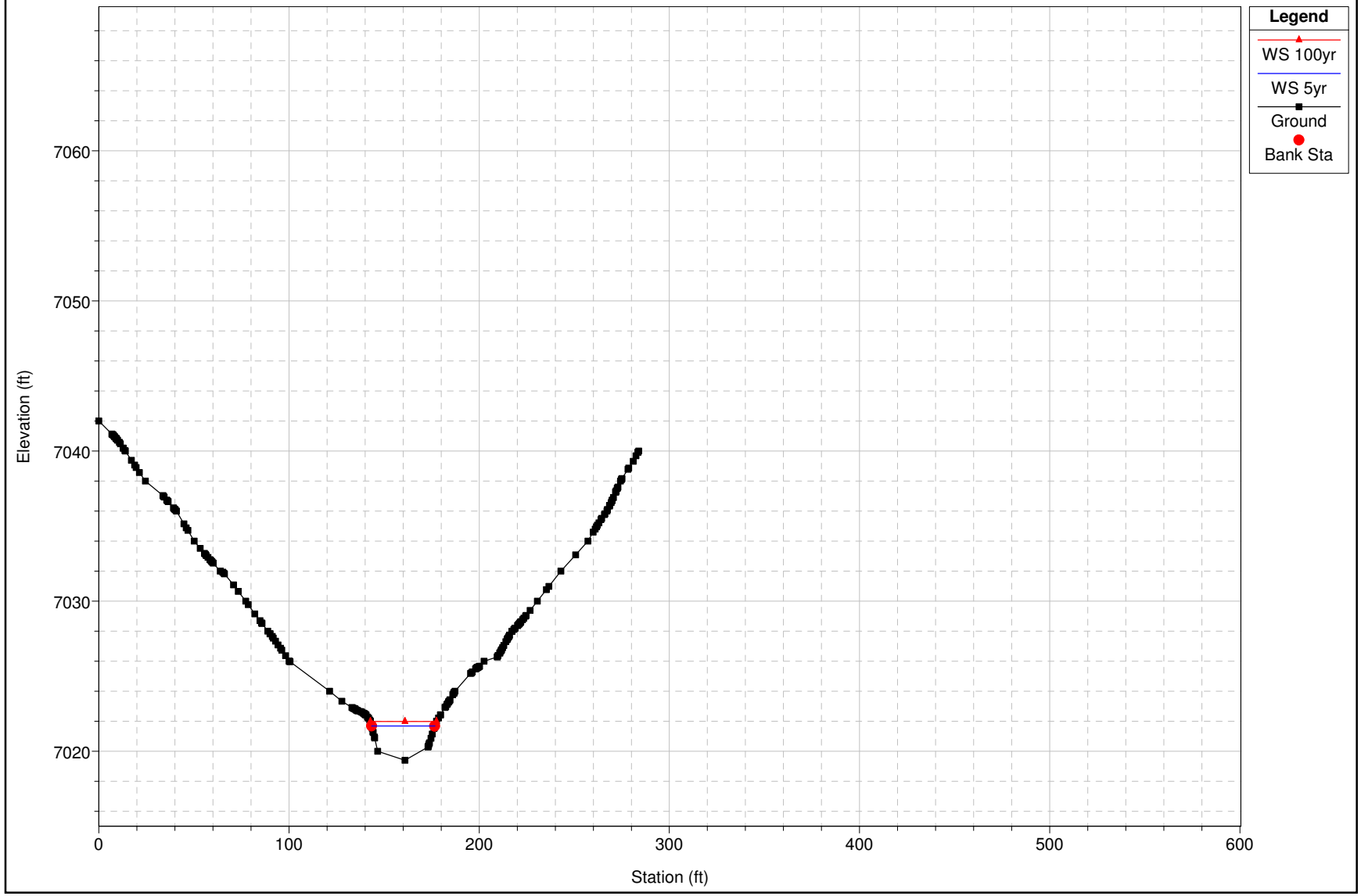
River = DP_1 Reach = reach_1 RS = 210.58 coordinates at station 162 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

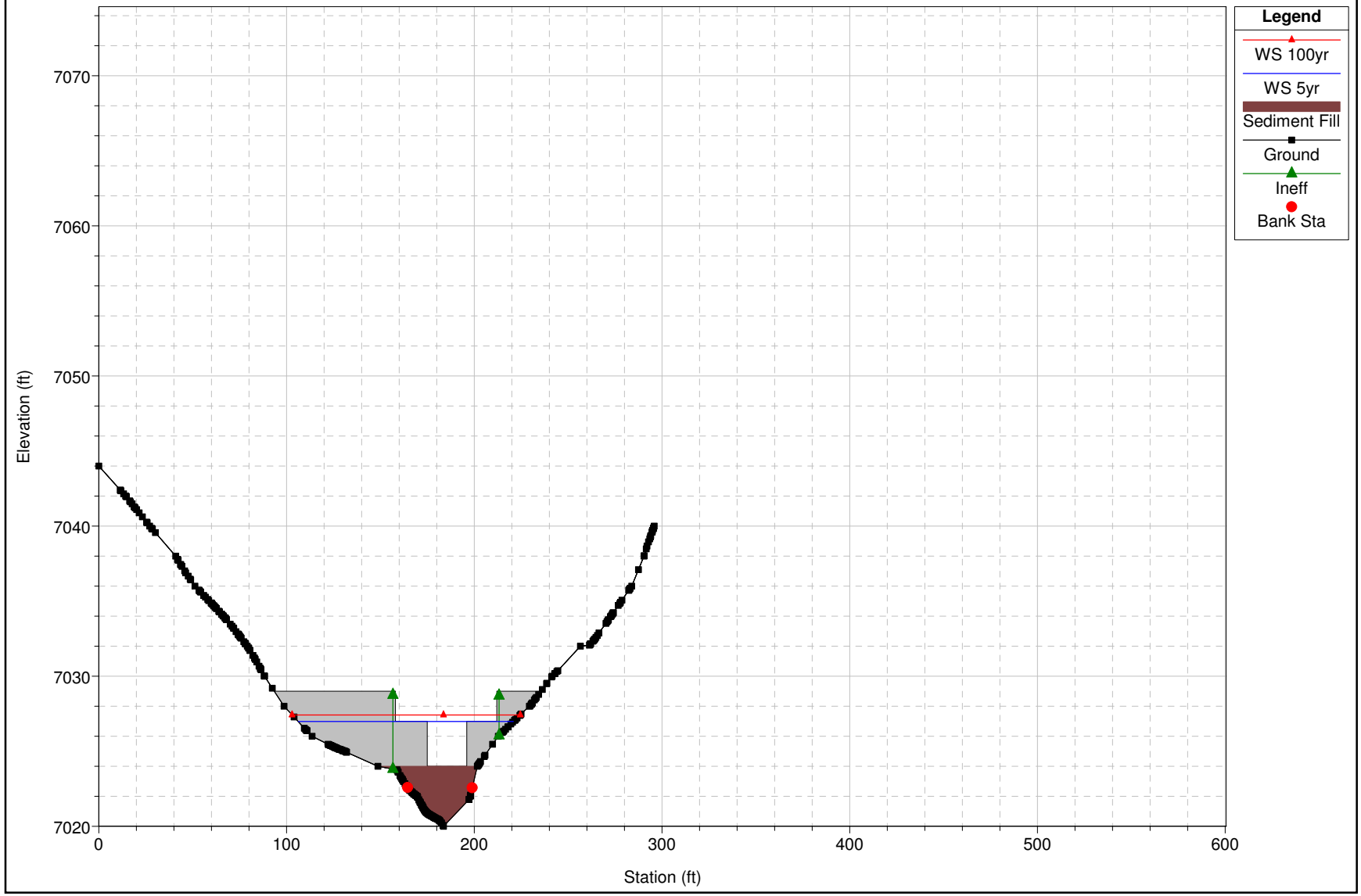
River = DP_1 Reach = reach_1 RS = 241.00 coordinates at station 161 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

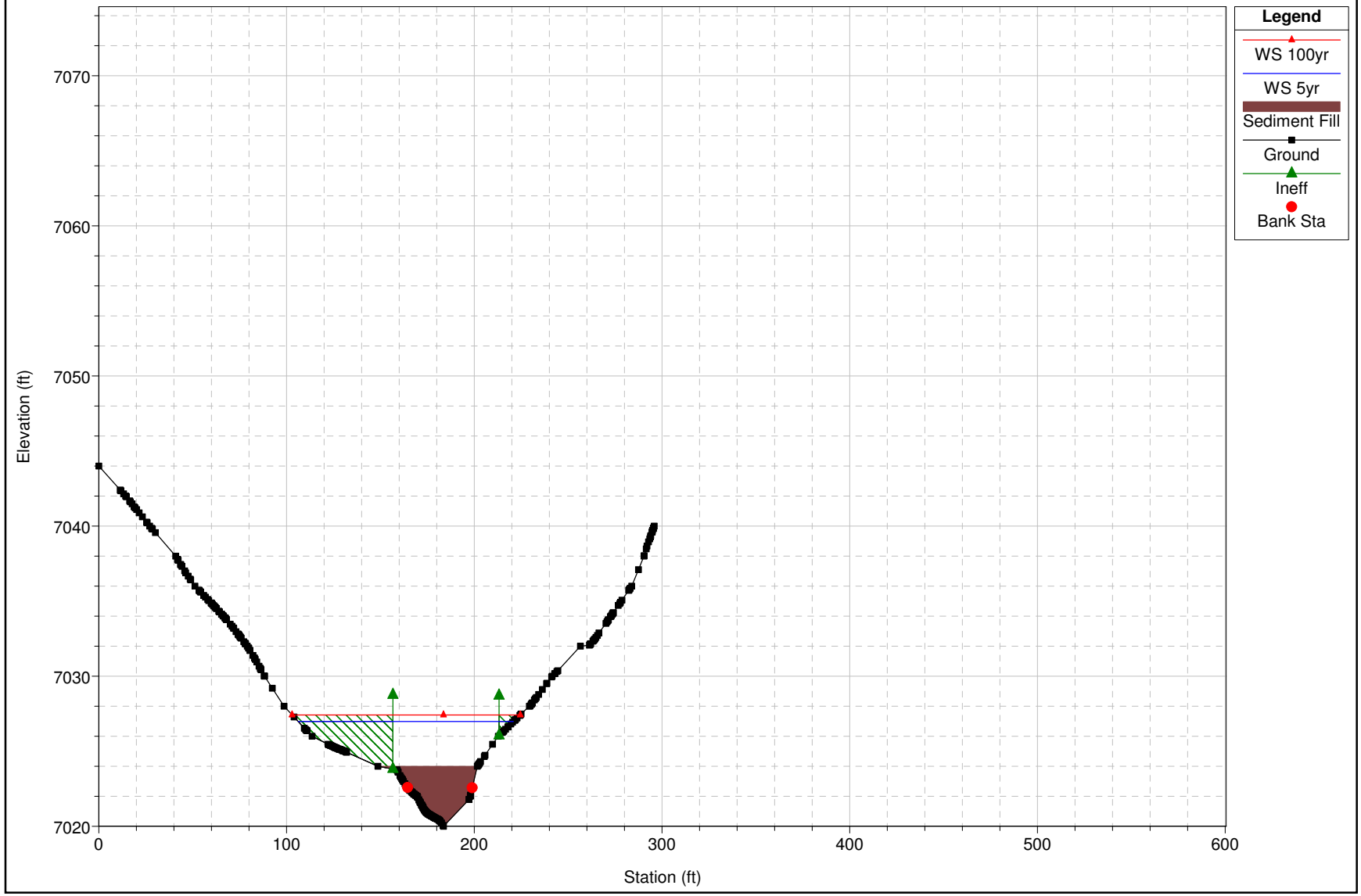
River = DP_1 Reach = reach_1 RS = 259 IS



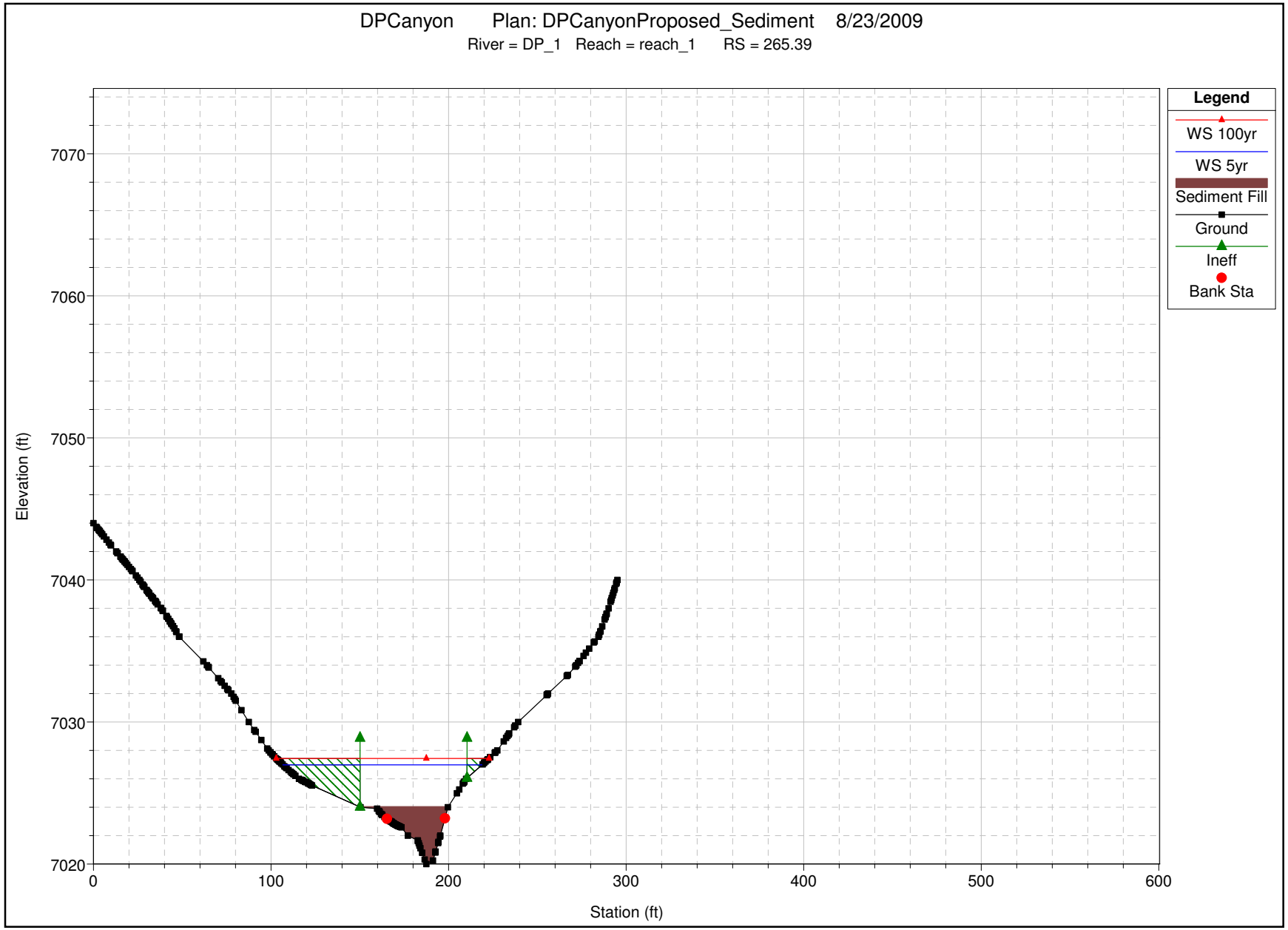
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

River = DP_1 Reach = reach_1 RS = 259.30



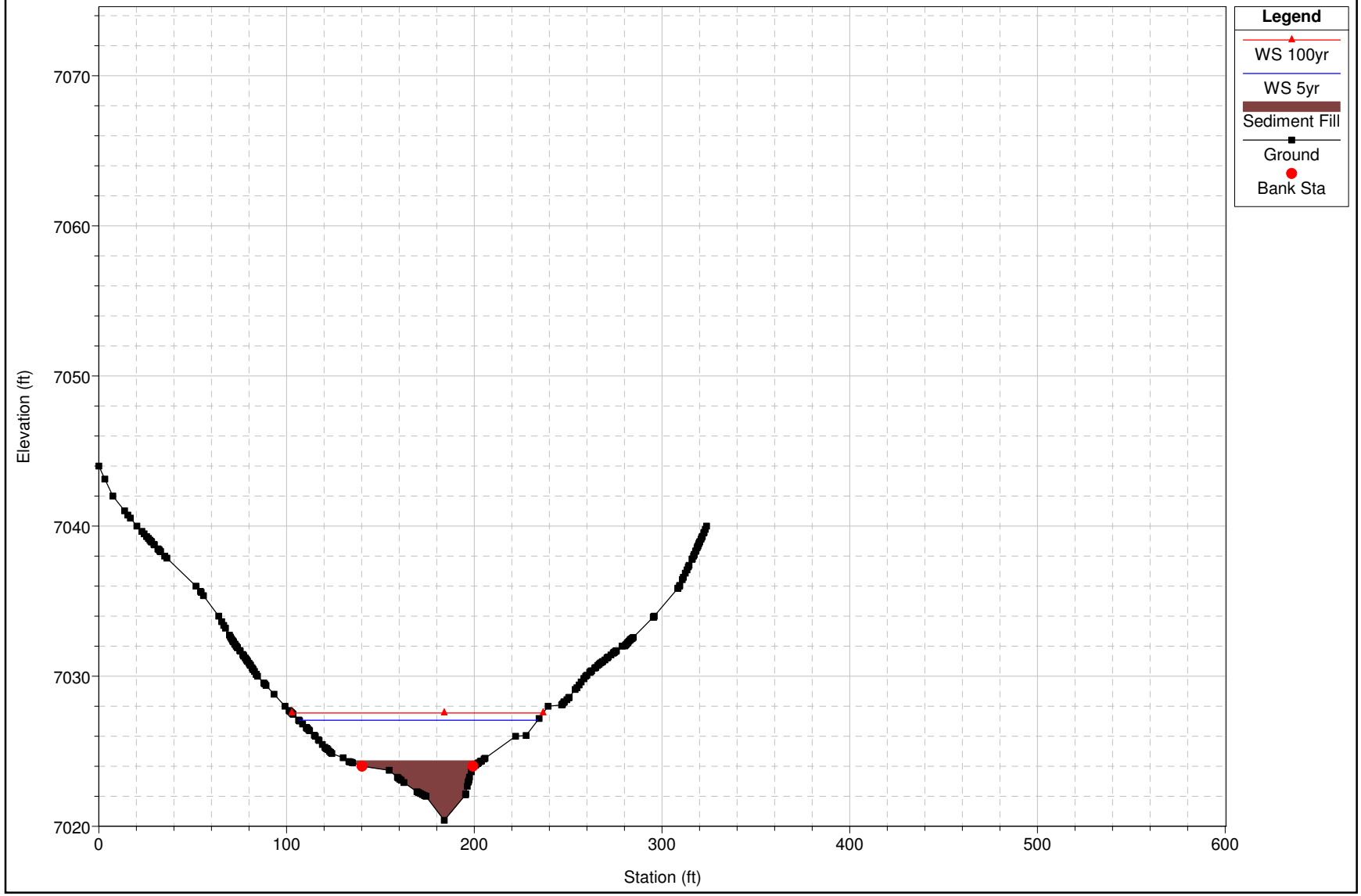
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

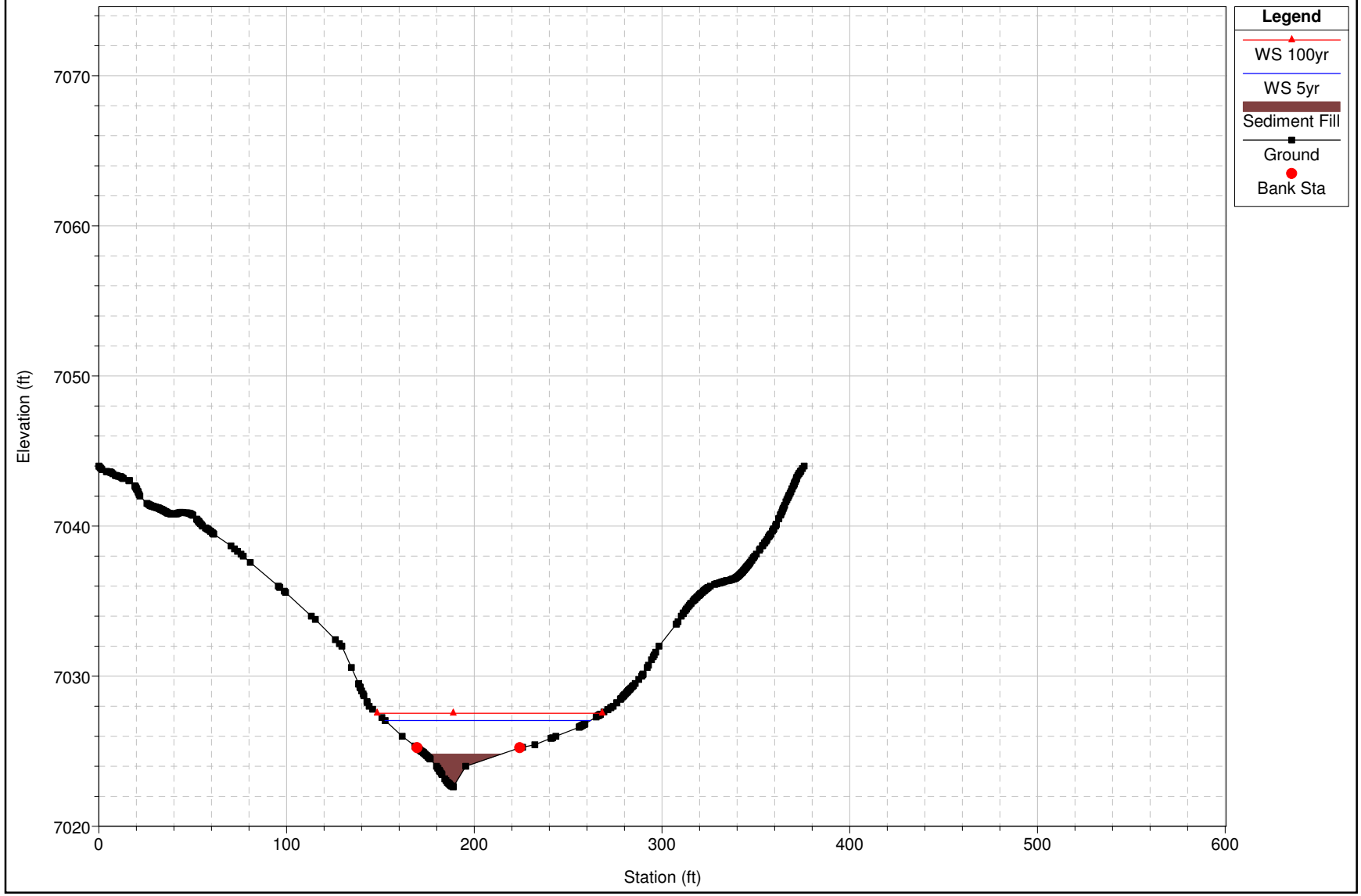
River = DP_1 Reach = reach_1 RS = 300.00 coordinates at station 184 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

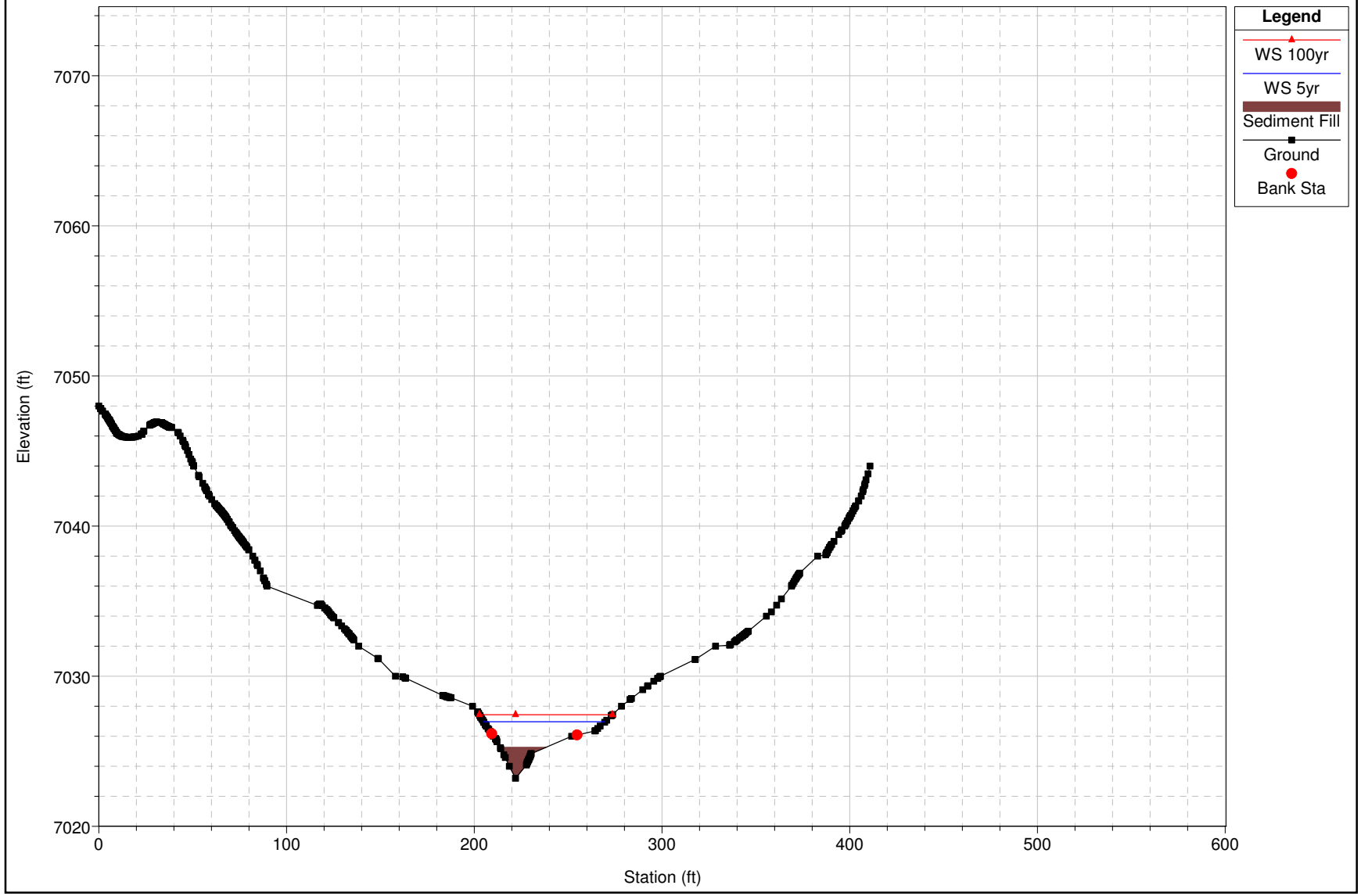
River = DP_1 Reach = reach_1 RS = 350.00



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

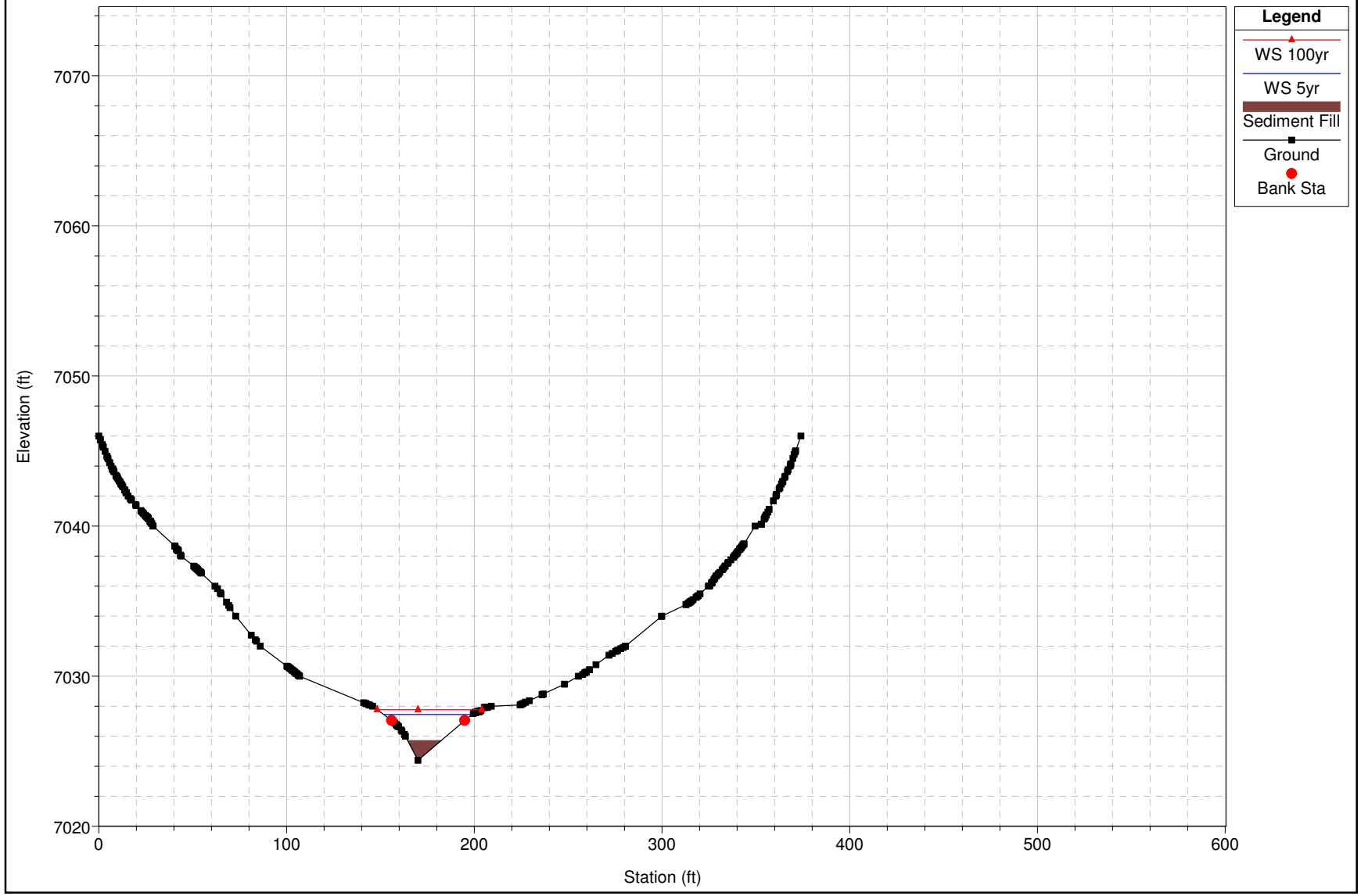
River = DP_1 Reach = reach_1 RS = 400.00 coordinates at station 222 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

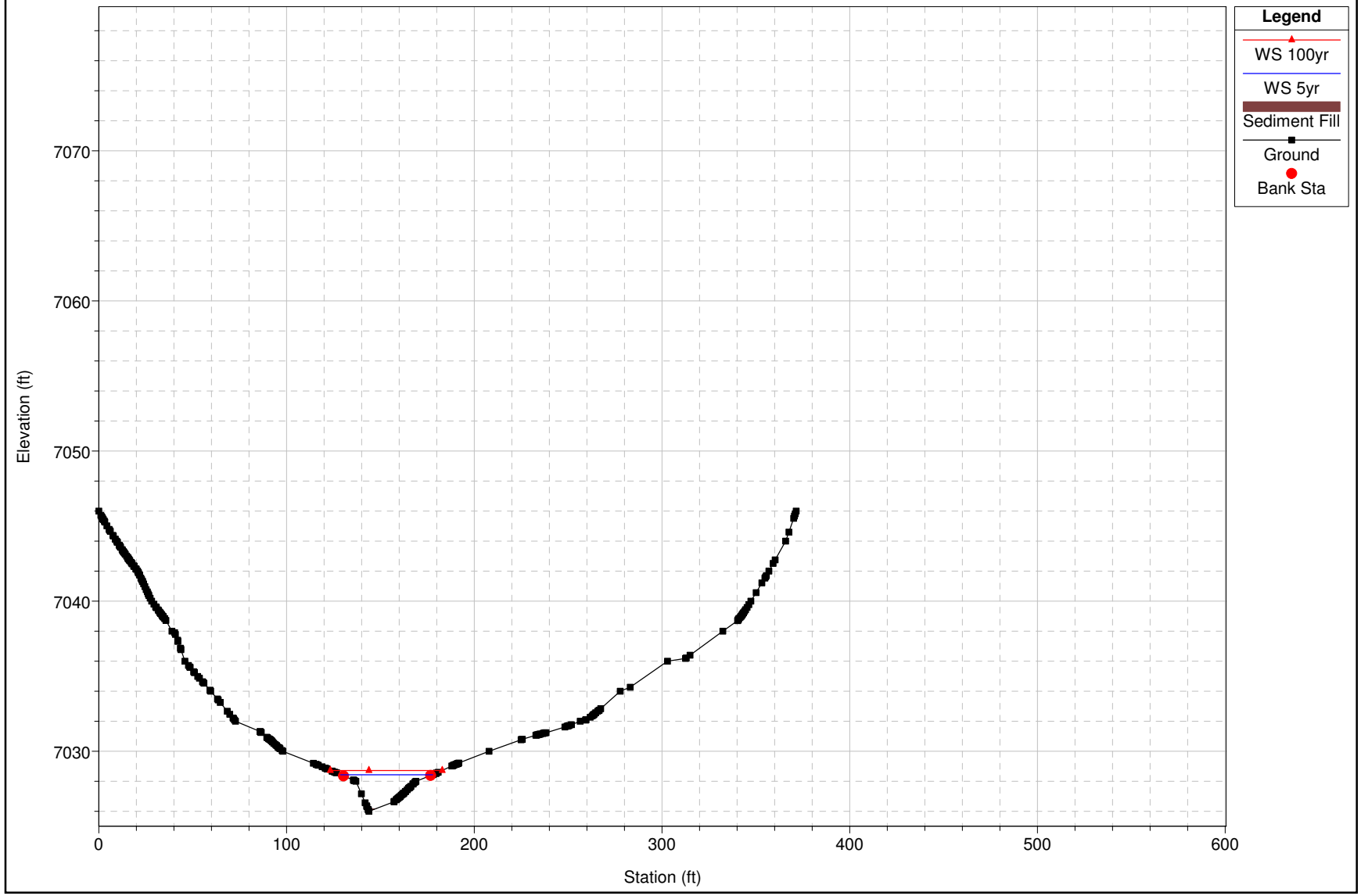
River = DP_1 Reach = reach_1 RS = 450.00 coordinates at station 170 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

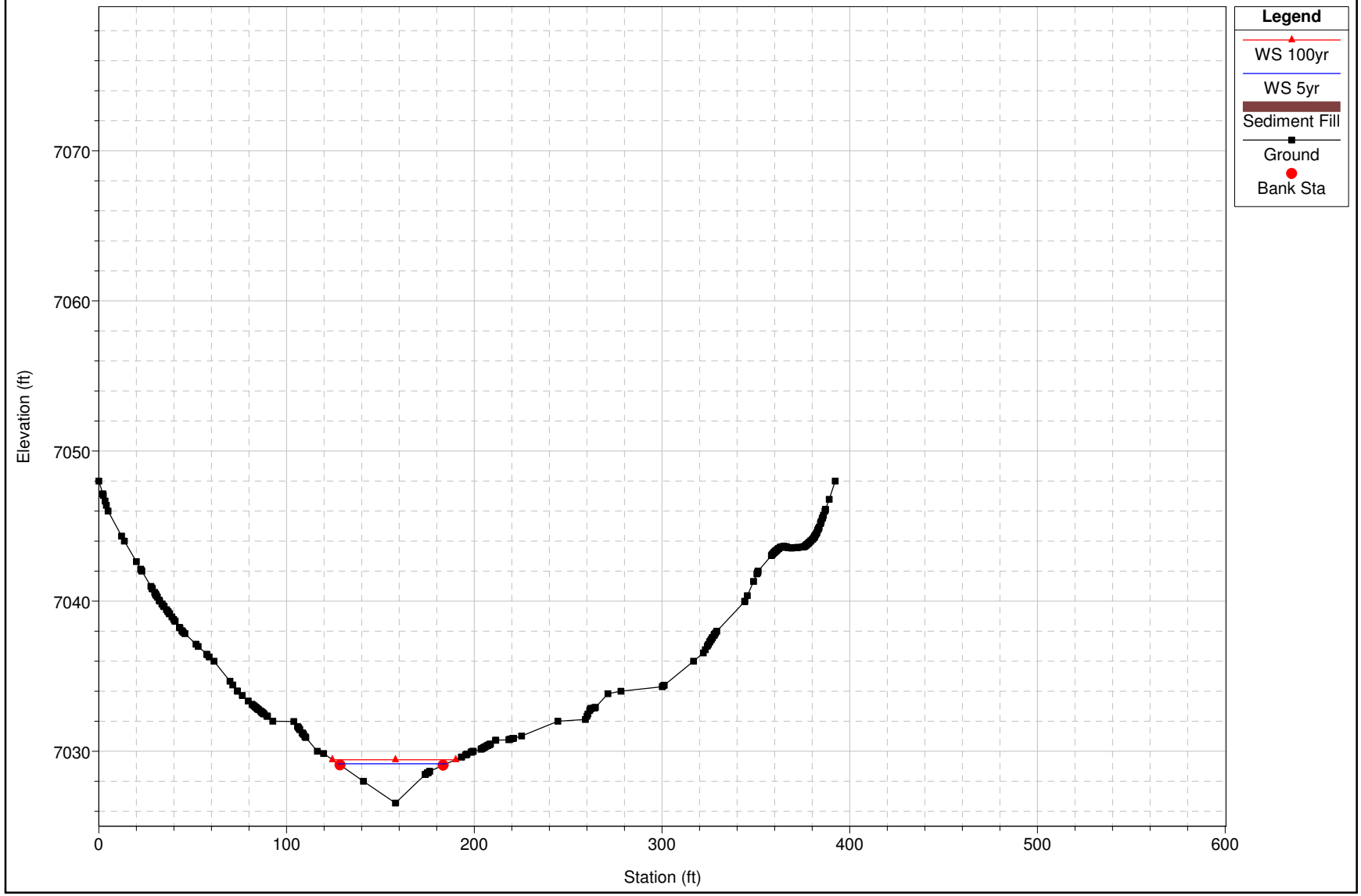
River = DP_1 Reach = reach_1 RS = 500.00



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

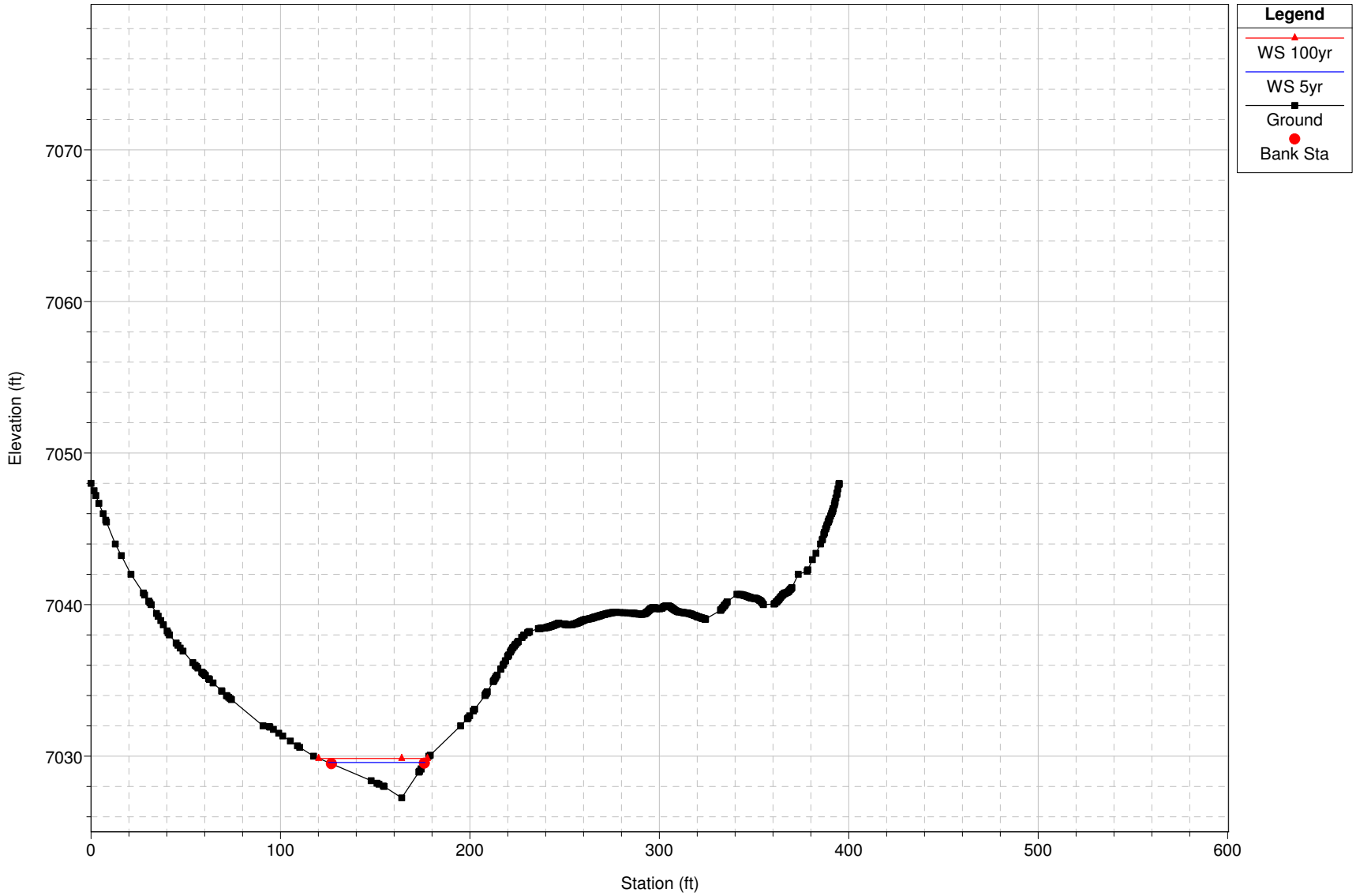
River = DP_1 Reach = reach_1 RS = 550.00 coordinates at station 158 interpolated from topo



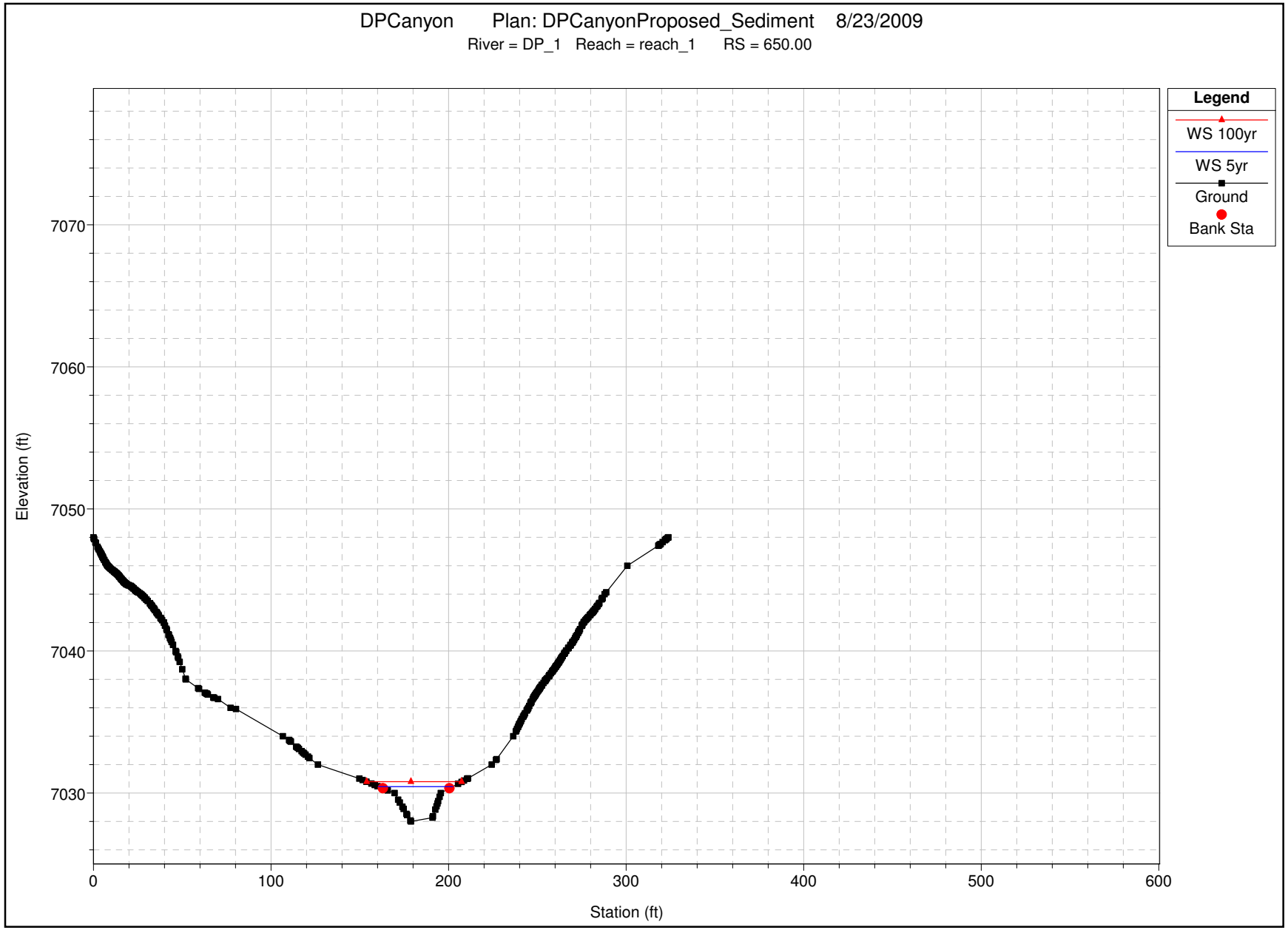
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

River = DP_1 Reach = reach_1 RS = 600.00 coordinates at station 164 interpolated from topo



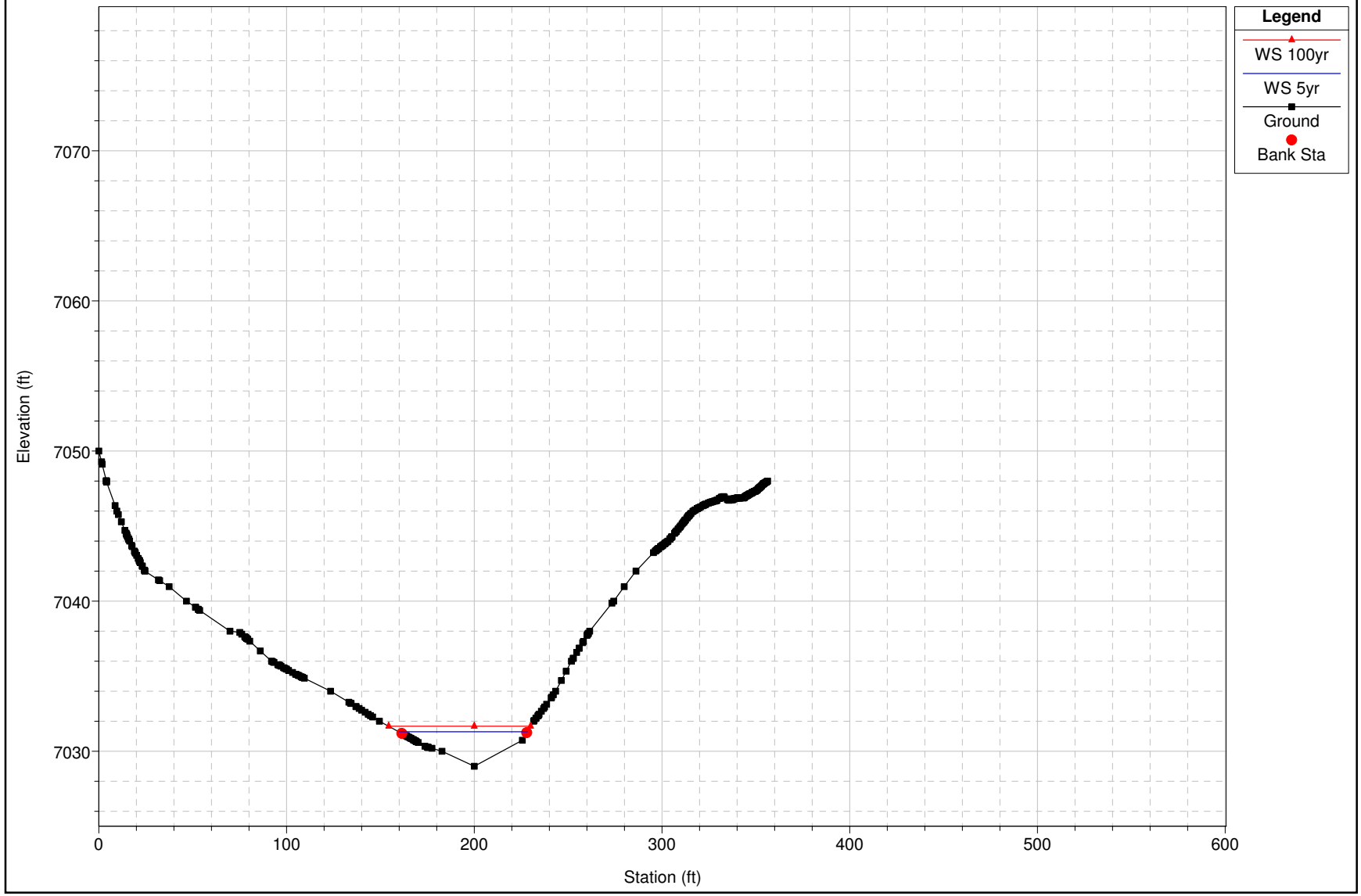
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



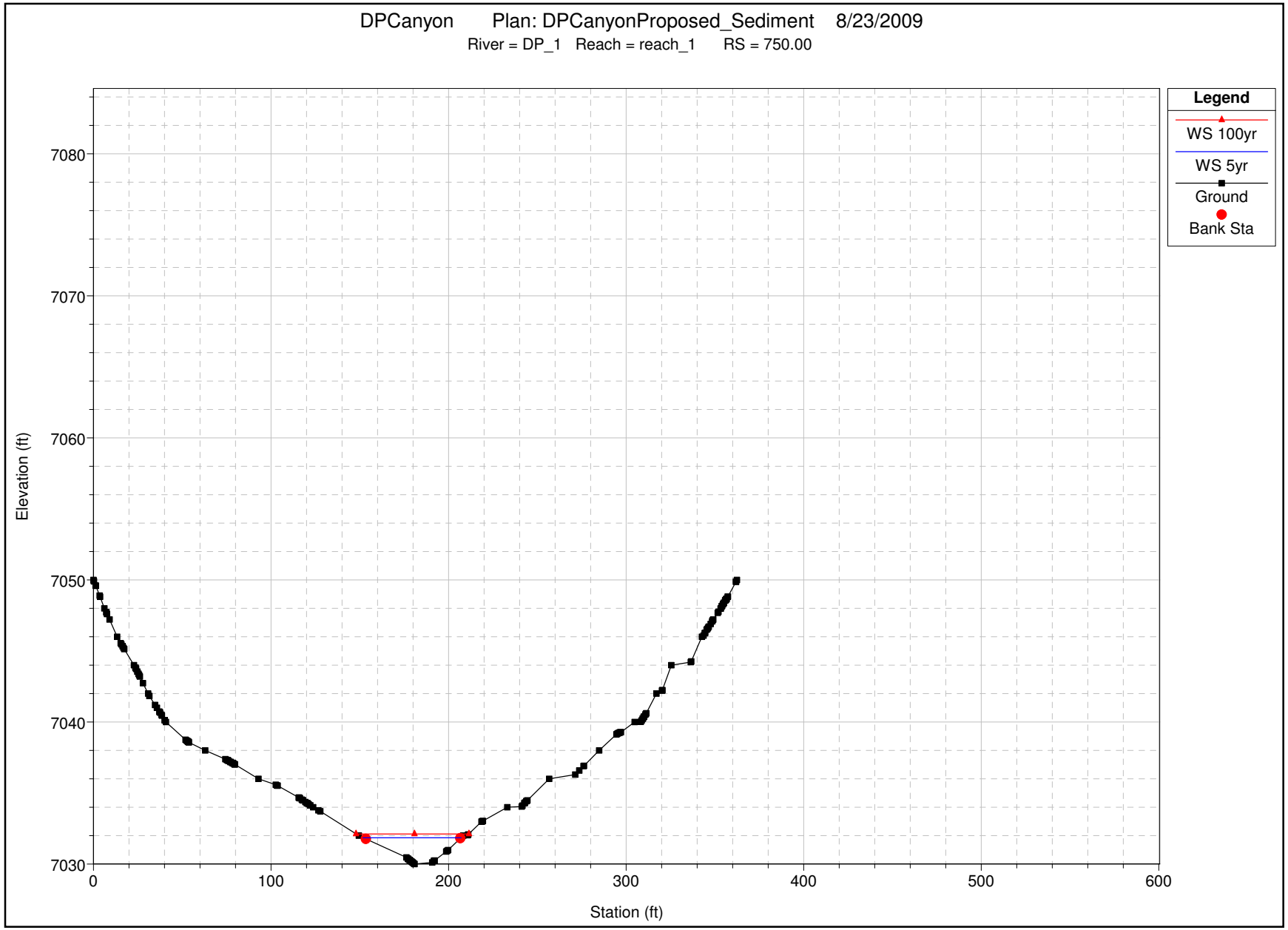
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

River = DP_1 Reach = reach_1 RS = 700.00 coordinates at station 200 interpolated from topo



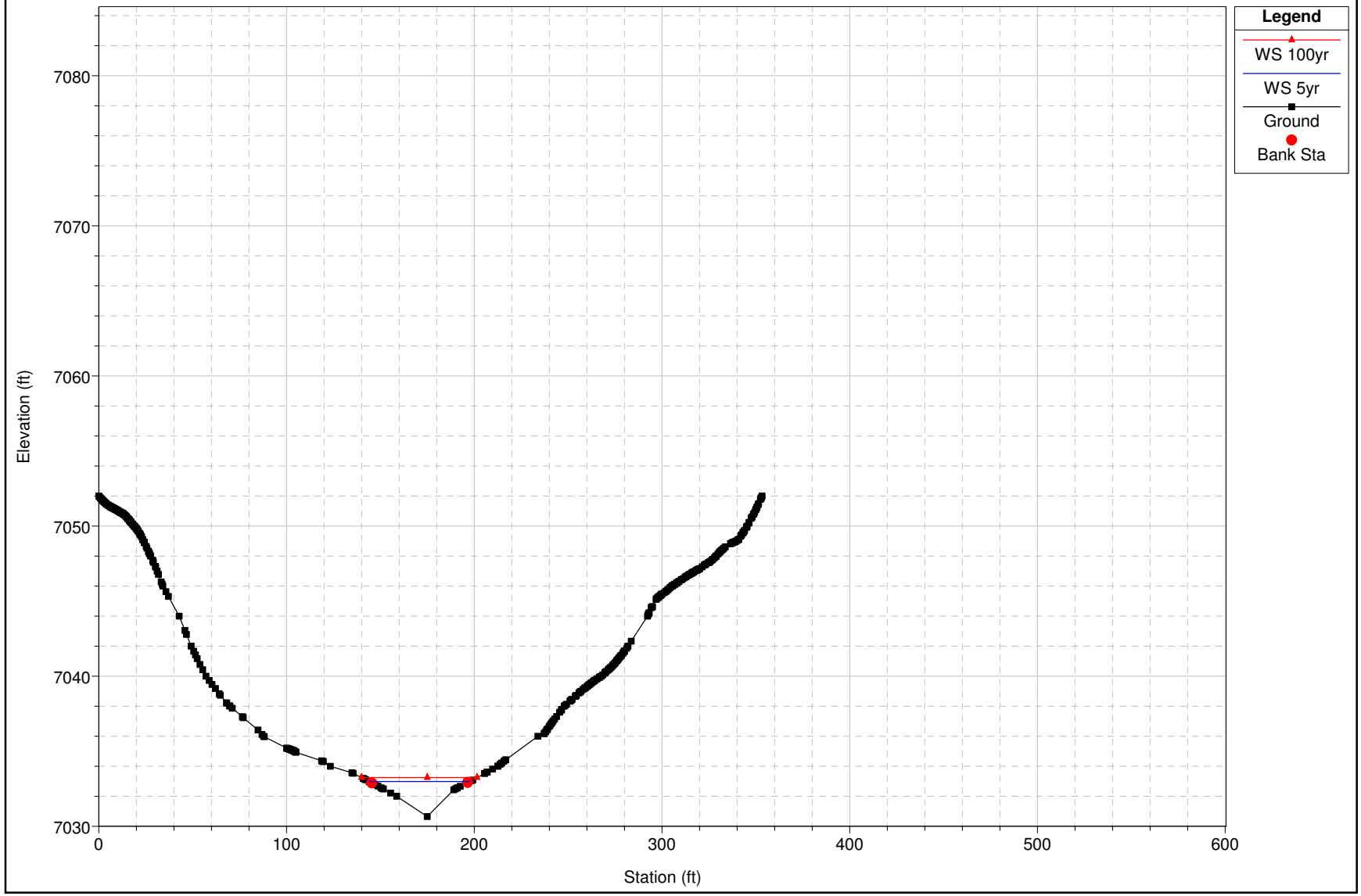
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

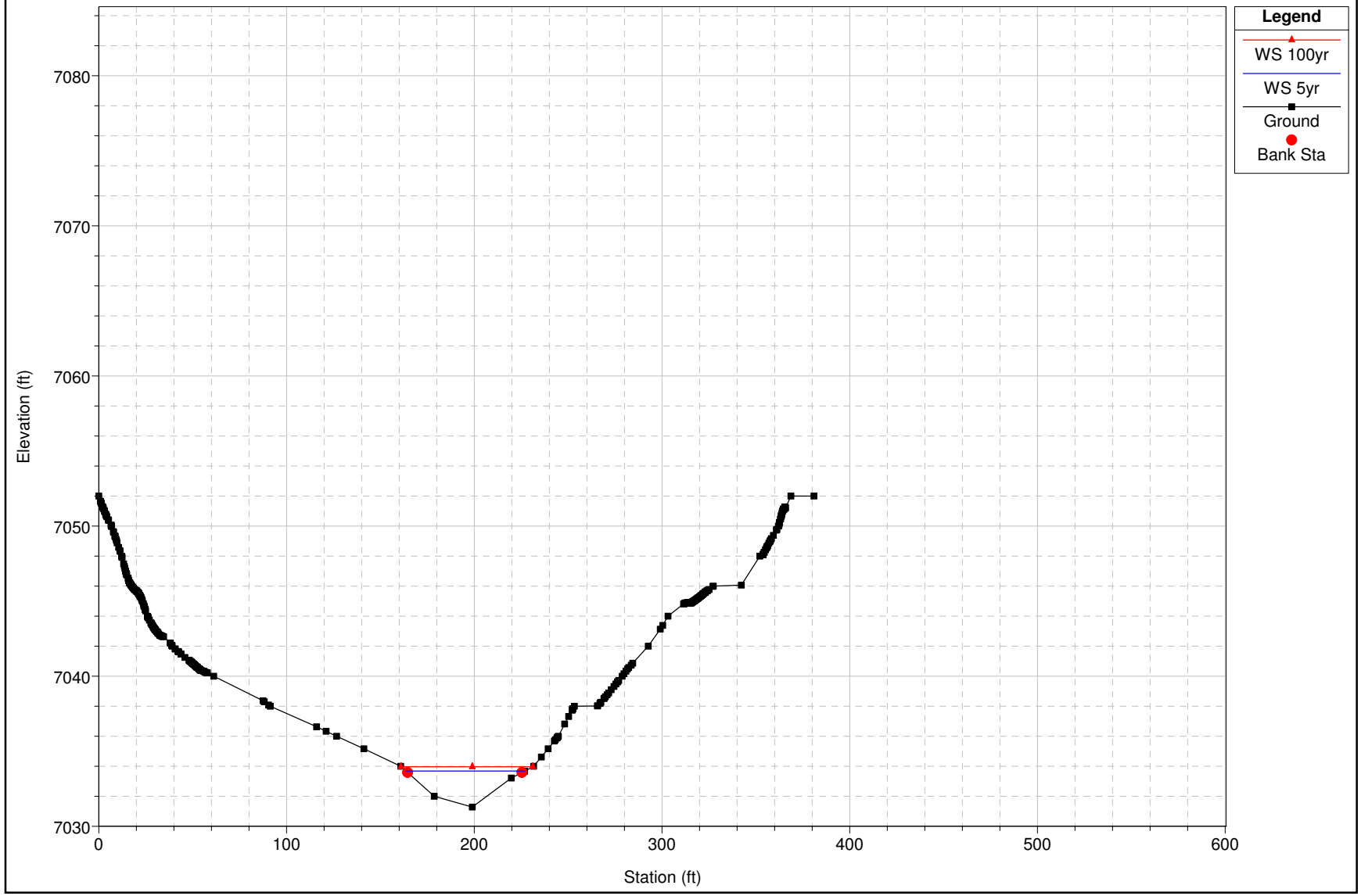
River = DP_1 Reach = reach_1 RS = 800.00 coordinates at station 175 interpolated from topo



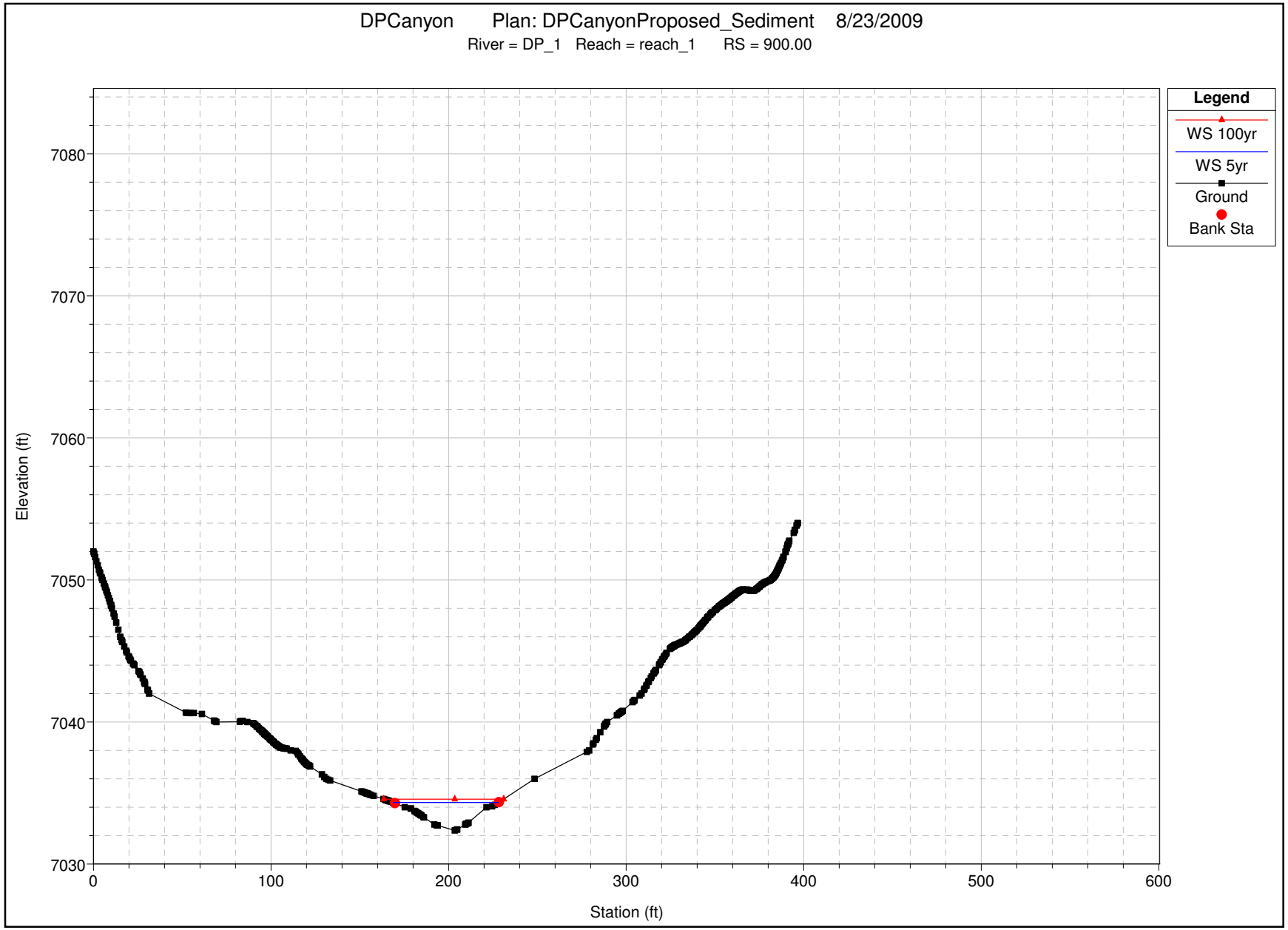
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

River = DP_1 Reach = reach_1 RS = 850.00 coordinates at station 199 interpolated from topo



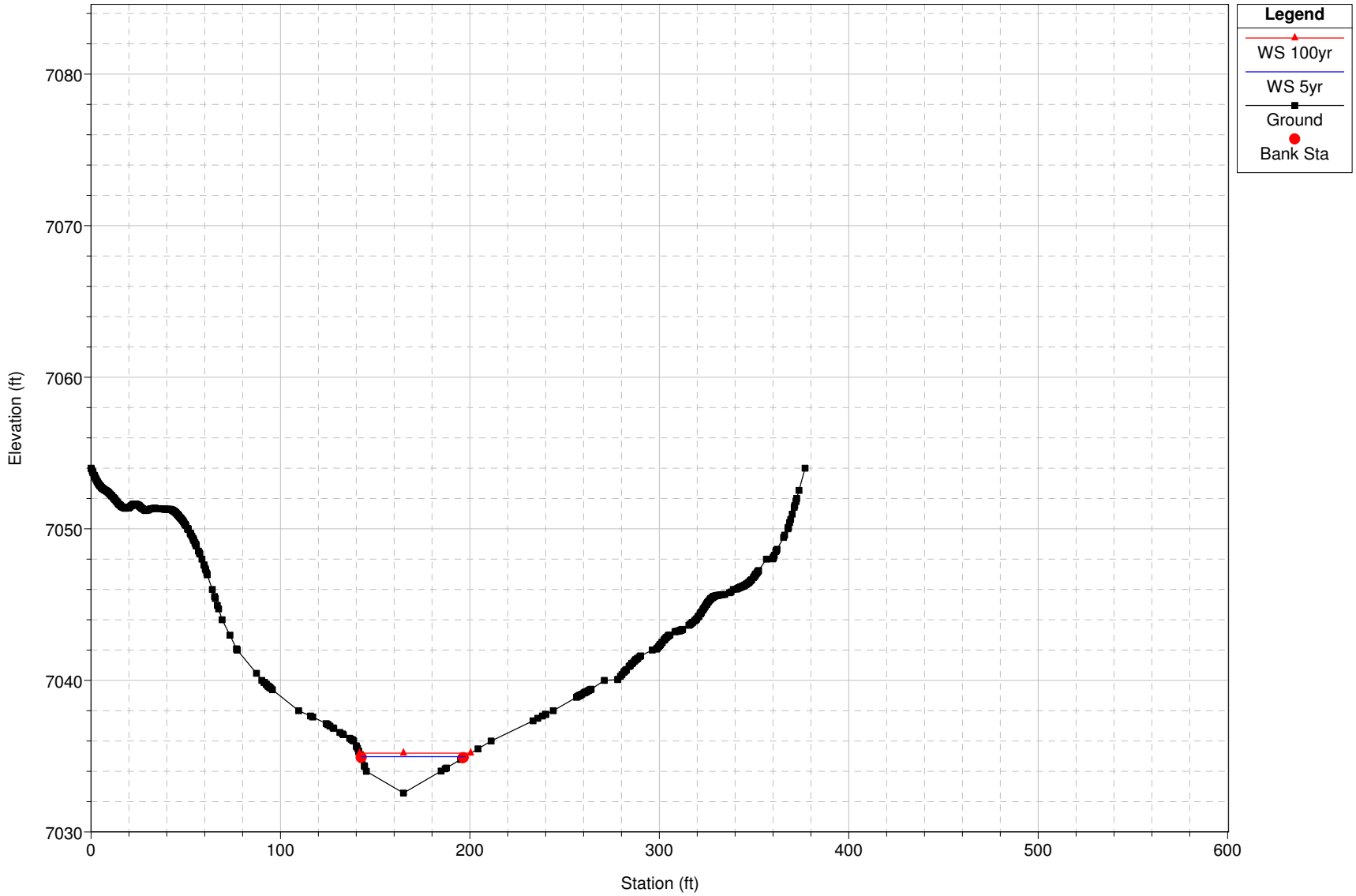
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

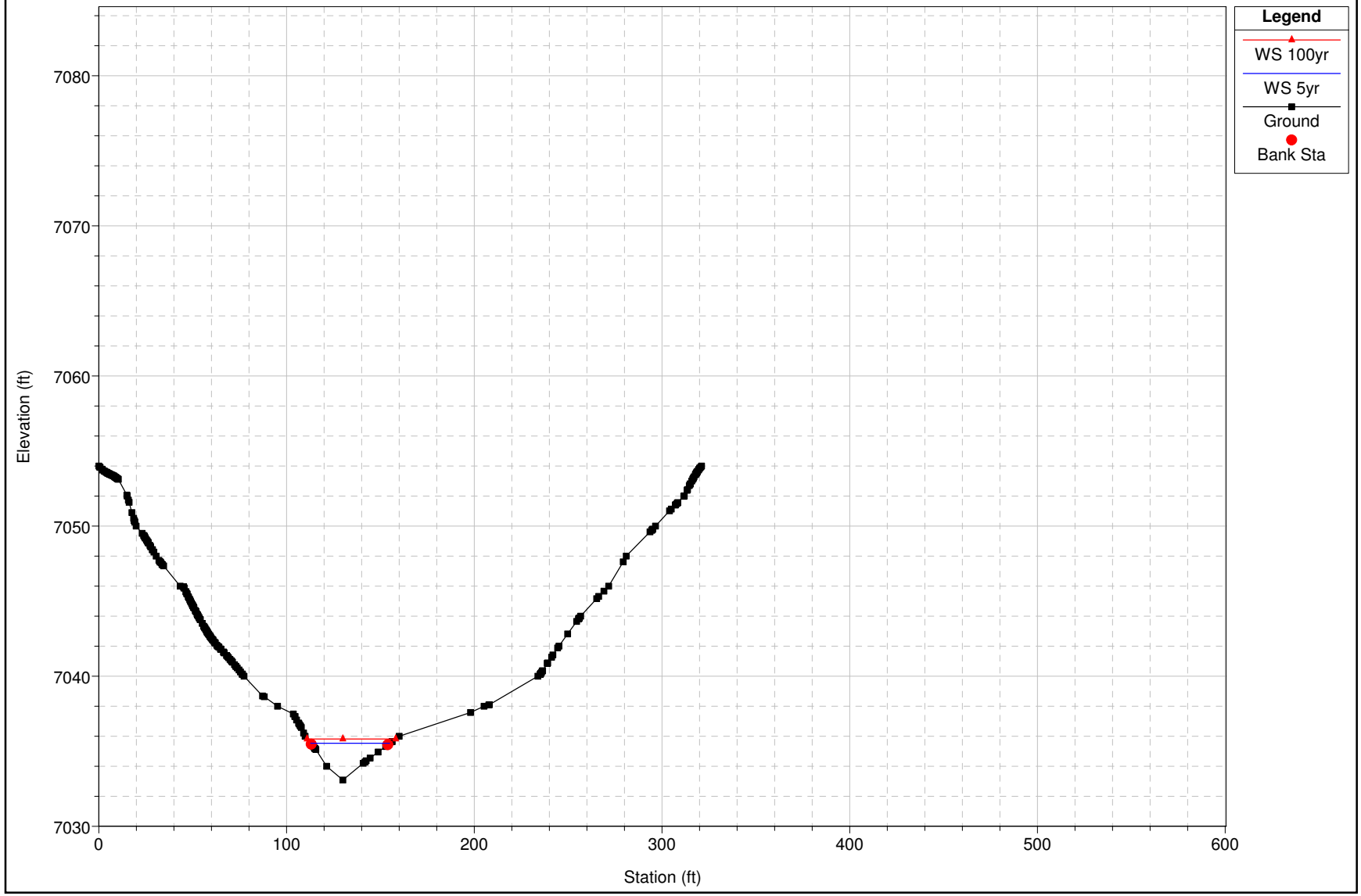
River = DP_1 Reach = reach_1 RS = 950.00 coordinates at station 165 interpolated from topo



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

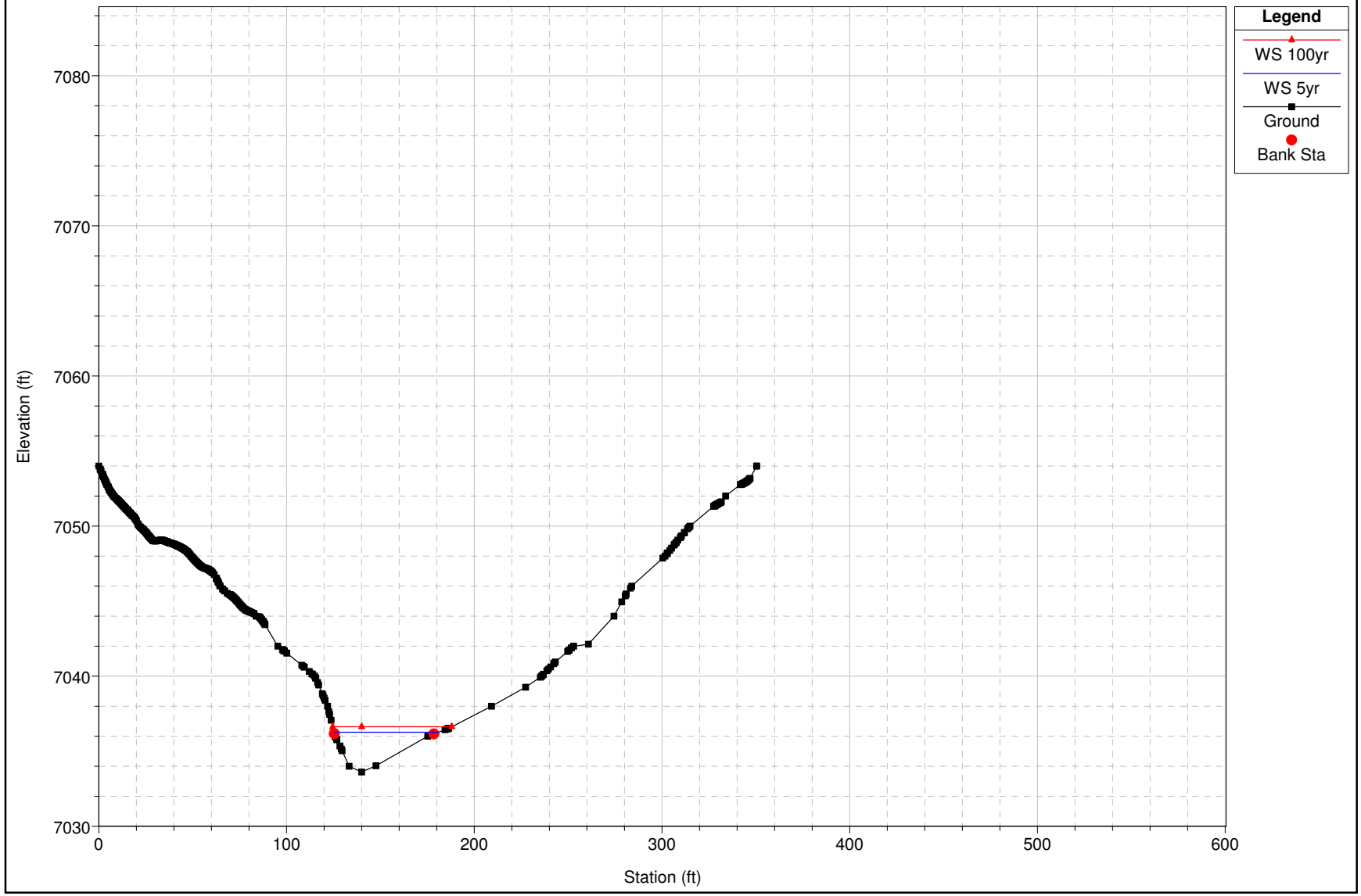
River = DP_1 Reach = reach_1 RS = 1000.00 coordinates at station 130 interpolated from topo



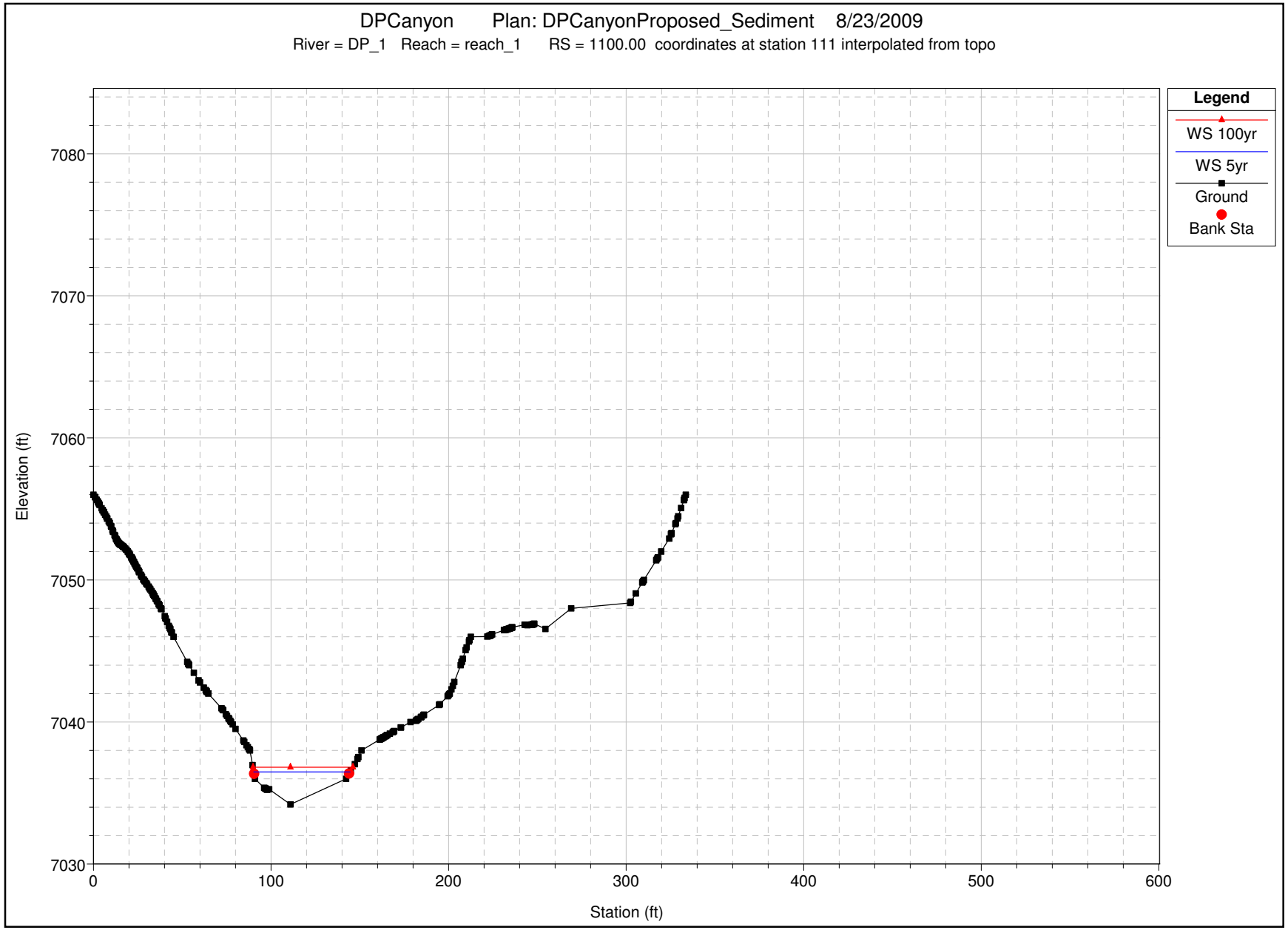
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

River = DP_1 Reach = reach_1 RS = 1050.00 coordinates at station 140 interpolated from topo



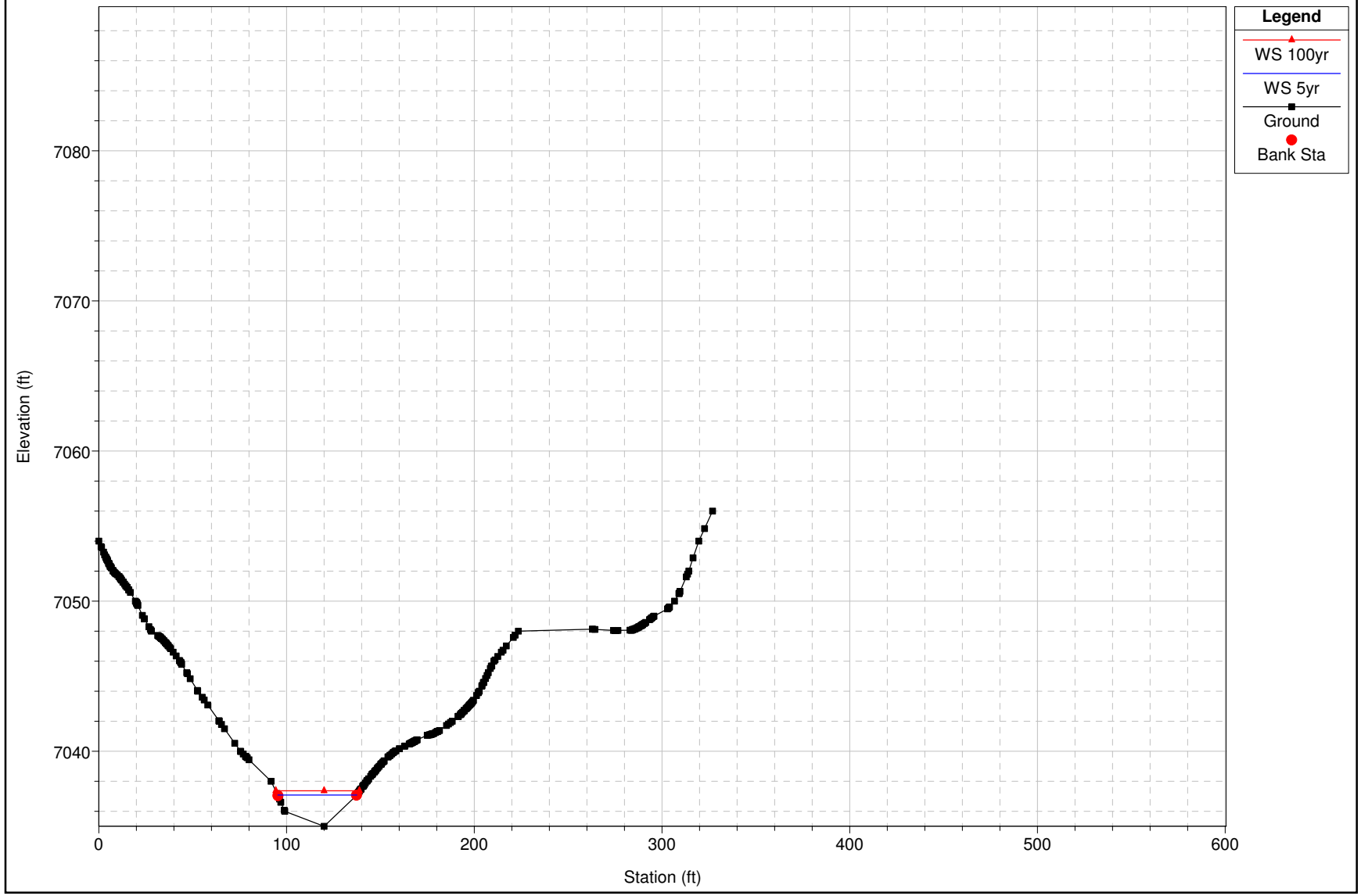
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

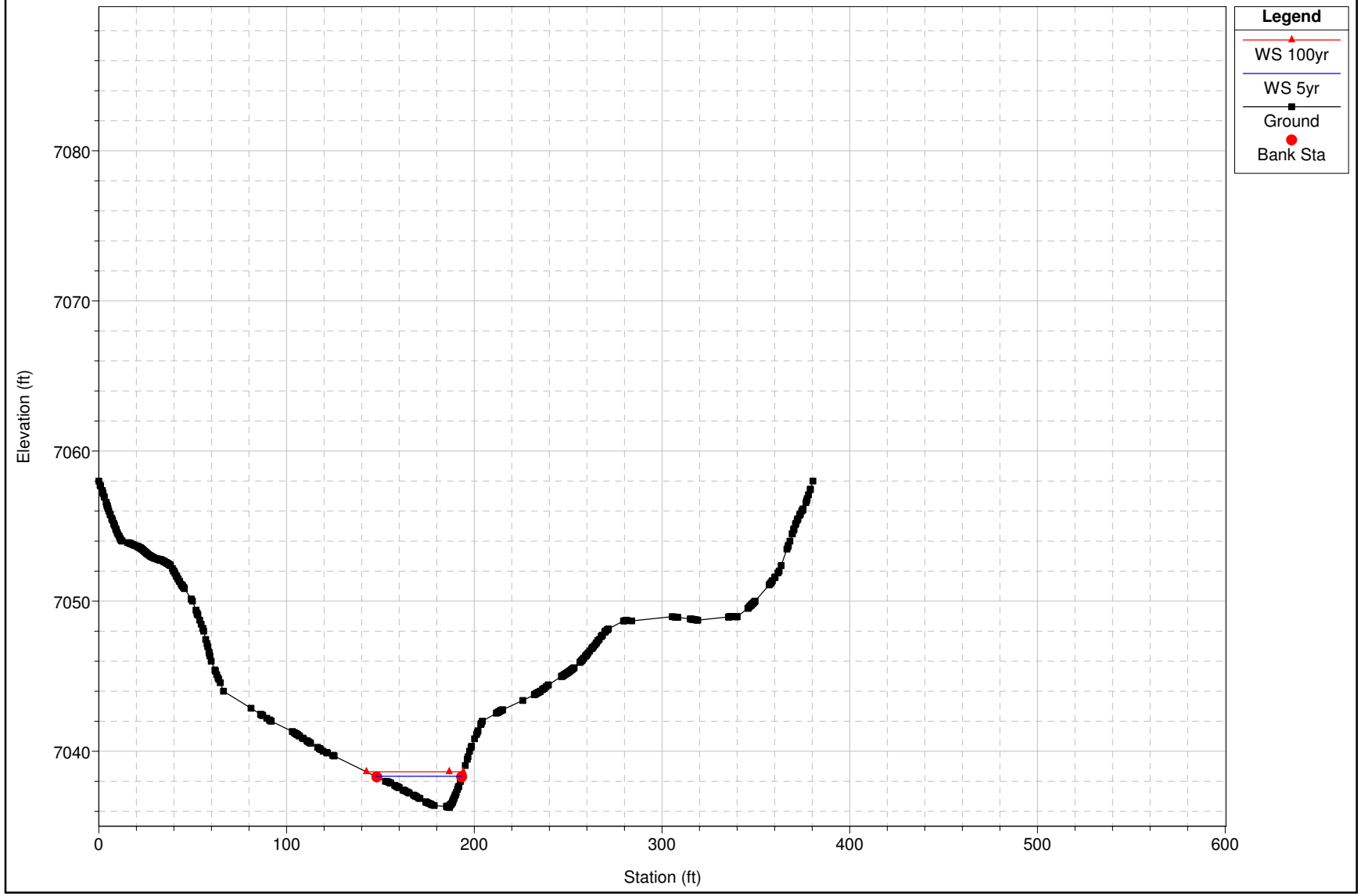
River = DP_1 Reach = reach_1 RS = 1150.00 coordinates at station 120 interpolated from topo



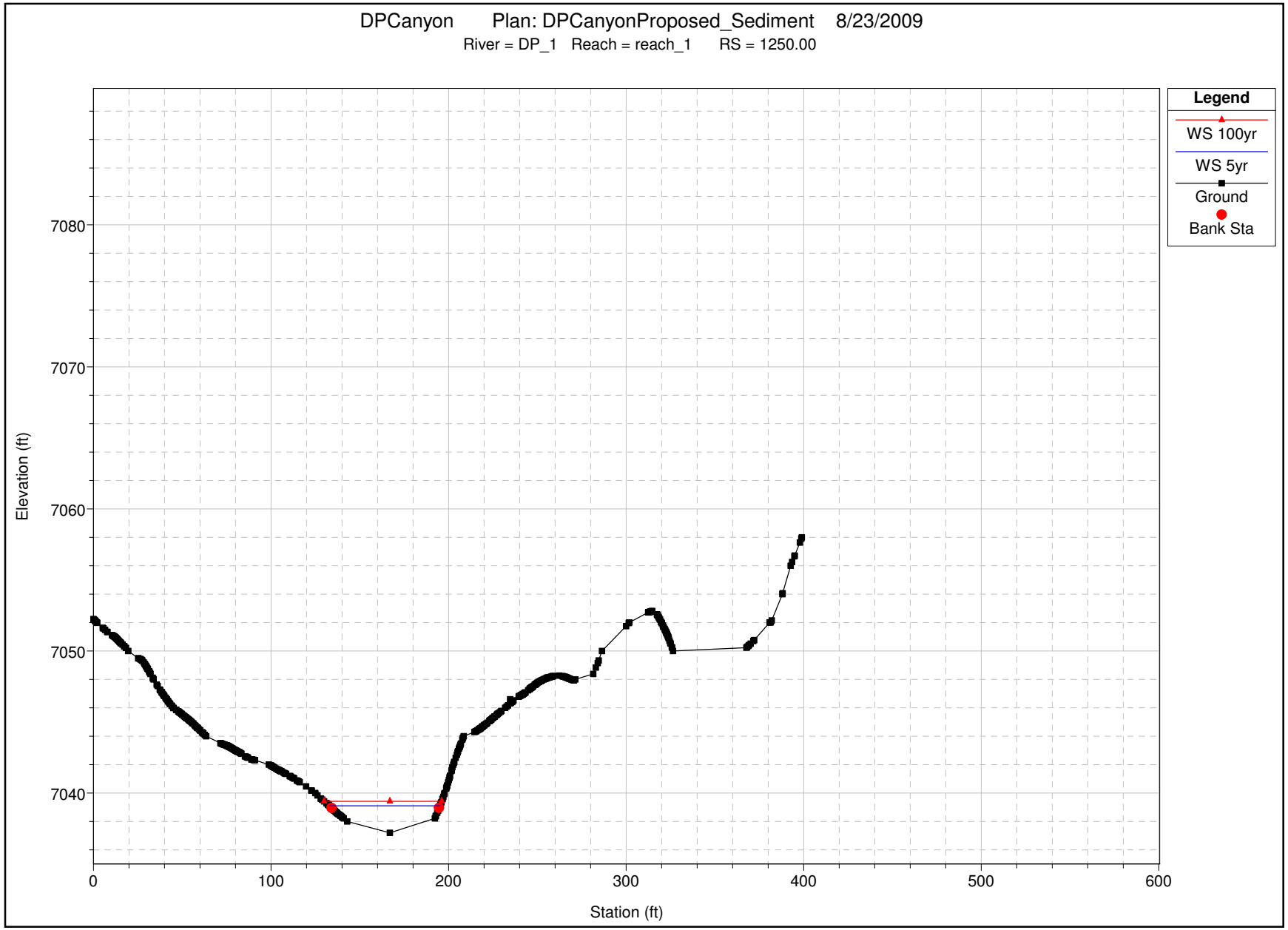
1 in Horiz. = 80 ft 1 in Vert. = 10 ft

DPCanyon Plan: DPCanyonProposed_Sediment 8/23/2009

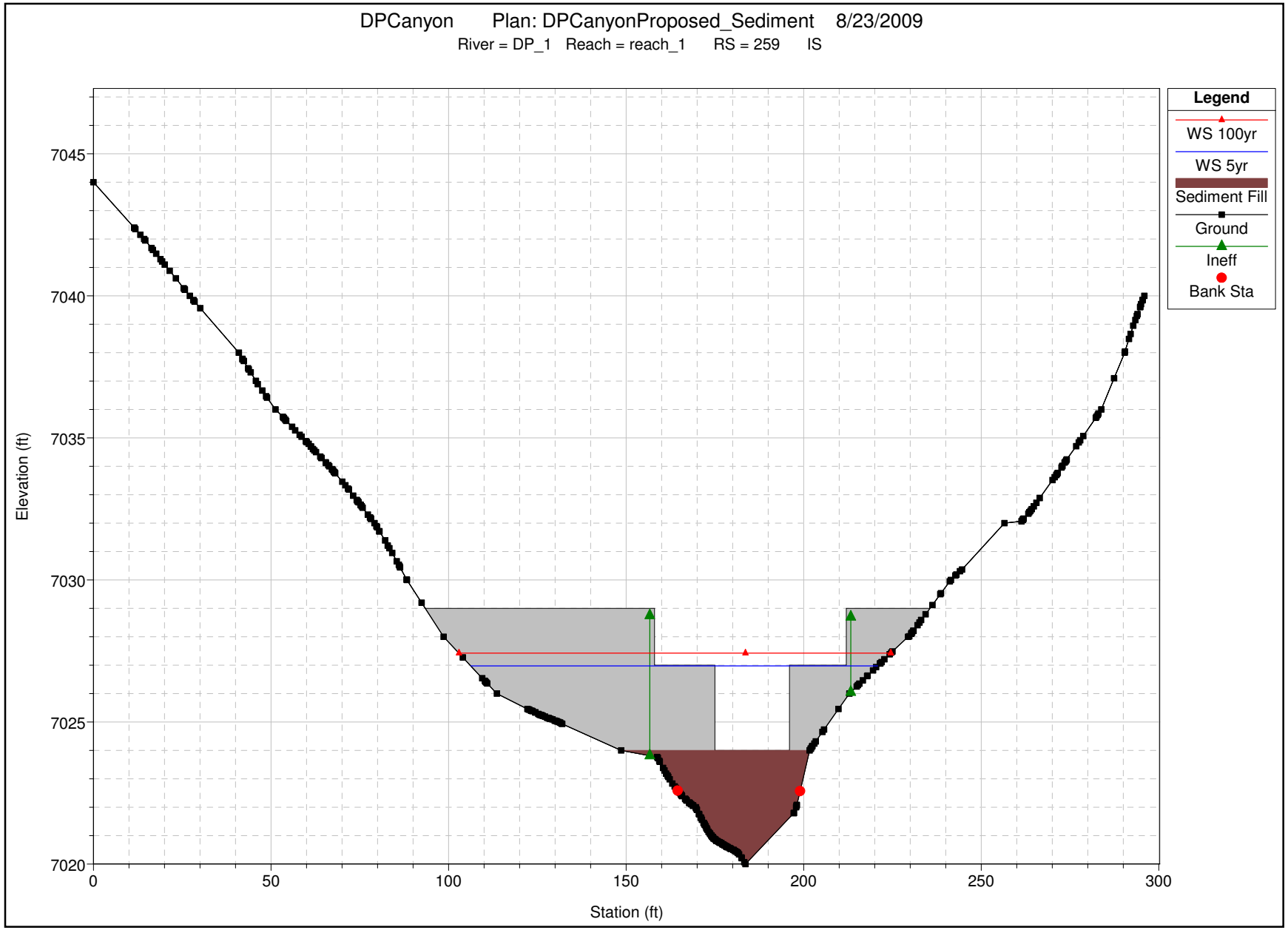
River = DP_1 Reach = reach_1 RS = 1200.00



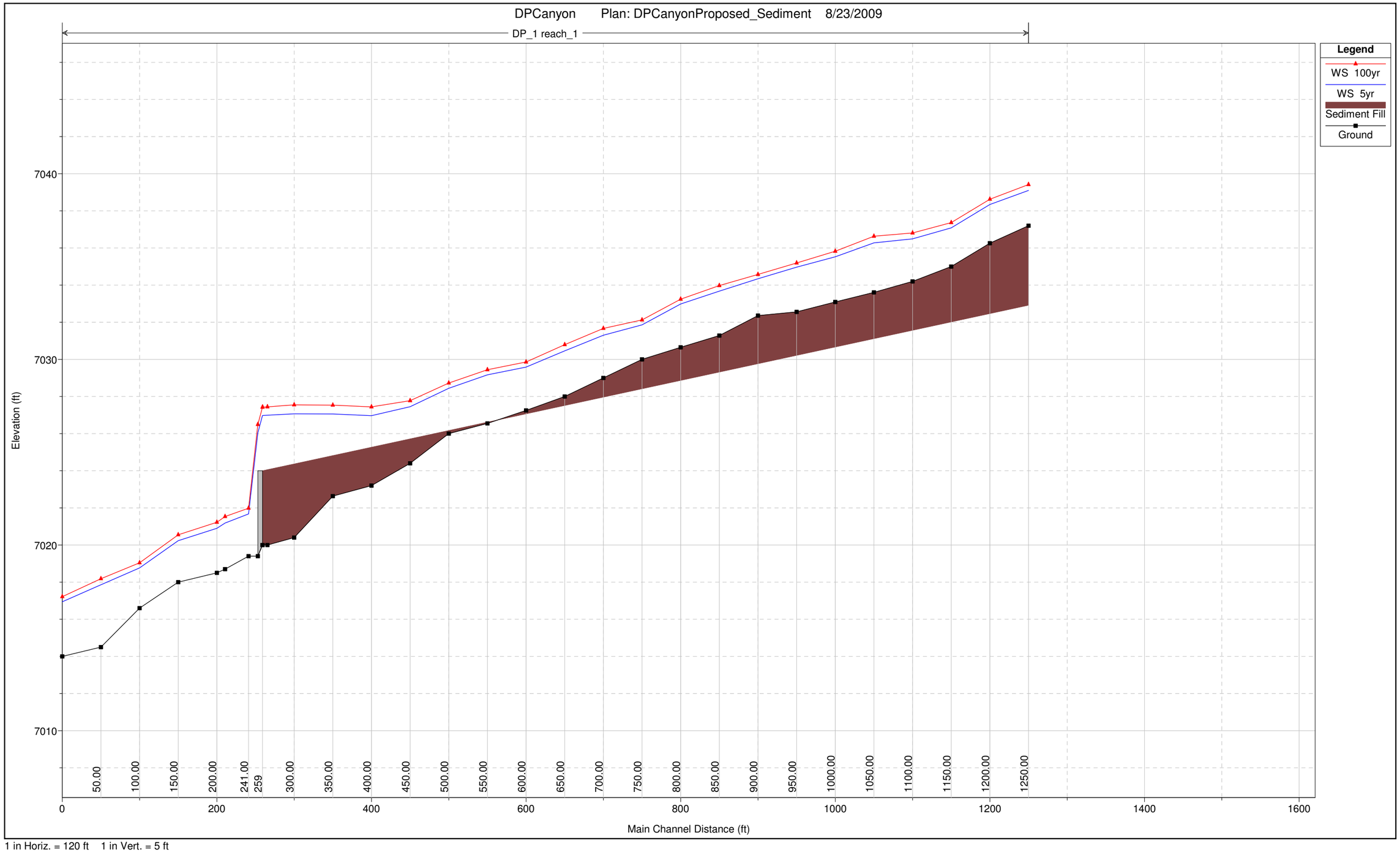
1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 80 ft 1 in Vert. = 10 ft



1 in Horiz. = 40 ft 1 in Vert. = 5 ft



1 in Horiz. = 120 ft 1 in Vert. = 5 ft

HEC-RAS Plan: DPCanyonProp_Sed River: DP_1 Reach: reach_1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	1250.00	5yr	343.00	7037.20	7039.10		7039.40	0.005640	4.40	78.16	62.23	0.68
reach_1	1250.00	100yr	465.00	7037.20	7039.41		7039.77	0.004992	4.78	98.32	66.19	0.67
reach_1	1200.00	5yr	343.00	7036.26	7038.34	7038.34	7038.96	0.012809	6.31	54.40	46.29	1.01
reach_1	1200.00	100yr	465.00	7036.26	7038.63	7038.63	7039.37	0.011560	6.91	68.35	51.61	1.00
reach_1	1150.00	5yr	343.00	7035.00	7037.08	7037.08	7037.72	0.012405	6.45	53.21	42.06	1.01
reach_1	1150.00	100yr	465.00	7035.00	7037.37	7037.37	7038.15	0.011519	7.12	65.71	44.58	1.00
reach_1	1100.00	5yr	343.00	7034.20	7036.49		7036.83	0.006065	4.72	72.77	54.26	0.71
reach_1	1100.00	100yr	465.00	7034.20	7036.81		7037.22	0.005478	5.16	90.58	56.23	0.70
reach_1	1050.00	5yr	343.00	7033.61	7036.27		7036.56	0.004376	4.29	80.13	55.82	0.62
reach_1	1050.00	100yr	465.00	7033.61	7036.63		7036.97	0.003937	4.69	101.52	63.40	0.60
reach_1	1000.00	5yr	343.00	7033.09	7035.53	7035.53	7036.18	0.012222	6.48	52.95	42.09	1.00
reach_1	1000.00	100yr	465.00	7033.09	7035.82	7035.82	7036.61	0.011332	7.15	66.07	47.13	1.00
reach_1	950.00	5yr	343.00	7032.56	7034.96	7034.62	7035.30	0.005905	4.67	73.52	54.79	0.70
reach_1	950.00	100yr	465.00	7032.56	7035.19	7034.91	7035.65	0.006424	5.40	86.67	58.64	0.75
reach_1	900.00	5yr	343.00	7032.36	7034.34	7034.34	7034.86	0.013307	5.77	59.44	59.40	1.01
reach_1	900.00	100yr	465.00	7032.36	7034.58	7034.58	7035.20	0.012194	6.34	74.45	67.66	1.00
reach_1	850.00	5yr	343.00	7031.28	7033.68		7033.93	0.004257	4.03	85.24	63.26	0.60
reach_1	850.00	100yr	465.00	7031.28	7033.97		7034.29	0.004104	4.50	105.03	70.25	0.61
reach_1	800.00	5yr	343.00	7030.65	7032.99	7032.99	7033.55	0.012974	6.04	56.88	53.66	1.01
reach_1	800.00	100yr	465.00	7030.65	7033.24	7033.24	7033.92	0.011856	6.64	71.70	61.49	1.00
reach_1	750.00	5yr	343.00	7030.00	7031.86	7031.86	7032.42	0.013407	6.00	57.21	55.16	1.02
reach_1	750.00	100yr	465.00	7030.00	7032.12	7032.12	7032.78	0.011751	6.51	72.95	63.55	0.99
reach_1	700.00	5yr	343.00	7029.00	7031.30		7031.55	0.004711	4.01	85.59	68.47	0.62
reach_1	700.00	100yr	465.00	7029.00	7031.67		7031.94	0.003727	4.22	112.07	75.60	0.58
reach_1	650.00	5yr	343.00	7028.00	7030.46	7030.46	7031.15	0.012144	6.67	51.66	41.93	1.00
reach_1	650.00	100yr	465.00	7028.00	7030.79	7030.79	7031.60	0.010609	7.22	67.72	53.50	0.97
reach_1	600.00	5yr	343.00	7027.25	7029.58	7029.58	7030.17	0.013280	6.18	55.59	50.89	1.02
reach_1	600.00	100yr	465.00	7027.25	7029.86	7029.86	7030.56	0.011777	6.73	70.47	57.38	1.00
reach_1	550.00	5yr	343.00	7026.62	7029.17		7029.54	0.007173	4.91	70.00	57.60	0.77
reach_1	550.00	100yr	465.00	7026.62	7029.44	7029.19	7029.90	0.006818	5.45	87.01	65.71	0.77
reach_1	500.00	5yr	343.00	7026.17	7028.44	7028.44	7029.05	0.012831	6.25	55.00	49.07	1.01
reach_1	500.00	100yr	465.00	7026.17	7028.73	7028.73	7029.44	0.011421	6.80	70.45	59.50	0.99
reach_1	450.00	5yr	343.00	7025.72	7027.45	7027.45	7028.10	0.011635	6.50	54.19	47.07	0.99
reach_1	450.00	100yr	465.00	7025.72	7027.77	7027.77	7028.53	0.010263	7.04	70.78	55.77	0.96
reach_1	400.00	5yr	343.00	7025.27	7026.97		7027.33	0.005706	4.88	78.51	64.77	0.70
reach_1	400.00	100yr	465.00	7025.27	7027.44		7027.79	0.004042	4.93	110.32	70.94	0.62
reach_1	350.00	5yr	343.00	7024.82	7027.06		7027.15	0.000940	2.56	175.60	109.64	0.30
reach_1	350.00	100yr	465.00	7024.82	7027.53		7027.64	0.000846	2.77	230.17	119.88	0.30
reach_1	300.00	5yr	343.00	7024.37	7027.07		7027.11	0.000330	1.75	275.97	127.26	0.19
reach_1	300.00	100yr	465.00	7024.37	7027.55		7027.60	0.000340	1.97	338.40	133.90	0.20
reach_1	265.39	5yr	343.00	7024.06	7026.99	7025.31	7027.09	0.000751	2.78	165.93	112.12	0.29
reach_1	265.39	100yr	465.00	7024.06	7027.44	7025.59	7027.57	0.000847	3.25	193.06	119.79	0.31
reach_1	259.30	5yr	343.00	7024.00	7026.98	7025.29	7027.08	0.000741	2.79	156.33	114.55	0.29
reach_1	259.30	100yr	465.00	7024.00	7027.42	7025.55	7027.56	0.000842	3.26	181.62	121.64	0.31
reach_1	259		Inl Struct									
reach_1	241.00	5yr	343.00	7019.40	7021.68		7022.26	0.007981	6.16	55.72	33.25	0.84
reach_1	241.00	100yr	465.00	7019.40	7021.98	7021.81	7022.75	0.008368	7.05	66.17	34.74	0.88
reach_1	210.58	5yr	343.00	7018.70	7021.18	7021.18	7021.95	0.012038	7.03	48.83	33.56	1.02
reach_1	210.58	100yr	465.00	7018.70	7021.54	7021.54	7022.45	0.010818	7.68	61.23	36.32	1.00
reach_1	200.00	5yr	343.00	7018.50	7020.90	7020.90	7021.64	0.012044	6.91	49.63	34.35	1.01
reach_1	200.00	100yr	465.00	7018.50	7021.23	7021.23	7022.13	0.011192	7.63	61.26	36.30	1.01

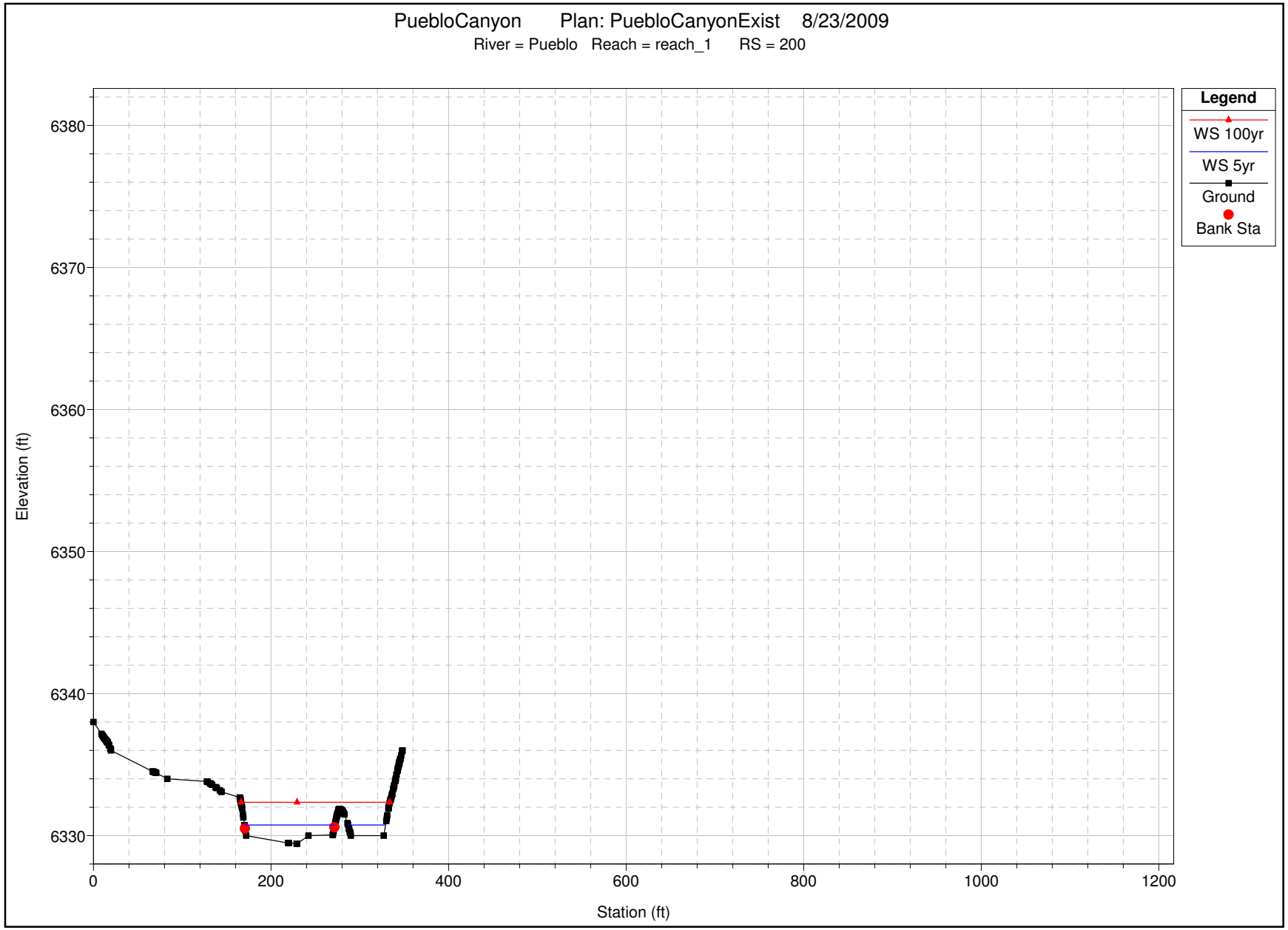
HEC-RAS Plan: DPCanyonProp_Sed River: DP_1 Reach: reach_1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	150.00	5yr	343.00	7018.00	7020.23	7020.23	7020.92	0.012103	6.64	51.63	38.26	1.00
reach_1	150.00	100yr	465.00	7018.00	7020.55	7020.55	7021.37	0.011054	7.27	64.66	42.79	0.99
reach_1	100.00	5yr	343.00	7016.60	7018.76	7018.76	7019.40	0.012255	6.42	53.41	41.97	1.00
reach_1	100.00	100yr	465.00	7016.60	7019.04	7019.04	7019.83	0.011644	7.14	65.49	44.36	1.01
reach_1	50.00	5yr	343.00	7014.50	7017.85	7017.85	7018.54	0.012459	6.64	51.67	38.57	1.01
reach_1	50.00	100yr	465.00	7014.50	7018.18	7018.18	7018.98	0.011618	7.17	65.04	42.67	1.00
reach_1	0.00	5yr	343.00	7014.00	7016.94	7016.94	7017.57	0.012359	6.36	54.07	45.11	1.00
reach_1	0.00	100yr	465.00	7014.00	7017.21	7017.21	7017.98	0.011638	7.05	67.16	49.35	1.00

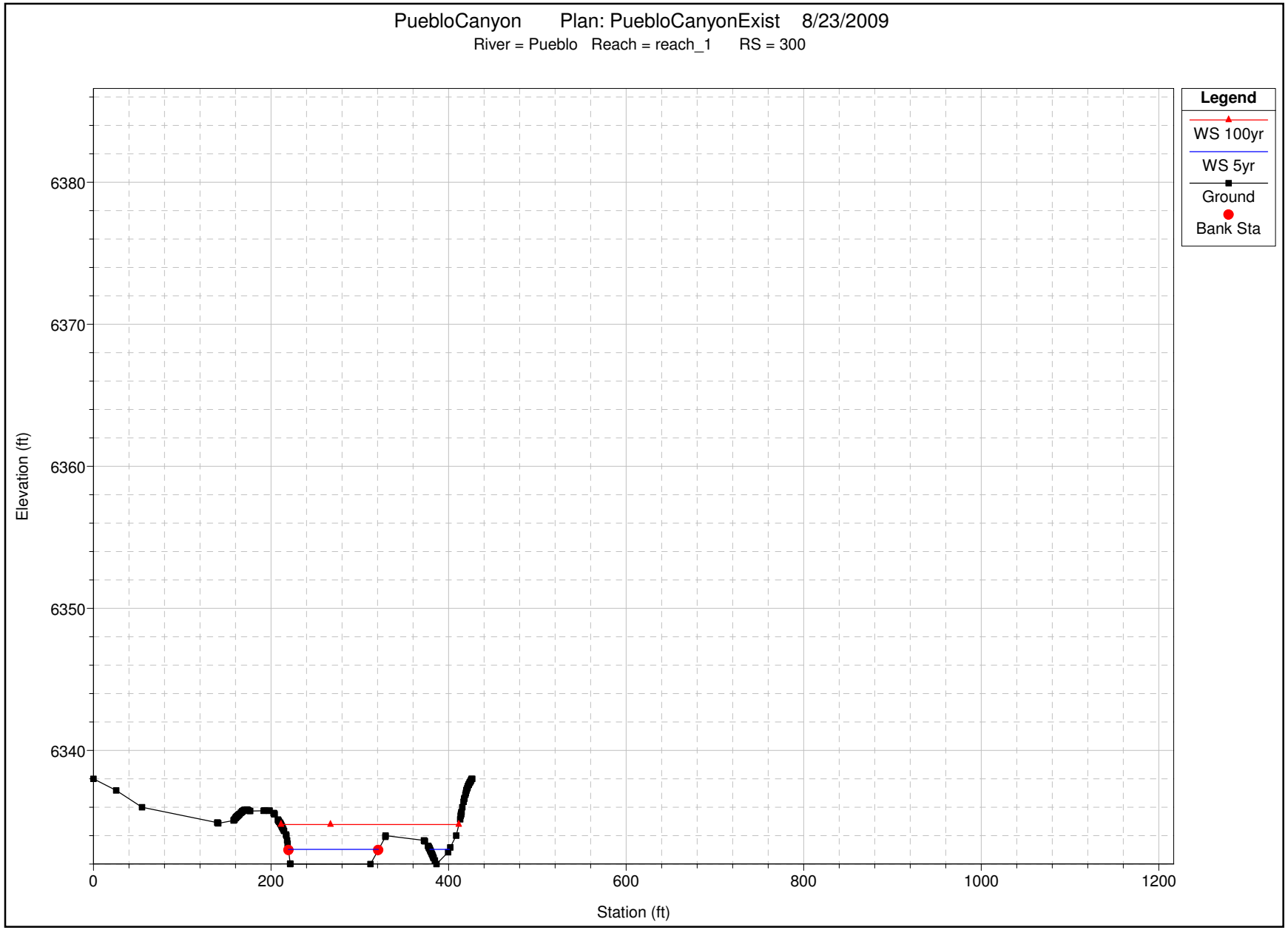
Pueblo Canyon

Existing Conditions

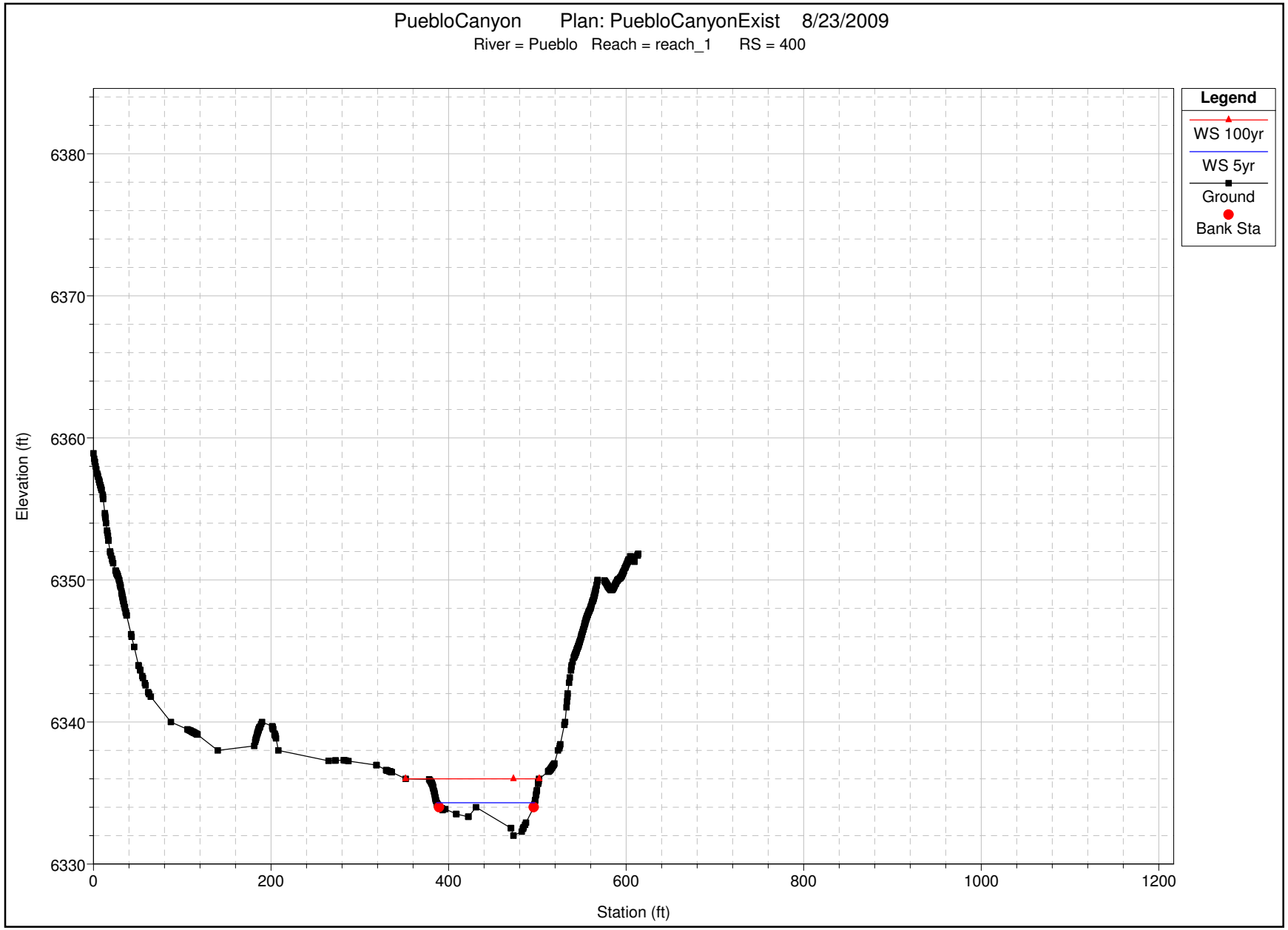
1 in Horiz. = 250 ft 1 in Vert. = 250 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



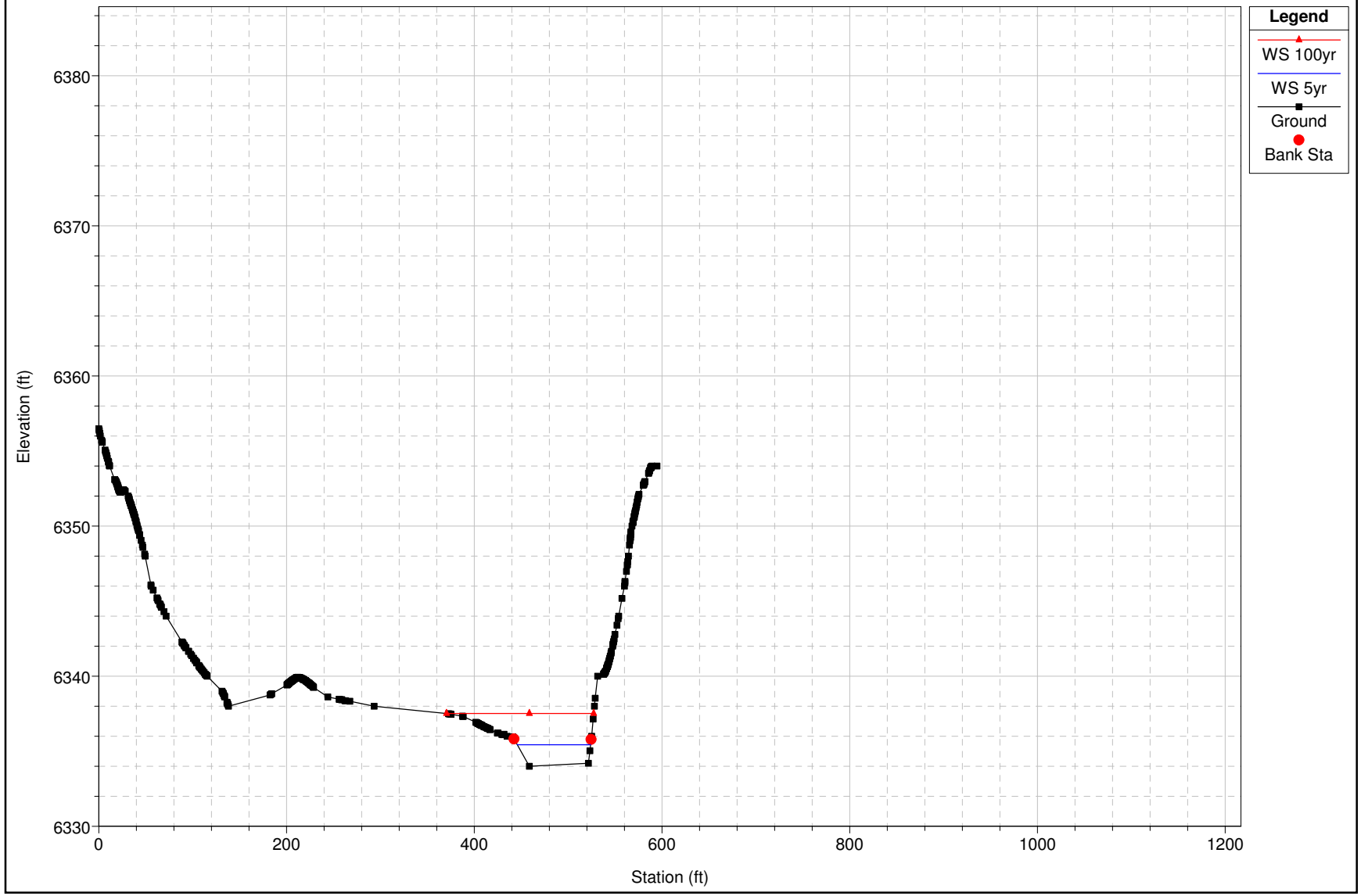
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



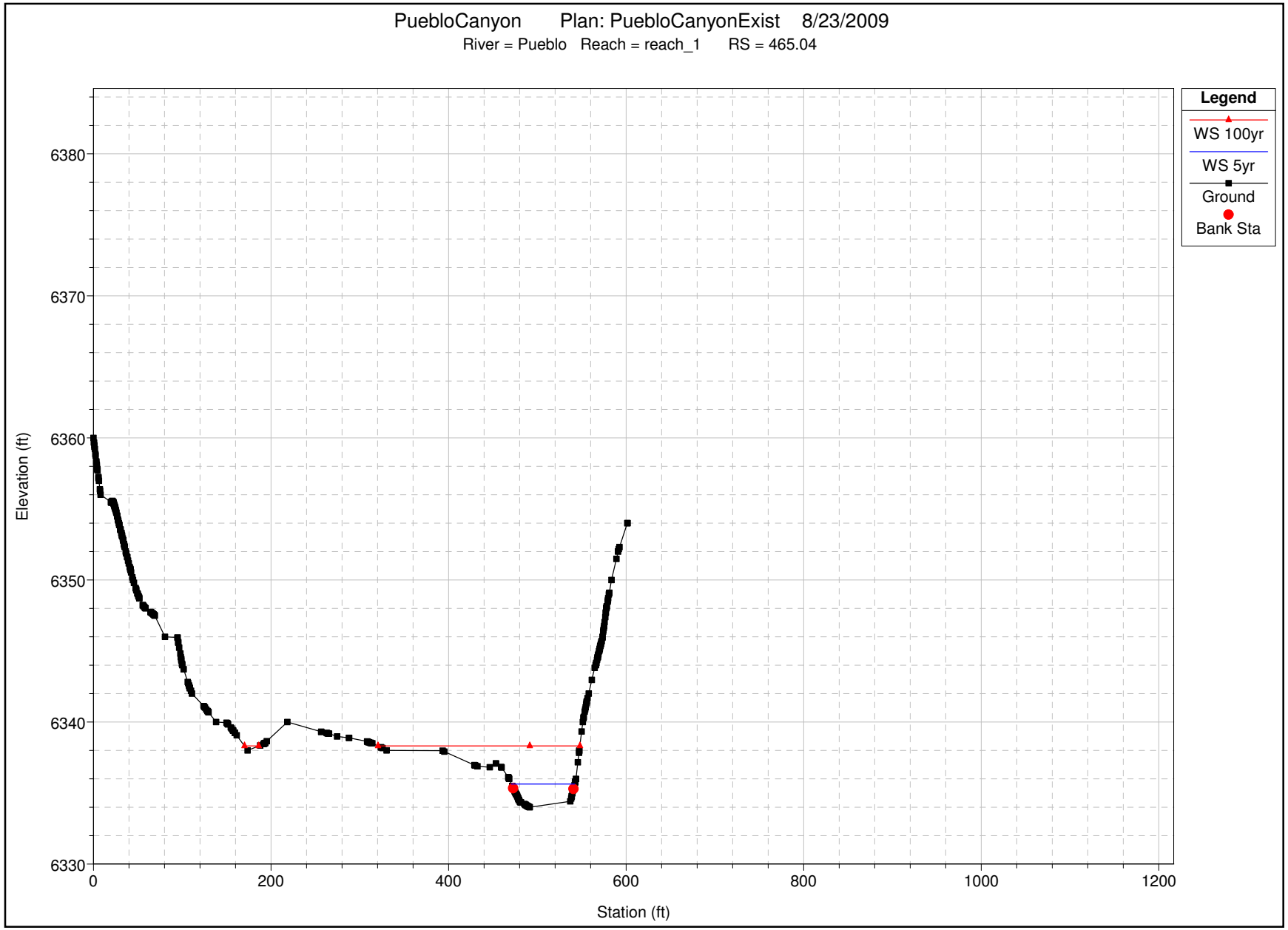
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

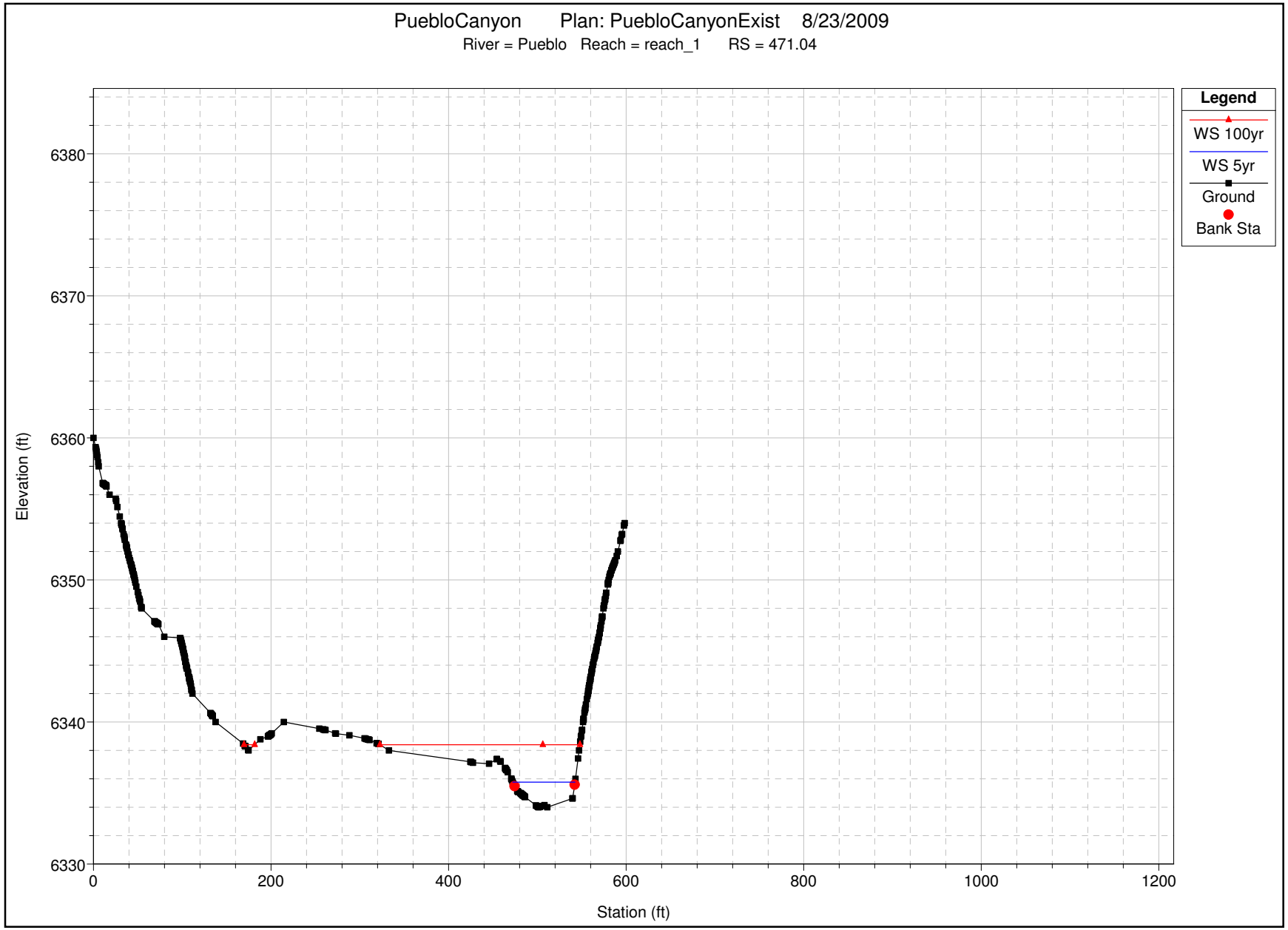
River = Pueblo Reach = reach_1 RS = 446.95



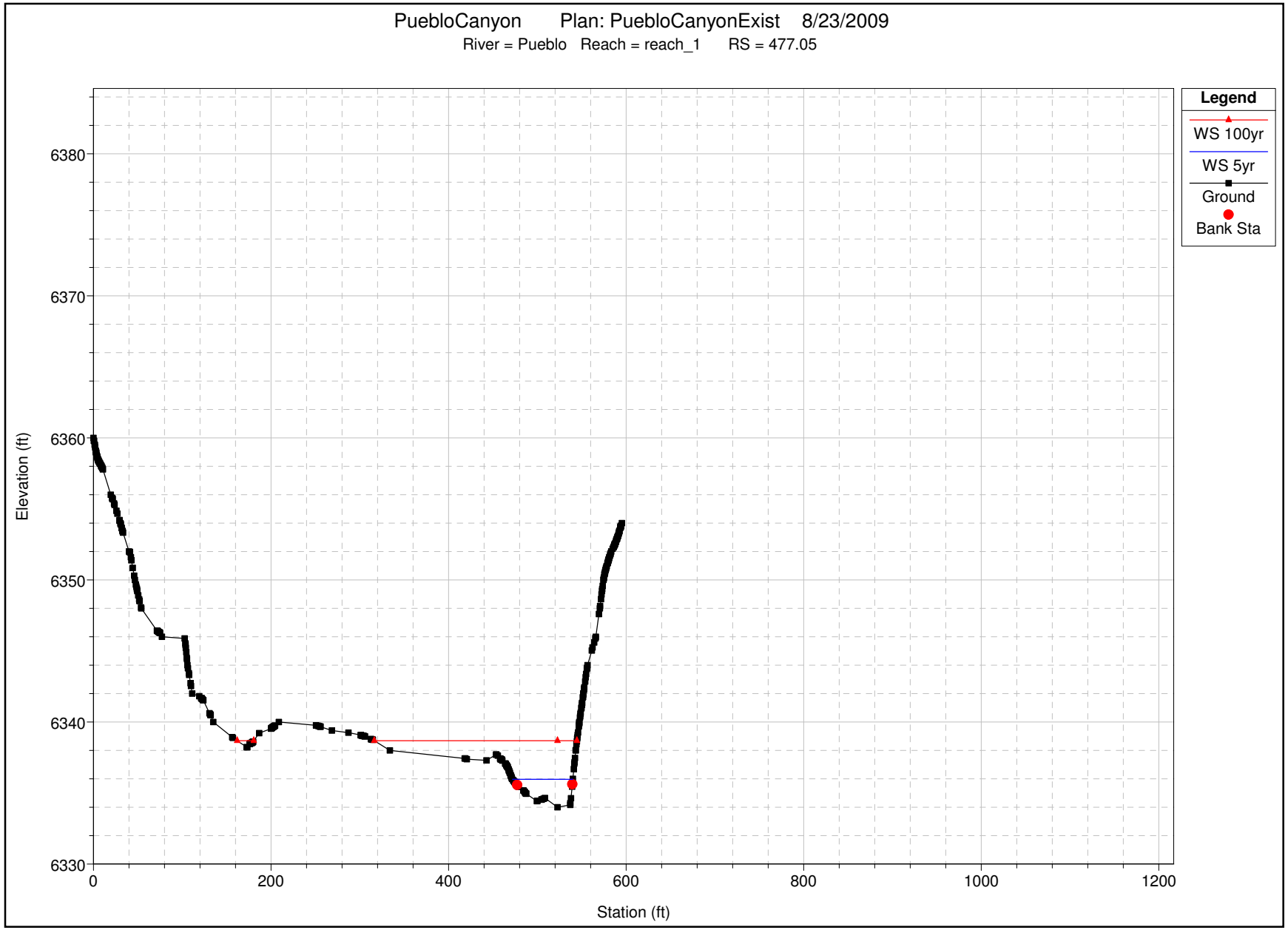
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



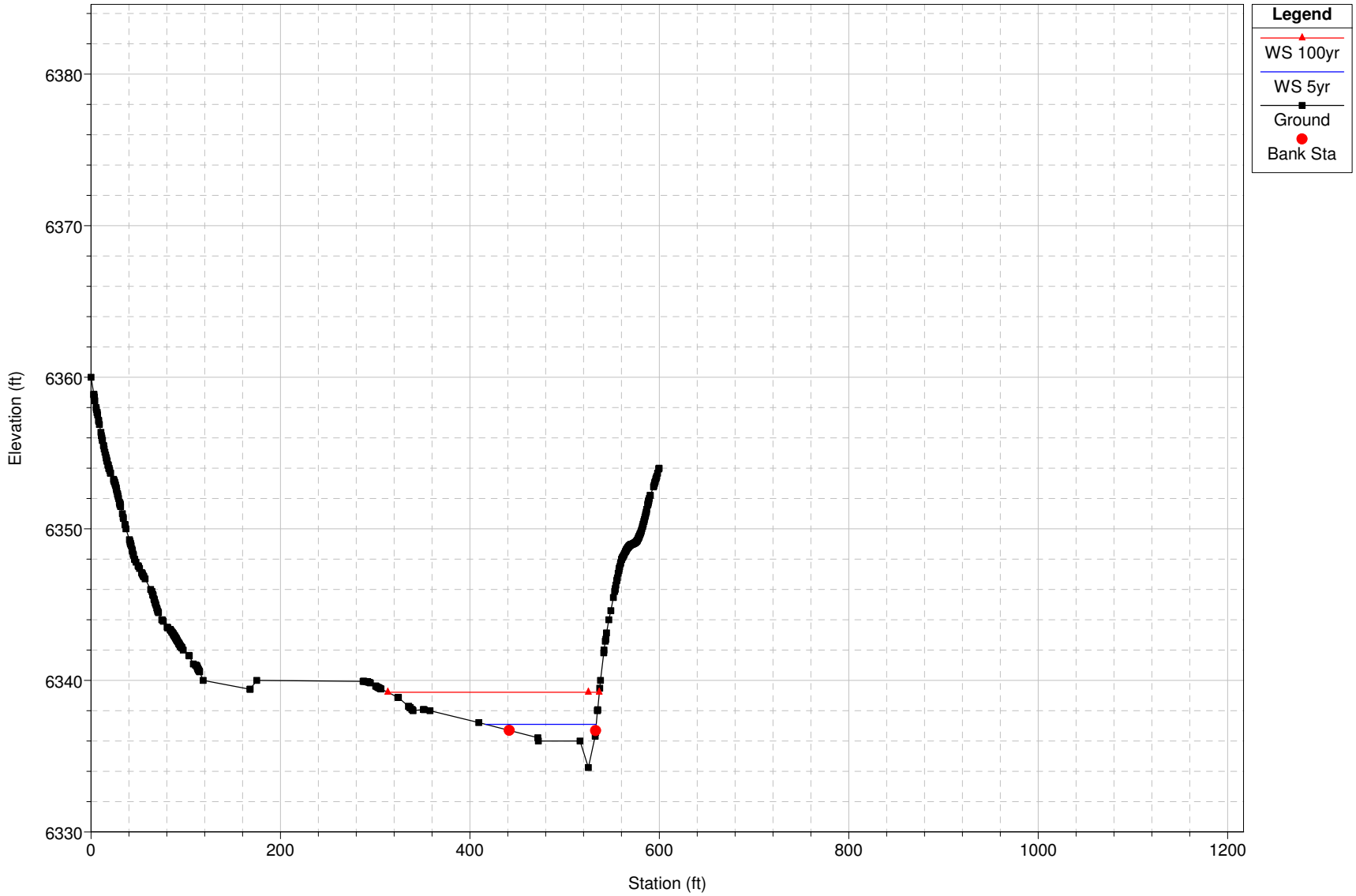
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



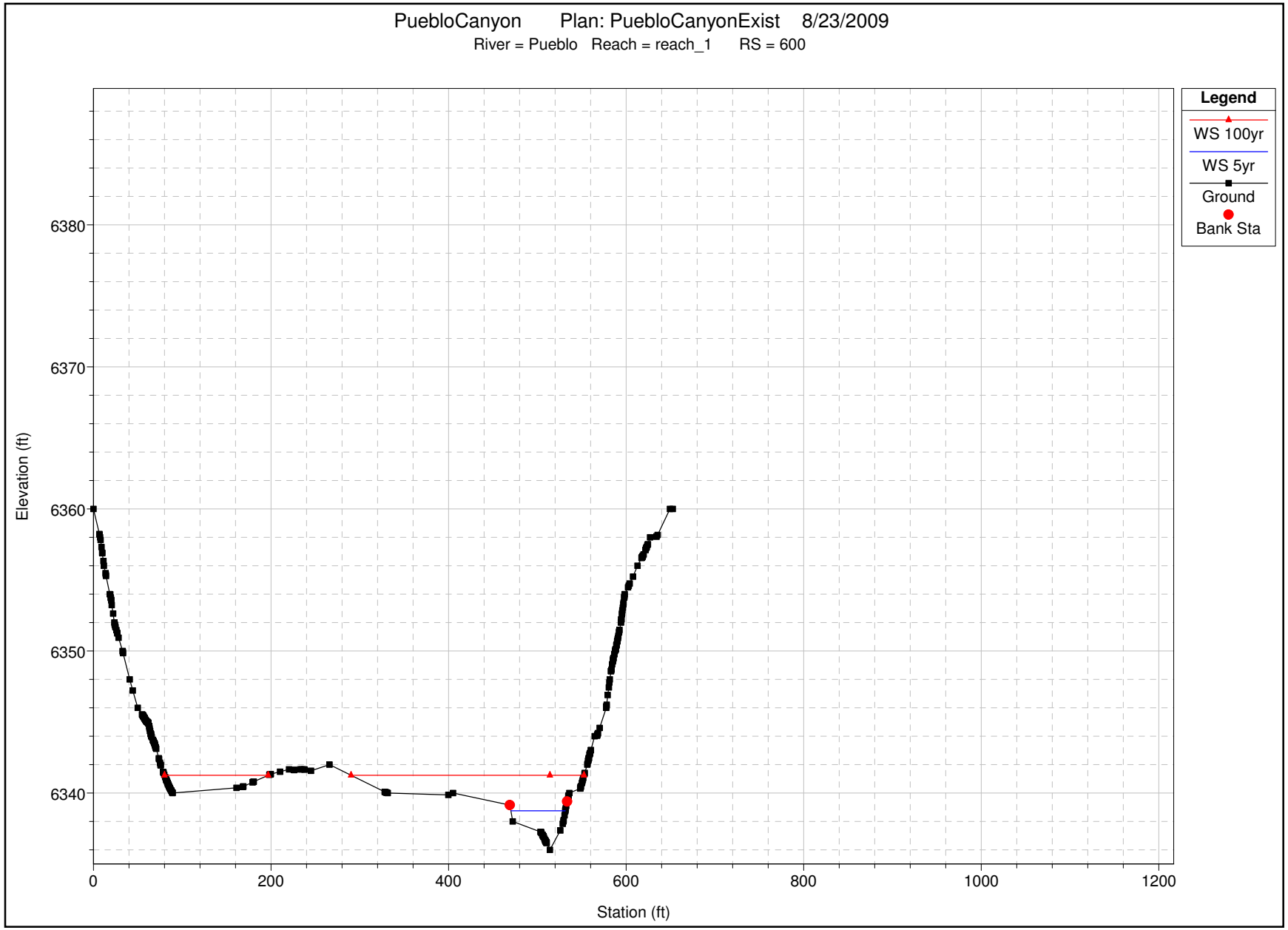
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

River = Pueblo Reach = reach_1 RS = 500 coordinate at station 525 interpolated from topo



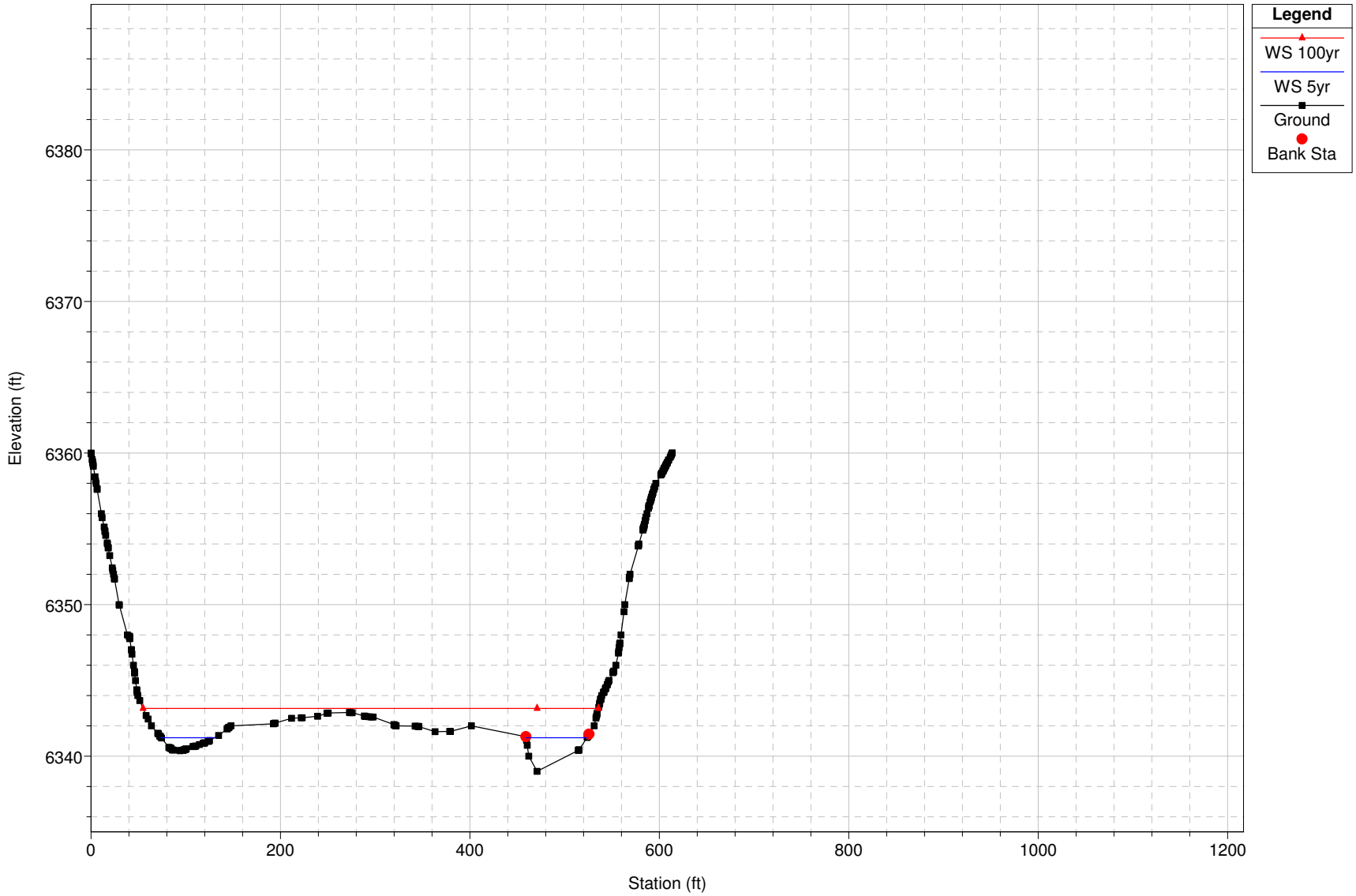
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



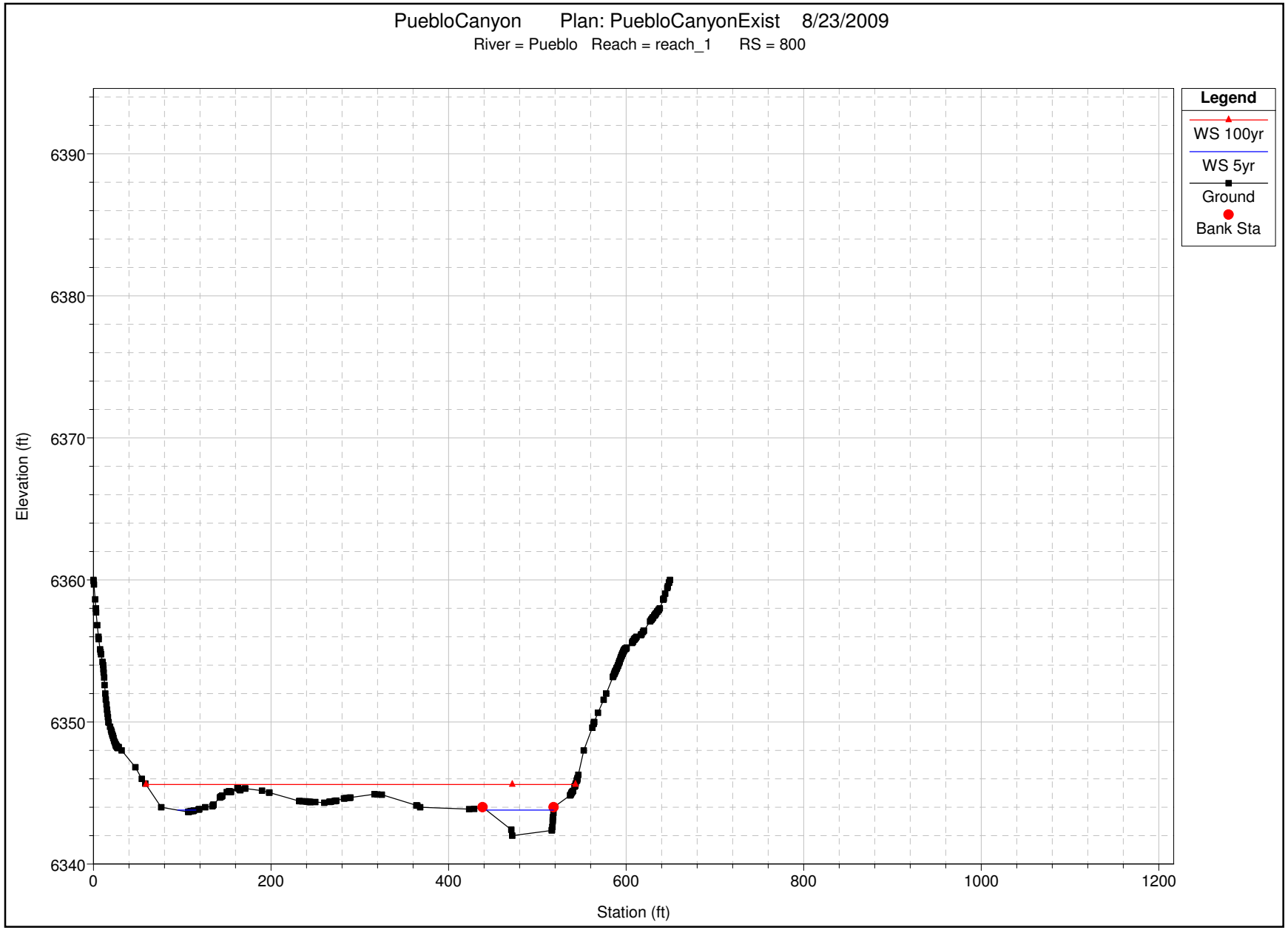
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

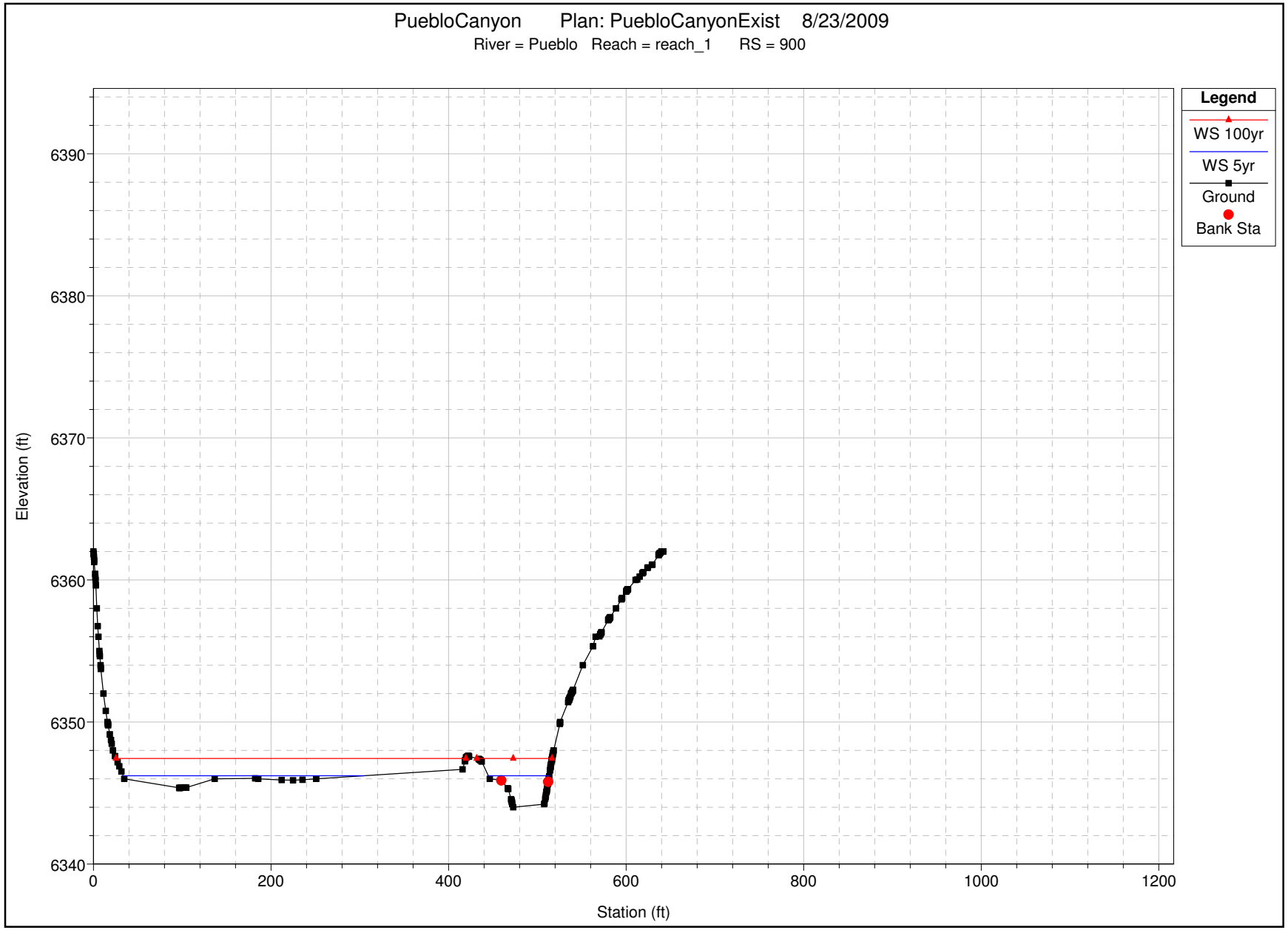
River = Pueblo Reach = reach_1 RS = 700 coordinate at station 471 interpolated from topo



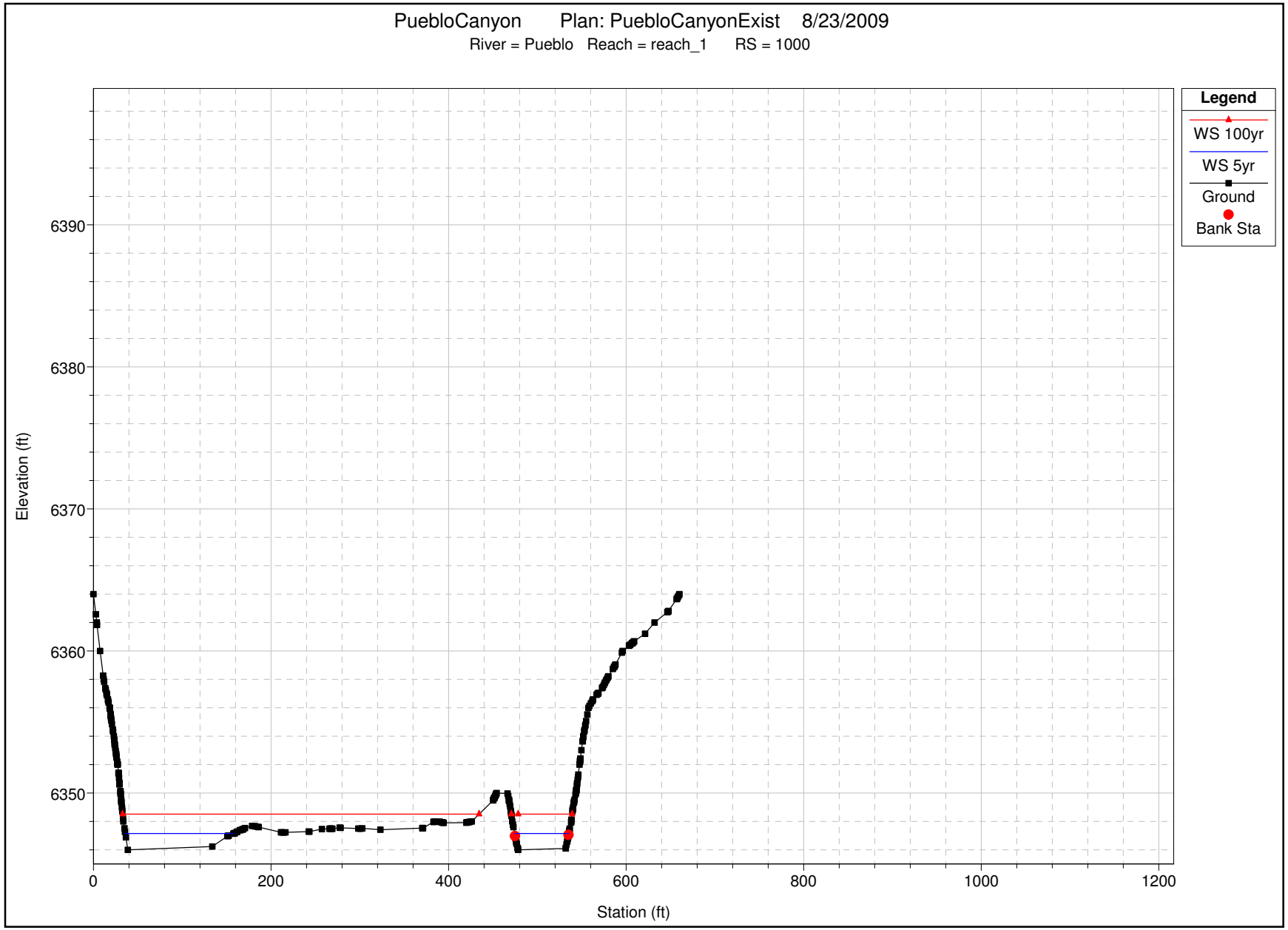
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



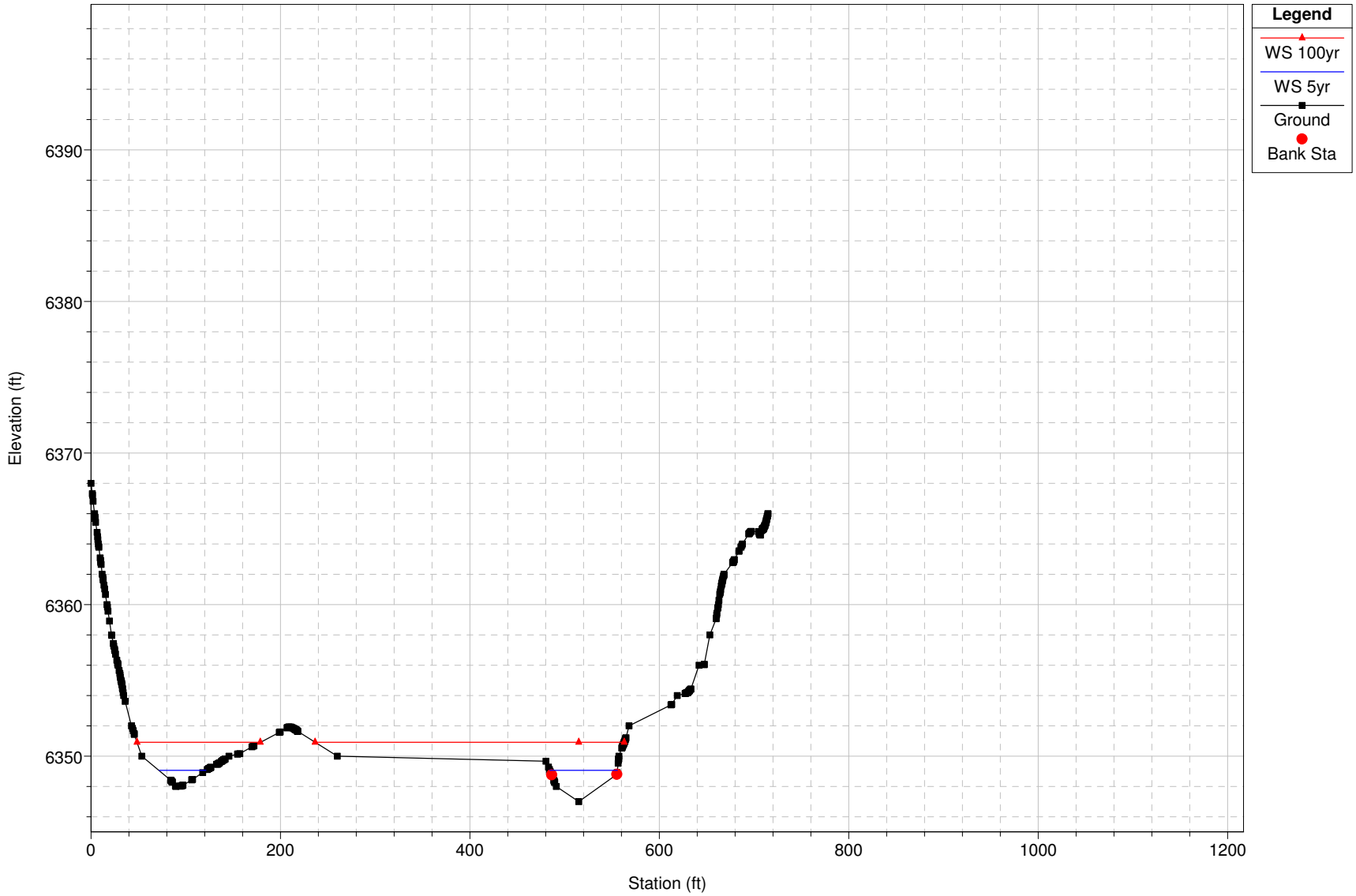
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



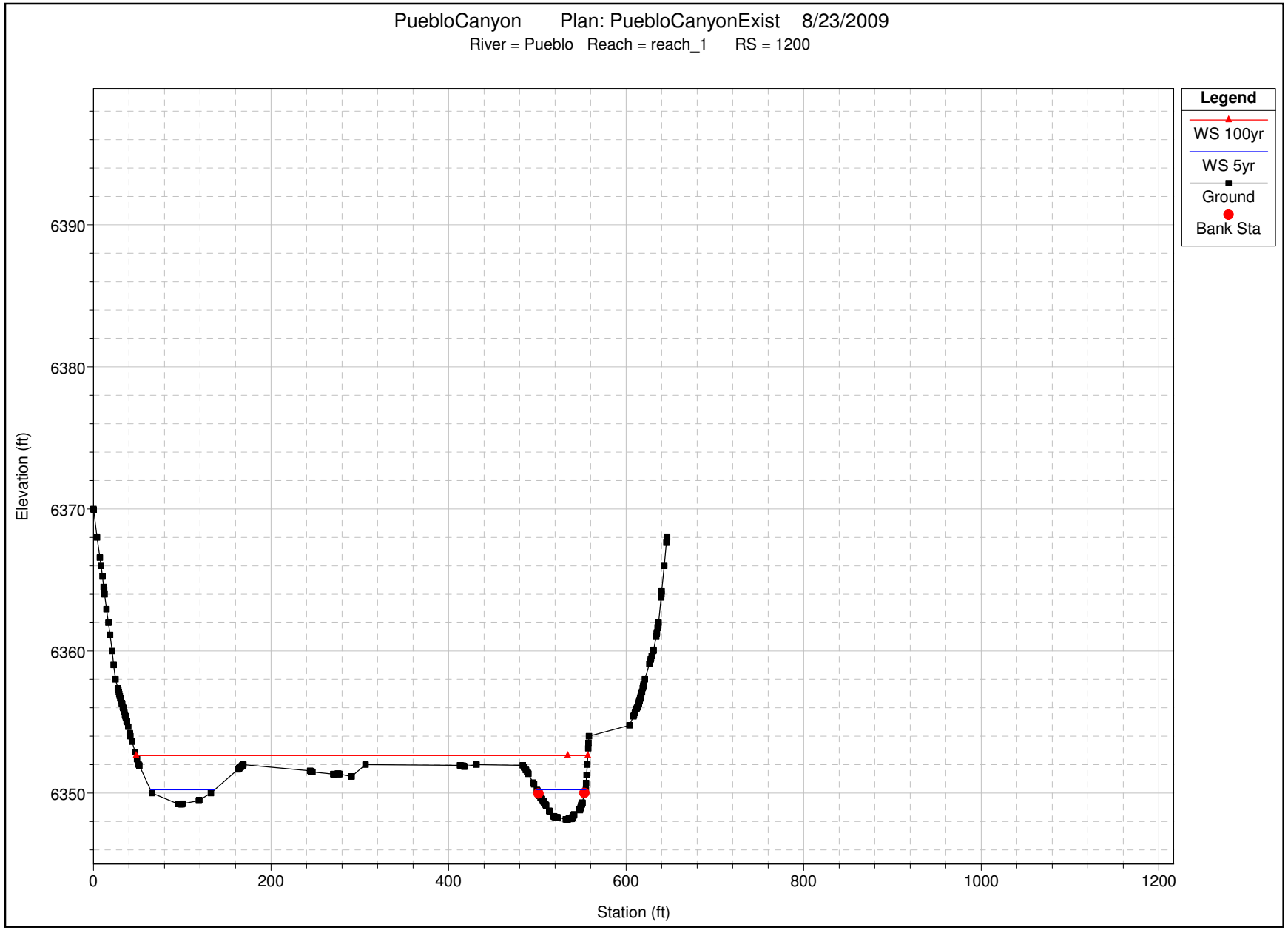
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

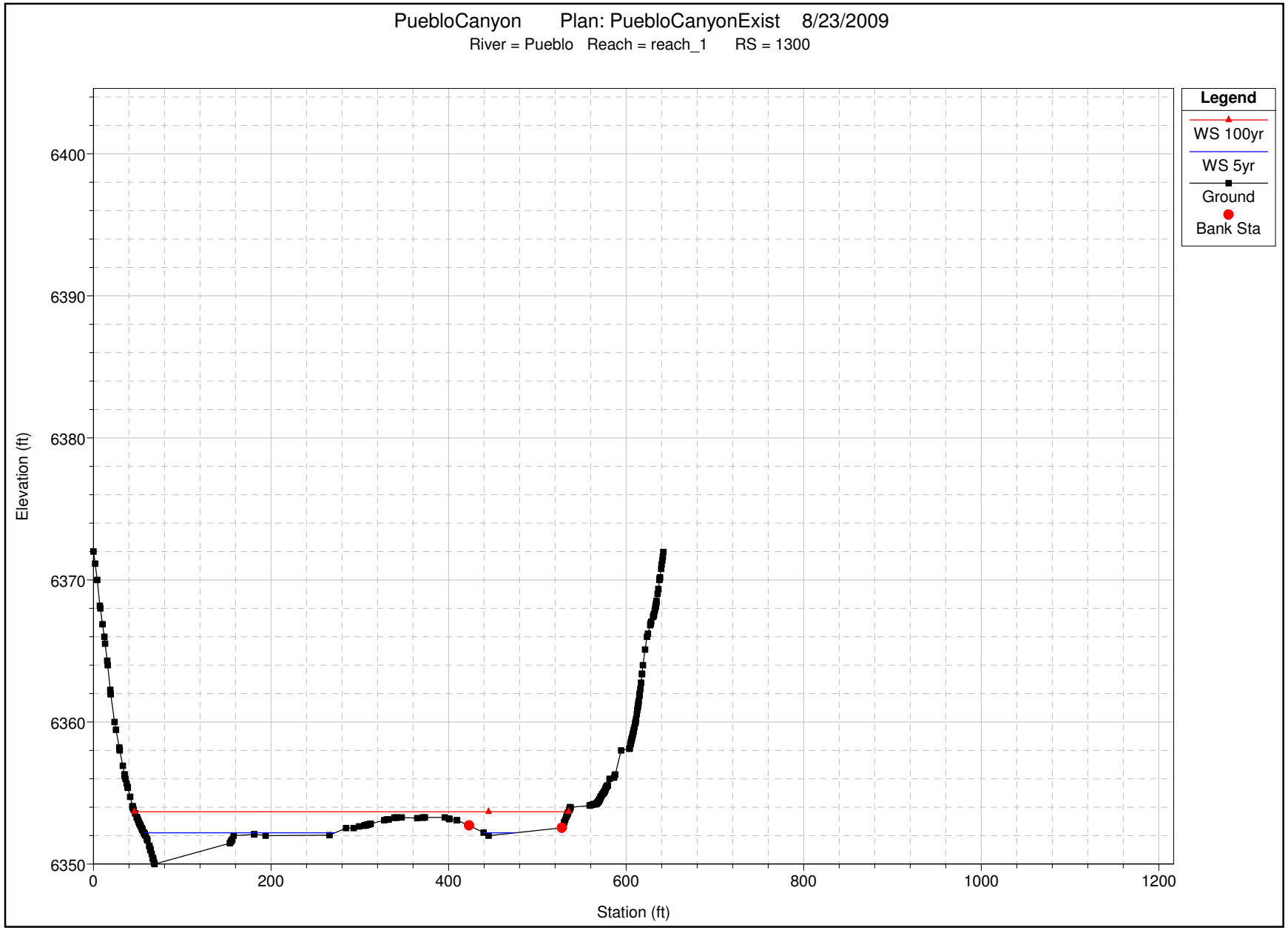
River = Pueblo Reach = reach_1 RS = 1100 coordinate at station 515 interpolated from topo



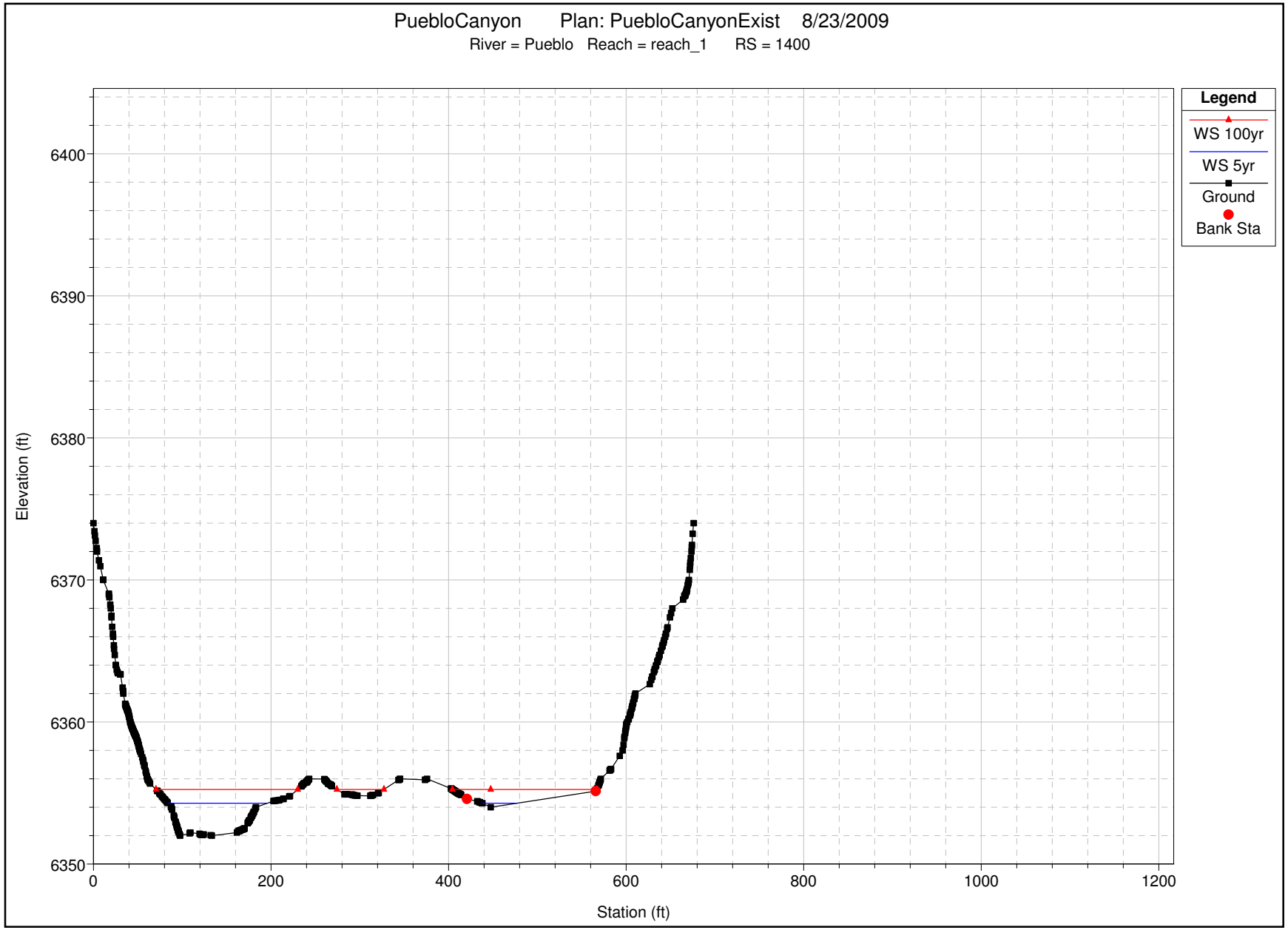
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



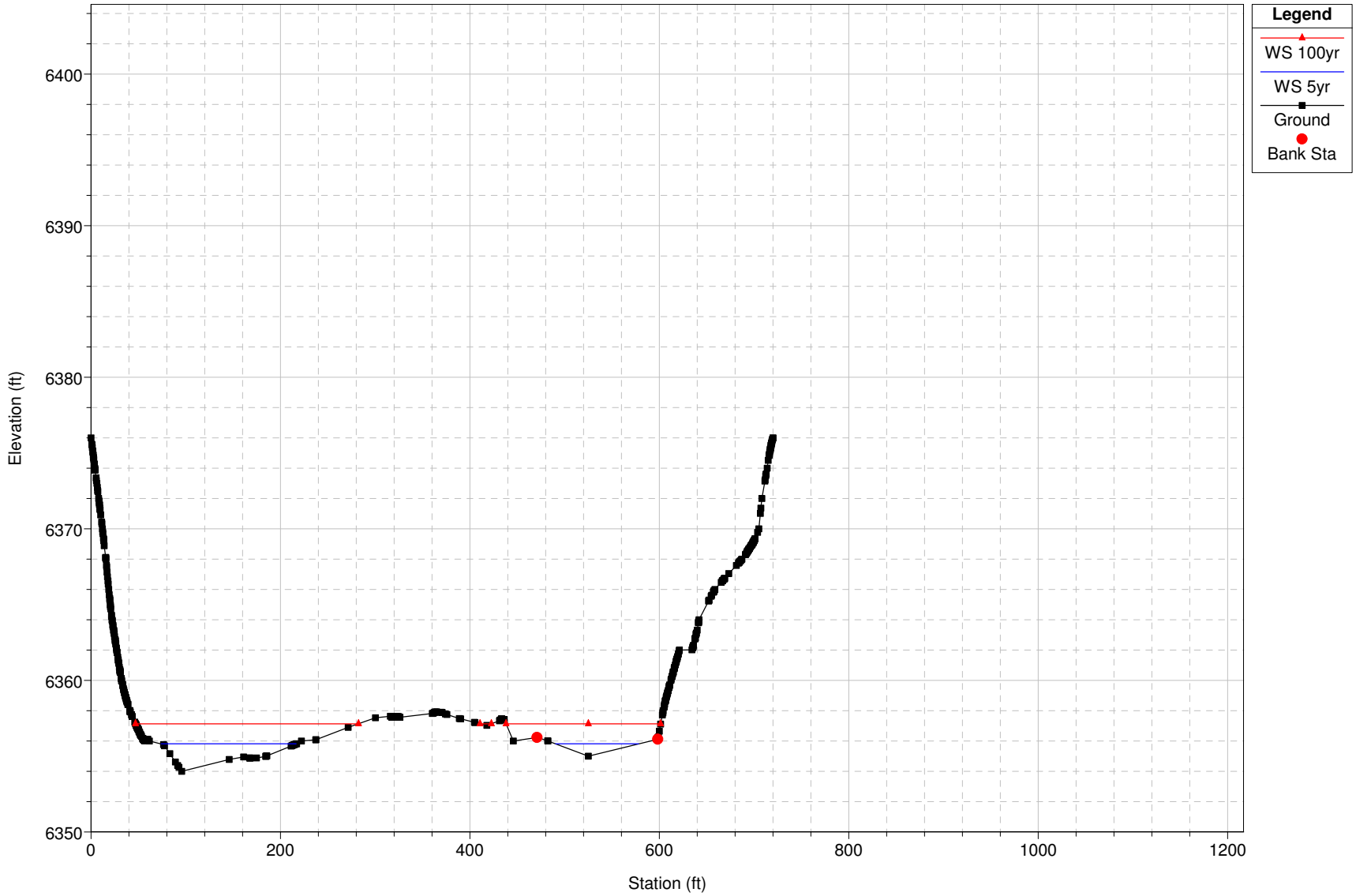
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



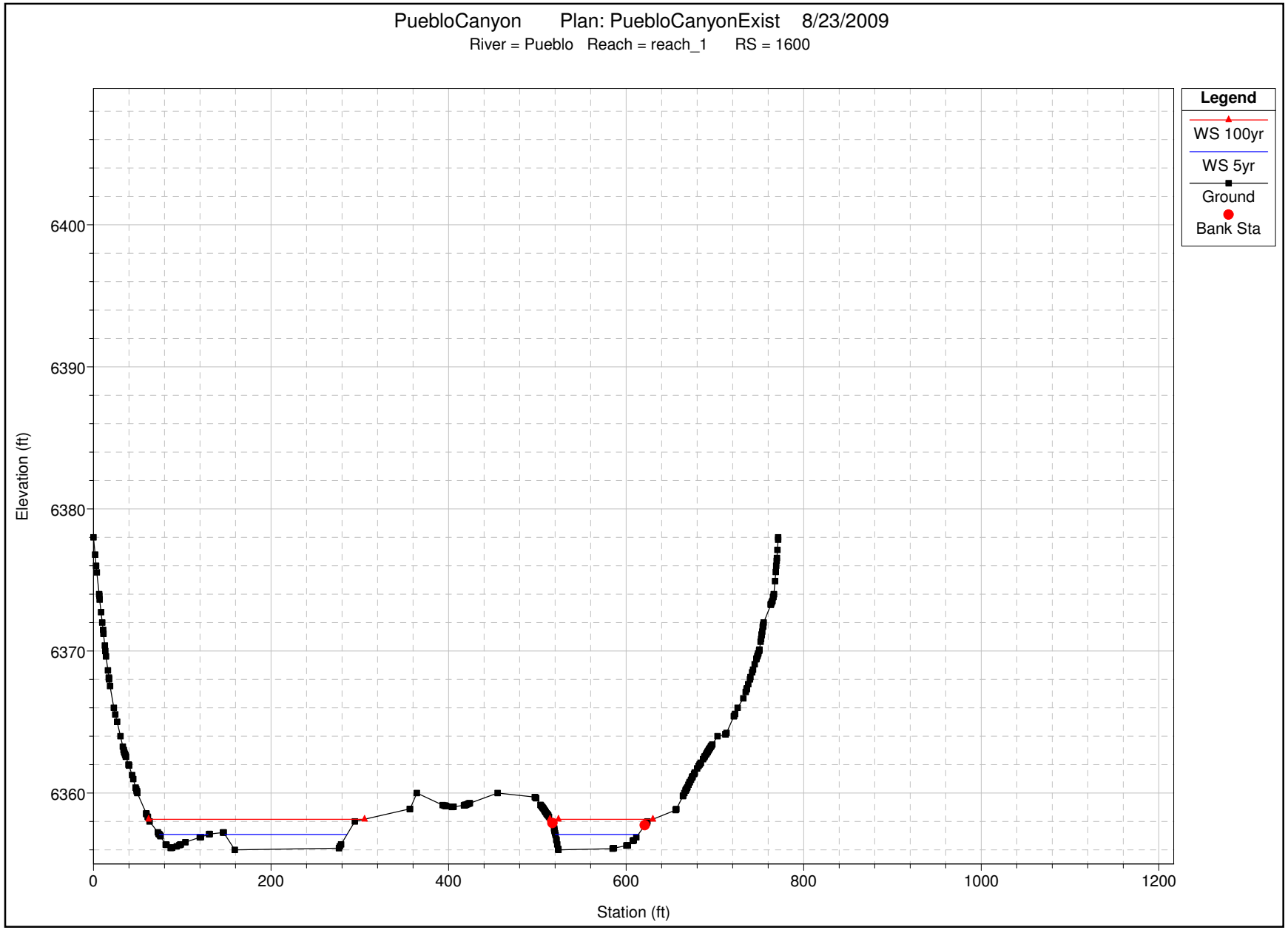
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

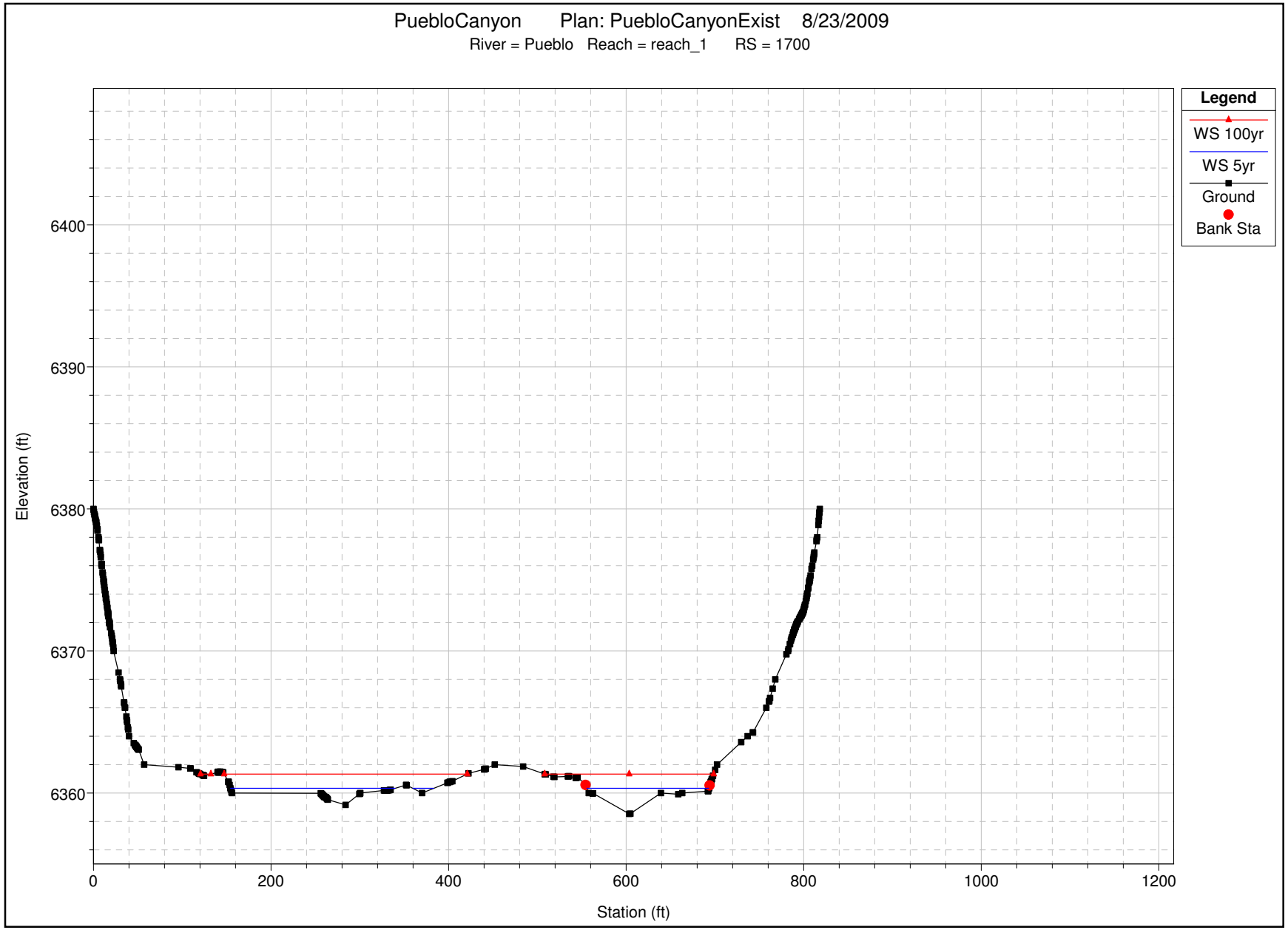
River = Pueblo Reach = reach_1 RS = 1500 coordinate at station 525 interpolated from topo



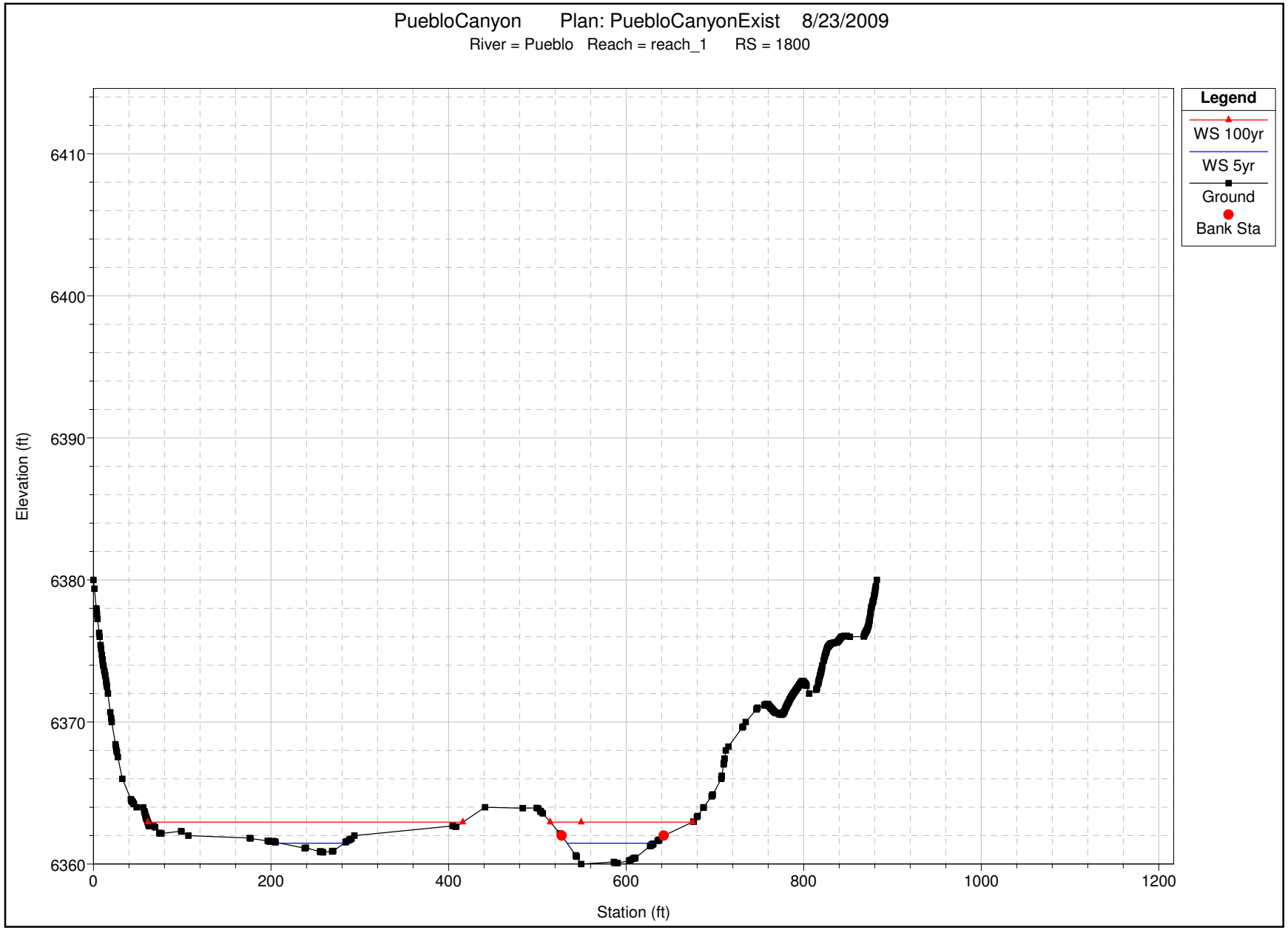
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



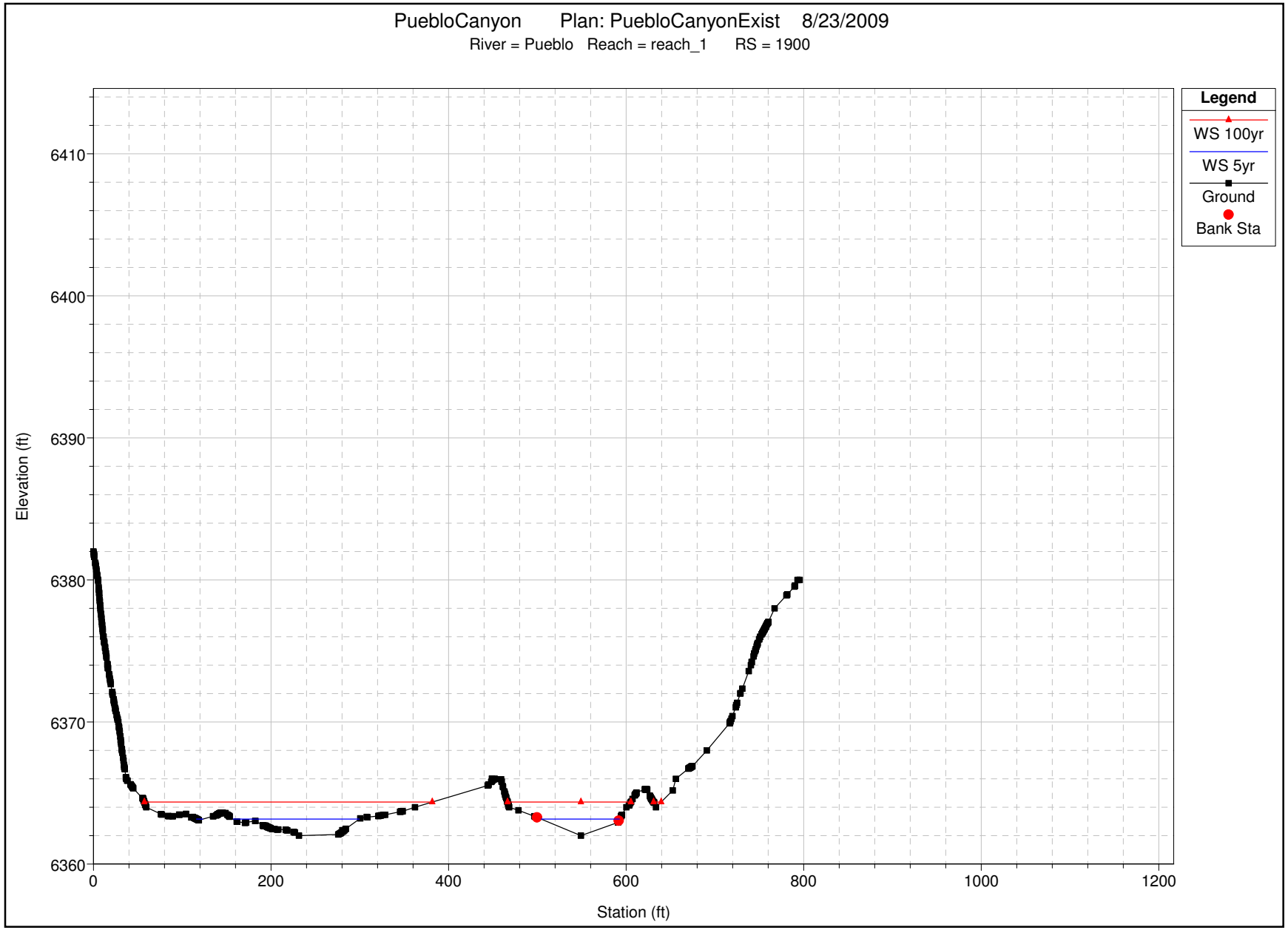
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



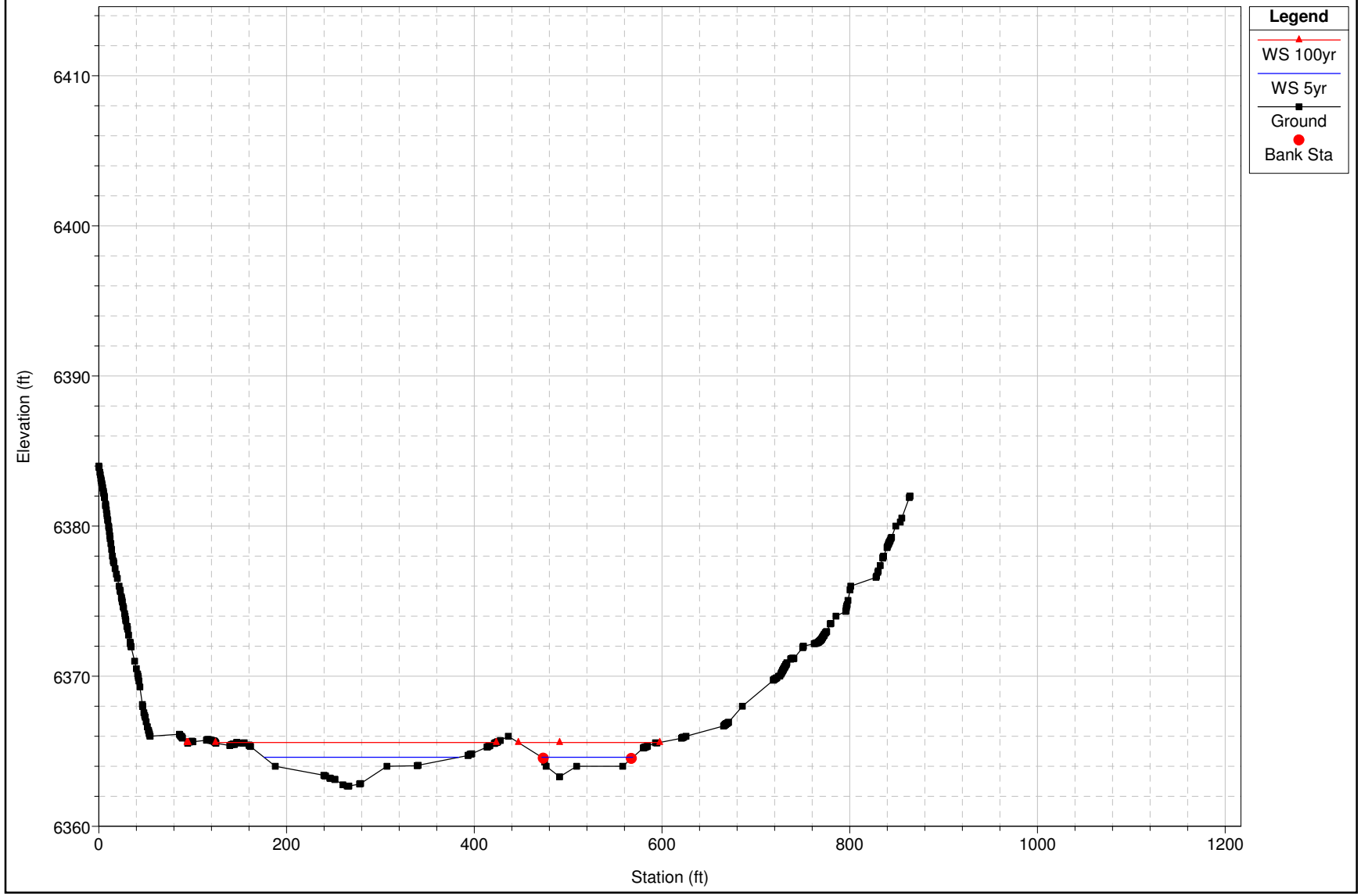
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

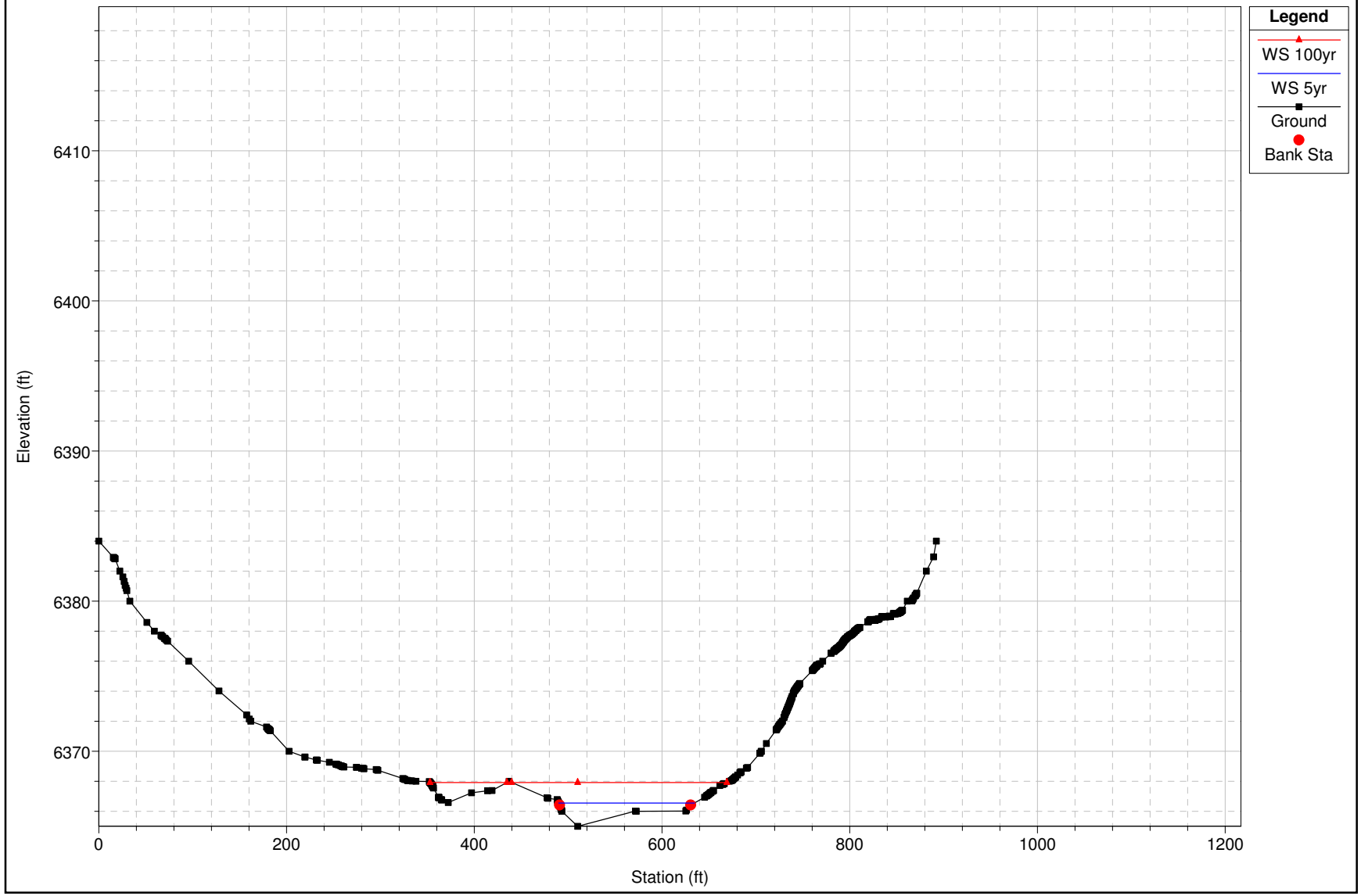
River = Pueblo Reach = reach_1 RS = 2000 coordinates at stations 491, 509, and 558 interpolated from topo



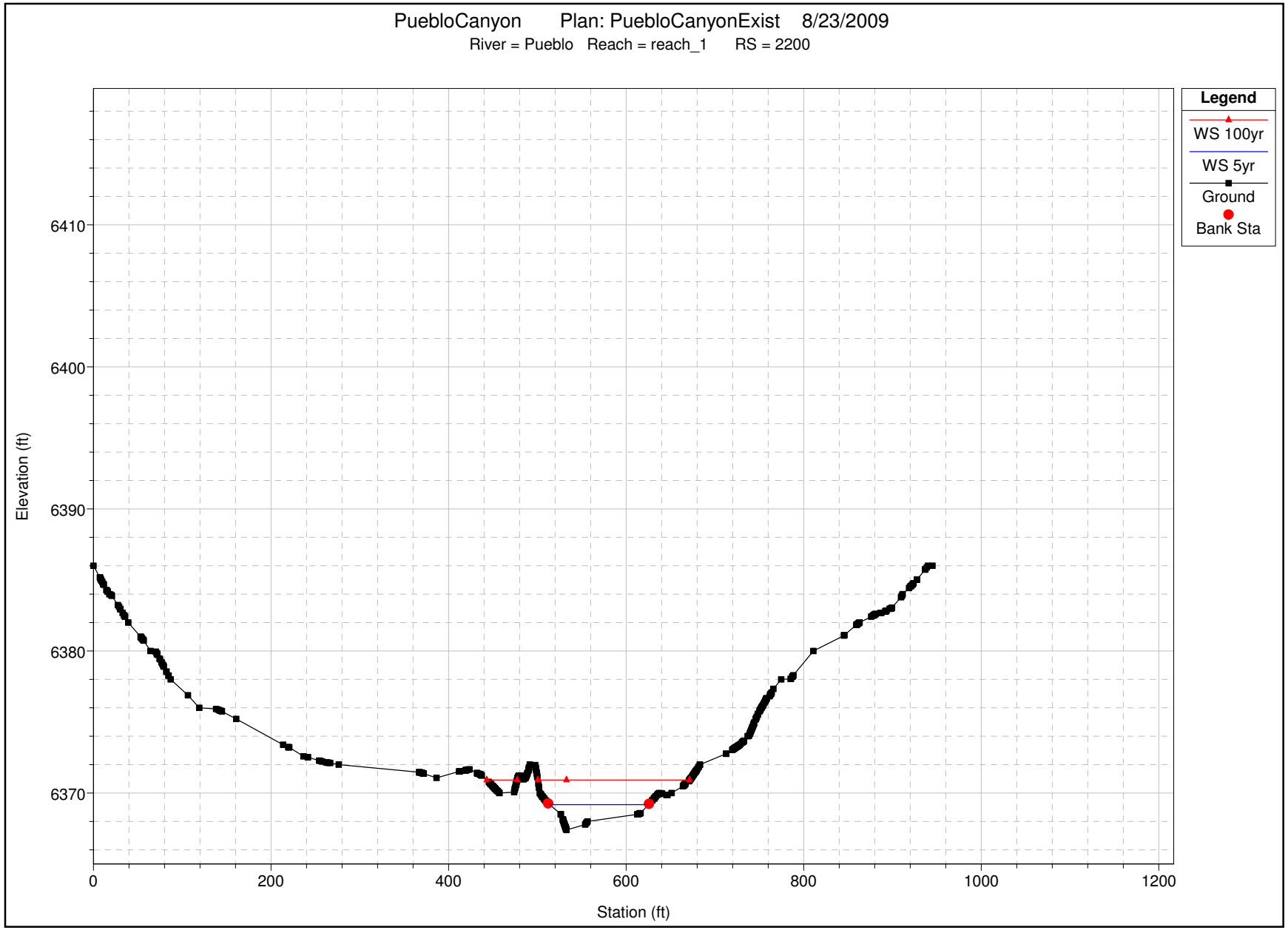
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

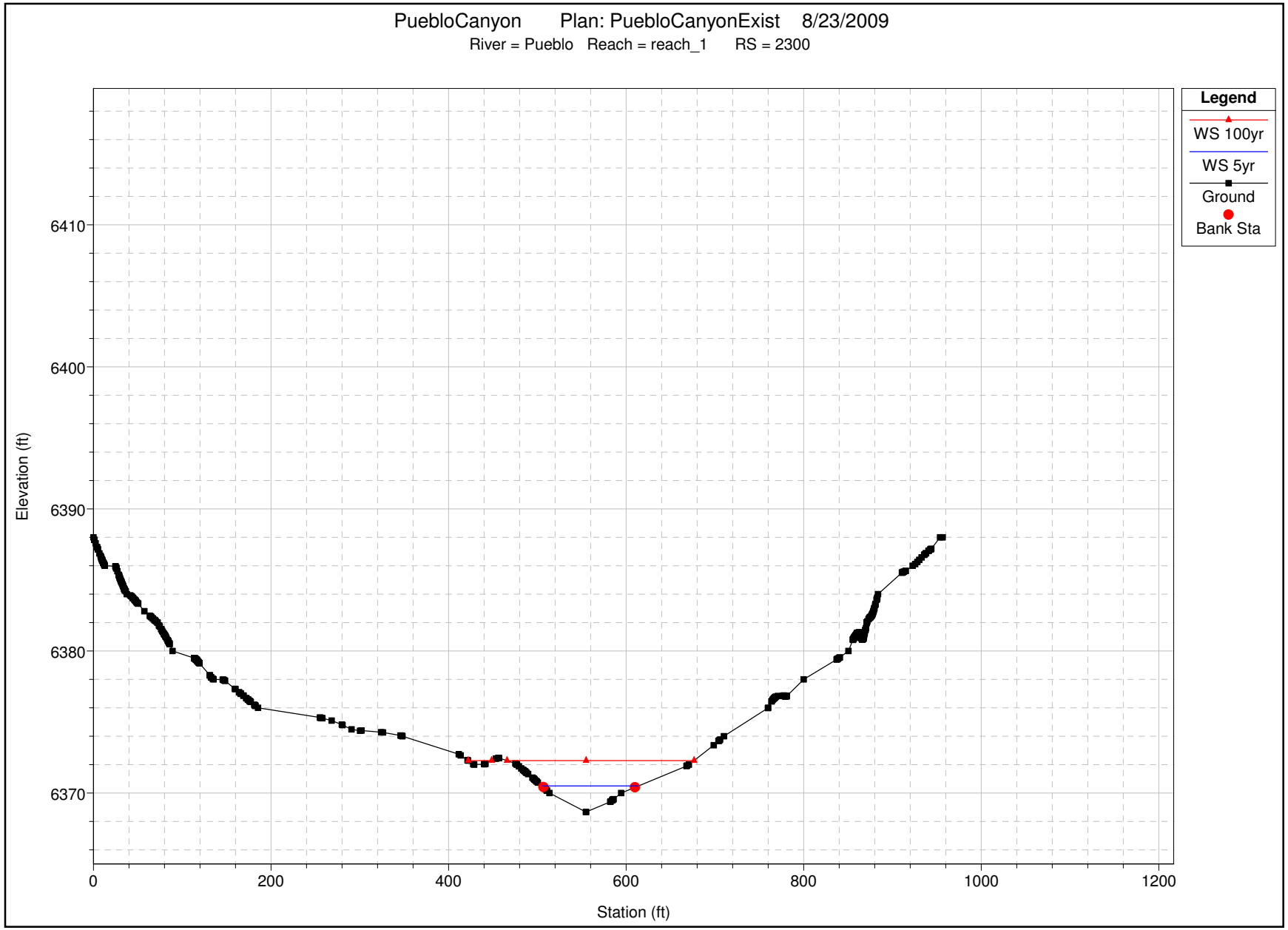
River = Pueblo Reach = reach_1 RS = 2100 coordinate at station 510 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



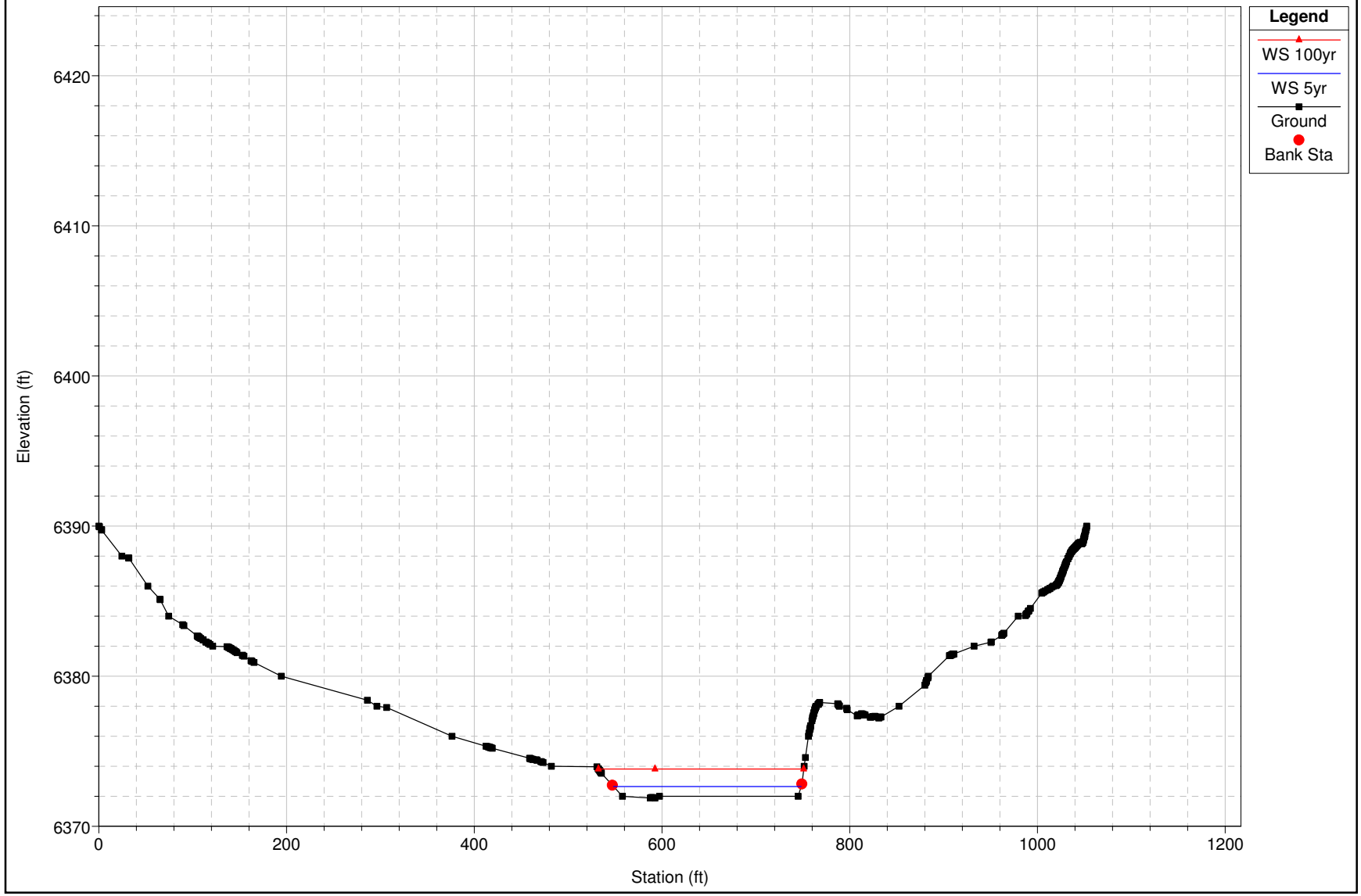
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



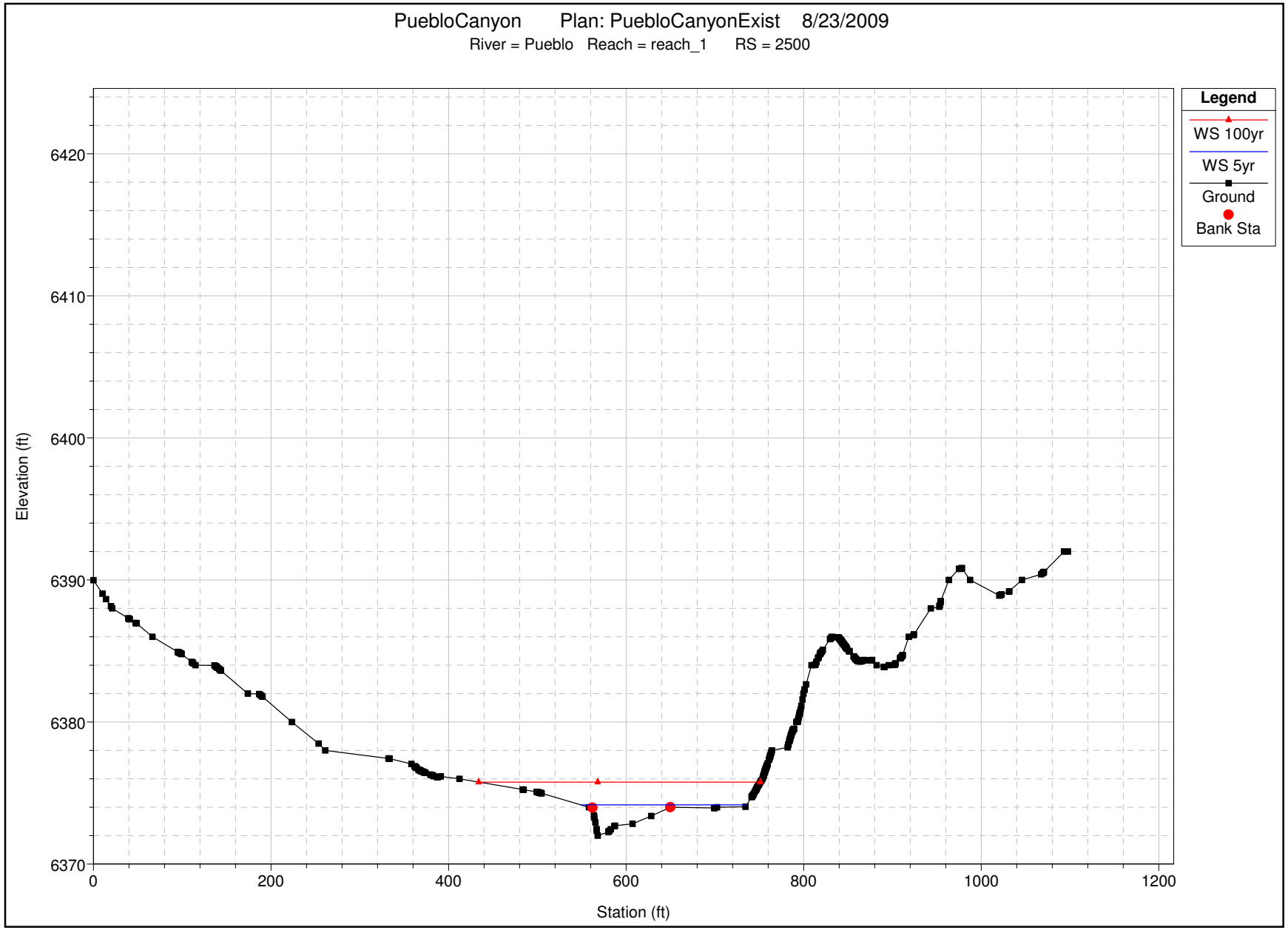
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonExist 8/23/2009

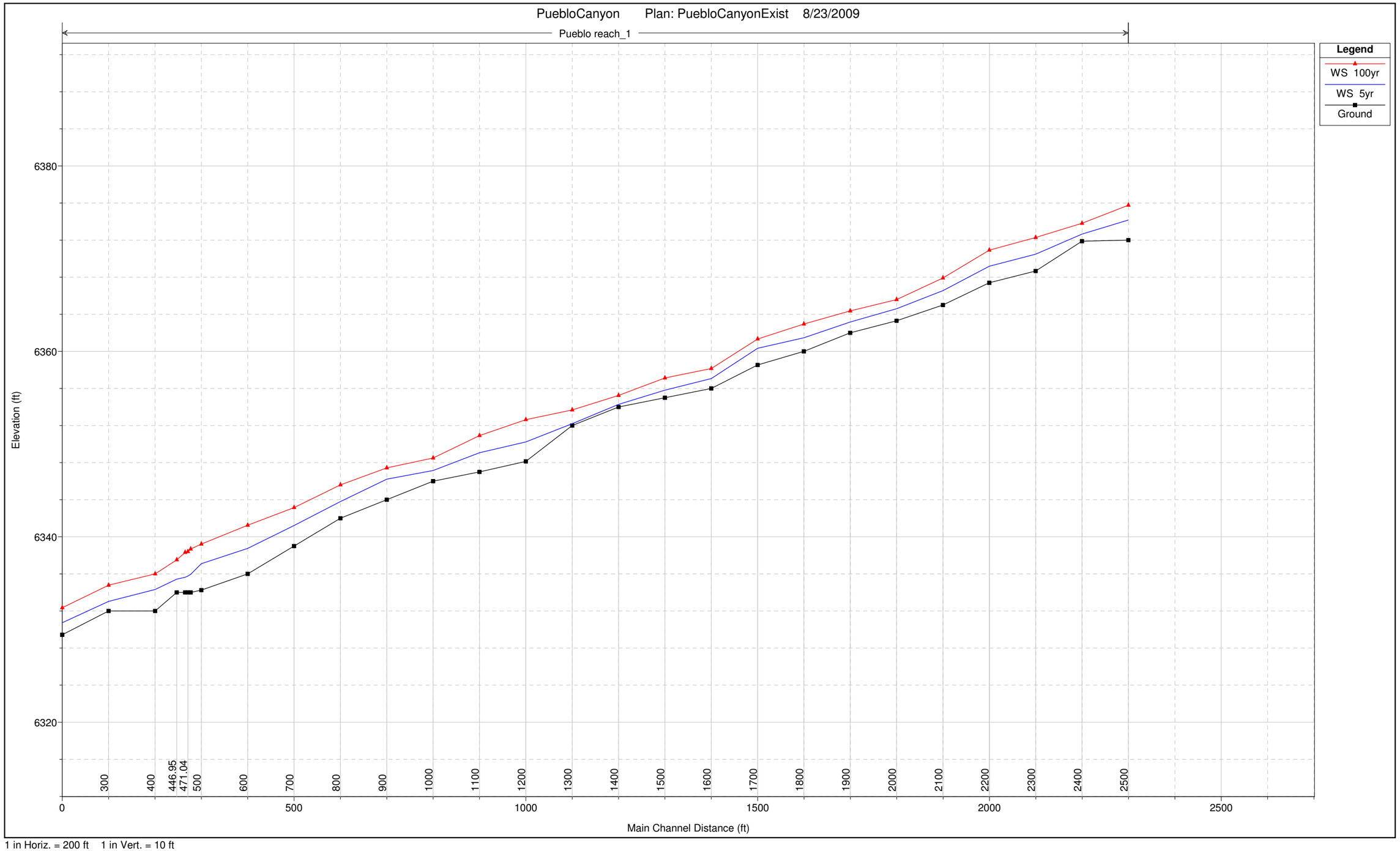
River = Pueblo Reach = reach_1 RS = 2400 coordinate at station 745 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 200 ft 1 in Vert. = 10 ft

HEC-RAS Plan: PuebloExist River: Pueblo Reach: reach_1

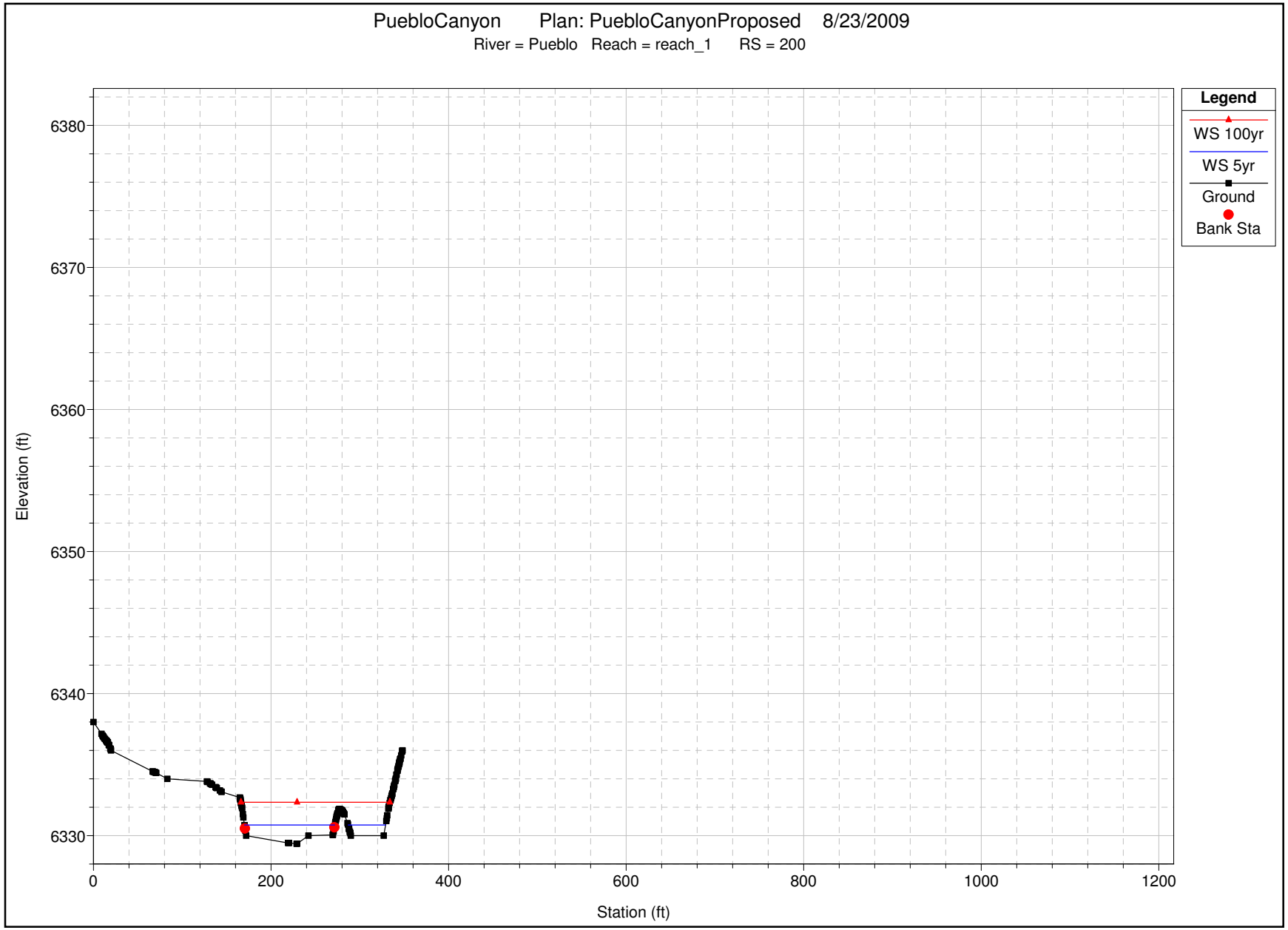
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	2500	5yr	593.00	6372.00	6374.17	6374.17	6374.65	0.010216	5.60	120.82	186.93	0.91
reach_1	2500	100yr	2740.00	6372.00	6375.77	6375.77	6376.72	0.008008	8.76	512.16	317.47	0.92
reach_1	2400	5yr	593.00	6371.88	6372.66	6372.66	6372.98	0.015336	4.59	129.31	199.93	1.00
reach_1	2400	100yr	2740.00	6371.88	6373.81	6373.81	6374.69	0.010523	7.51	372.32	218.66	0.99
reach_1	2300	5yr	593.00	6368.66	6370.49	6370.48	6371.00	0.013035	5.69	104.40	108.14	1.00
reach_1	2300	100yr	2740.00	6368.66	6372.28	6372.28	6373.42	0.008091	8.84	394.21	237.02	0.93
reach_1	2200	5yr	593.00	6367.40	6369.18	6369.18	6369.67	0.013622	5.59	106.06	111.35	1.01
reach_1	2200	100yr	2740.00	6367.40	6370.91	6370.91	6372.02	0.008241	8.64	377.03	205.19	0.93
reach_1	2100	5yr	593.00	6365.00	6366.56	6366.56	6366.98	0.014336	5.19	114.68	144.75	1.01
reach_1	2100	100yr	2740.00	6365.00	6367.92	6367.92	6368.91	0.009899	8.29	428.38	311.39	0.99
reach_1	2000	5yr	593.00	6363.30	6364.60		6364.73	0.010082	3.86	243.13	304.09	0.82
reach_1	2000	100yr	2740.00	6363.30	6365.59	6365.42	6366.22	0.014994	8.53	601.25	451.25	1.16
reach_1	1900	5yr	593.00	6362.00	6363.17	6363.17	6363.51	0.025437	5.83	156.20	237.40	1.29
reach_1	1900	100yr	2740.00	6362.00	6364.37	6364.37	6365.04	0.014070	8.69	615.29	471.77	1.14
reach_1	1800	5yr	593.00	6360.00	6361.46	6361.45	6361.91	0.011359	5.48	127.81	168.98	0.94
reach_1	1800	100yr	2740.00	6360.00	6362.95	6362.95	6363.63	0.007479	7.57	652.93	515.07	0.87
reach_1	1700	5yr	593.00	6358.54	6360.34	6360.34	6360.62	0.013541	4.72	184.60	346.41	0.97
reach_1	1700	100yr	2740.00	6358.54	6361.34	6361.34	6362.00	0.011713	7.71	586.70	475.79	1.03
reach_1	1600	5yr	593.00	6356.00	6357.08		6357.23	0.007387	3.98	240.64	285.61	0.74
reach_1	1600	100yr	2740.00	6356.00	6358.16	6357.93	6358.75	0.011040	7.85	591.40	359.38	1.01
reach_1	1500	5yr	593.00	6355.00	6355.81	6355.59	6356.00	0.024357	4.23	172.73	230.33	1.17
reach_1	1500	100yr	2740.00	6355.00	6357.14	6356.72	6357.60	0.011342	7.05	628.64	410.46	1.00
reach_1	1400	5yr	593.00	6354.00	6354.29		6354.44	0.011313	1.44	191.22	152.19	0.67
reach_1	1400	100yr	2740.00	6354.00	6355.26	6355.19	6355.85	0.031851	7.18	450.55	375.55	1.48
reach_1	1300	5yr	593.00	6352.00	6352.20	6352.07	6352.41	0.046939	2.28	160.45	249.75	1.28
reach_1	1300	100yr	2740.00	6352.00	6353.69	6353.02	6354.01	0.011192	6.53	739.45	488.86	0.98
reach_1	1200	5yr	593.00	6348.13	6350.23	6350.23	6350.82	0.009772	6.51	127.04	127.58	0.92
reach_1	1200	100yr	2740.00	6348.13	6352.63	6352.63	6353.36	0.004827	8.55	783.20	508.74	0.76
reach_1	1100	5yr	593.00	6347.00	6349.06	6349.06	6349.63	0.011726	6.27	116.26	121.13	0.98
reach_1	1100	100yr	2740.00	6347.00	6350.91	6350.91	6351.68	0.006497	8.51	677.58	456.38	0.85
reach_1	1000	5yr	593.00	6346.00	6347.14	6347.00	6347.47	0.012283	5.63	172.32	182.89	0.97
reach_1	1000	100yr	2740.00	6346.00	6348.51	6348.51	6349.16	0.010250	8.98	694.64	470.13	1.02
reach_1	900	5yr	593.00	6344.00	6346.22	6346.22	6346.64	0.006026	5.58	187.18	340.53	0.74
reach_1	900	100yr	2740.00	6344.00	6347.44	6347.44	6348.15	0.007937	9.09	726.49	478.95	0.93
reach_1	800	5yr	593.00	6342.00	6343.80	6343.80	6344.40	0.011980	6.26	95.94	96.20	0.99
reach_1	800	100yr	2740.00	6342.00	6345.60	6345.60	6346.30	0.006124	7.97	700.13	483.78	0.81
reach_1	700	5yr	593.00	6339.00	6341.22	6341.22	6341.79	0.010855	6.31	116.89	120.67	0.95
reach_1	700	100yr	2740.00	6339.00	6343.15	6343.15	6343.86	0.005836	8.25	728.69	480.58	0.81
reach_1	600	5yr	593.00	6336.00	6338.75	6338.75	6339.48	0.012223	6.85	86.51	61.28	1.02
reach_1	600	100yr	2740.00	6336.00	6341.25	6341.25	6342.19	0.005246	8.71	596.81	379.34	0.79
reach_1	500	5yr	593.00	6334.25	6337.10	6337.10	6337.64	0.012936	5.93	104.48	117.20	1.00
reach_1	500	100yr	2740.00	6334.25	6339.21		6340.07	0.005599	8.01	486.82	223.20	0.79
reach_1	477.05	5yr	593.00	6334.00	6335.96	6335.96	6336.67	0.011786	6.75	88.96	68.01	1.00
reach_1	477.05	100yr	2740.00	6334.00	6338.69	6338.69	6339.91	0.005503	9.43	447.90	246.94	0.82
reach_1	471.04	5yr	593.00	6334.00	6335.77	6335.77	6336.44	0.012139	6.58	90.36	70.18	1.01
reach_1	471.04	100yr	2740.00	6334.00	6338.40	6338.39	6339.62	0.005614	9.28	427.86	237.29	0.82
reach_1	465.04	5yr	593.00	6334.00	6335.64	6335.64	6336.31	0.012085	6.57	90.78	71.41	1.00
reach_1	465.04	100yr	2740.00	6334.00	6338.31	6338.31	6339.57	0.005623	9.35	410.42	243.51	0.82
reach_1	446.95	5yr	593.00	6334.00	6335.43	6335.43	6336.04	0.012631	6.29	94.25	78.05	1.01
reach_1	446.95	100yr	2740.00	6334.00	6337.51	6337.51	6339.01	0.008639	10.00	321.54	156.71	0.98
reach_1	400	5yr	593.00	6332.00	6334.32	6334.25	6334.76	0.010839	5.31	112.29	110.46	0.91

HEC-RAS Plan: PuebloExist River: Pueblo Reach: reach_1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	400	100yr	2740.00	6332.00	6336.01	6336.01	6337.35	0.009300	9.33	308.96	150.46	0.99
reach_1	300	5yr	593.00	6332.00	6333.04	6333.04	6333.54	0.013700	5.74	112.03	123.74	1.02
reach_1	300	100yr	2740.00	6332.00	6334.78	6334.78	6335.88	0.008421	8.86	403.63	200.40	0.95
reach_1	200	5yr	593.00	6329.43	6330.74	6330.74	6331.20	0.014192	5.65	124.15	144.01	1.03
reach_1	200	100yr	2740.00	6329.43	6332.35	6332.35	6333.52	0.010087	9.25	374.91	167.78	1.02

Proposed Conditions

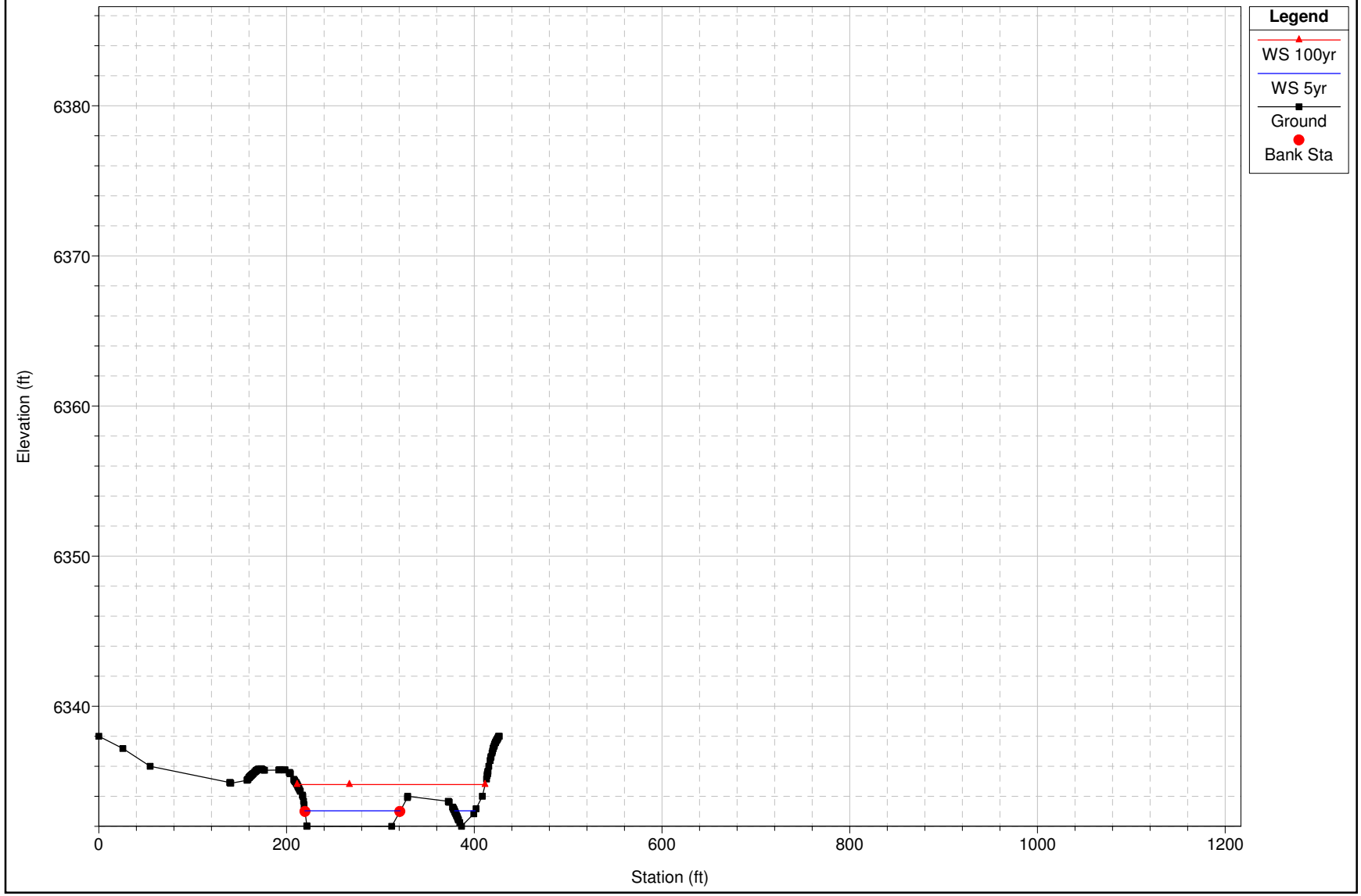
1 in Horiz. = 250 ft 1 in Vert. = 250 ft



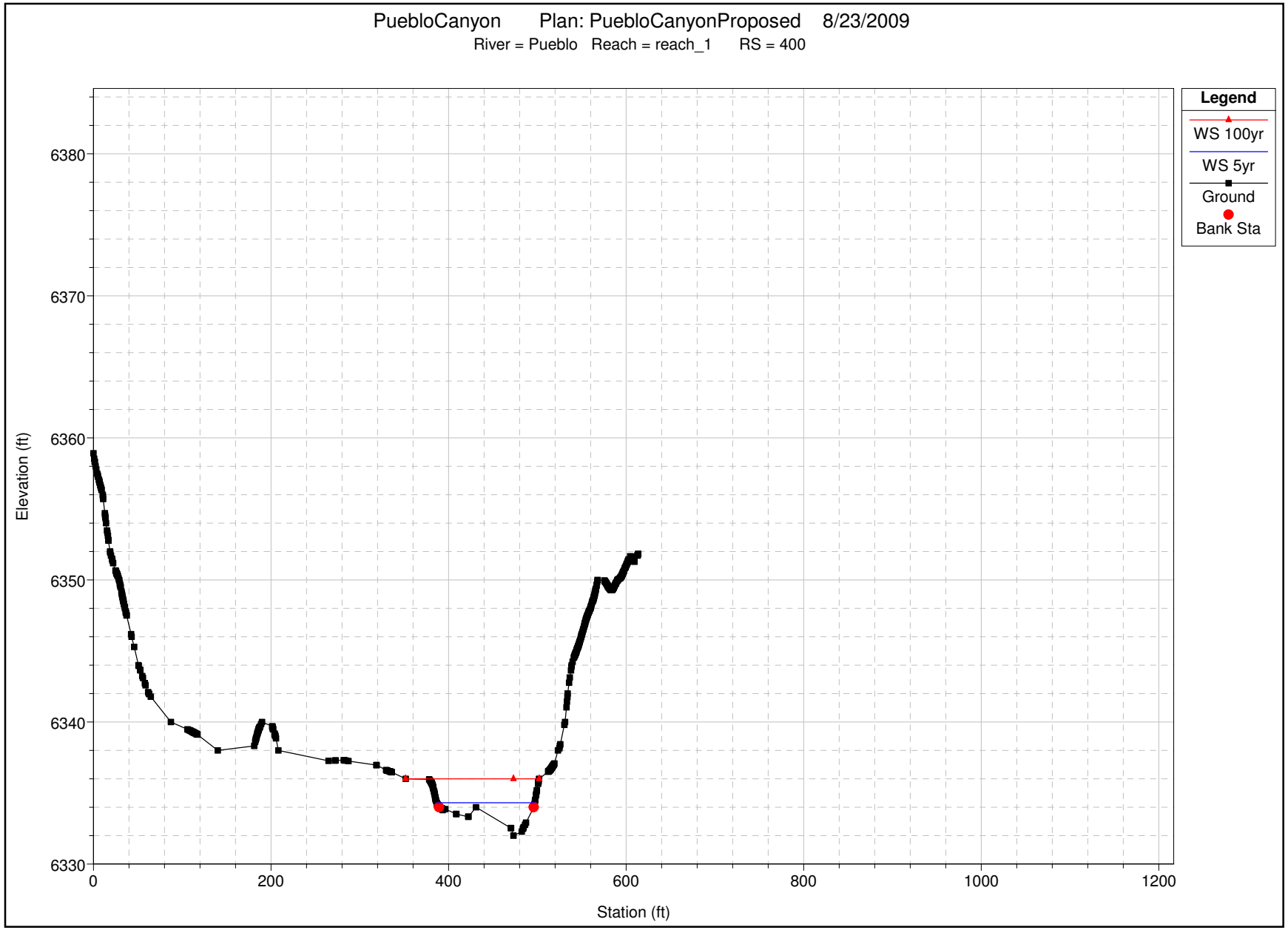
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

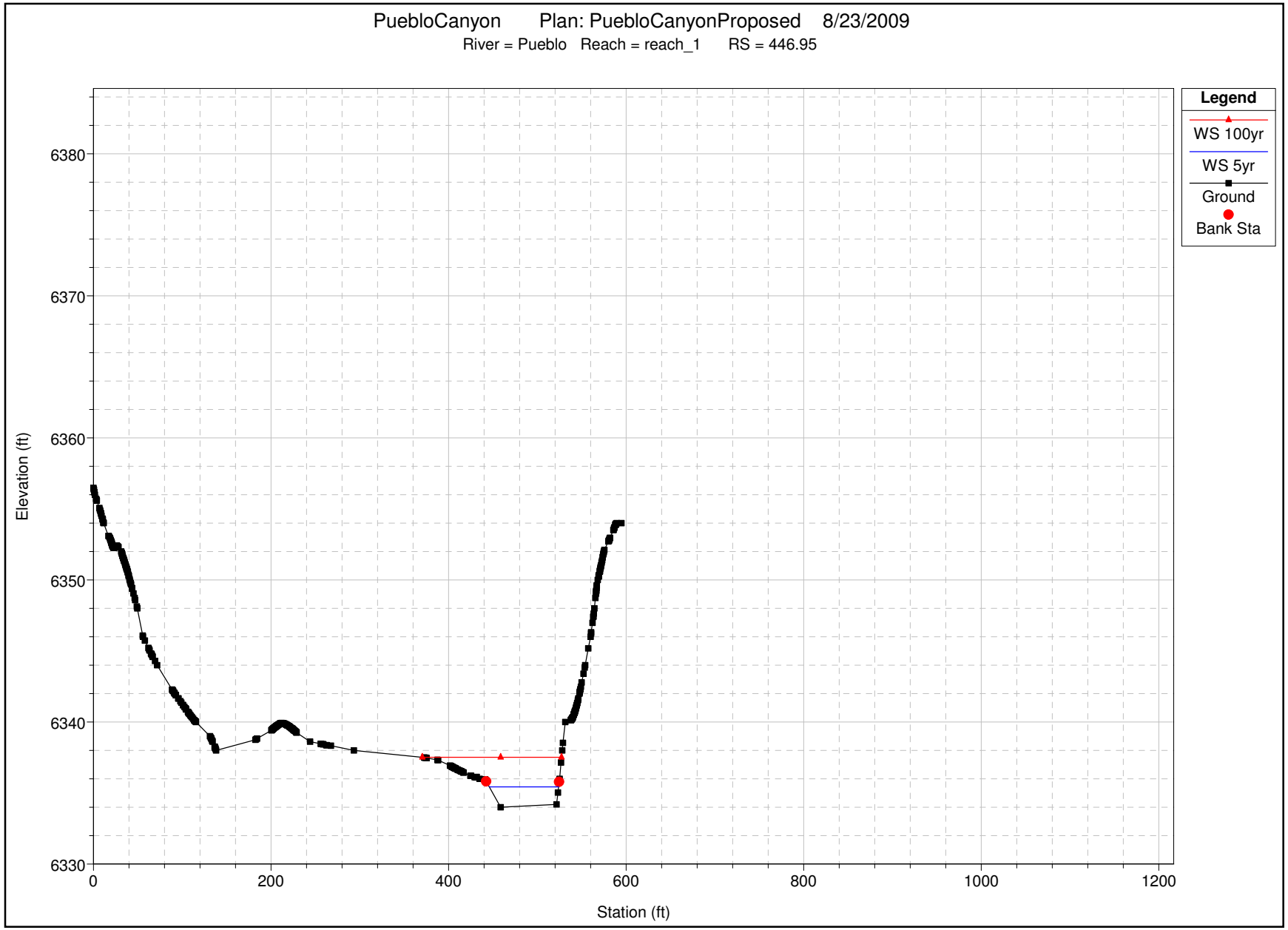
River = Pueblo Reach = reach_1 RS = 300



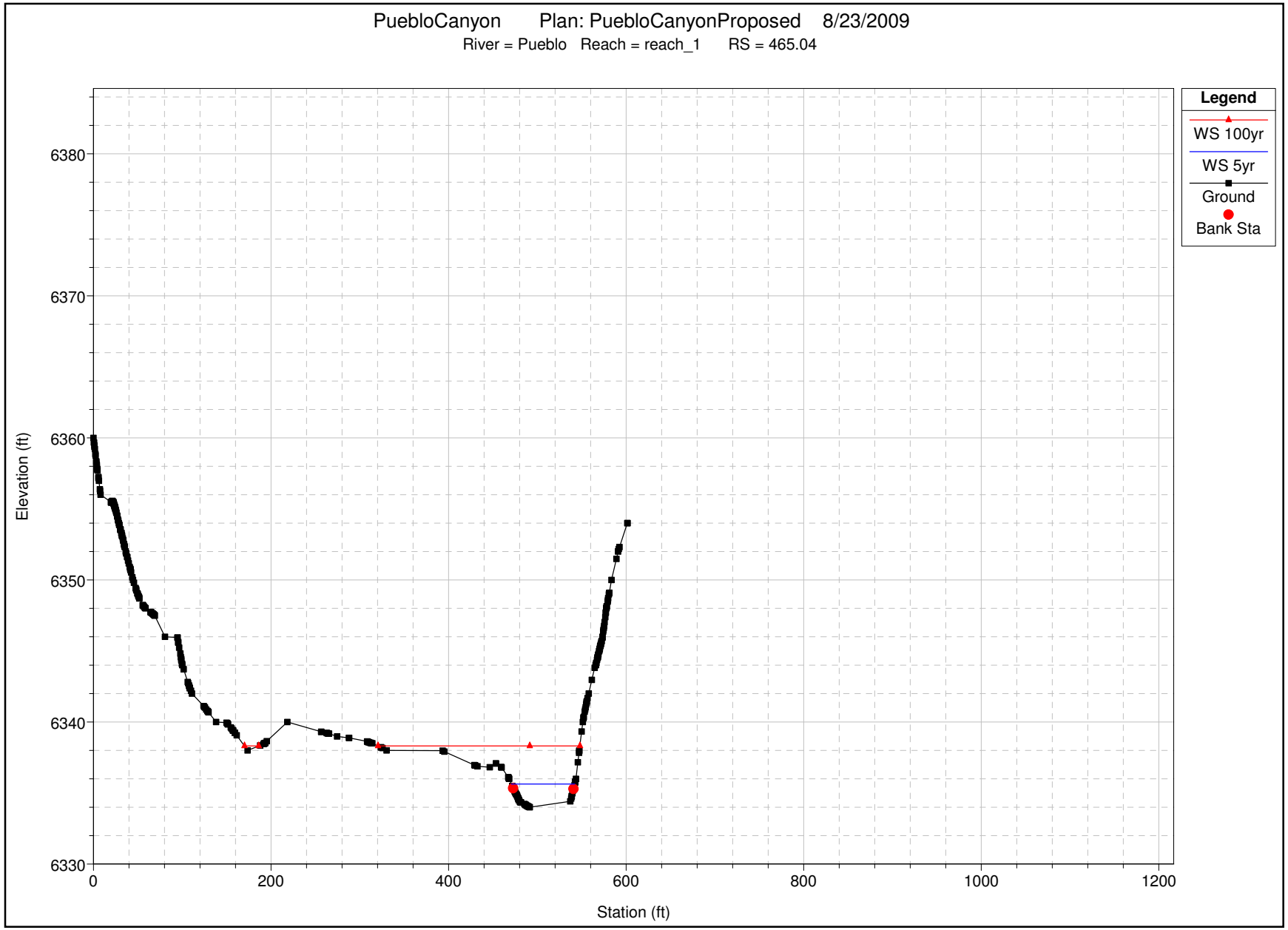
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



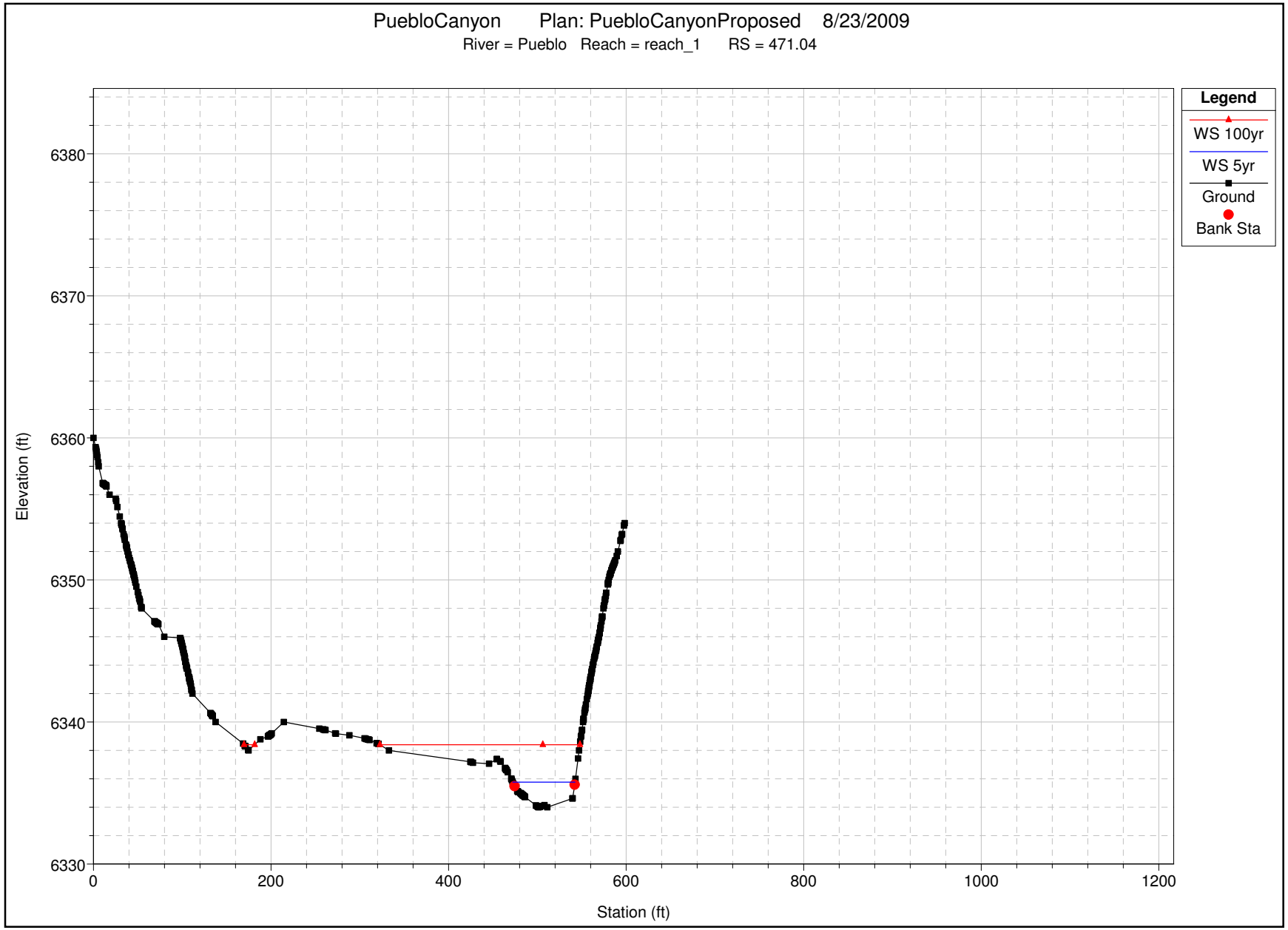
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



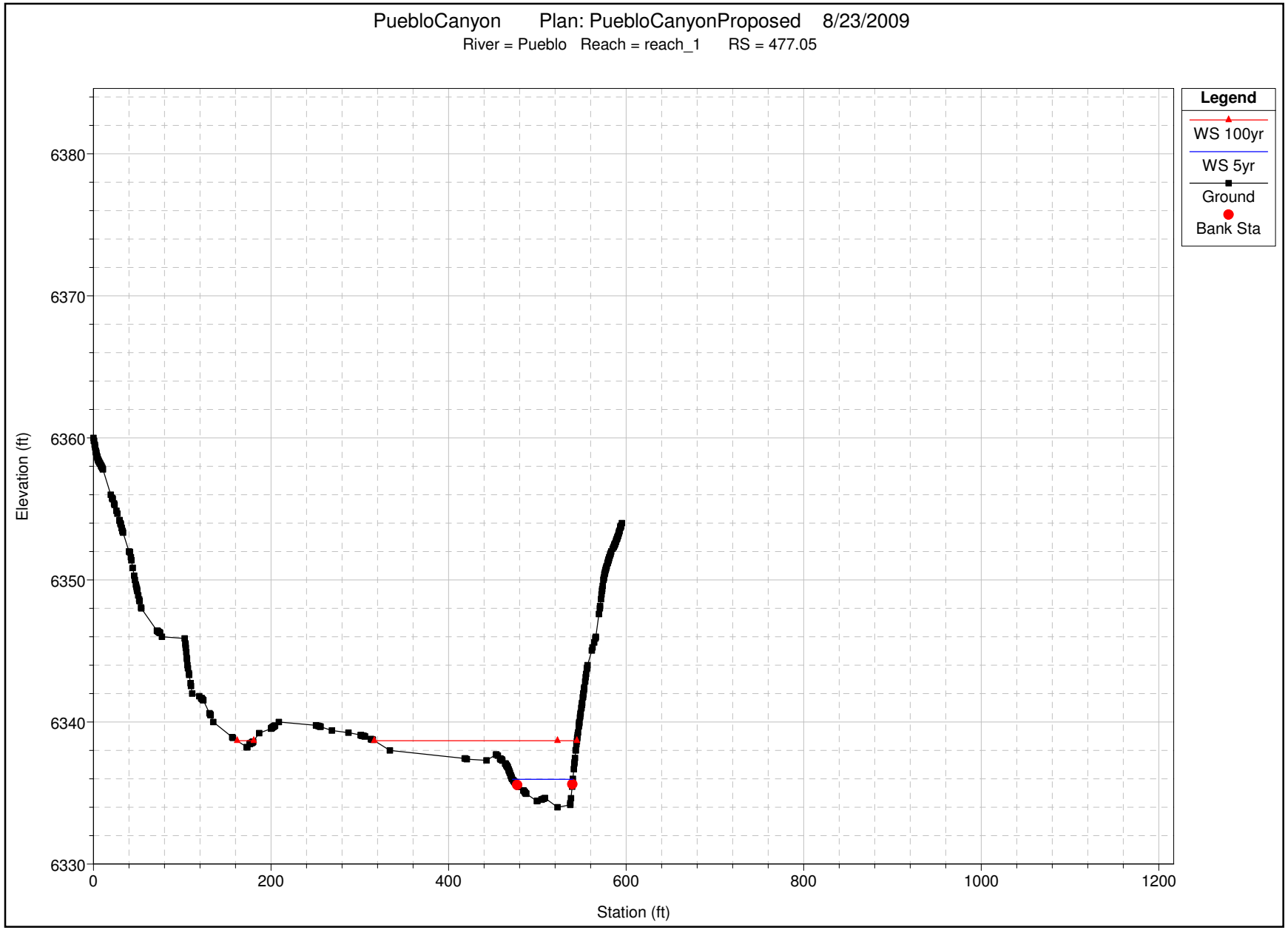
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



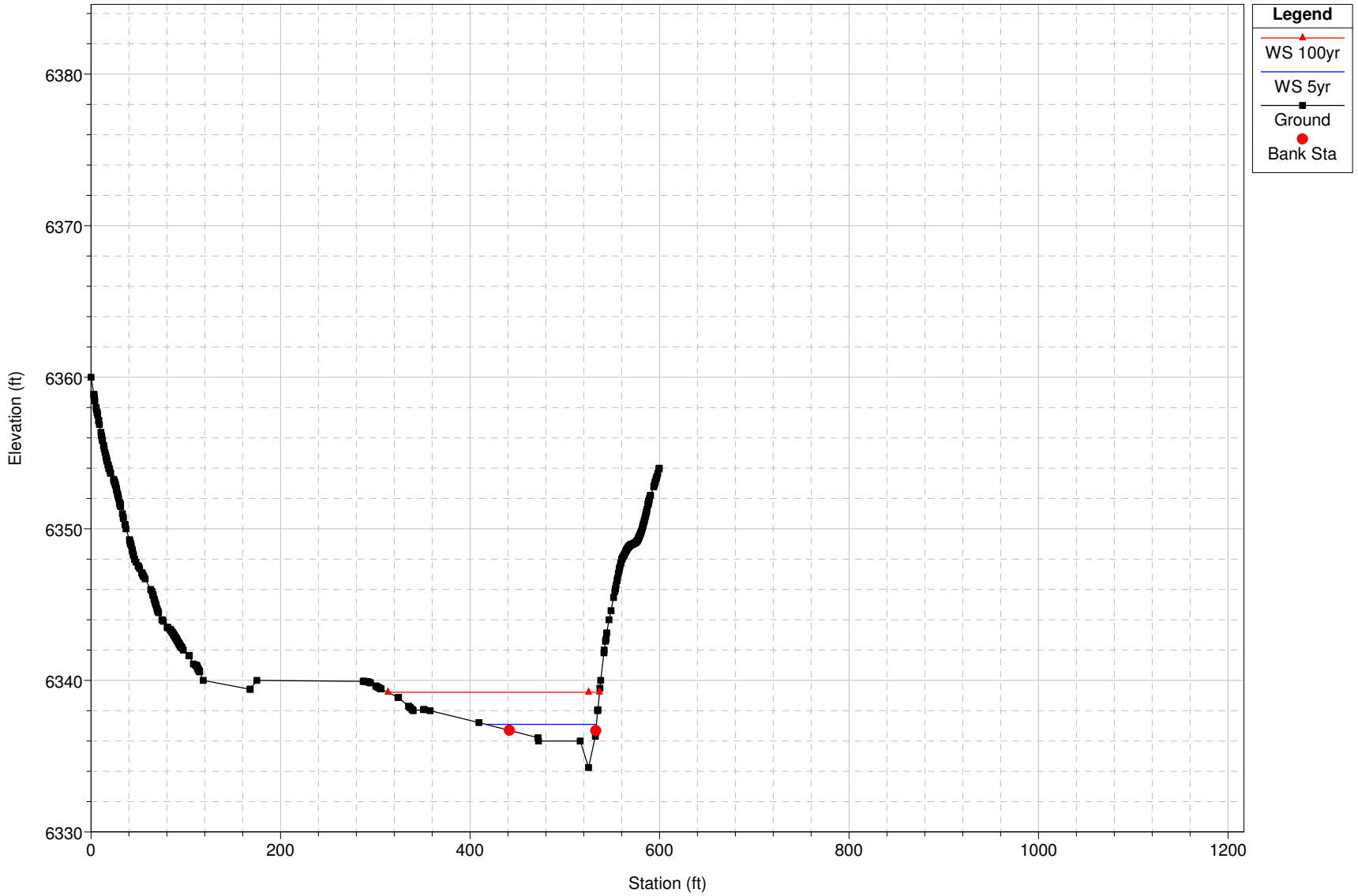
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



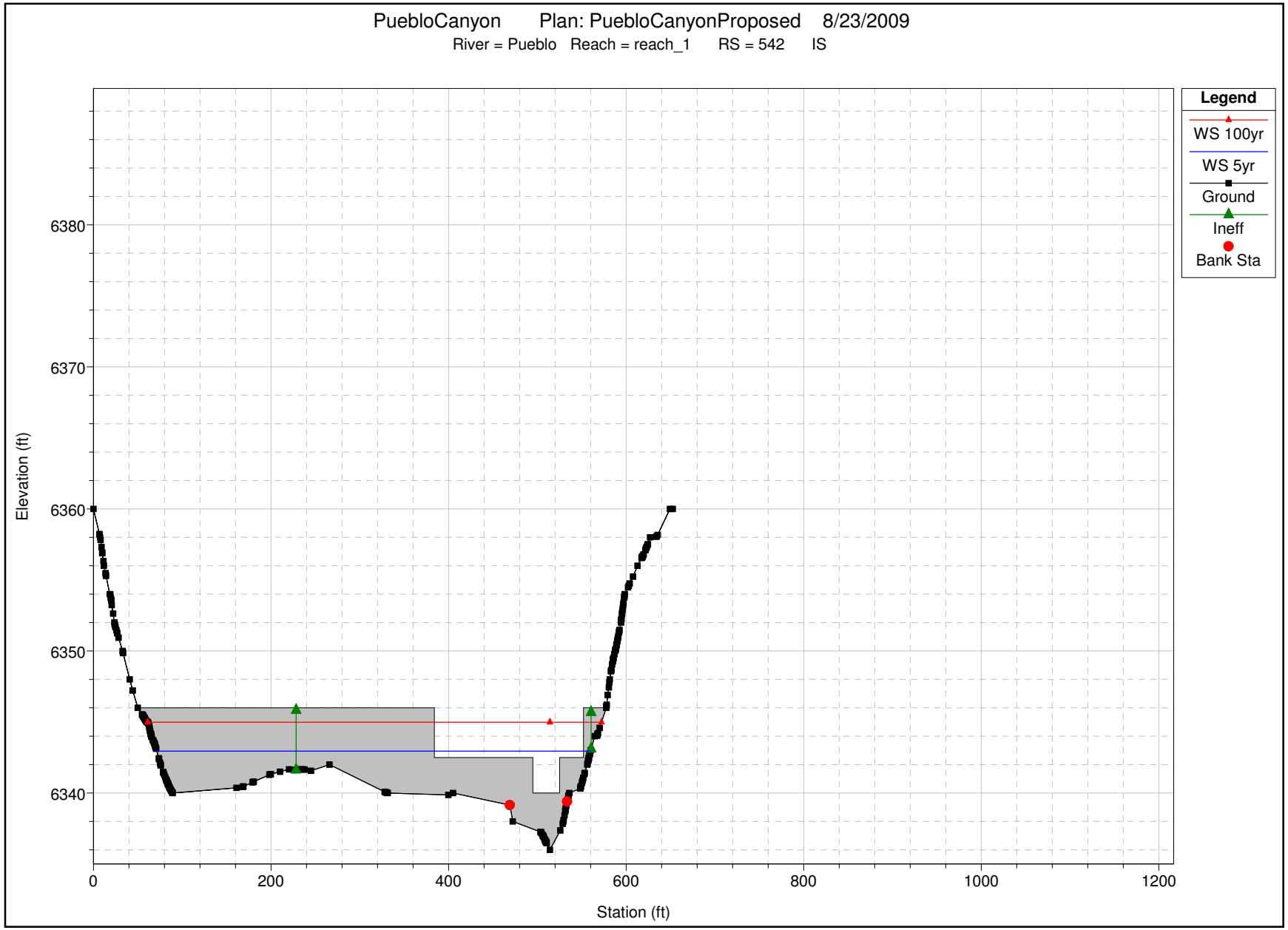
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

River = Pueblo Reach = reach_1 RS = 500 coordinate at station 525 interpolated from topo



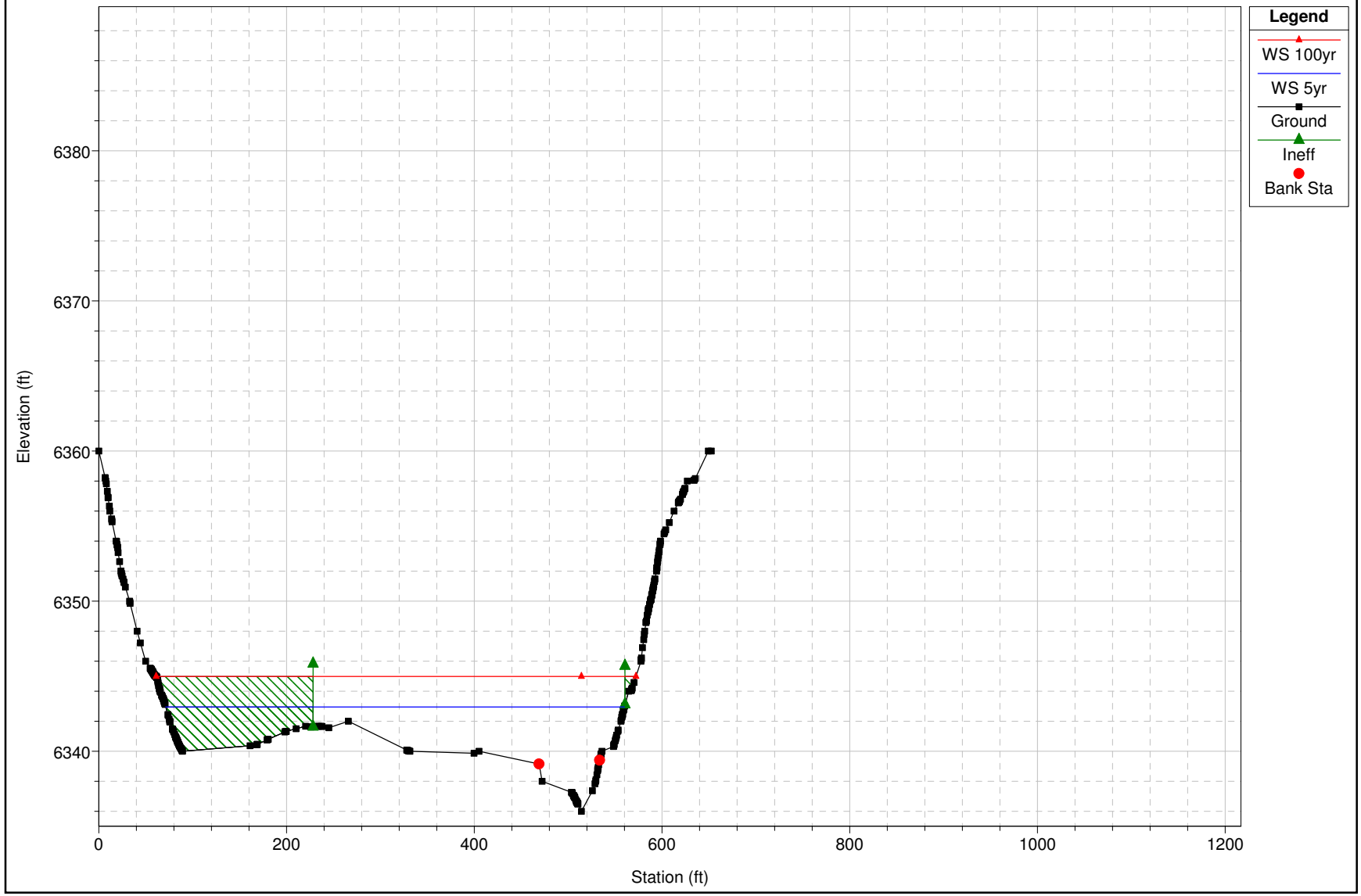
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

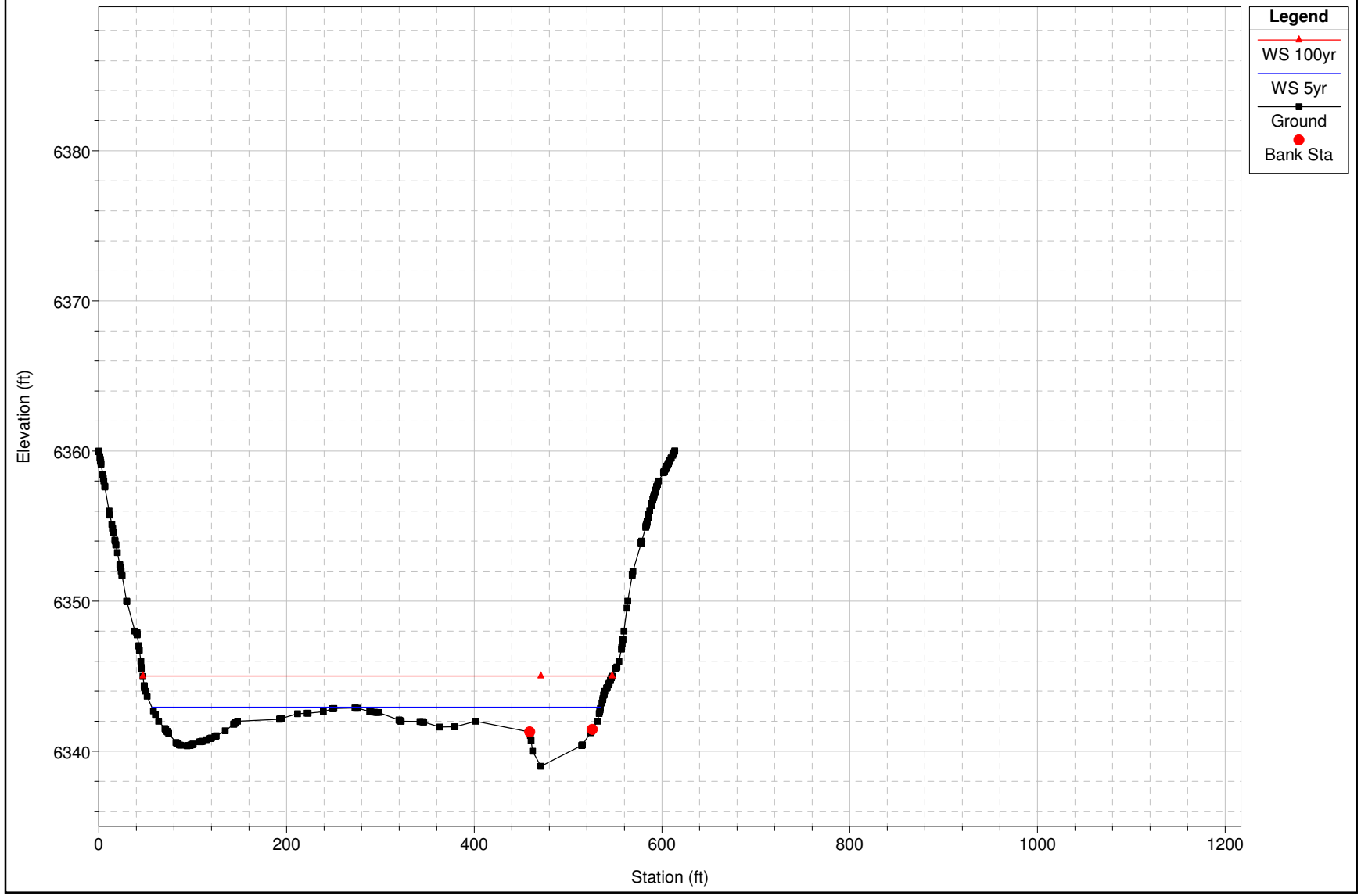
River = Pueblo Reach = reach_1 RS = 600



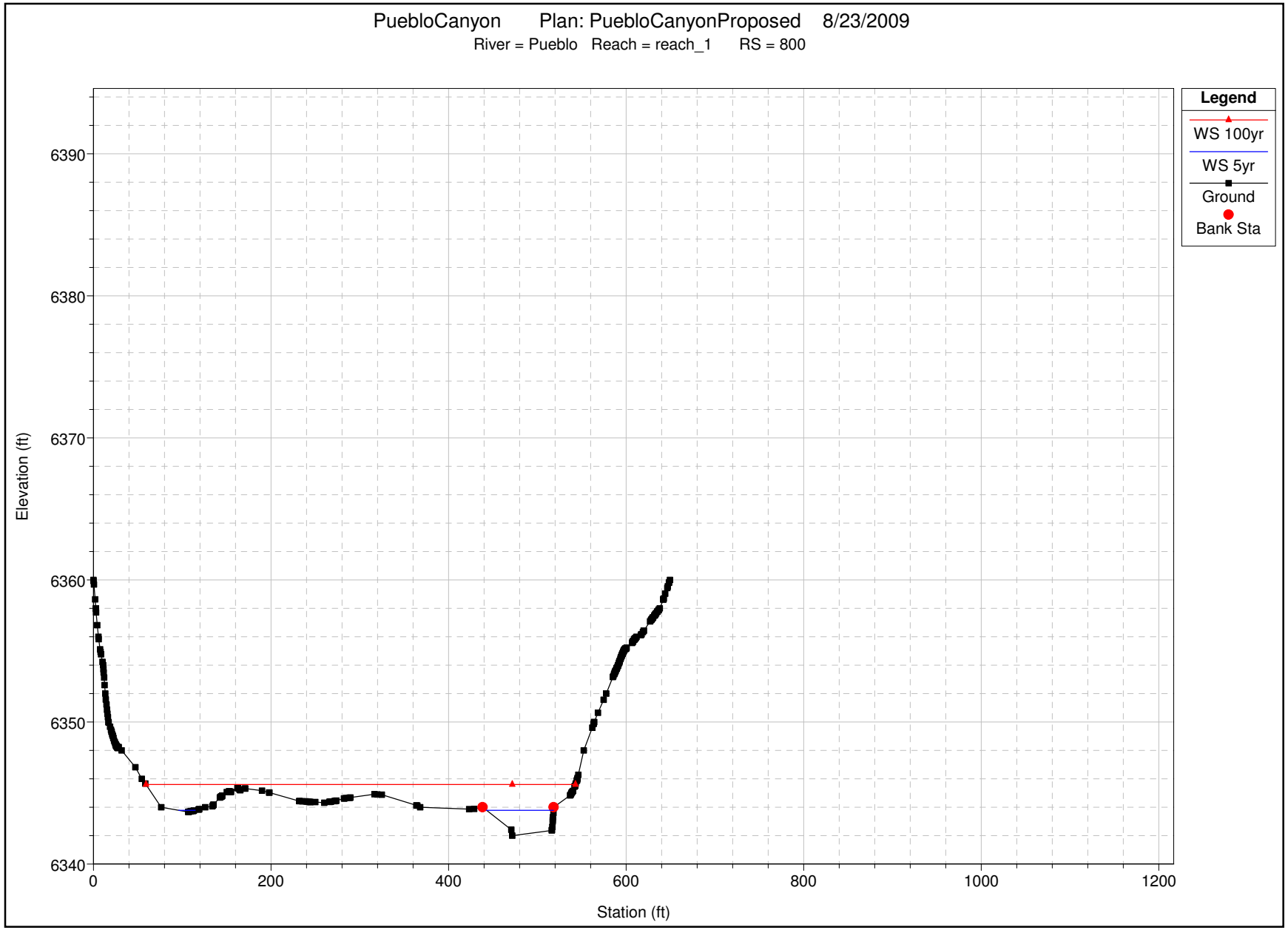
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

River = Pueblo Reach = reach_1 RS = 700 coordinate at station 471 interpolated from topo



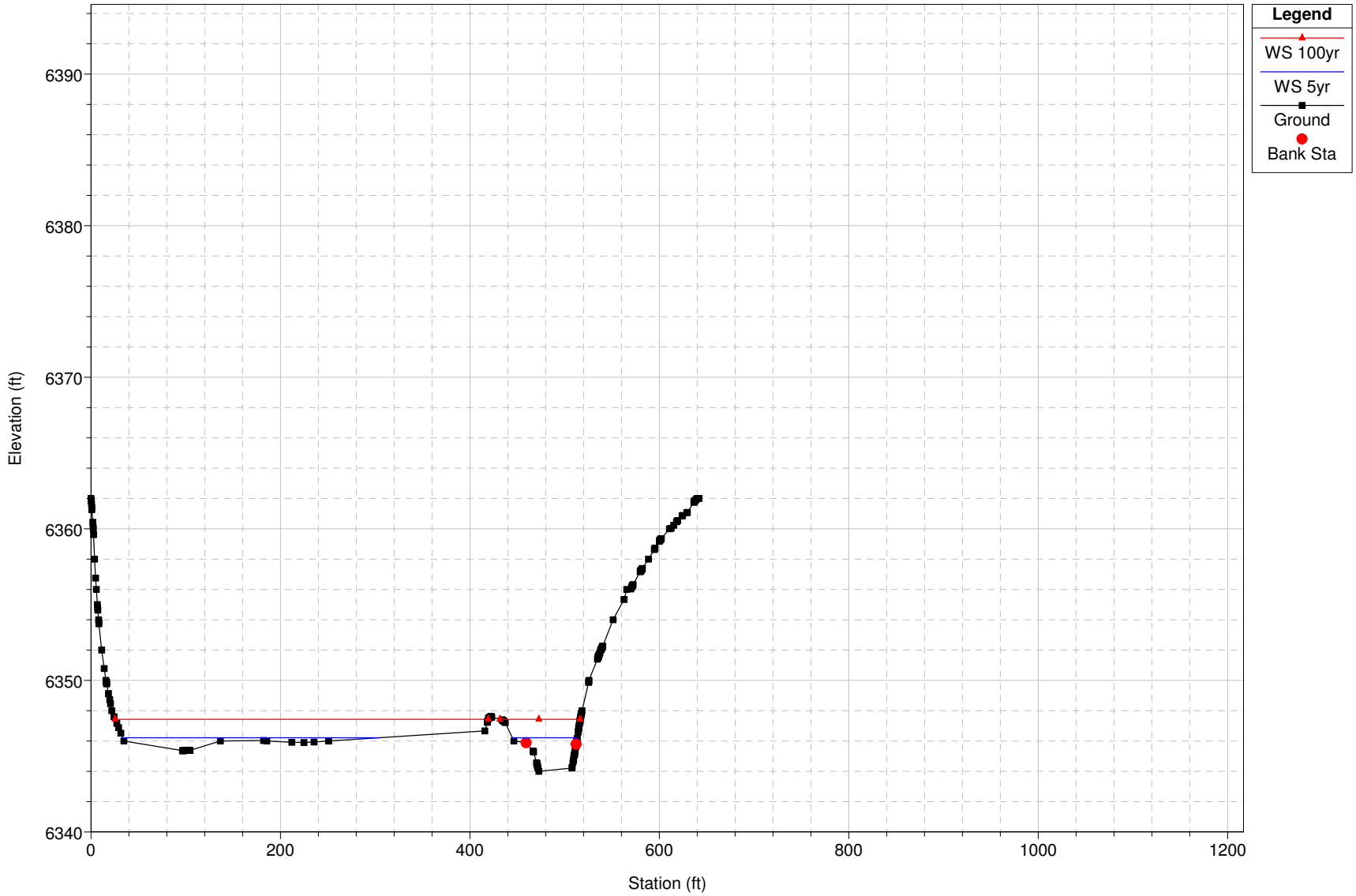
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



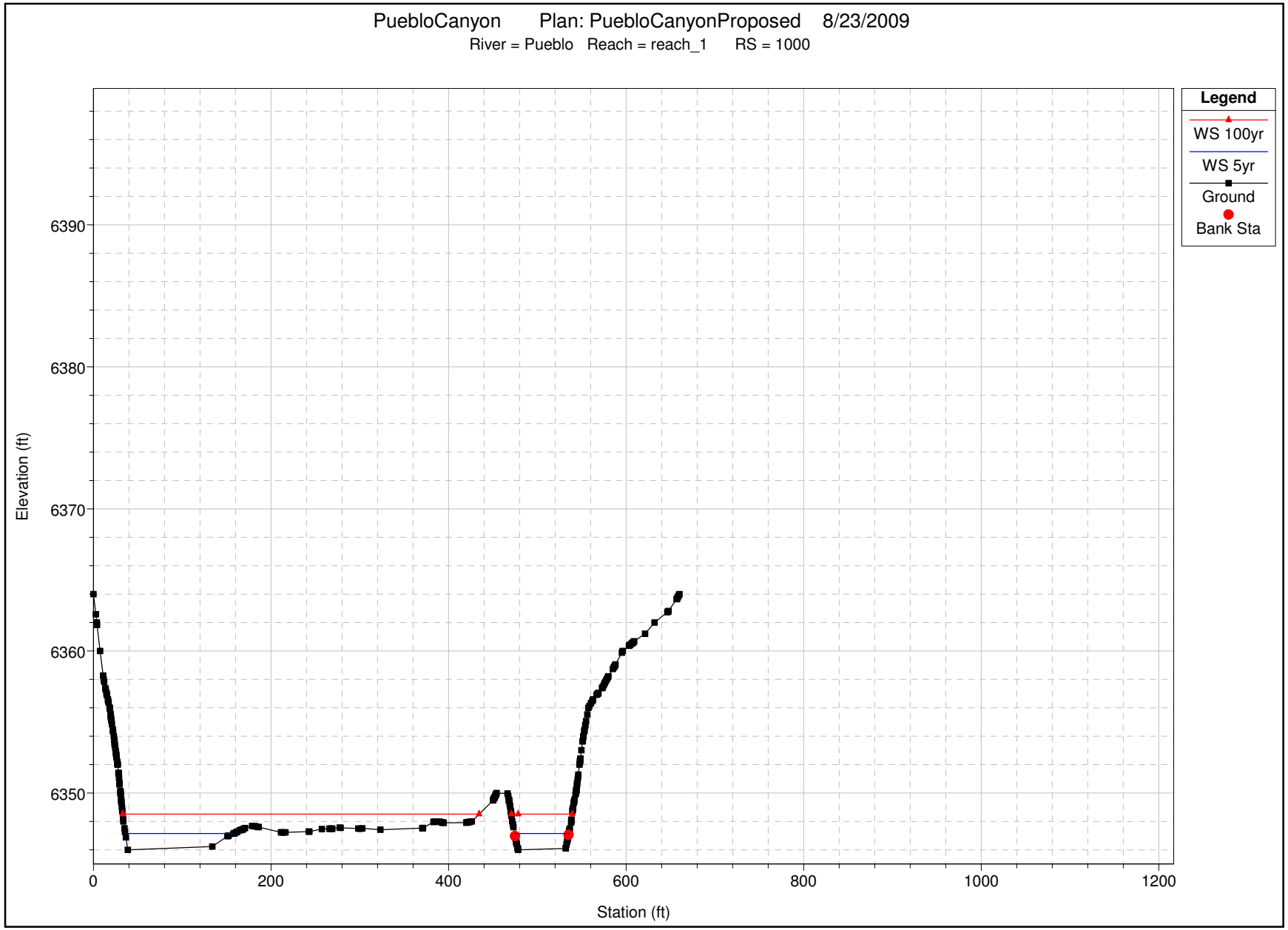
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

River = Pueblo Reach = reach_1 RS = 900



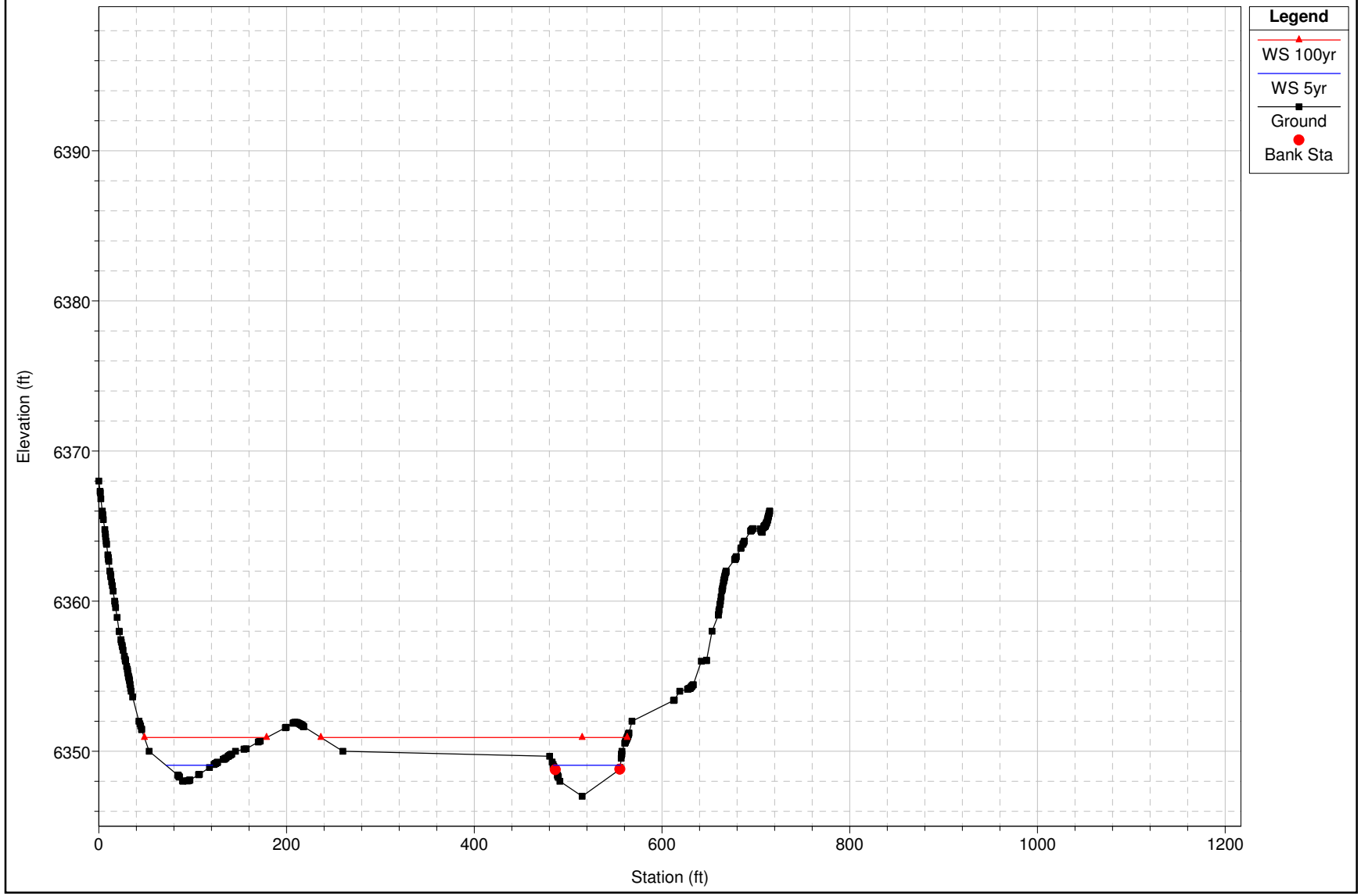
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



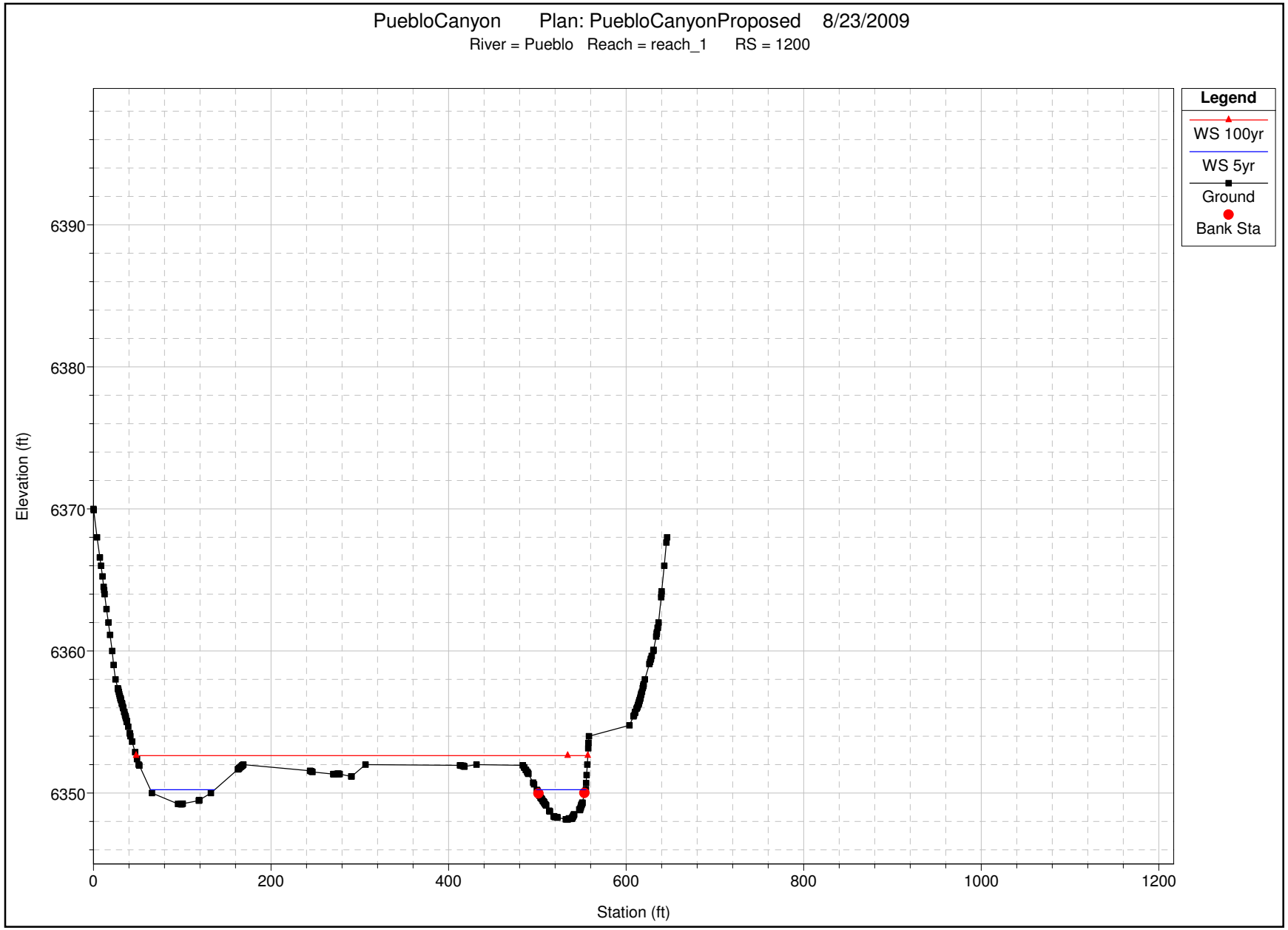
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

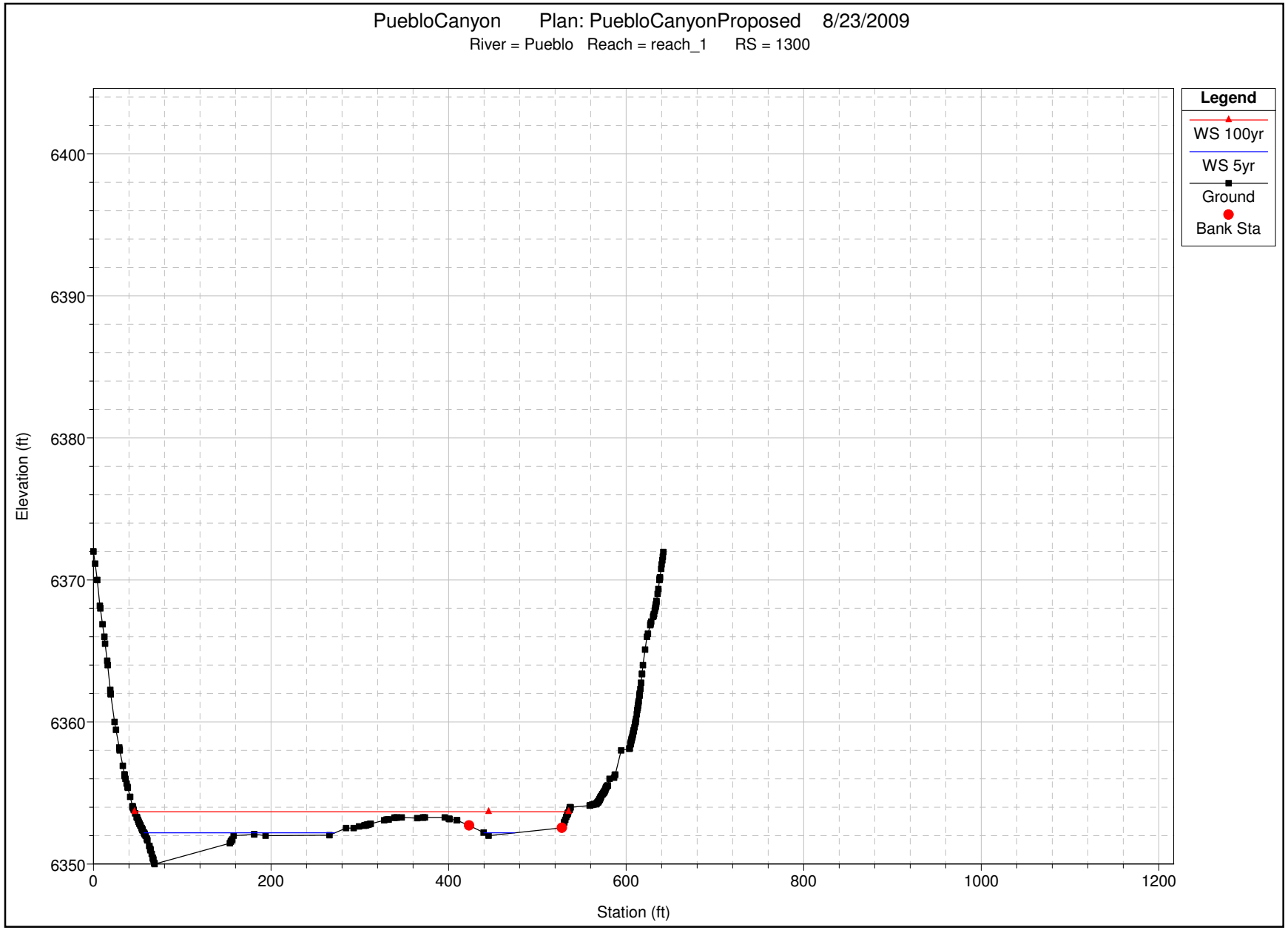
River = Pueblo Reach = reach_1 RS = 1100 coordinate at station 515 interpolated from topo



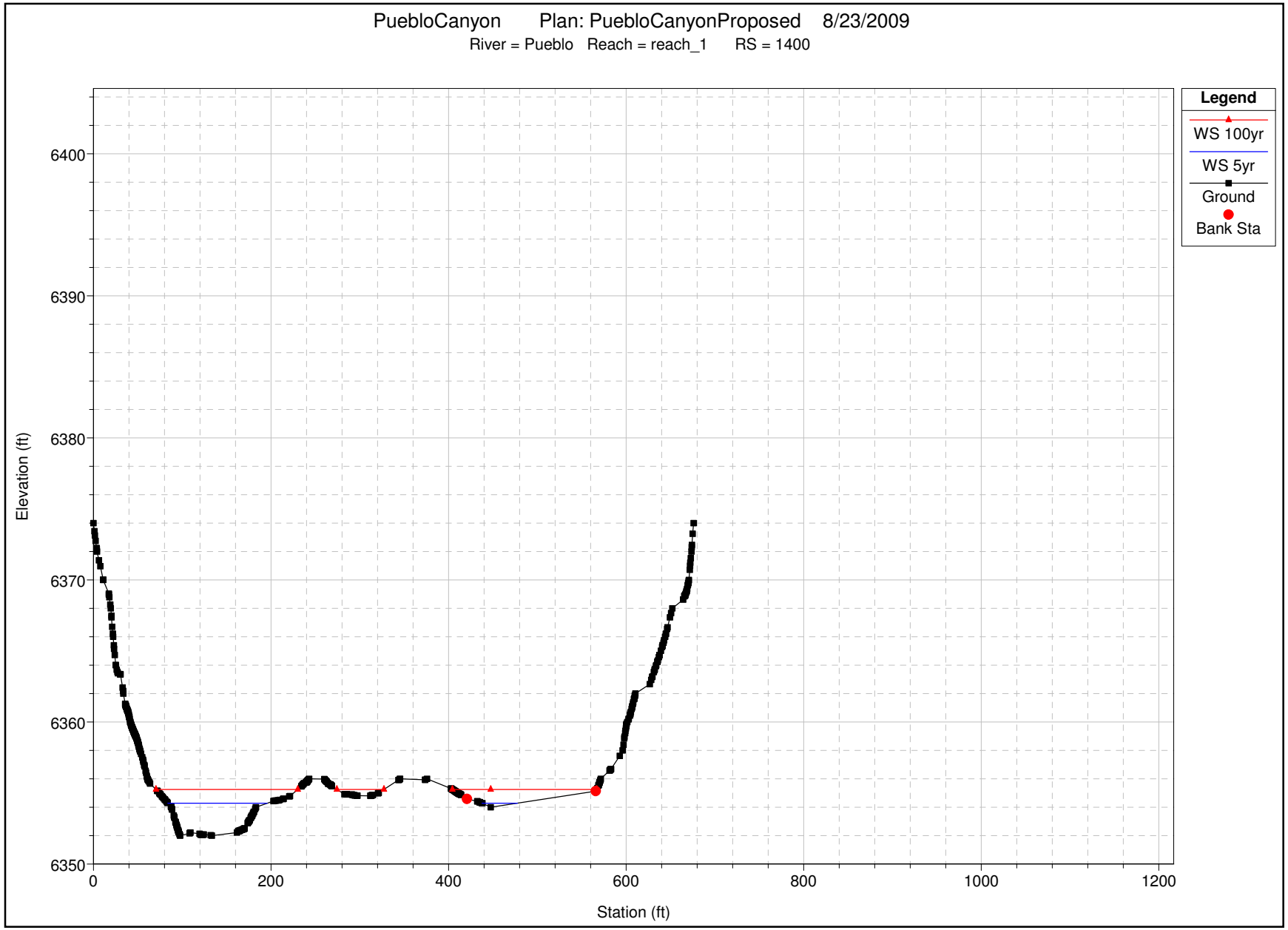
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



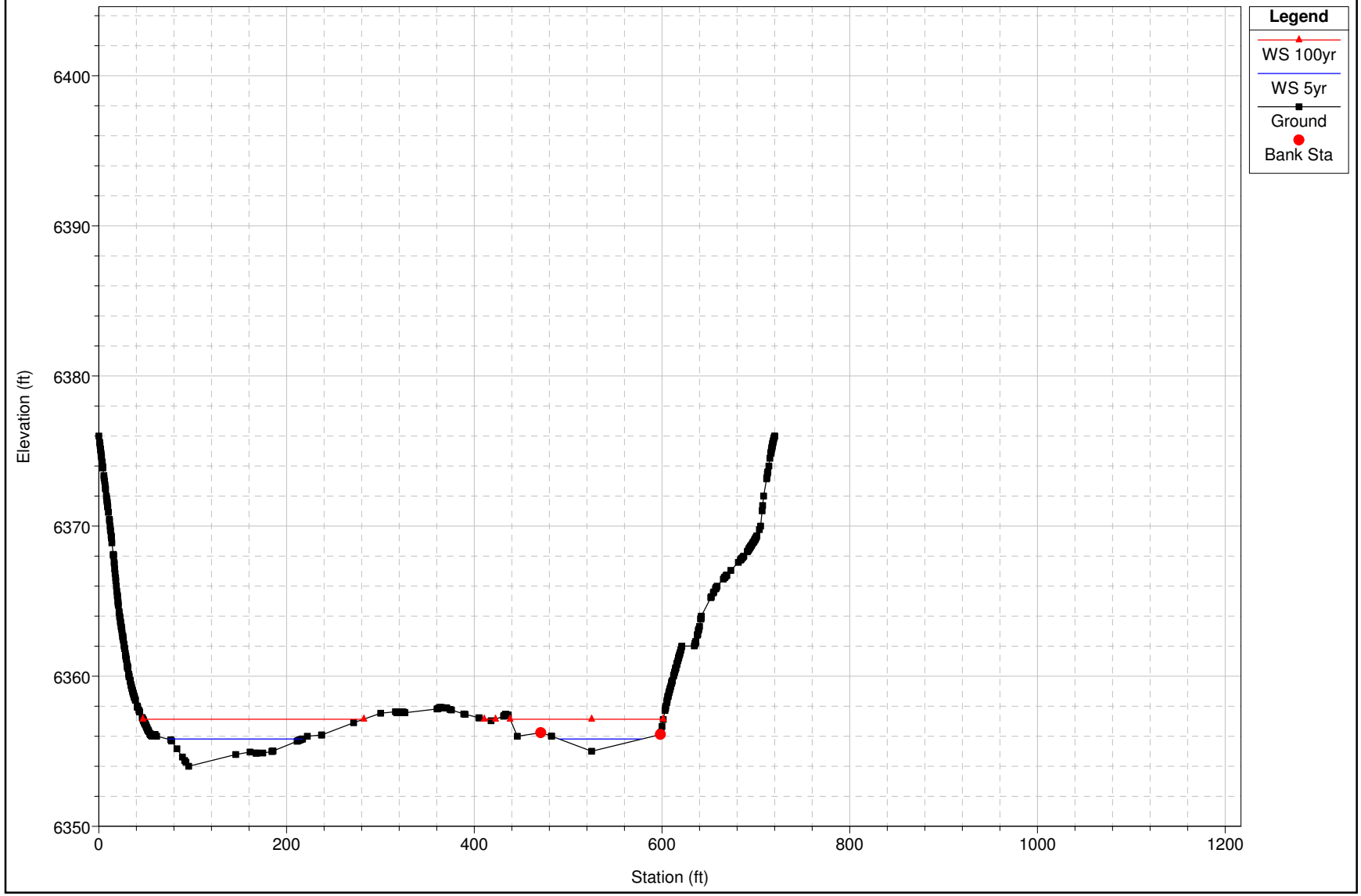
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



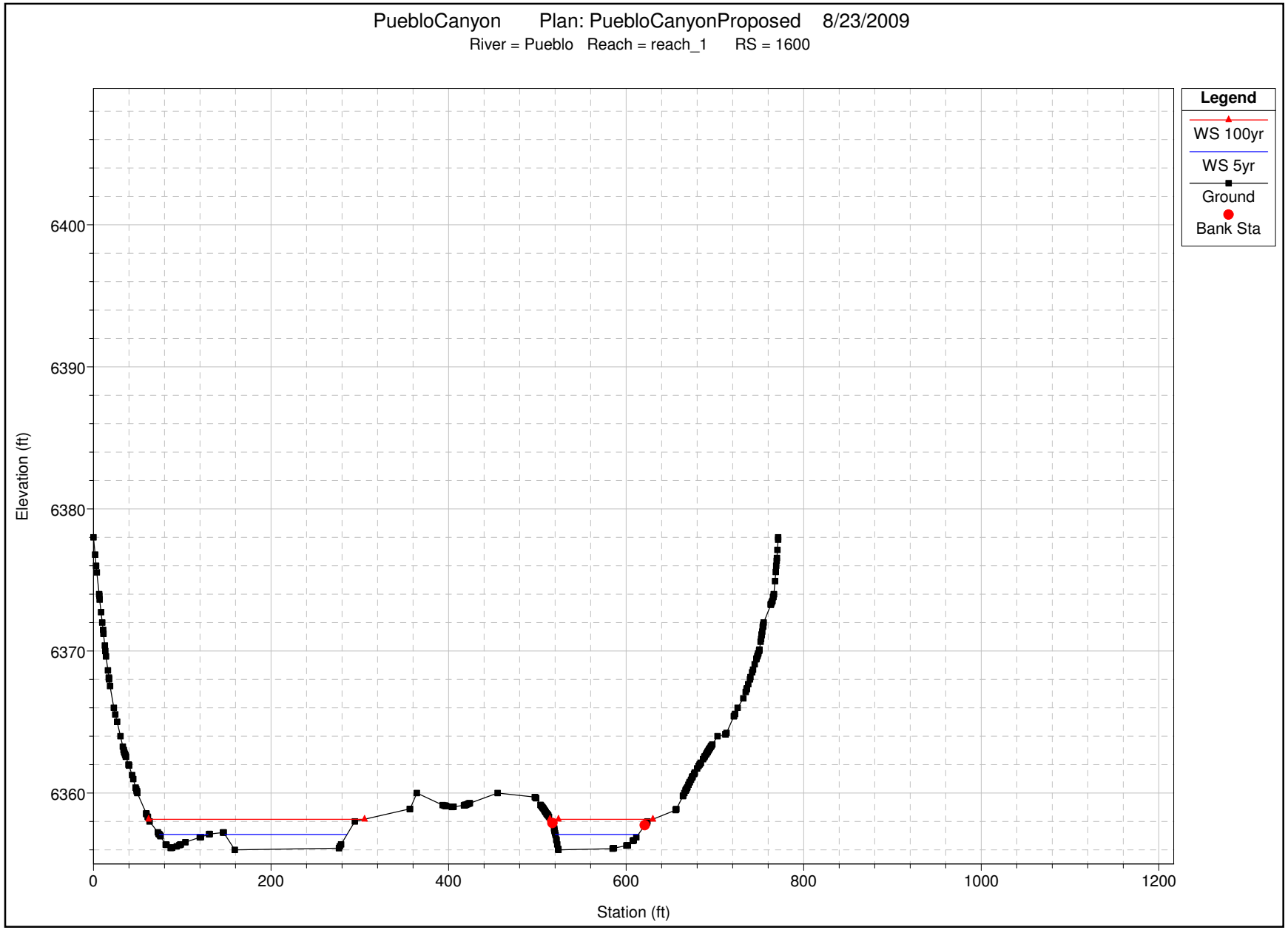
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

River = Pueblo Reach = reach_1 RS = 1500 coordinate at station 525 interpolated from topo



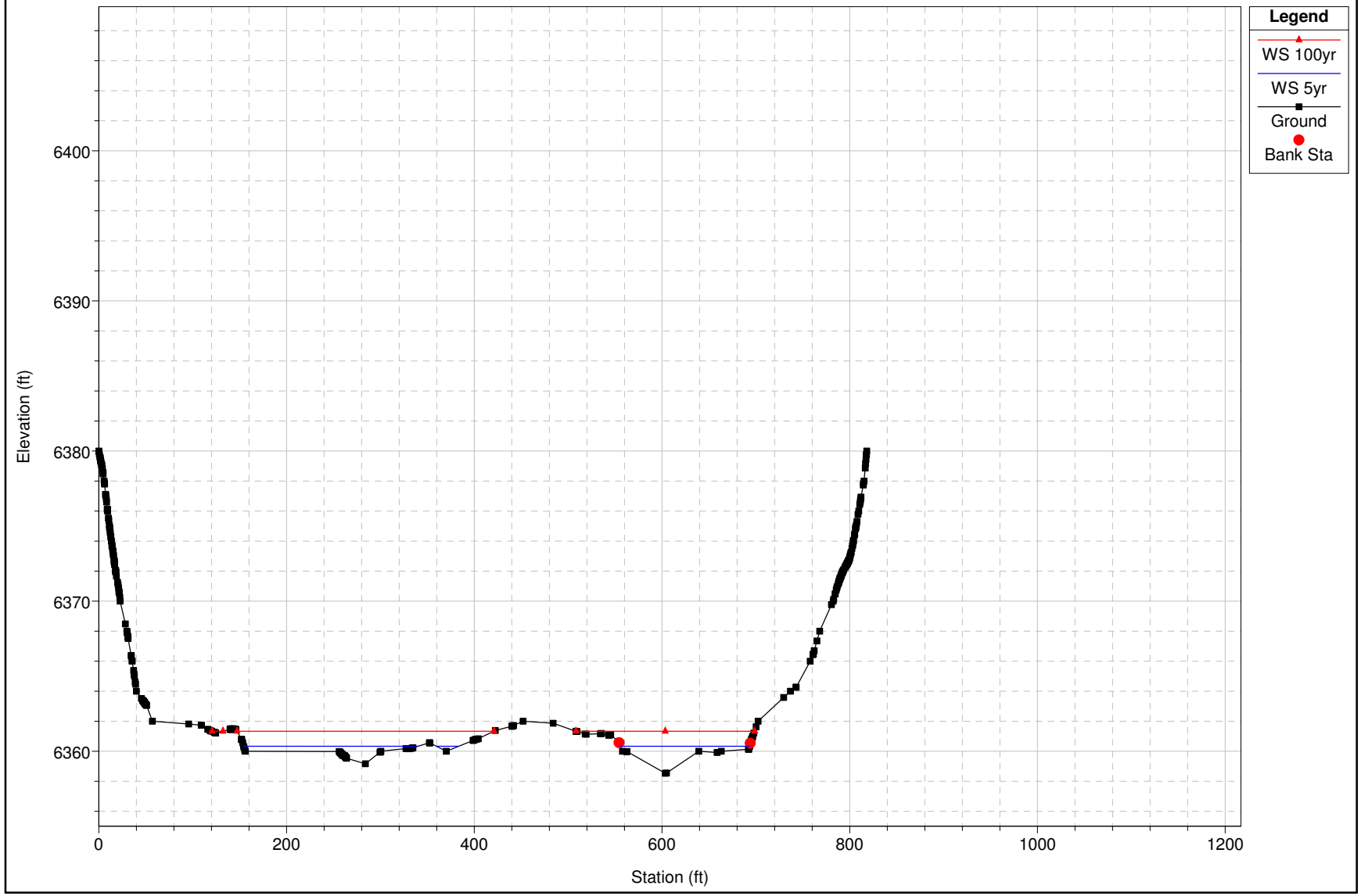
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



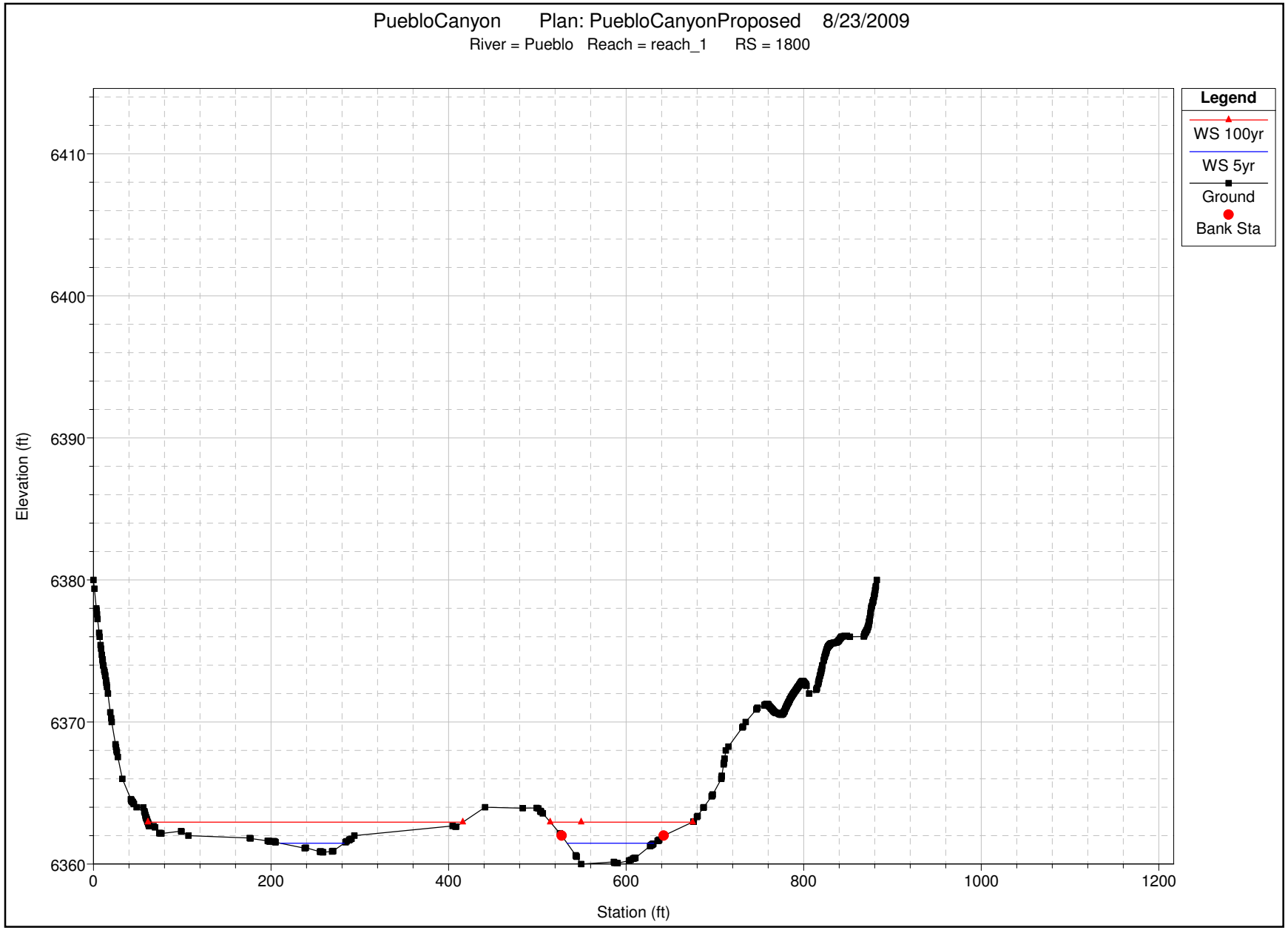
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

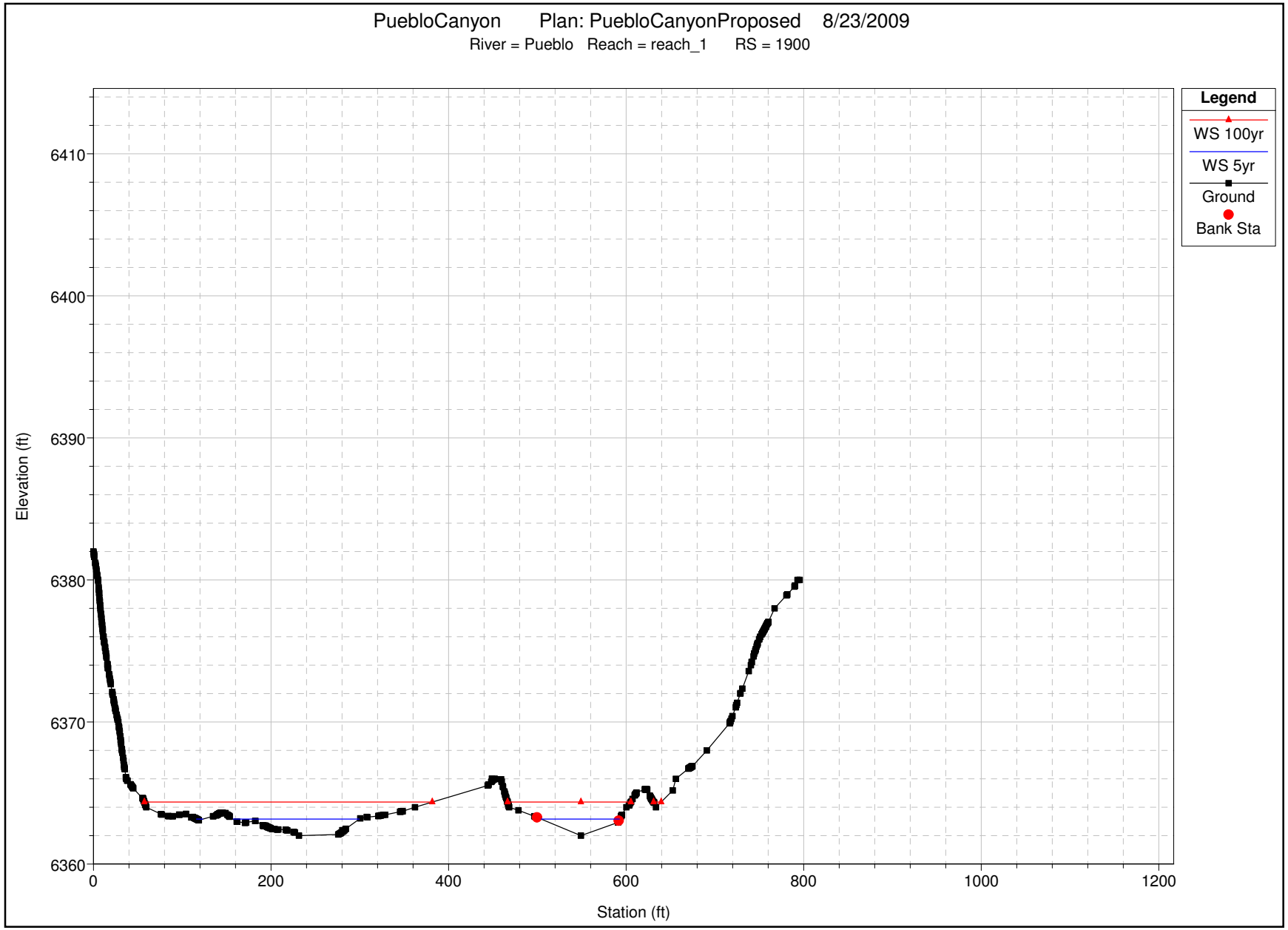
River = Pueblo Reach = reach_1 RS = 1700



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



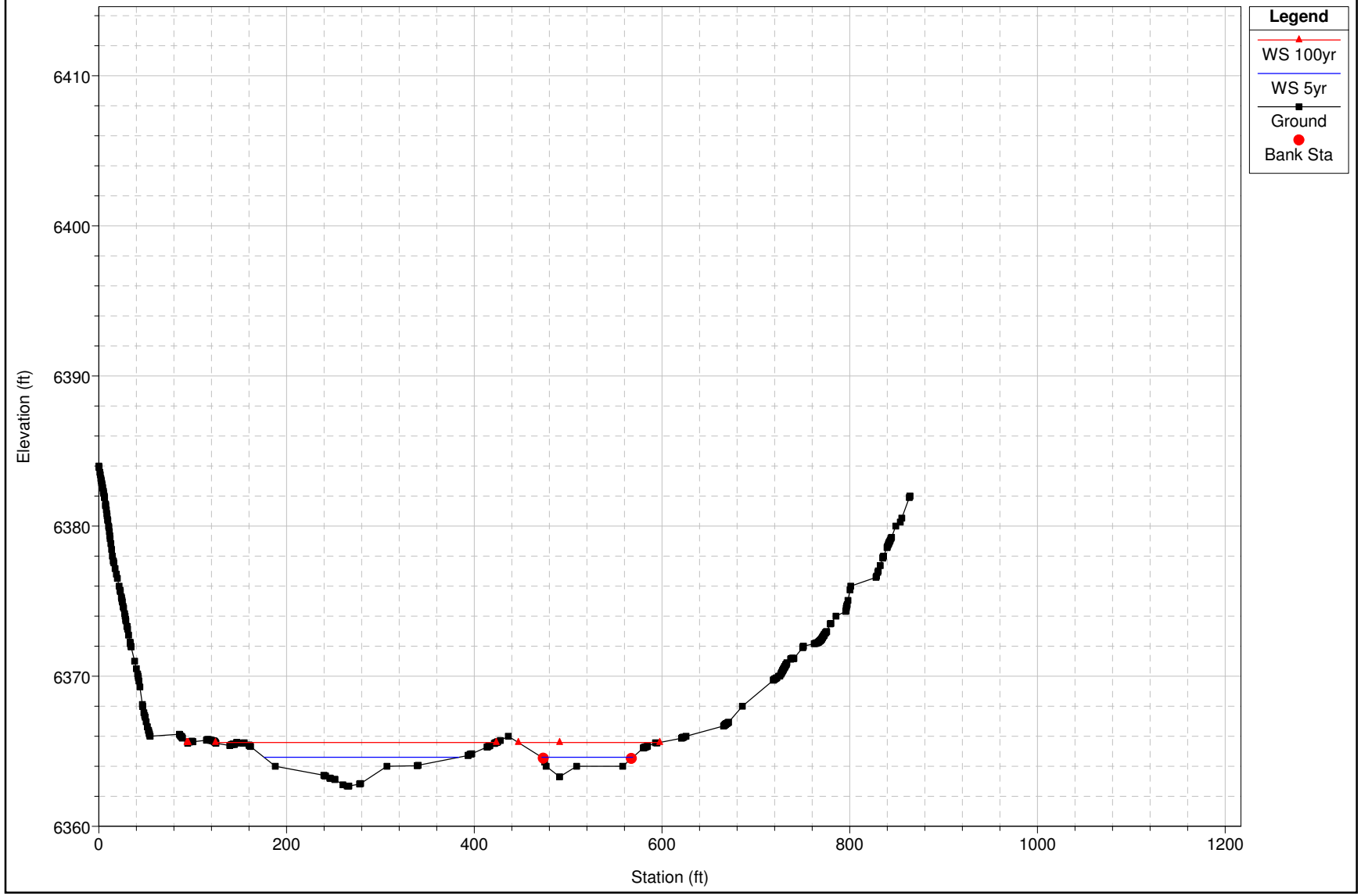
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

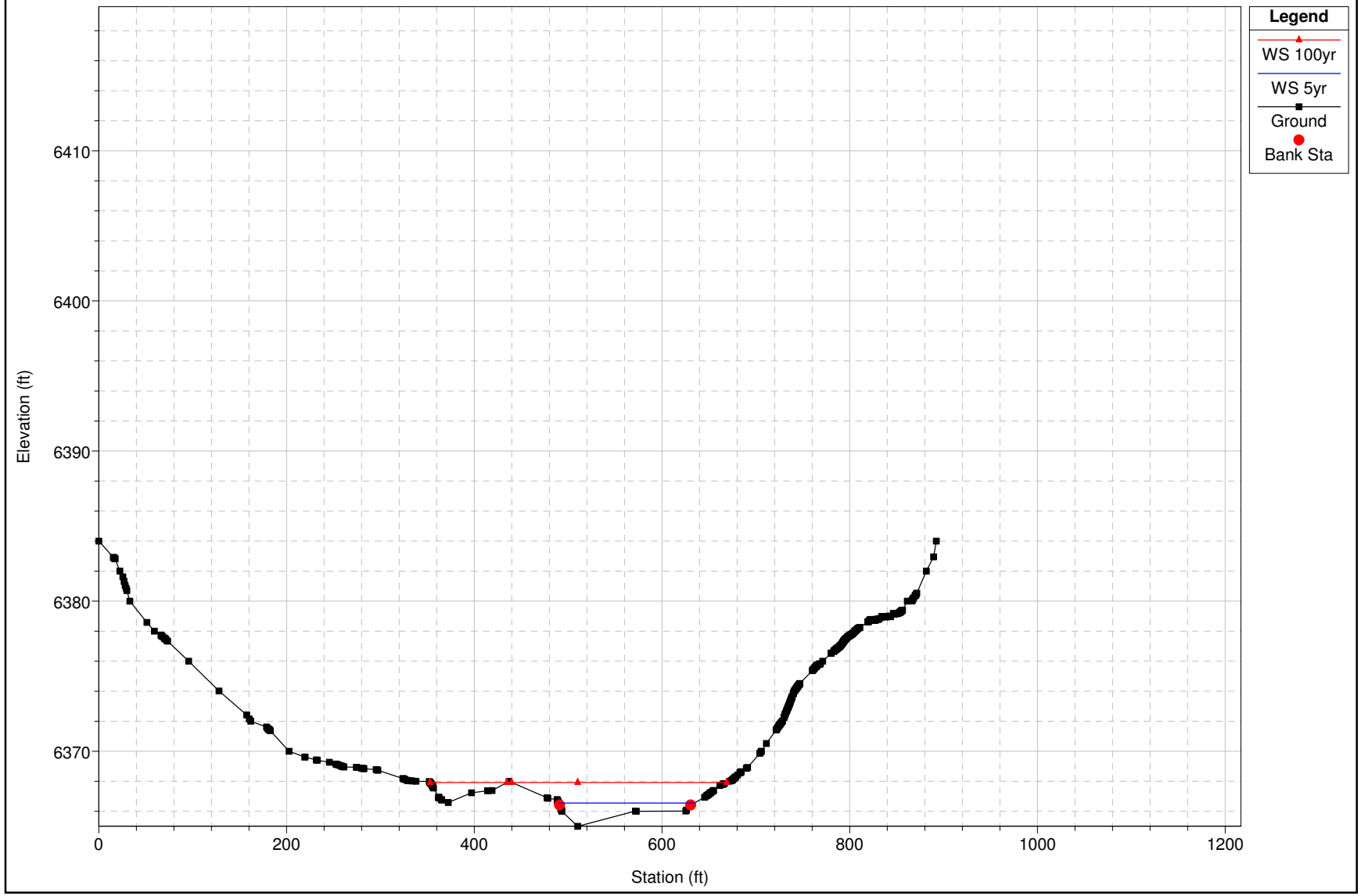
River = Pueblo Reach = reach_1 RS = 2000 coordinates at stations 491, 509, and 558 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

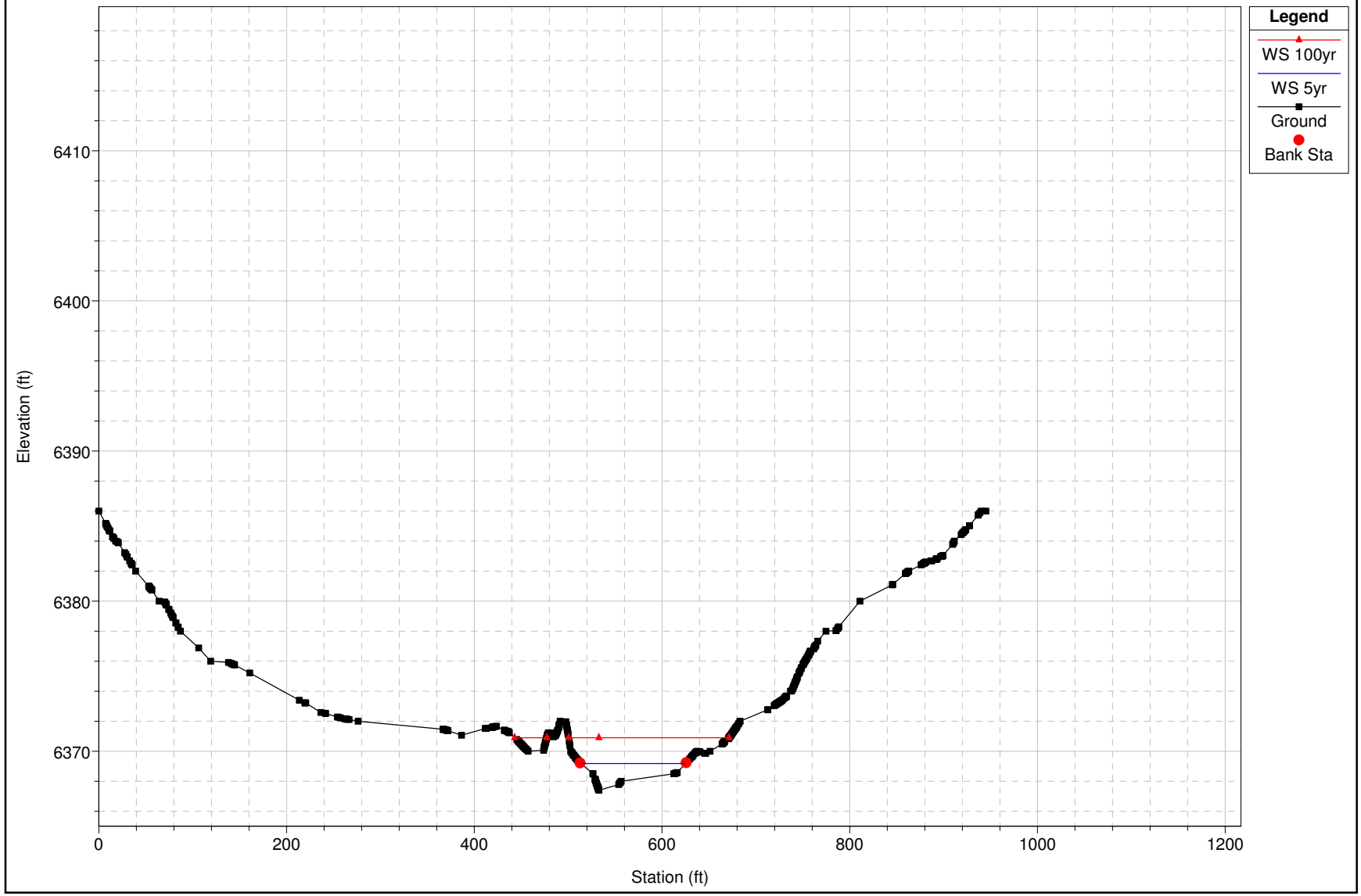
River = Pueblo Reach = reach_1 RS = 2100 coordinate at station 510 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

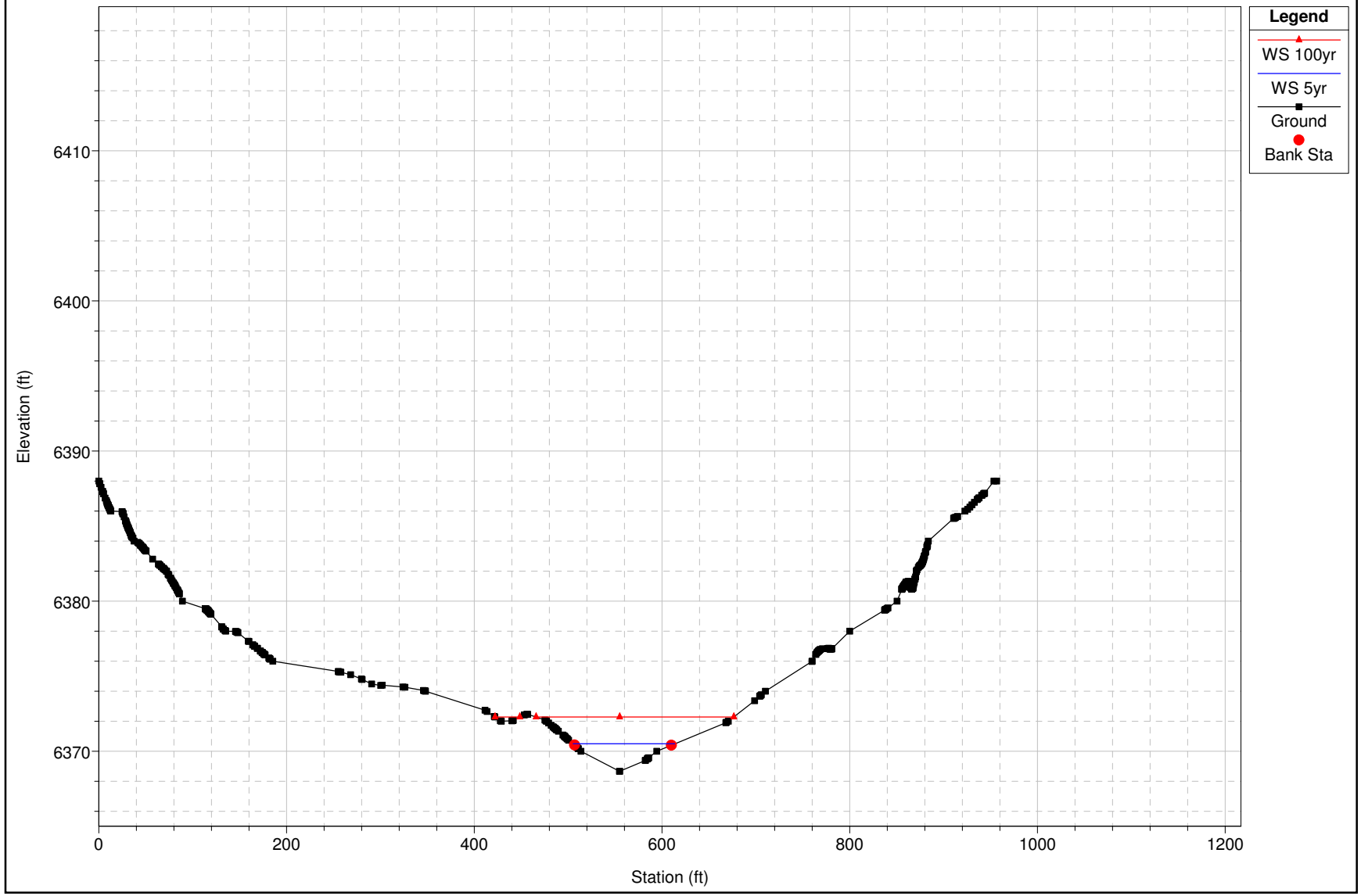
River = Pueblo Reach = reach_1 RS = 2200



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

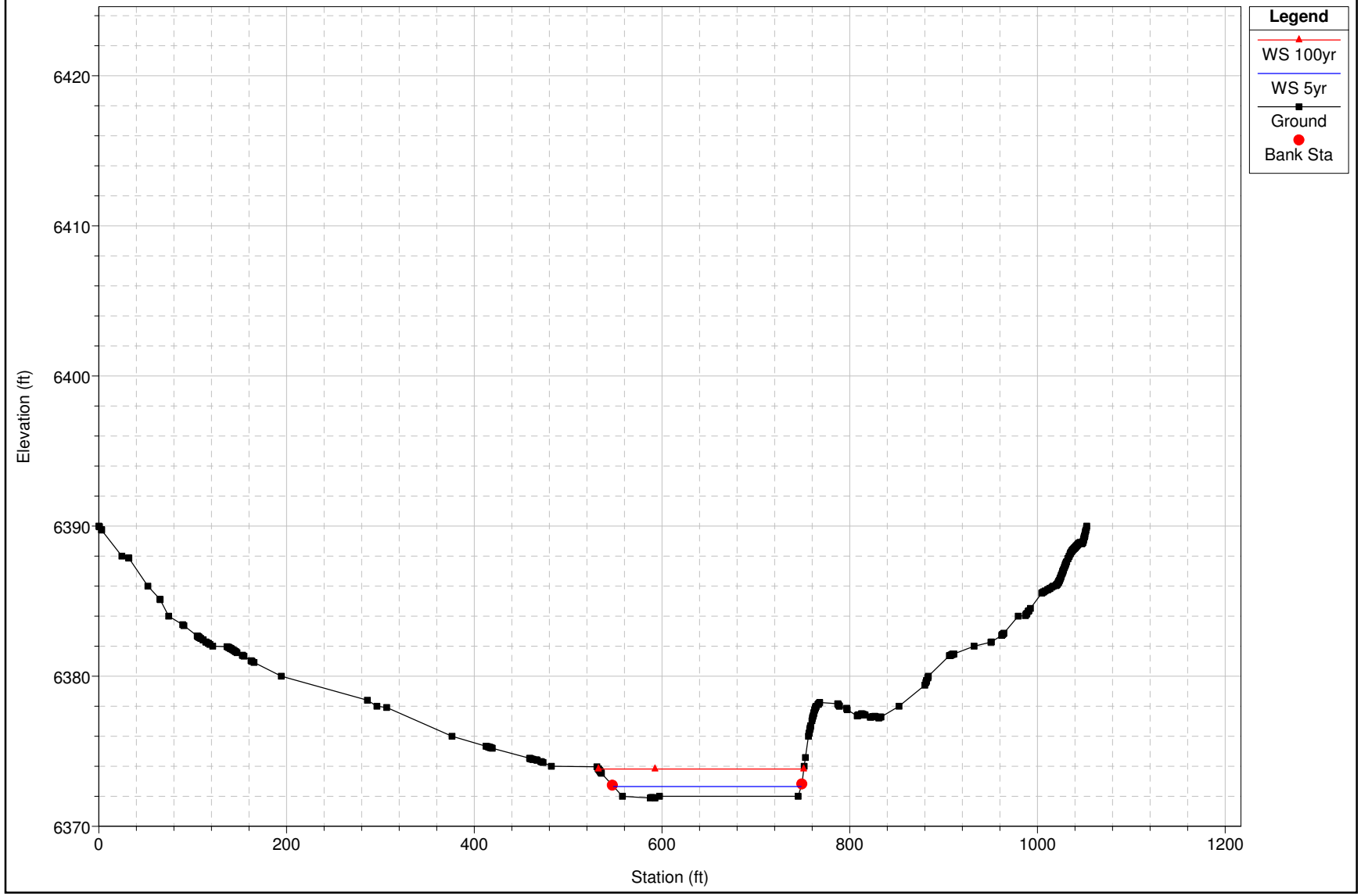
River = Pueblo Reach = reach_1 RS = 2300



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

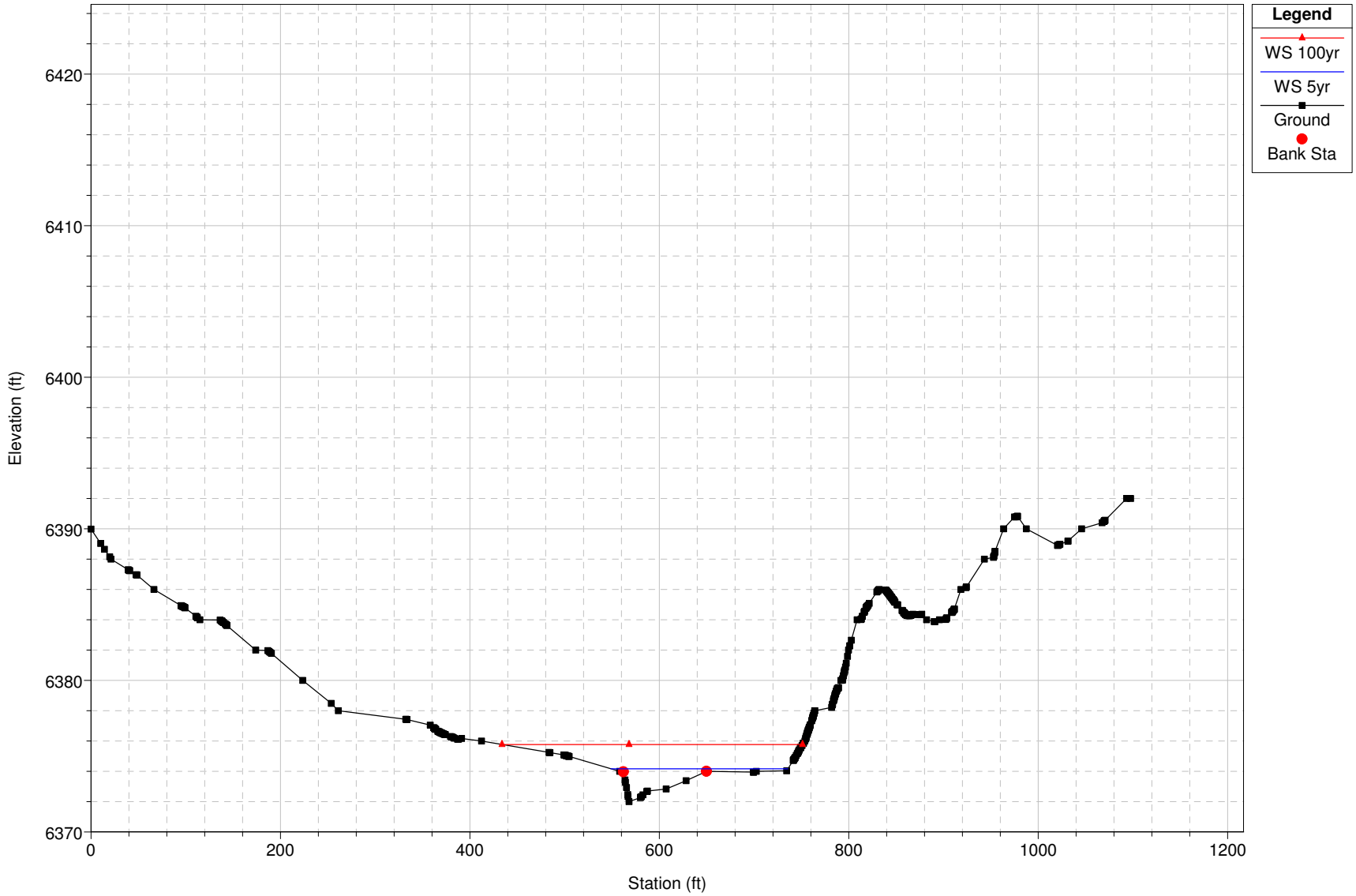
River = Pueblo Reach = reach_1 RS = 2400 coordinate at station 745 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

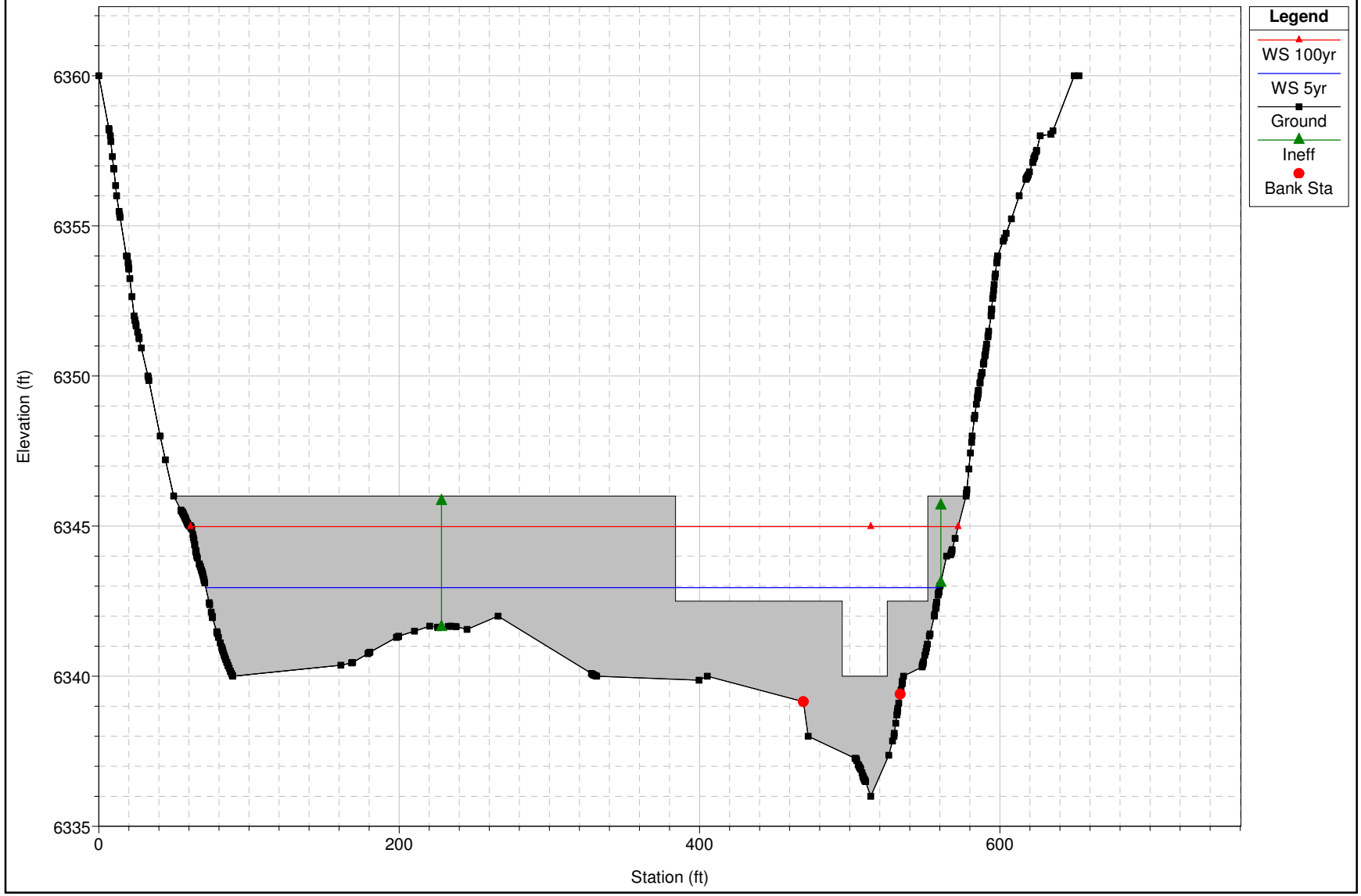
River = Pueblo Reach = reach_1 RS = 2500



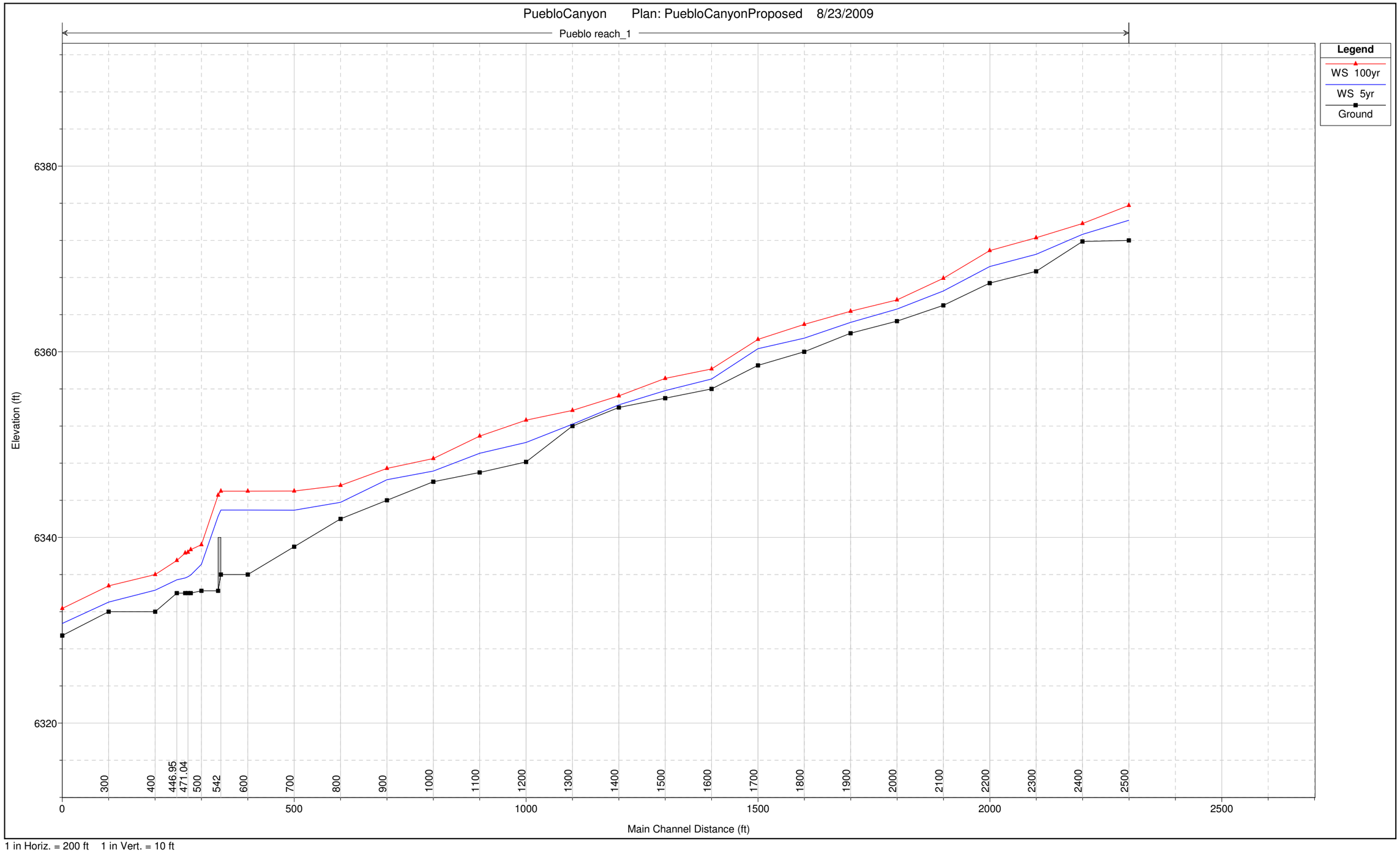
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed 8/23/2009

River = Pueblo Reach = reach_1 RS = 542 IS



1 in Horiz. = 100 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 10 ft

HEC-RAS Plan: PuebloProp River: Pueblo Reach: reach_1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	2500	5yr	593.00	6372.00	6374.17	6374.17	6374.65	0.010216	5.60	120.82	186.93	0.91
reach_1	2500	100yr	2740.00	6372.00	6375.77	6375.77	6376.72	0.008008	8.76	512.16	317.47	0.92
reach_1	2400	5yr	593.00	6371.88	6372.66	6372.66	6372.98	0.015336	4.59	129.31	199.93	1.00
reach_1	2400	100yr	2740.00	6371.88	6373.81	6373.81	6374.69	0.010523	7.51	372.32	218.66	0.99
reach_1	2300	5yr	593.00	6368.66	6370.49	6370.48	6371.00	0.012972	5.68	104.56	108.23	1.00
reach_1	2300	100yr	2740.00	6368.66	6372.28	6372.28	6373.42	0.008091	8.84	394.21	237.02	0.93
reach_1	2200	5yr	593.00	6367.40	6369.18	6369.18	6369.67	0.013767	5.61	105.68	111.24	1.01
reach_1	2200	100yr	2740.00	6367.40	6370.91	6370.91	6372.02	0.008342	8.68	375.43	204.92	0.94
reach_1	2100	5yr	593.00	6365.00	6366.56	6366.56	6366.98	0.014336	5.19	114.68	144.75	1.01
reach_1	2100	100yr	2740.00	6365.00	6367.92	6367.92	6368.91	0.009899	8.29	428.38	311.39	0.99
reach_1	2000	5yr	593.00	6363.30	6364.60		6364.73	0.010082	3.86	243.13	304.09	0.82
reach_1	2000	100yr	2740.00	6363.30	6365.59	6365.42	6366.22	0.014994	8.53	601.25	451.25	1.16
reach_1	1900	5yr	593.00	6362.00	6363.17	6363.17	6363.51	0.025437	5.83	156.20	237.40	1.29
reach_1	1900	100yr	2740.00	6362.00	6364.37	6364.37	6365.04	0.014070	8.69	615.29	471.77	1.14
reach_1	1800	5yr	593.00	6360.00	6361.46	6361.45	6361.91	0.011359	5.48	127.81	168.98	0.94
reach_1	1800	100yr	2740.00	6360.00	6362.95	6362.95	6363.63	0.007479	7.57	652.93	515.07	0.87
reach_1	1700	5yr	593.00	6358.54	6360.34	6360.34	6360.62	0.013541	4.72	184.60	346.41	0.97
reach_1	1700	100yr	2740.00	6358.54	6361.34	6361.34	6362.00	0.011713	7.71	586.70	475.79	1.03
reach_1	1600	5yr	593.00	6356.00	6357.08		6357.23	0.007387	3.98	240.64	285.61	0.74
reach_1	1600	100yr	2740.00	6356.00	6358.16	6357.93	6358.75	0.011040	7.85	591.40	359.38	1.01
reach_1	1500	5yr	593.00	6355.00	6355.81	6355.59	6356.00	0.024357	4.23	172.73	230.33	1.17
reach_1	1500	100yr	2740.00	6355.00	6357.14	6356.72	6357.60	0.011342	7.05	628.64	410.46	1.00
reach_1	1400	5yr	593.00	6354.00	6354.29		6354.44	0.011313	1.44	191.22	152.19	0.67
reach_1	1400	100yr	2740.00	6354.00	6355.26	6355.19	6355.85	0.031851	7.18	450.55	375.55	1.48
reach_1	1300	5yr	593.00	6352.00	6352.20	6352.07	6352.41	0.046939	2.28	160.45	249.75	1.28
reach_1	1300	100yr	2740.00	6352.00	6353.69	6353.02	6354.01	0.011192	6.53	739.45	488.86	0.98
reach_1	1200	5yr	593.00	6348.13	6350.23	6350.23	6350.82	0.009772	6.51	127.04	127.58	0.92
reach_1	1200	100yr	2740.00	6348.13	6352.63	6352.63	6353.36	0.004827	8.55	783.20	508.74	0.76
reach_1	1100	5yr	593.00	6347.00	6349.06	6349.06	6349.63	0.011726	6.27	116.26	121.13	0.98
reach_1	1100	100yr	2740.00	6347.00	6350.91	6350.91	6351.68	0.006497	8.51	677.58	456.38	0.85
reach_1	1000	5yr	593.00	6346.00	6347.14	6347.00	6347.47	0.012283	5.63	172.32	182.89	0.97
reach_1	1000	100yr	2740.00	6346.00	6348.51	6348.51	6349.16	0.010250	8.98	694.64	470.13	1.02
reach_1	900	5yr	593.00	6344.00	6346.22	6346.22	6346.64	0.006026	5.58	187.18	340.53	0.74
reach_1	900	100yr	2740.00	6344.00	6347.44	6347.44	6348.15	0.007937	9.09	726.49	478.95	0.93
reach_1	800	5yr	593.00	6342.00	6343.79	6343.79	6344.40	0.012282	6.31	94.92	94.25	1.00
reach_1	800	100yr	2740.00	6342.00	6345.60	6345.60	6346.30	0.006099	7.96	701.31	483.82	0.81
reach_1	700	5yr	593.00	6339.00	6342.94		6342.99	0.000390	2.04	626.86	478.27	0.21
reach_1	700	100yr	2740.00	6339.00	6345.01		6345.12	0.000653	3.73	1639.71	500.16	0.29
reach_1	600	5yr	593.00	6336.00	6342.95	6338.78	6342.97	0.000053	1.12	1027.77	488.67	0.08
reach_1	600	100yr	2740.00	6336.00	6344.98	6341.27	6345.08	0.000283	3.18	1702.31	511.17	0.20
reach_1	542		Inl Struct									
reach_1	500	5yr	593.00	6334.25	6337.10	6337.10	6337.64	0.012936	5.93	104.48	117.20	1.00
reach_1	500	100yr	2740.00	6334.25	6339.21		6340.07	0.005599	8.01	486.82	223.20	0.79
reach_1	477.05	5yr	593.00	6334.00	6335.96	6335.96	6336.67	0.011786	6.75	88.96	68.01	1.00
reach_1	477.05	100yr	2740.00	6334.00	6338.69	6338.69	6339.91	0.005503	9.43	447.90	246.94	0.82
reach_1	471.04	5yr	593.00	6334.00	6335.77	6335.77	6336.44	0.012139	6.58	90.36	70.18	1.01
reach_1	471.04	100yr	2740.00	6334.00	6338.40	6338.39	6339.62	0.005614	9.28	427.86	237.29	0.82
reach_1	465.04	5yr	593.00	6334.00	6335.64	6335.64	6336.31	0.012085	6.57	90.78	71.41	1.00
reach_1	465.04	100yr	2740.00	6334.00	6338.31	6338.31	6339.57	0.005623	9.35	410.42	243.51	0.82
reach_1	446.95	5yr	593.00	6334.00	6335.43	6335.43	6336.04	0.012631	6.29	94.25	78.05	1.01
reach_1	446.95	100yr	2740.00	6334.00	6337.51	6337.51	6339.01	0.008639	10.00	321.54	156.71	0.98

HEC-RAS Plan: PuebloProp River: Pueblo Reach: reach_1 (Continued)

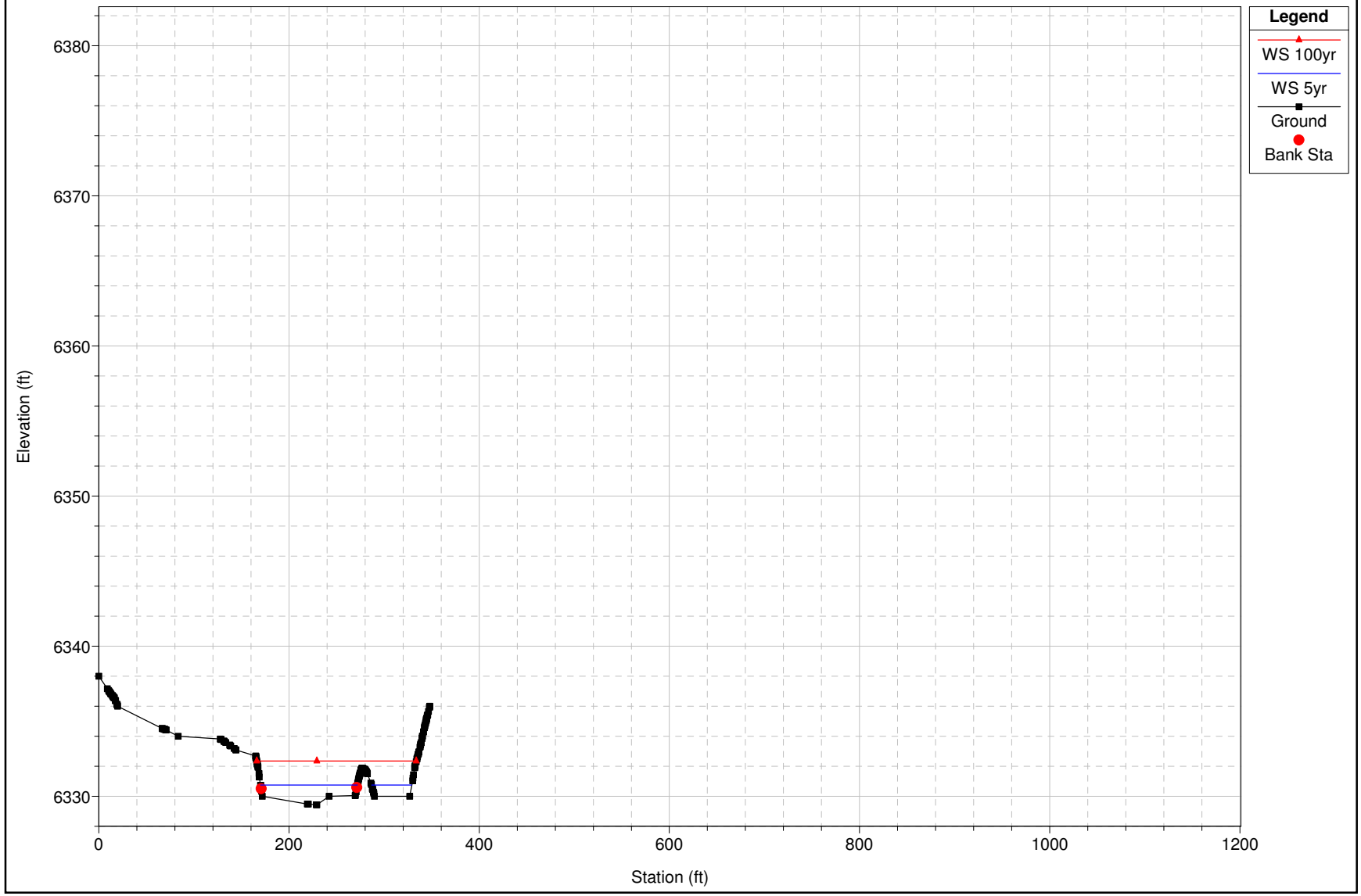
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	400	5yr	593.00	6332.00	6334.32	6334.25	6334.76	0.010839	5.31	112.29	110.46	0.91
reach_1	400	100yr	2740.00	6332.00	6336.01	6336.01	6337.35	0.009300	9.33	308.96	150.46	0.99
reach_1	300	5yr	593.00	6332.00	6333.04	6333.04	6333.54	0.013700	5.74	112.03	123.74	1.02
reach_1	300	100yr	2740.00	6332.00	6334.78	6334.78	6335.88	0.008421	8.86	403.63	200.40	0.95
reach_1	200	5yr	593.00	6329.43	6330.74	6330.74	6331.20	0.014192	5.65	124.15	144.01	1.03
reach_1	200	100yr	2740.00	6329.43	6332.35	6332.35	6333.52	0.010087	9.25	374.91	167.78	1.02

Proposed Conditions
With Sediment

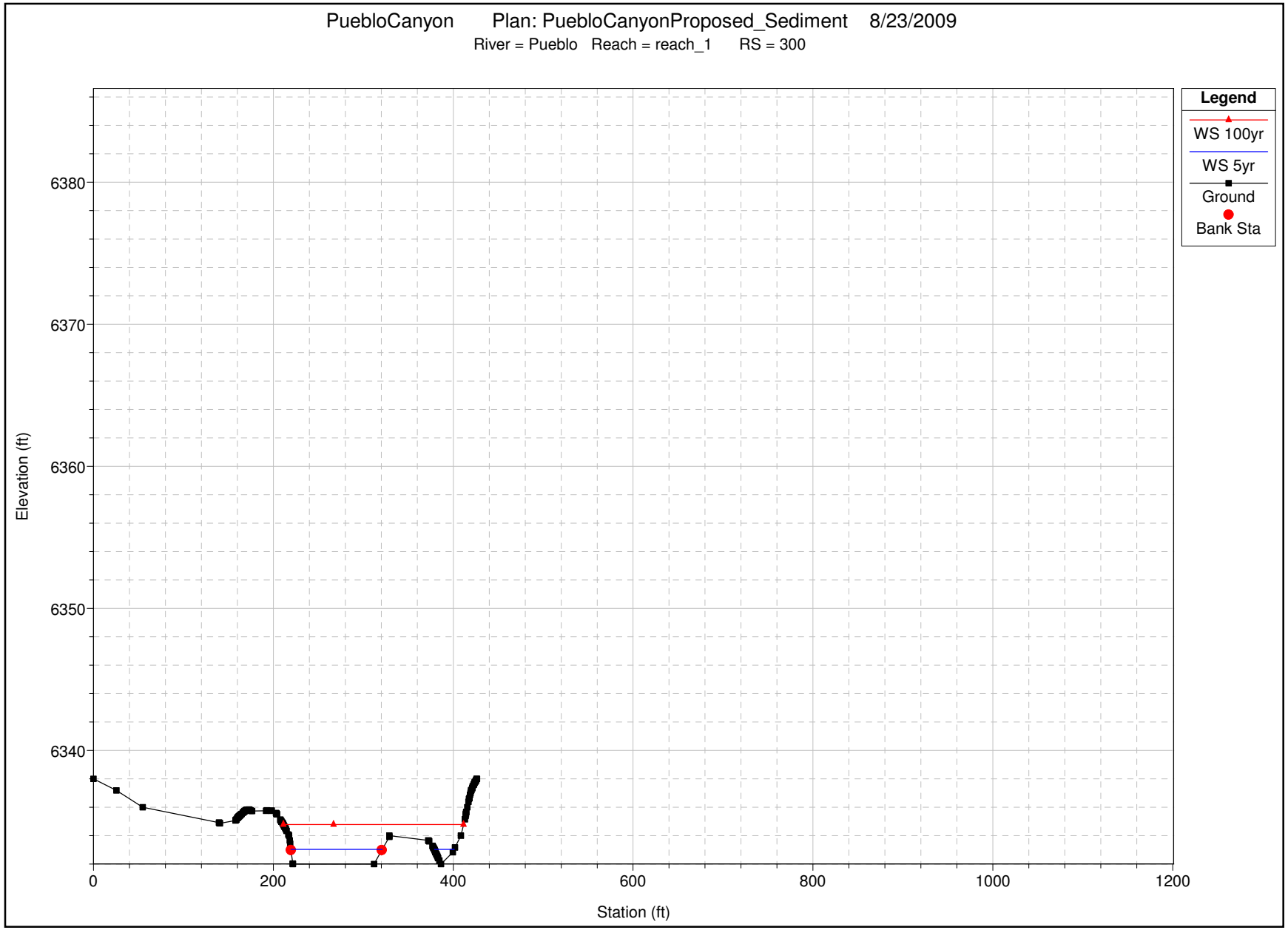
1 in Horiz. = 250 ft 1 in Vert. = 250 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

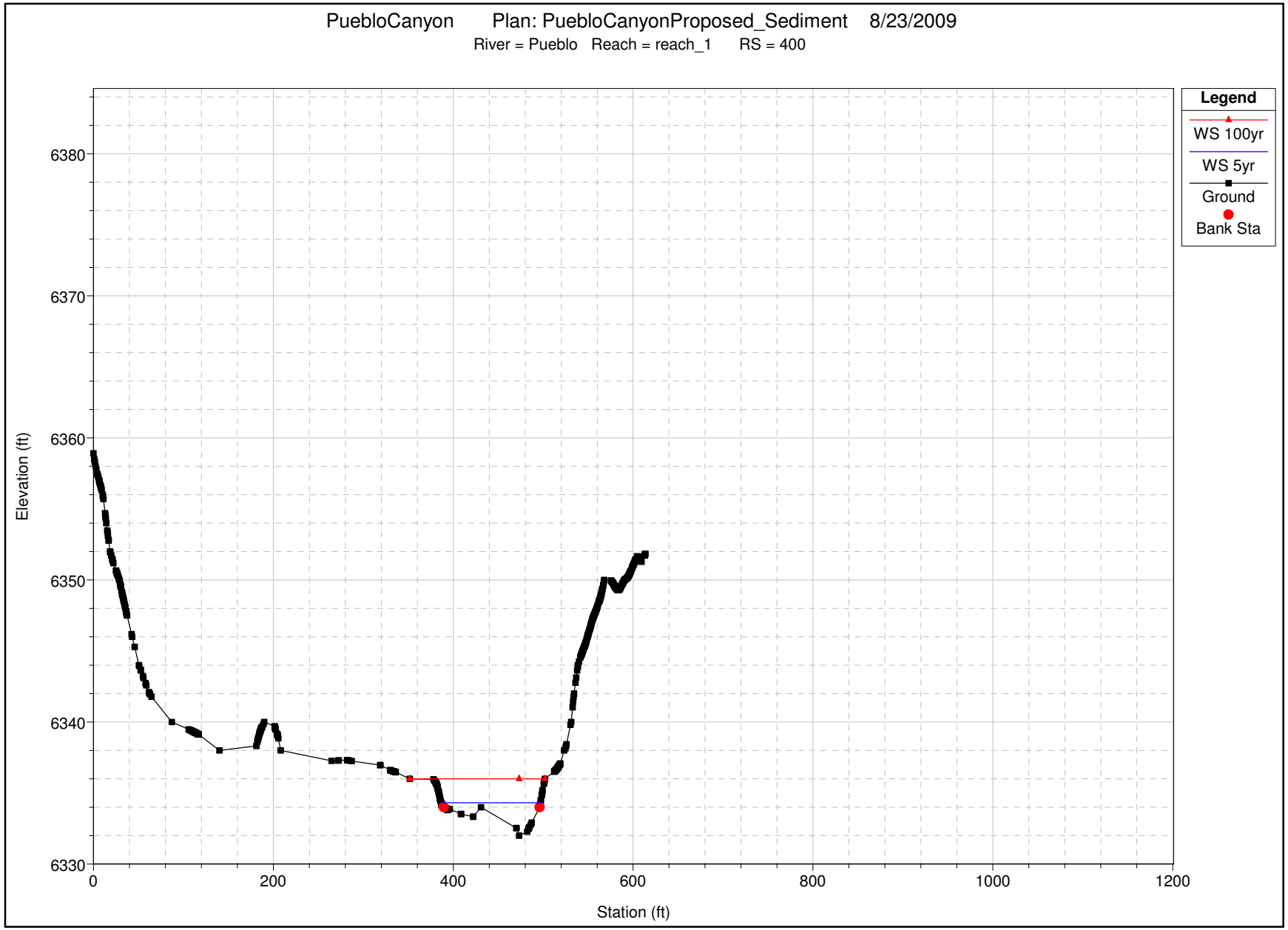
River = Pueblo Reach = reach_1 RS = 200



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



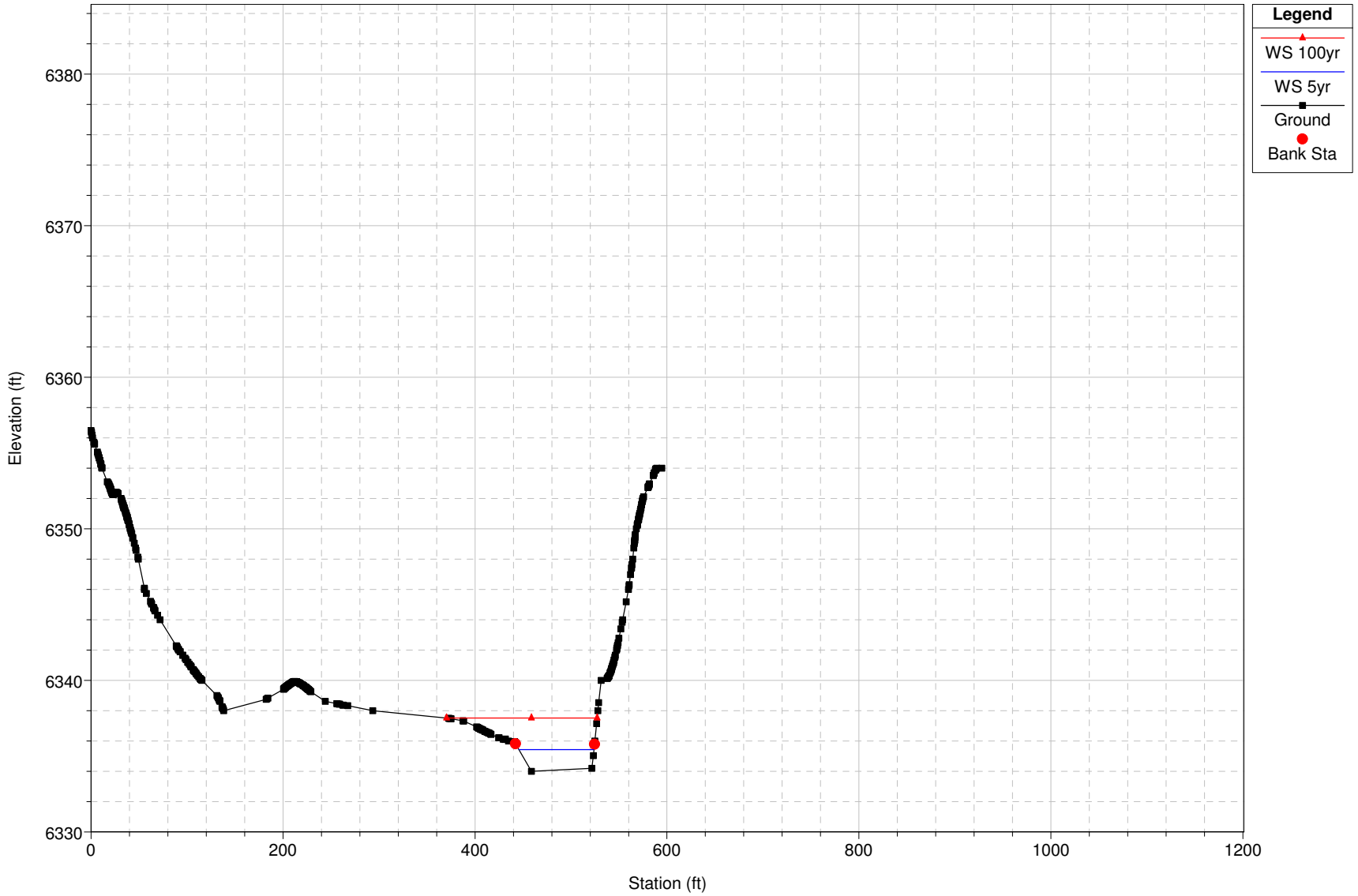
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

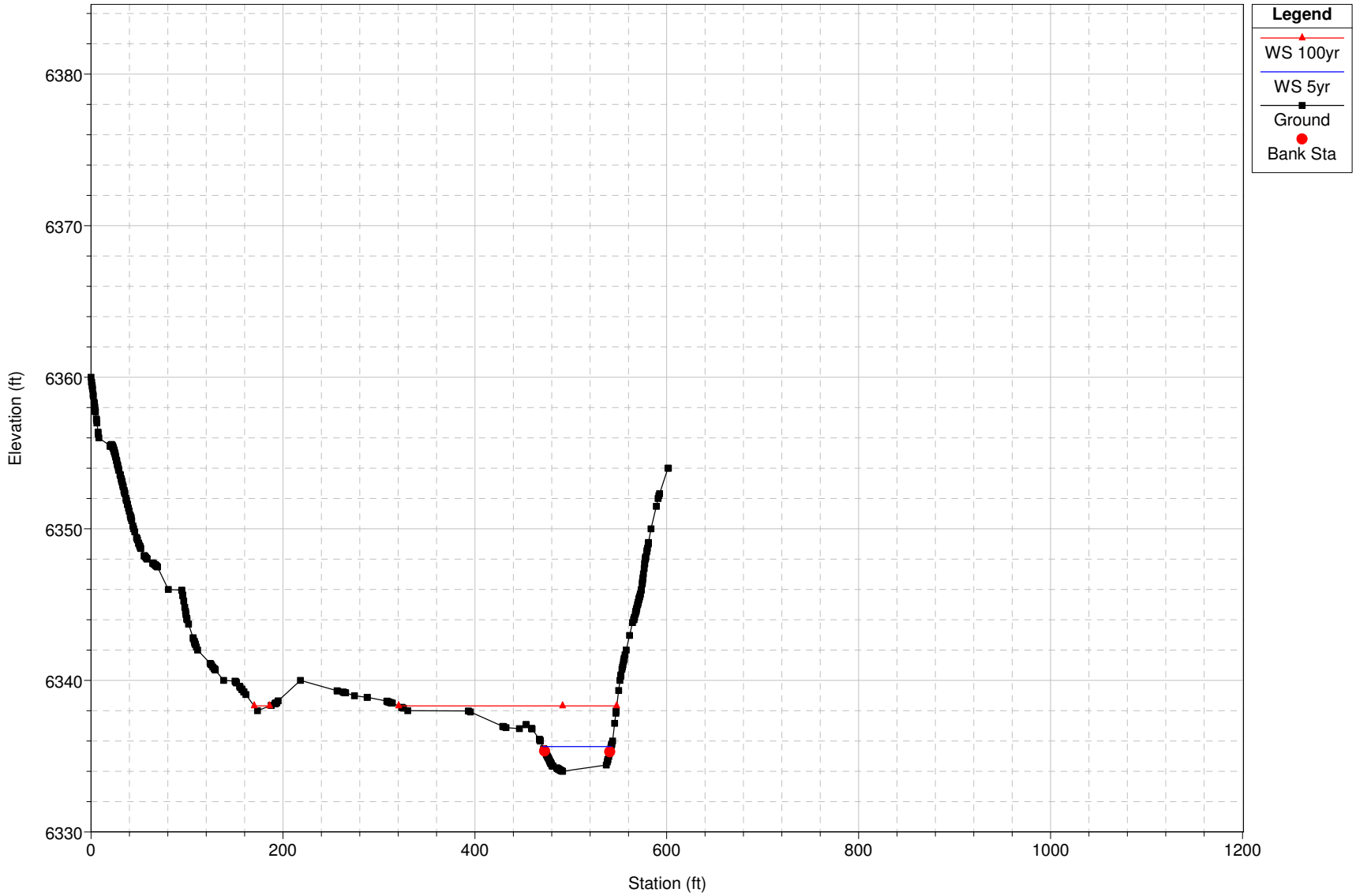
River = Pueblo Reach = reach_1 RS = 446.95



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

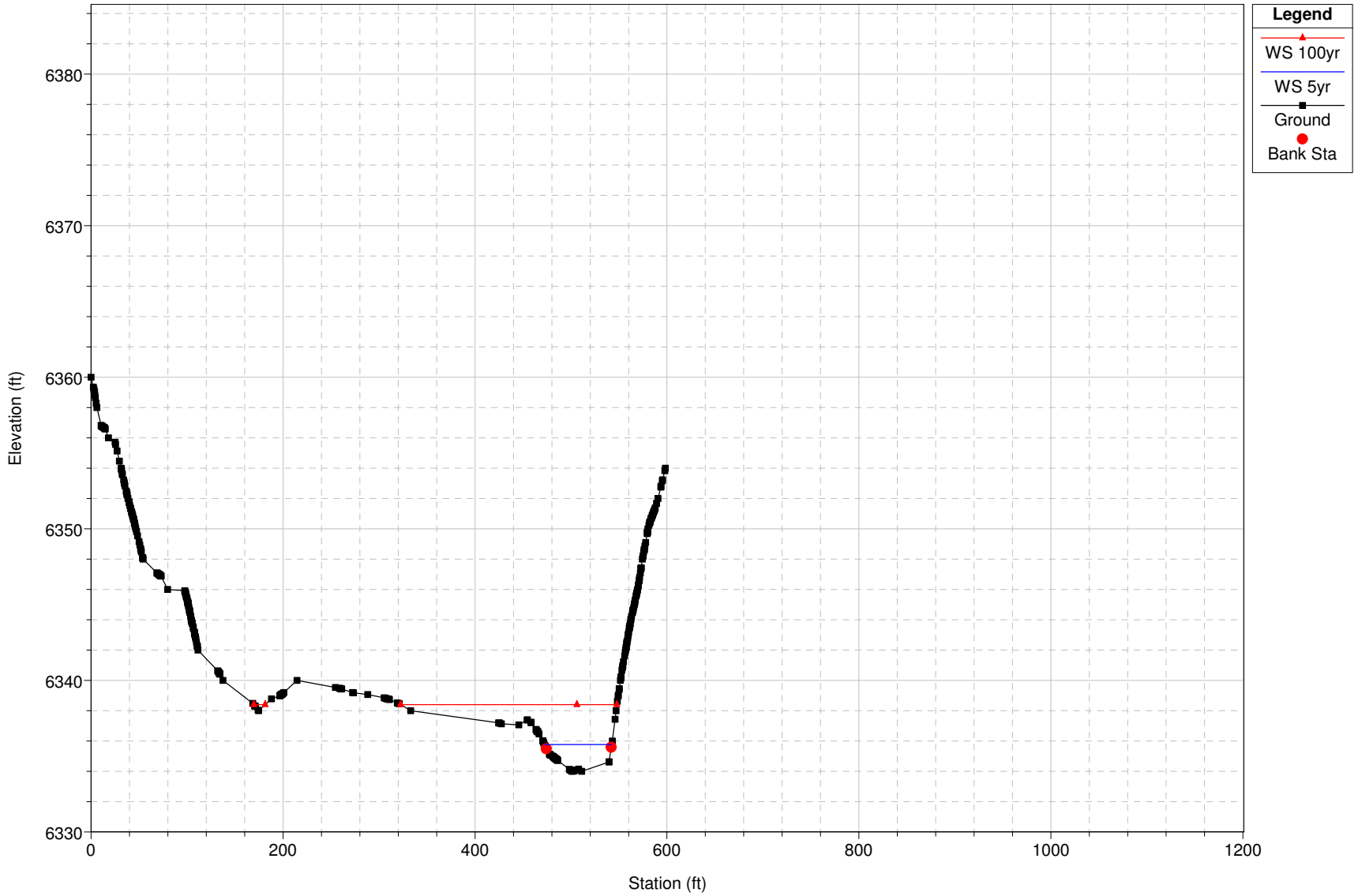
River = Pueblo Reach = reach_1 RS = 465.04



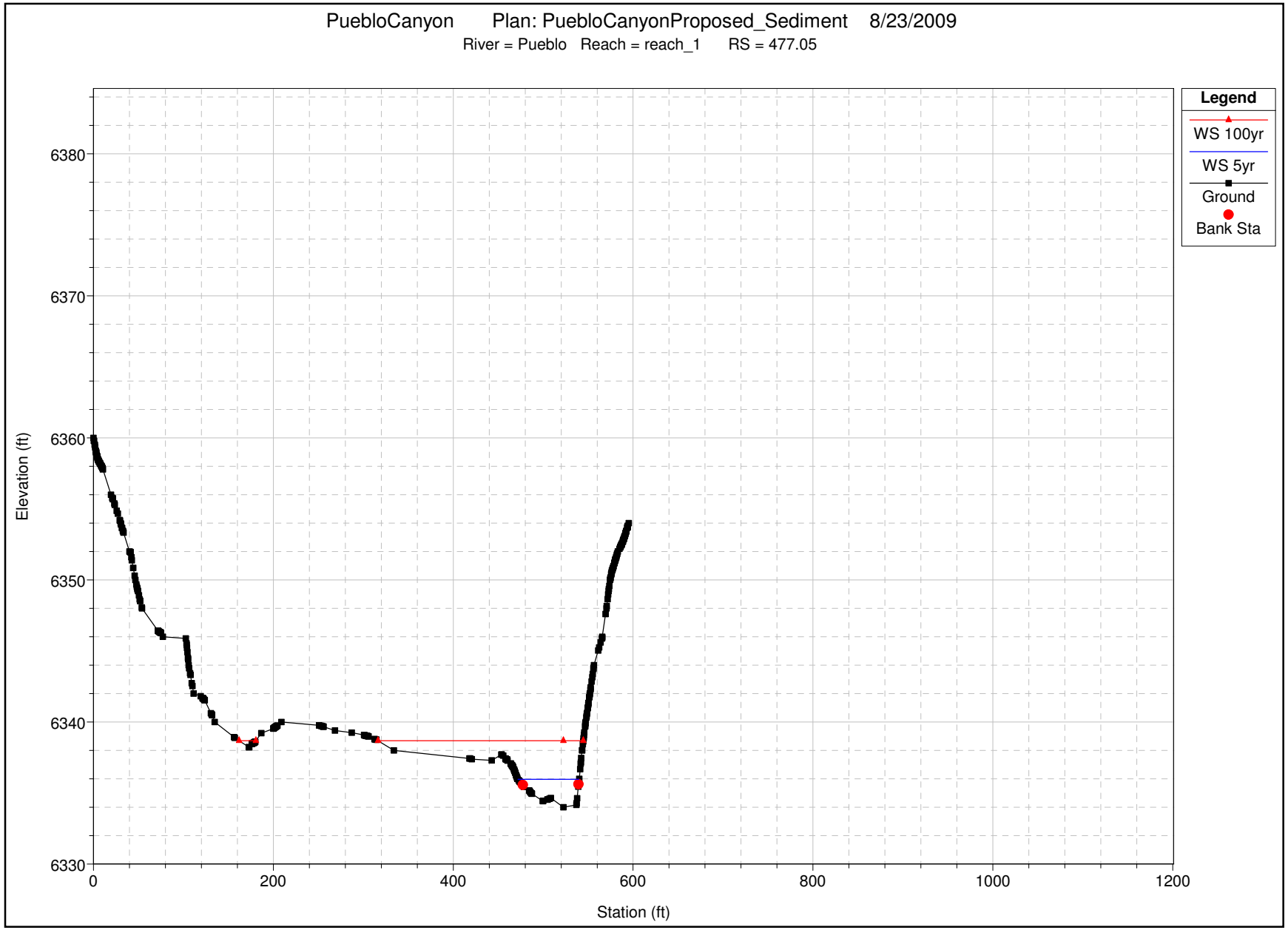
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

River = Pueblo Reach = reach_1 RS = 471.04



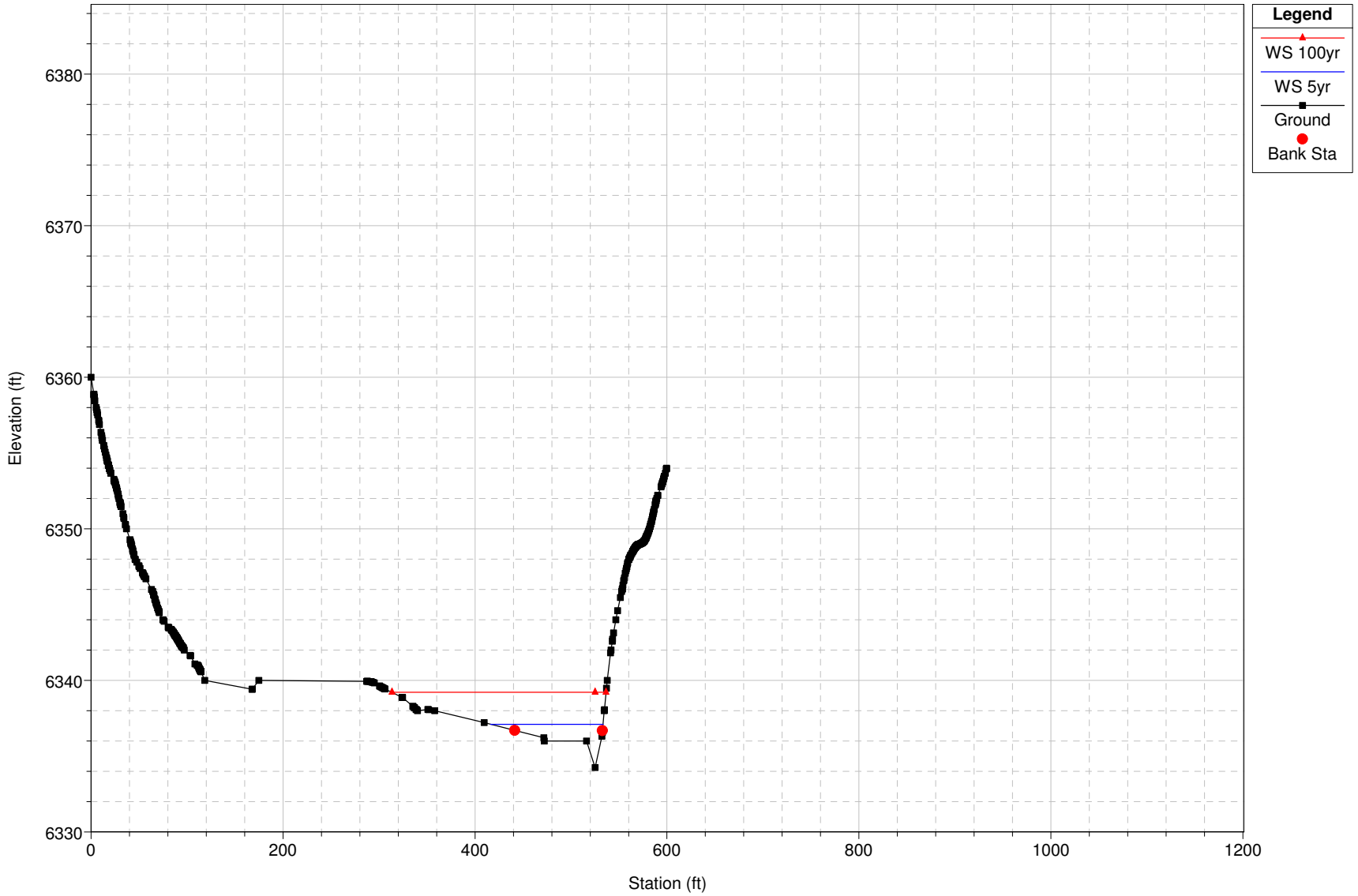
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

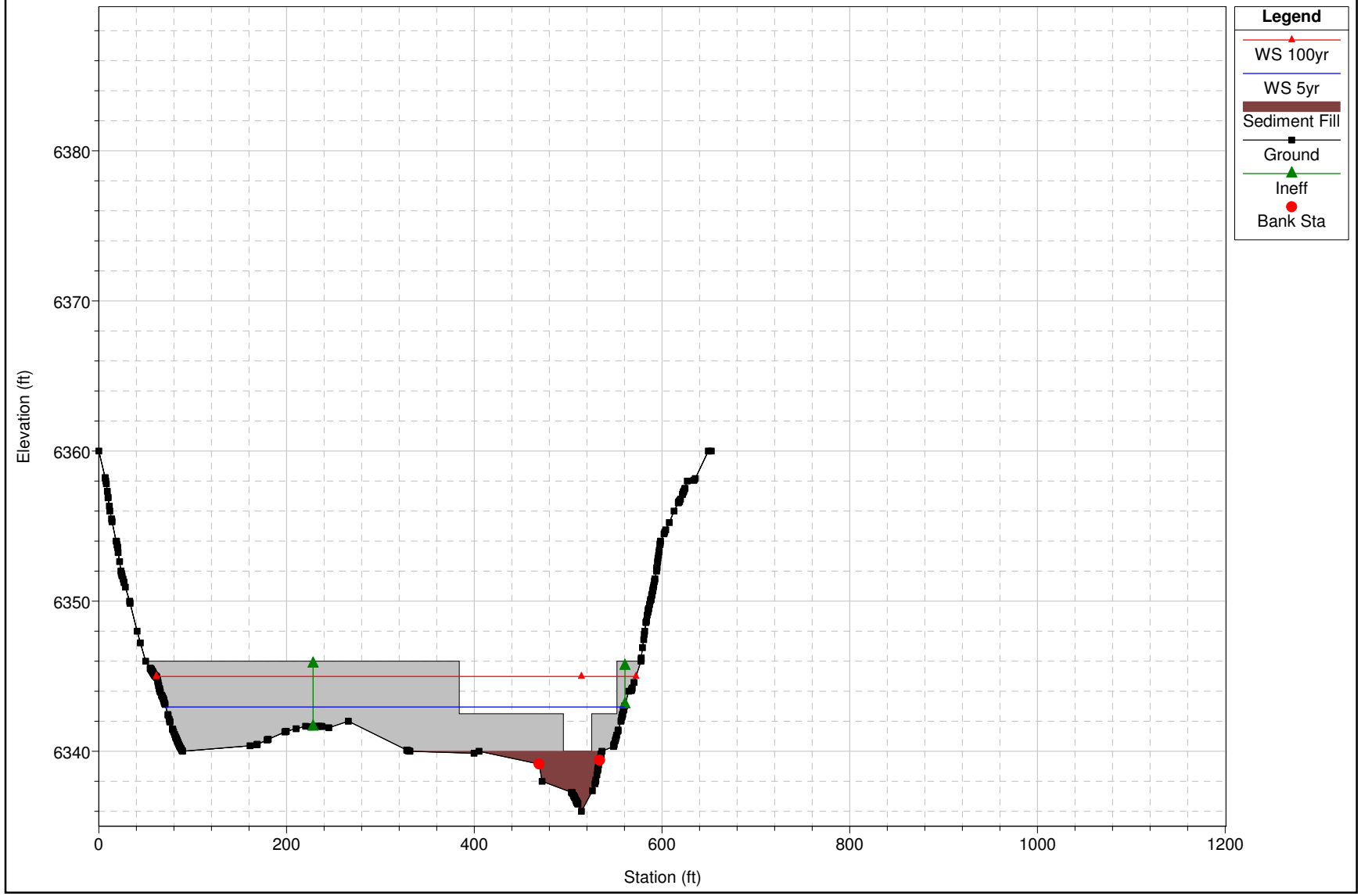
River = Pueblo Reach = reach_1 RS = 500 coordinate at station 525 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

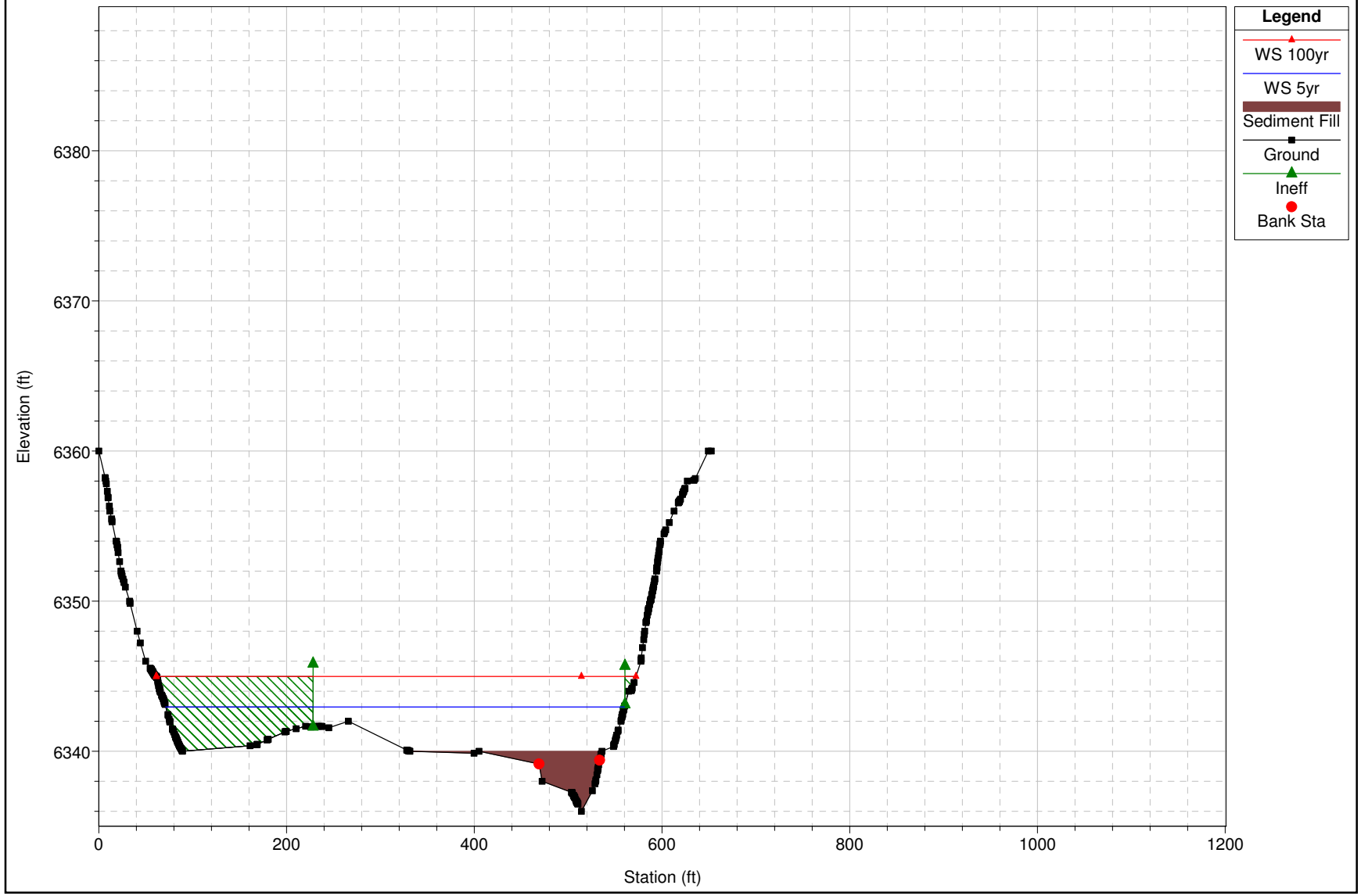
River = Pueblo Reach = reach_1 RS = 542 IS



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

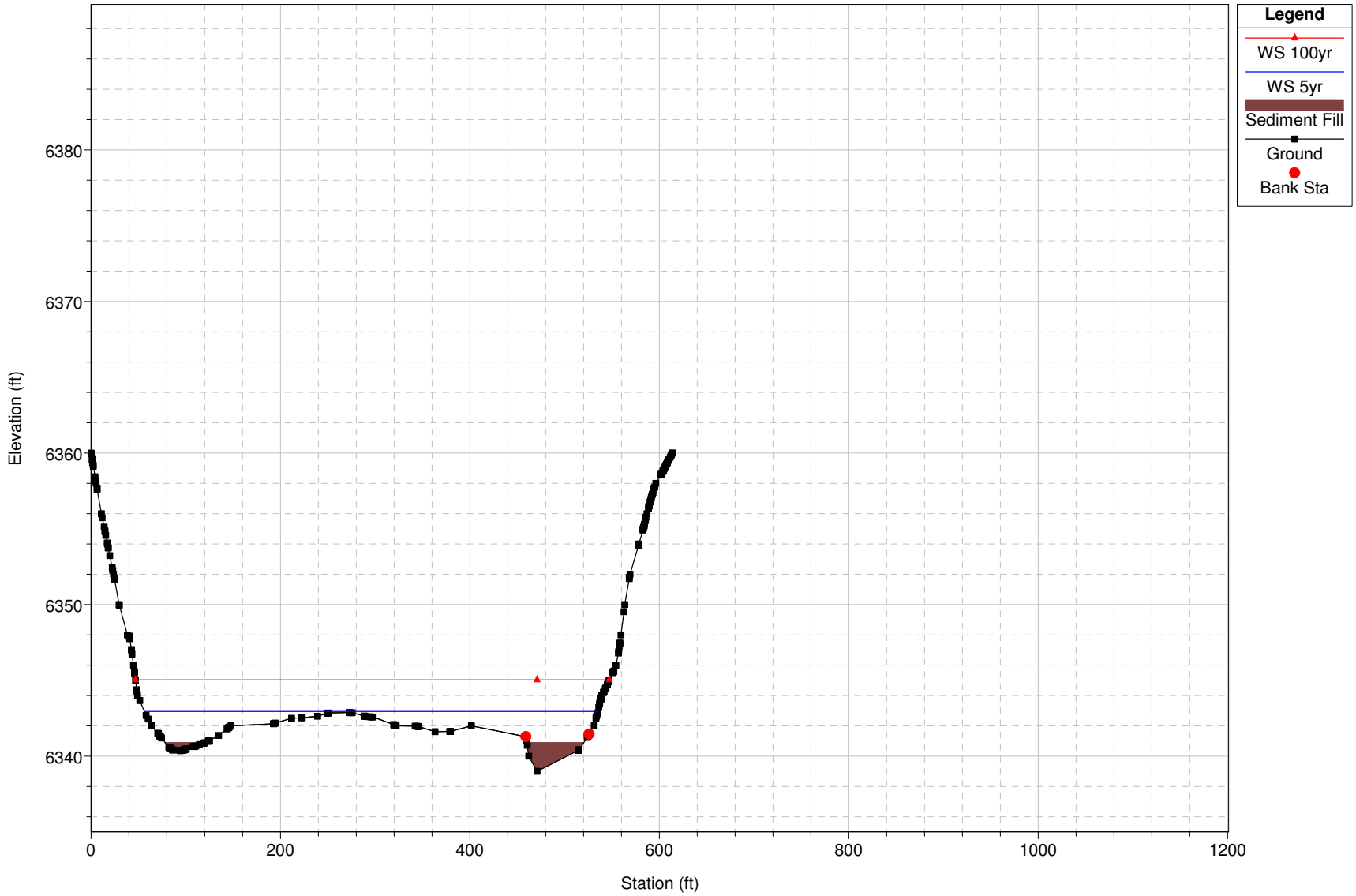
River = Pueblo Reach = reach_1 RS = 600



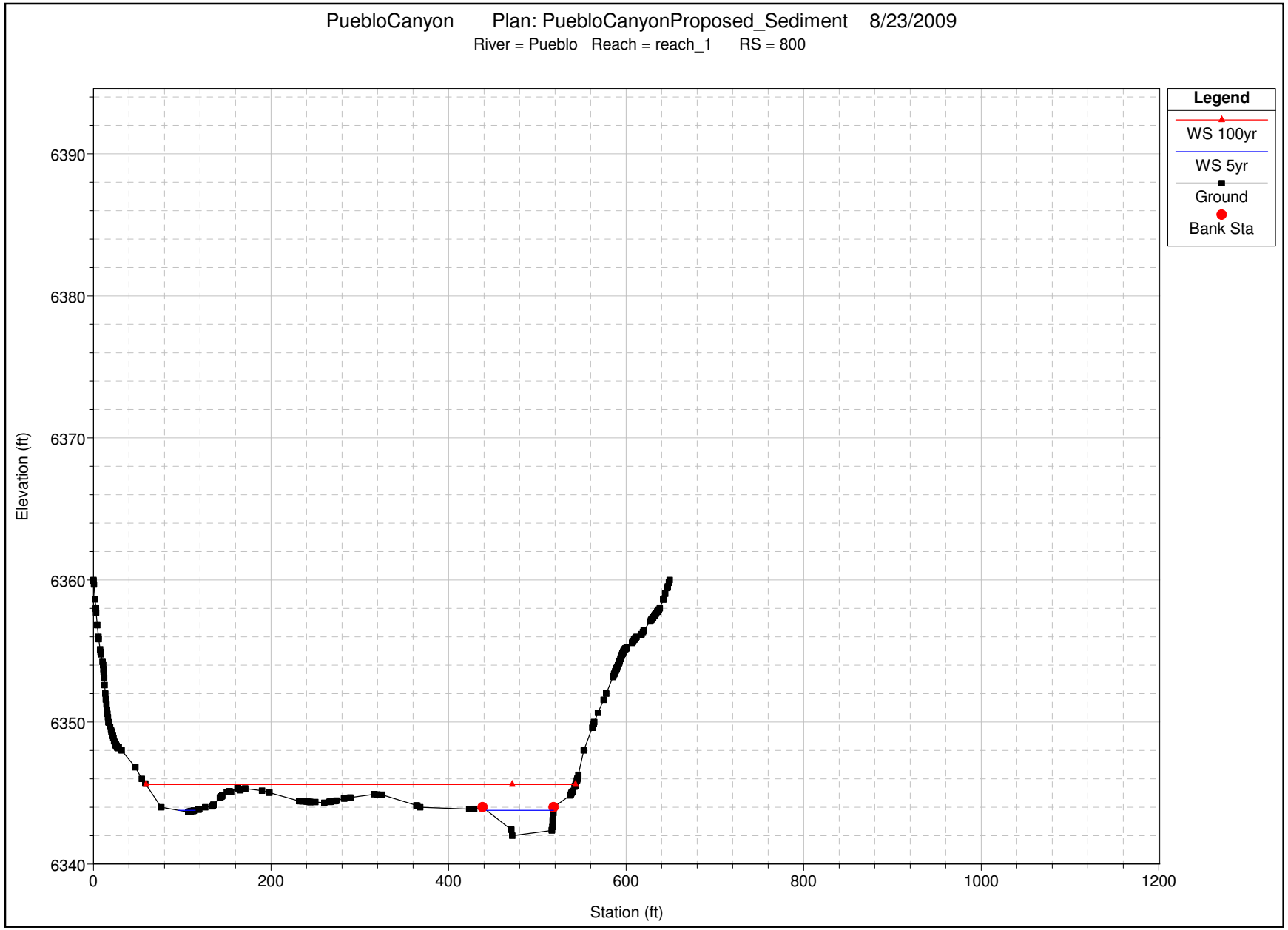
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

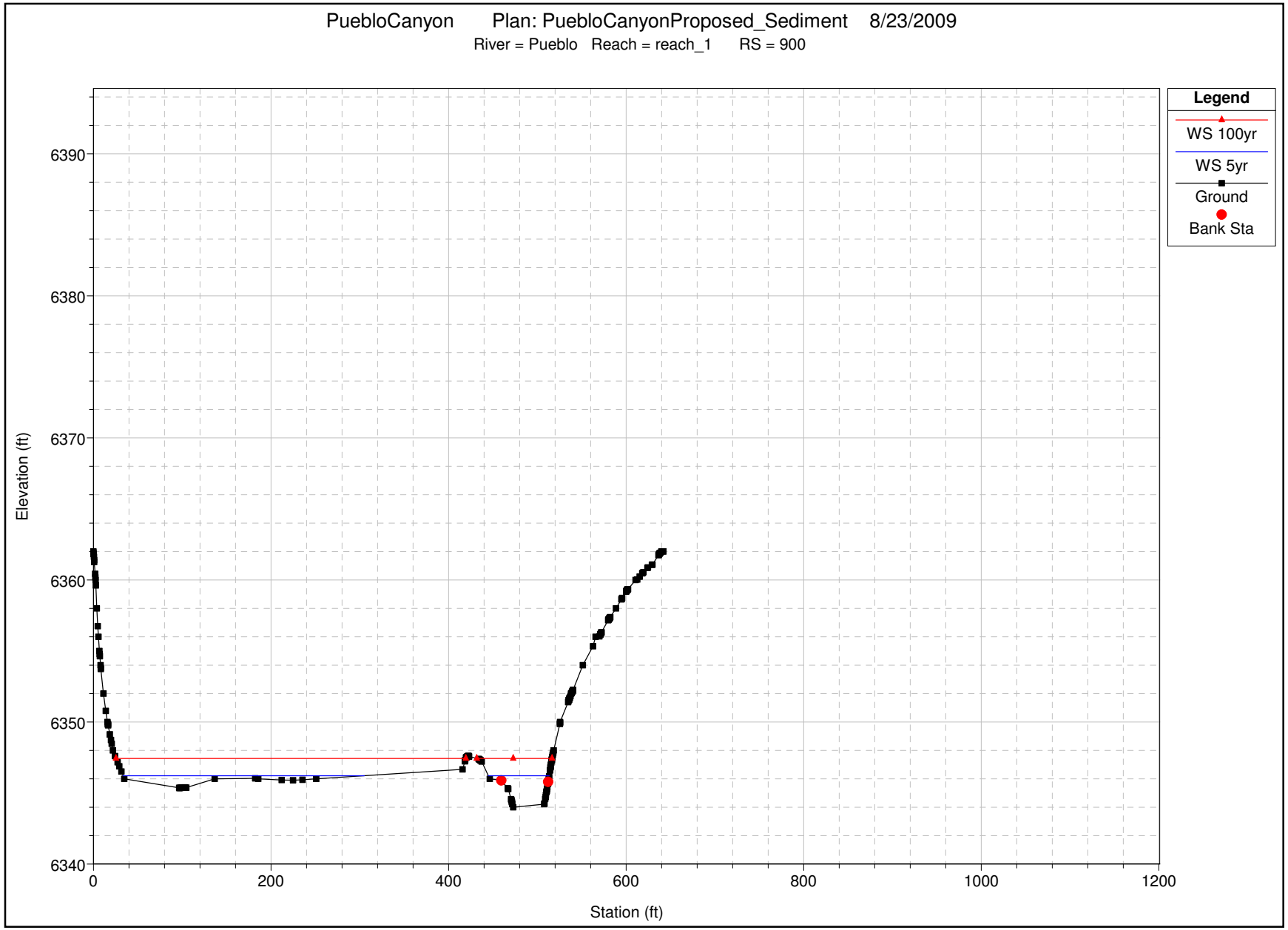
River = Pueblo Reach = reach_1 RS = 700 coordinate at station 471 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



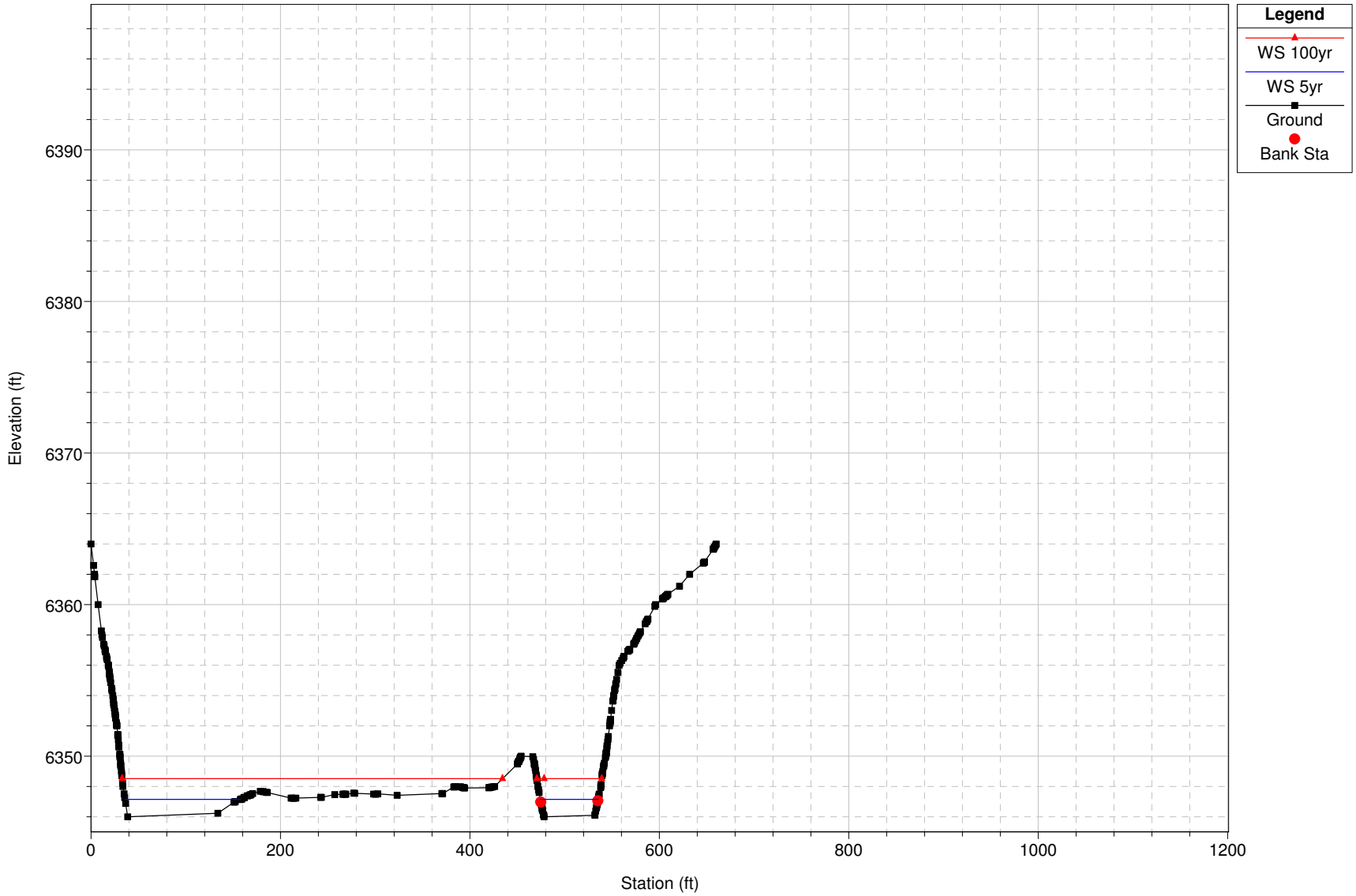
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

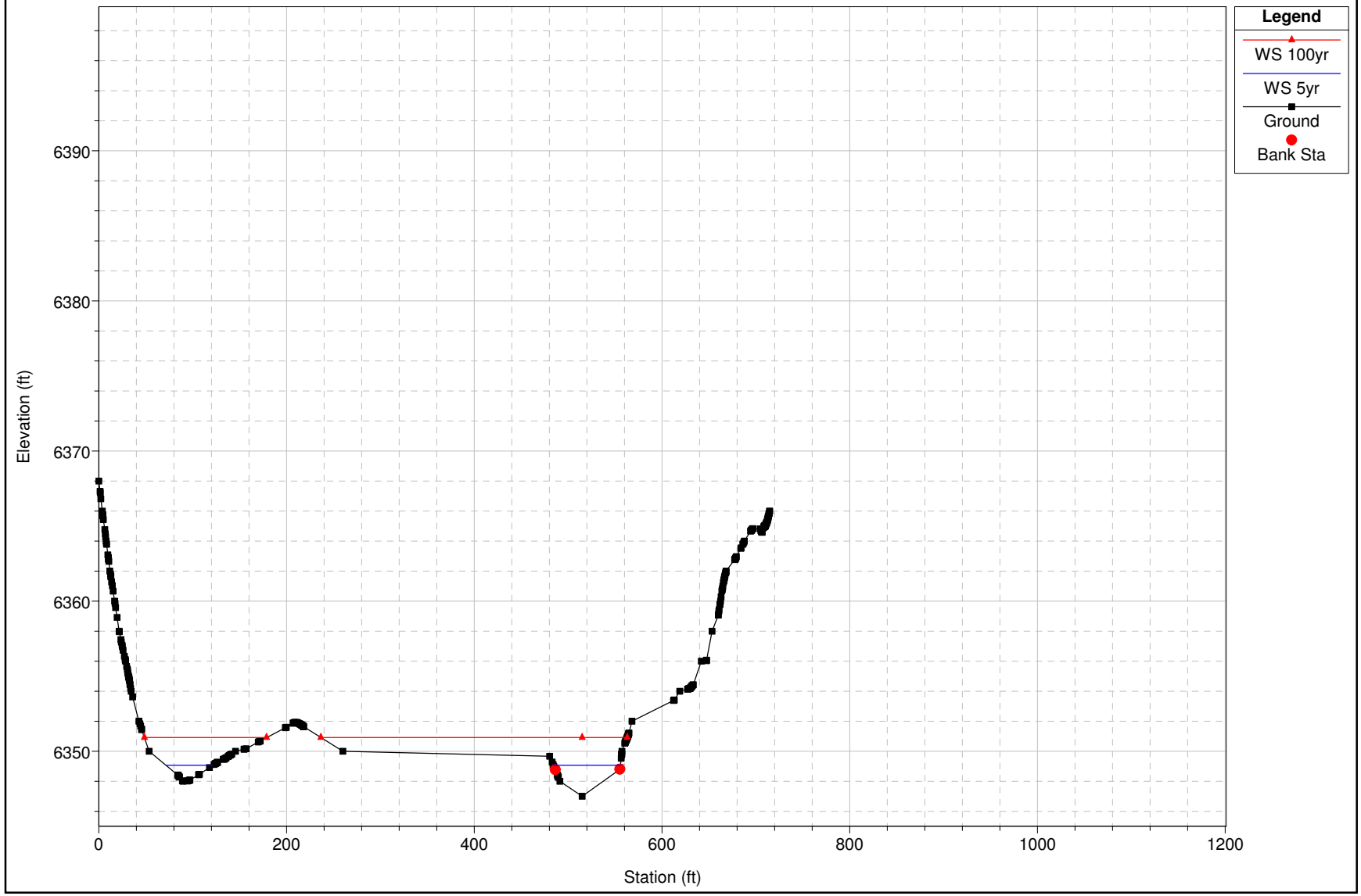
River = Pueblo Reach = reach_1 RS = 1000



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

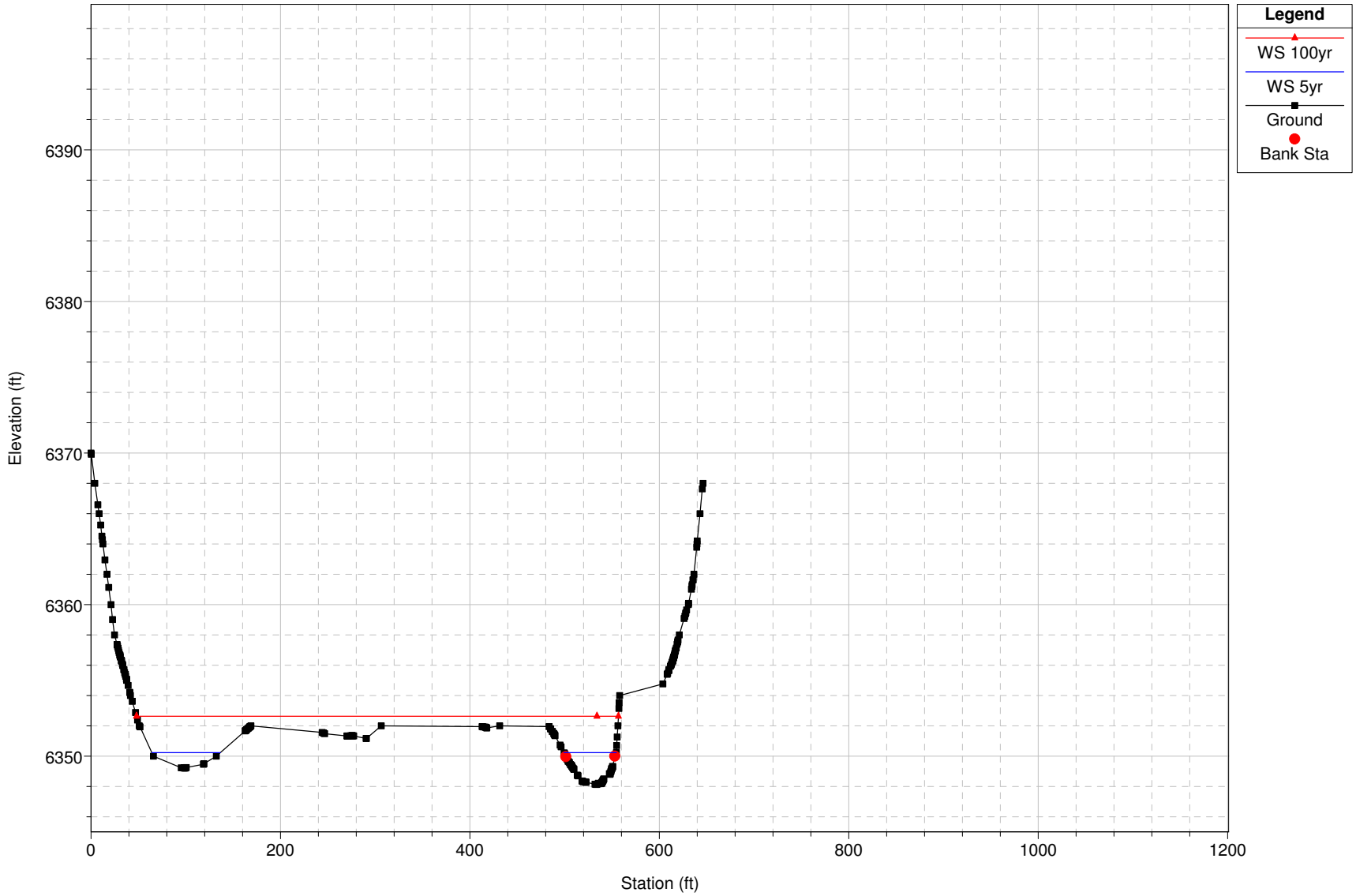
River = Pueblo Reach = reach_1 RS = 1100 coordinate at station 515 interpolated from topo



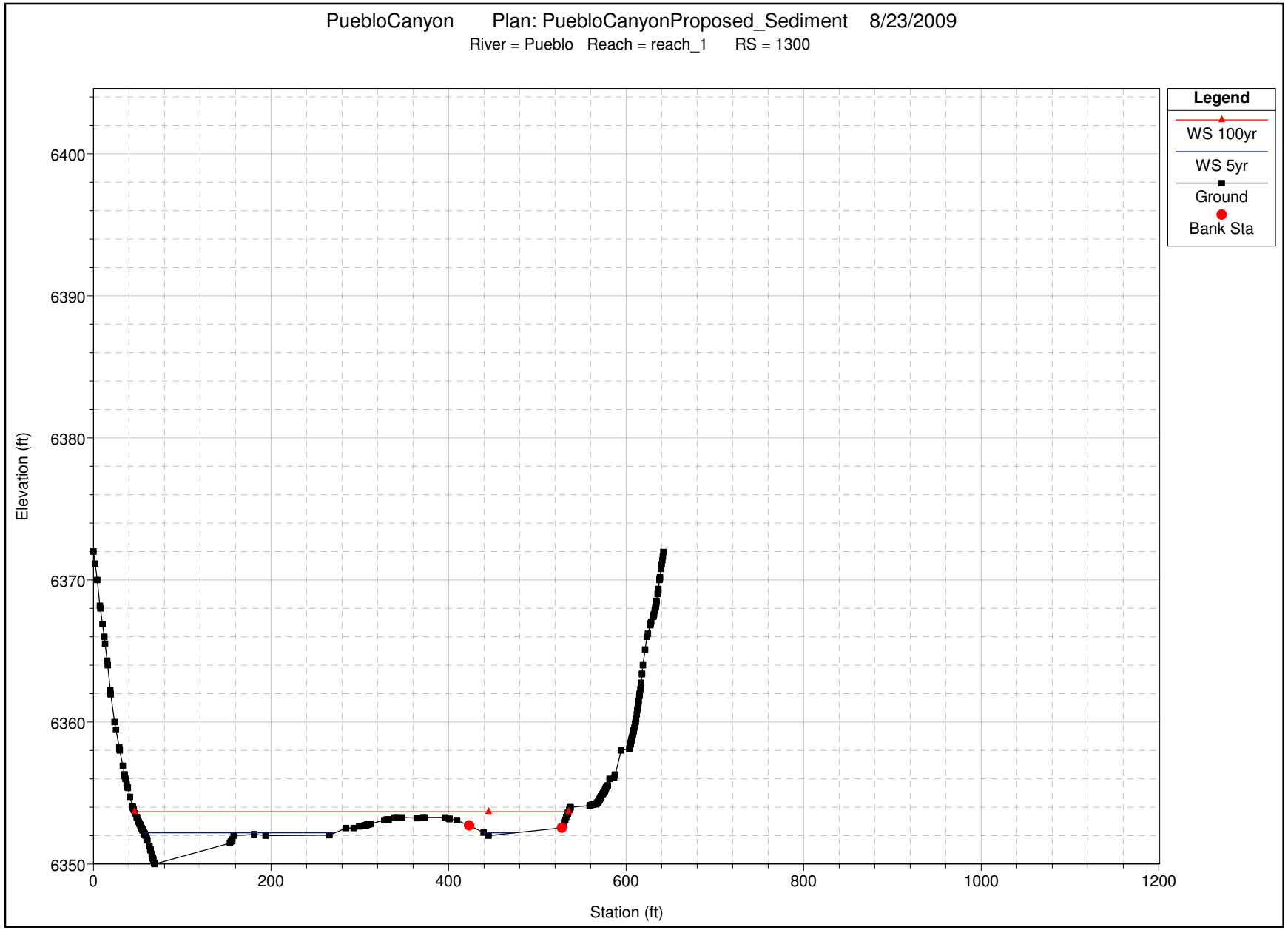
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

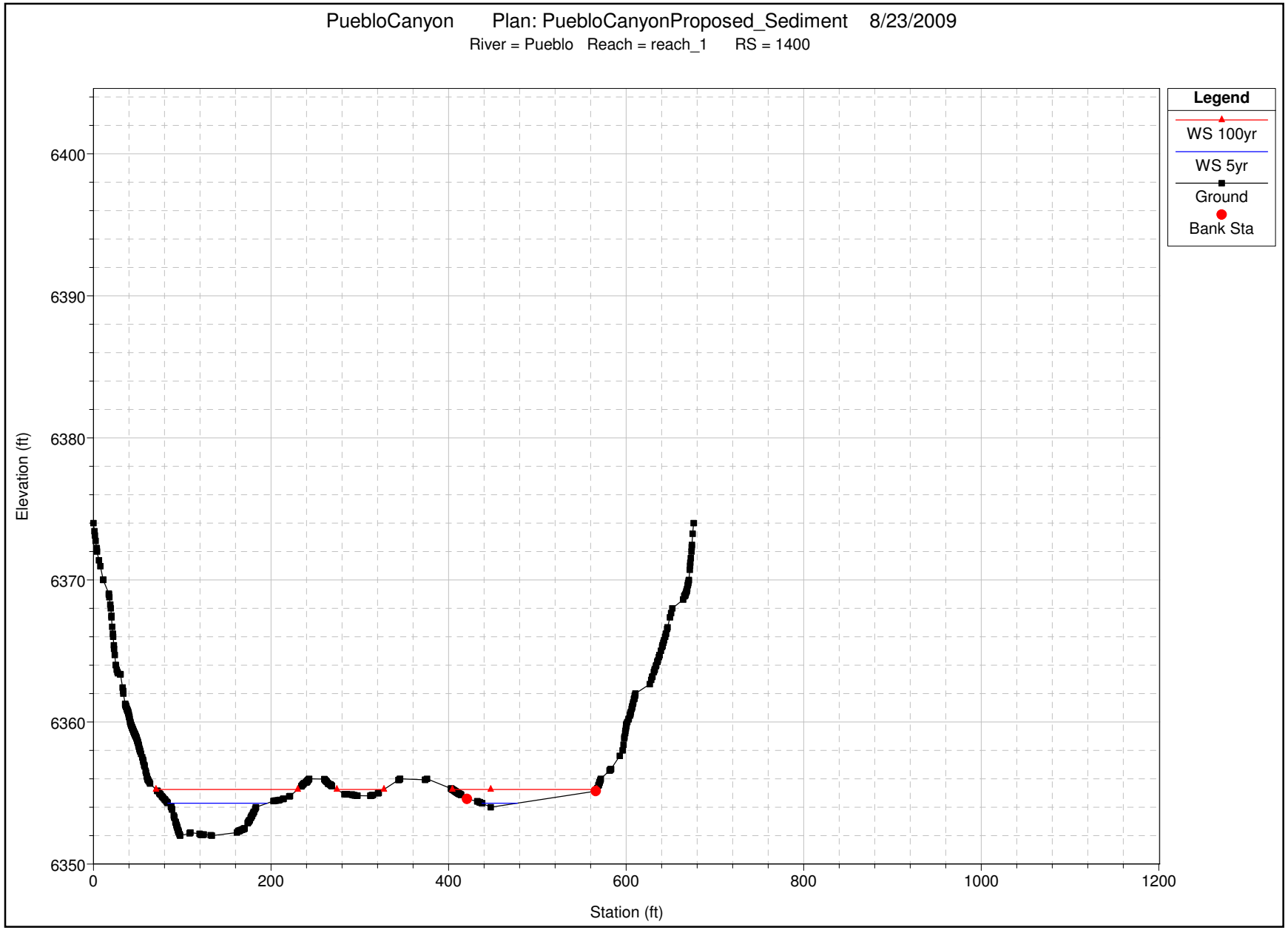
River = Pueblo Reach = reach_1 RS = 1200



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



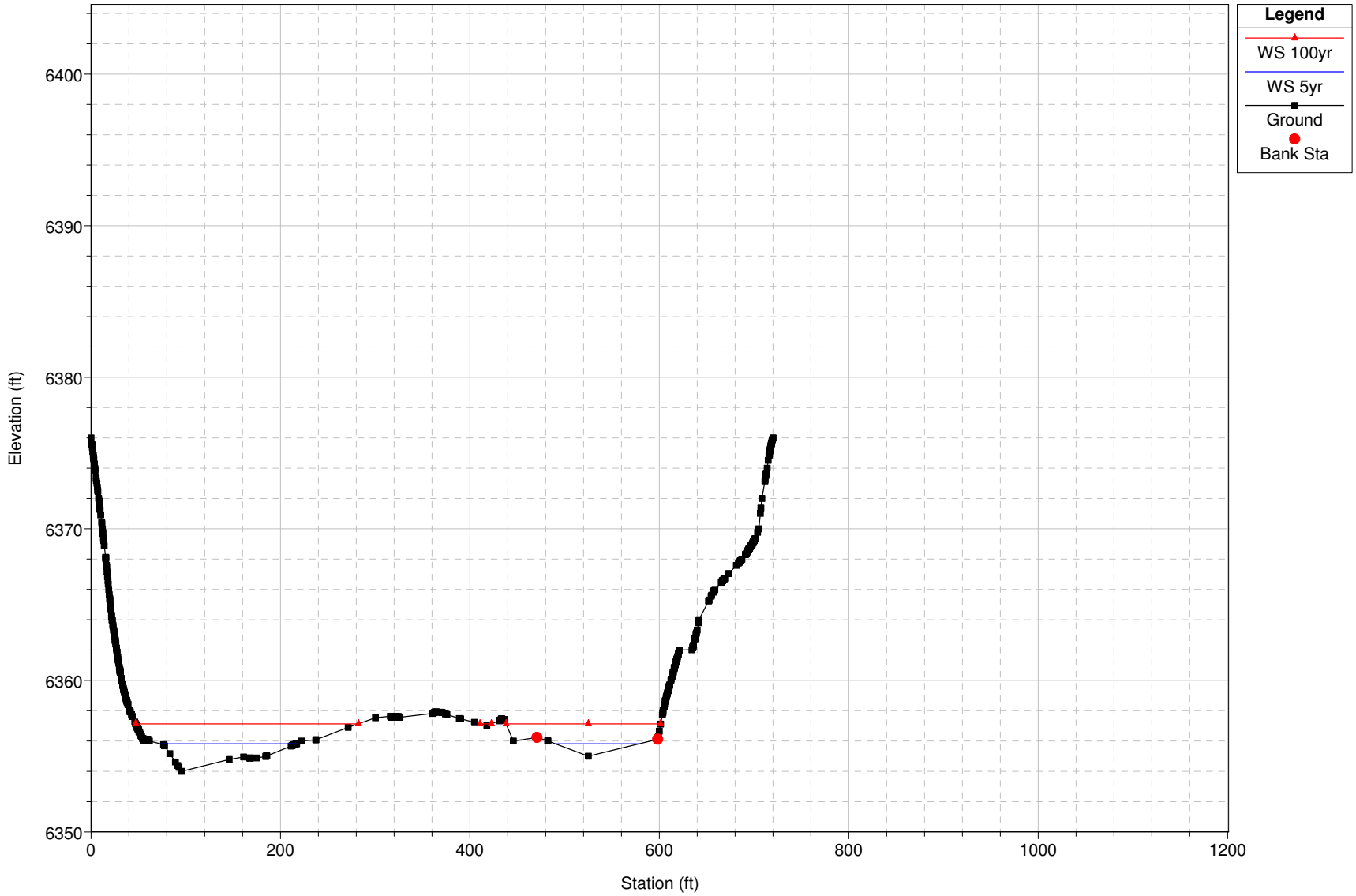
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



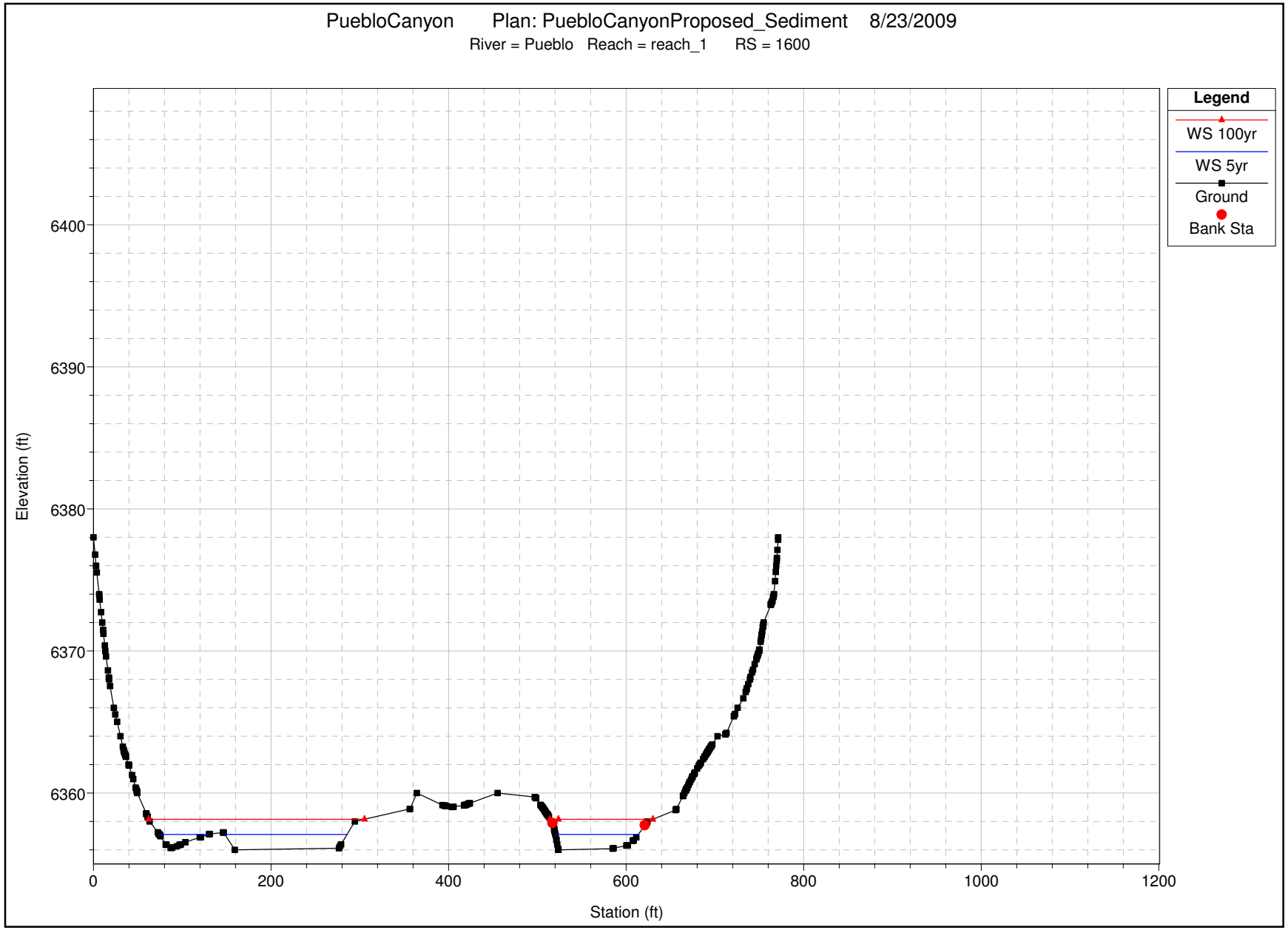
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

River = Pueblo Reach = reach_1 RS = 1500 coordinate at station 525 interpolated from topo



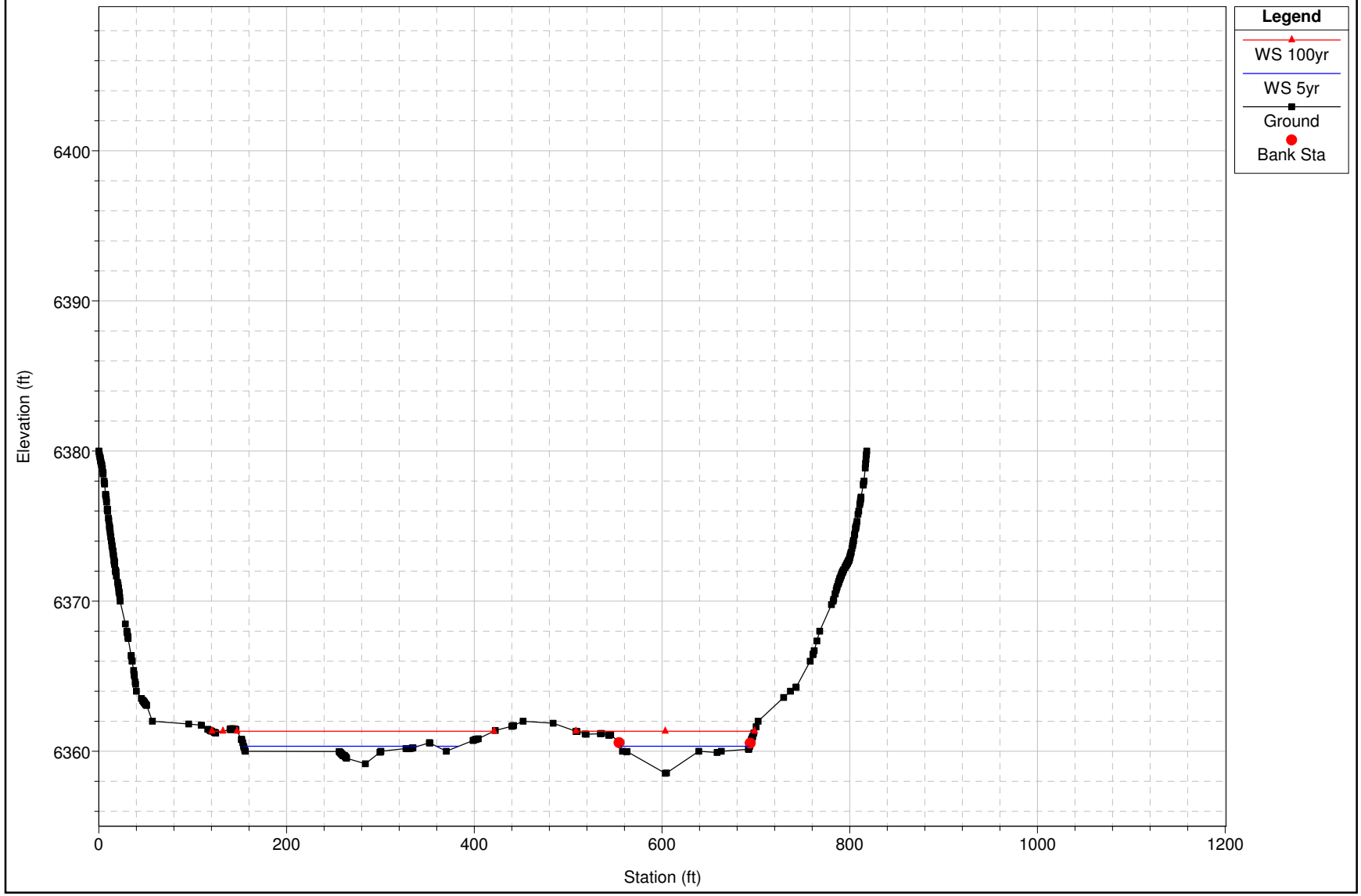
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



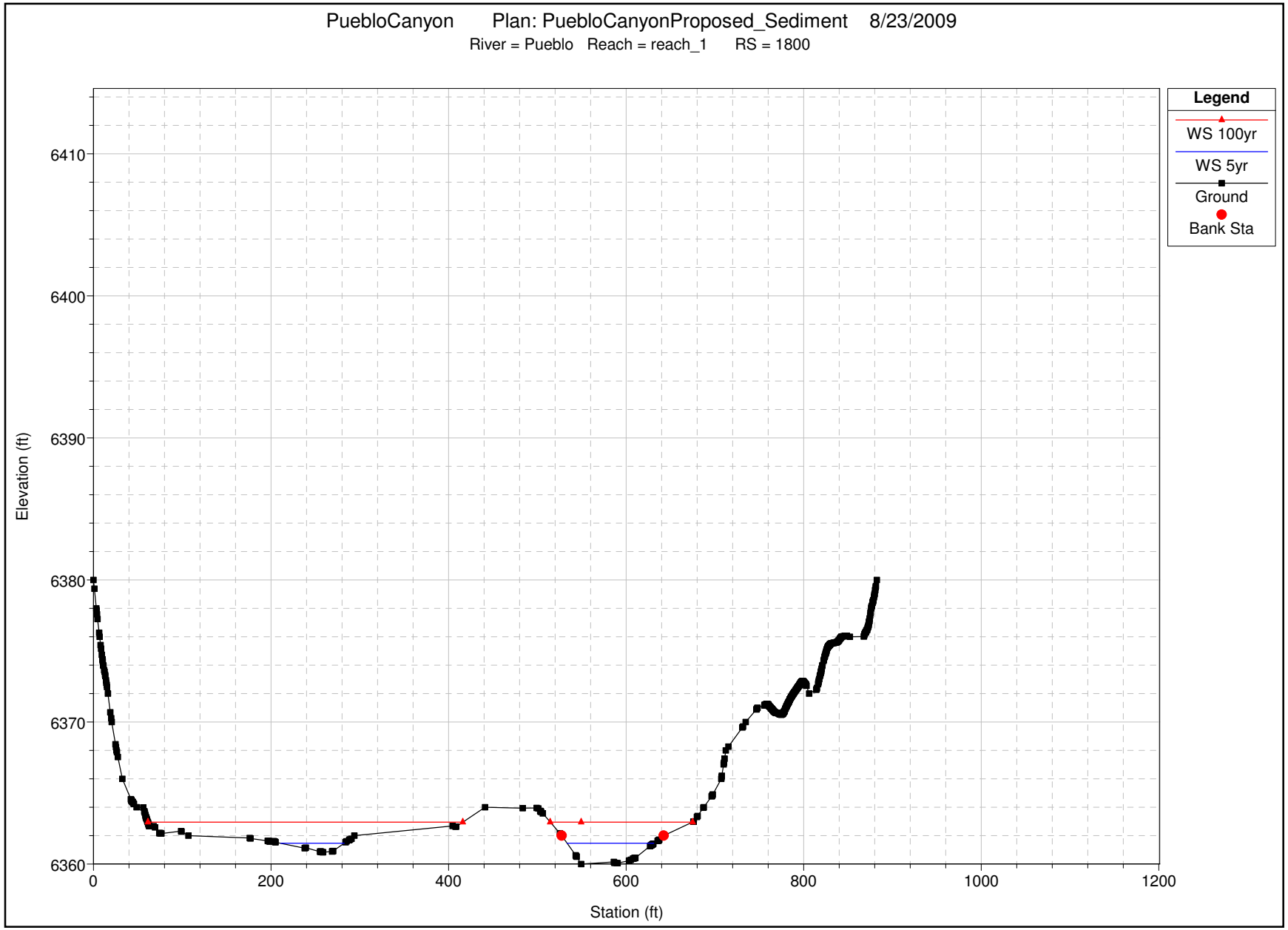
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

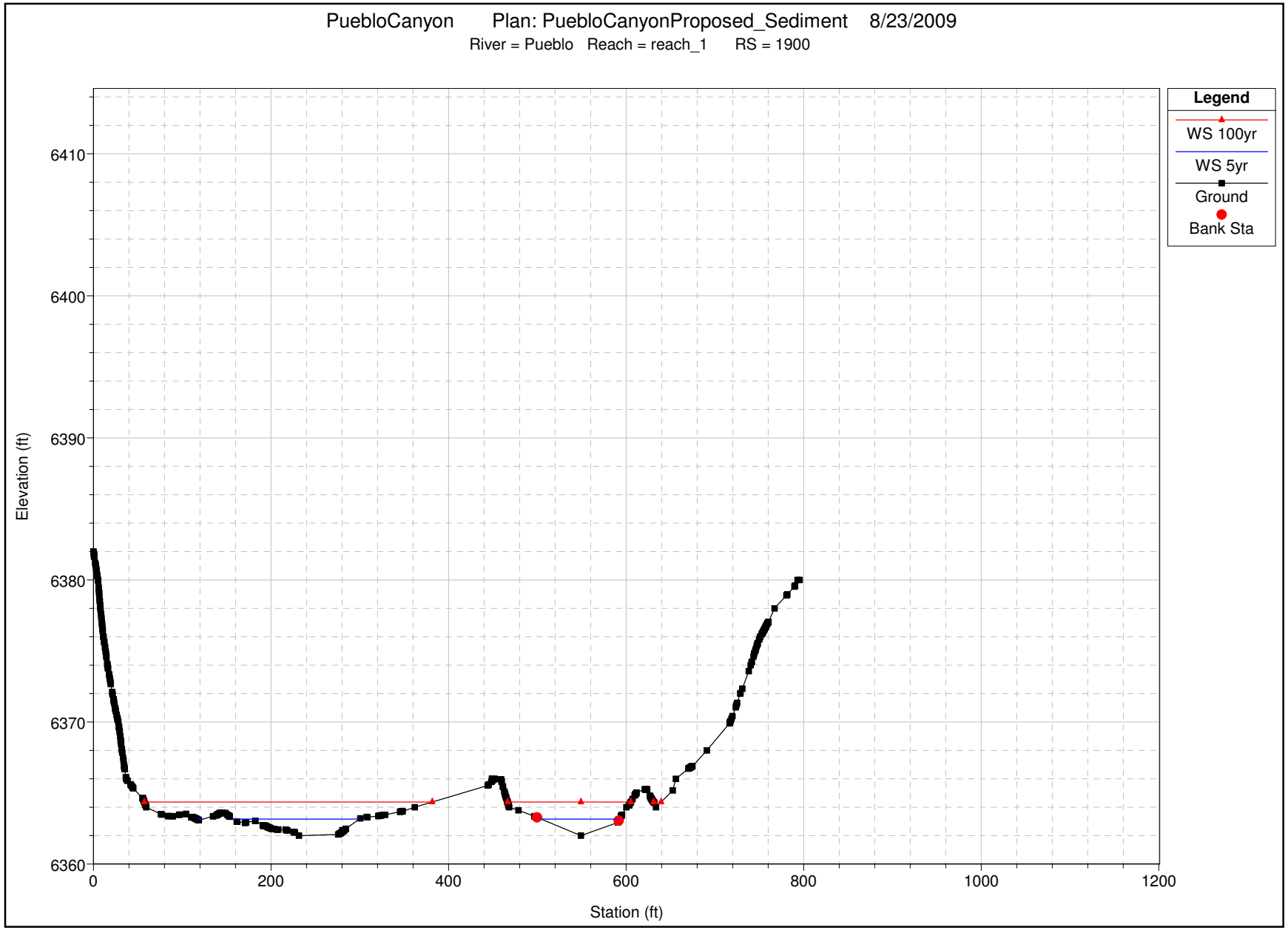
River = Pueblo Reach = reach_1 RS = 1700



1 in Horiz. = 160 ft 1 in Vert. = 10 ft



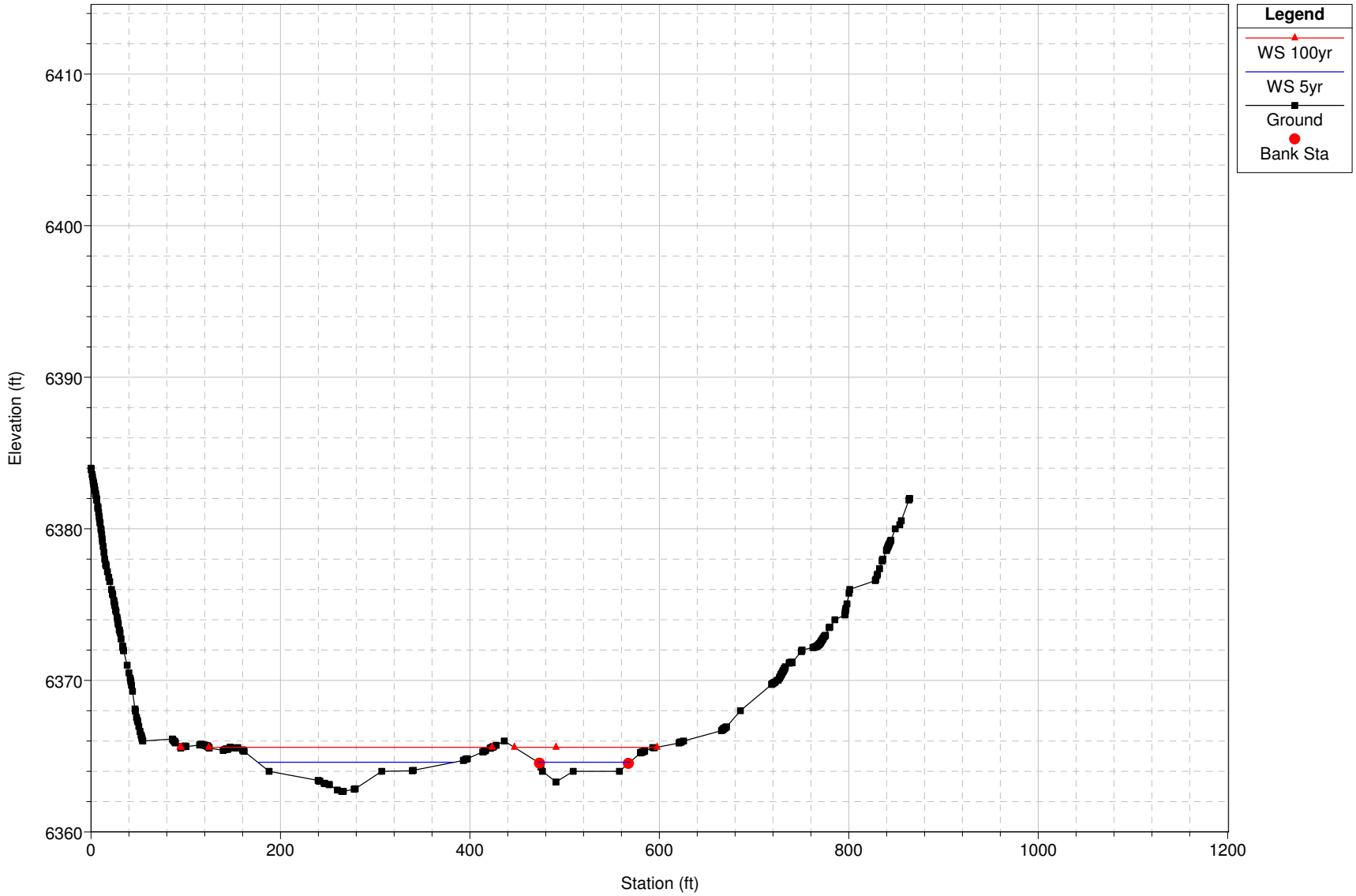
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

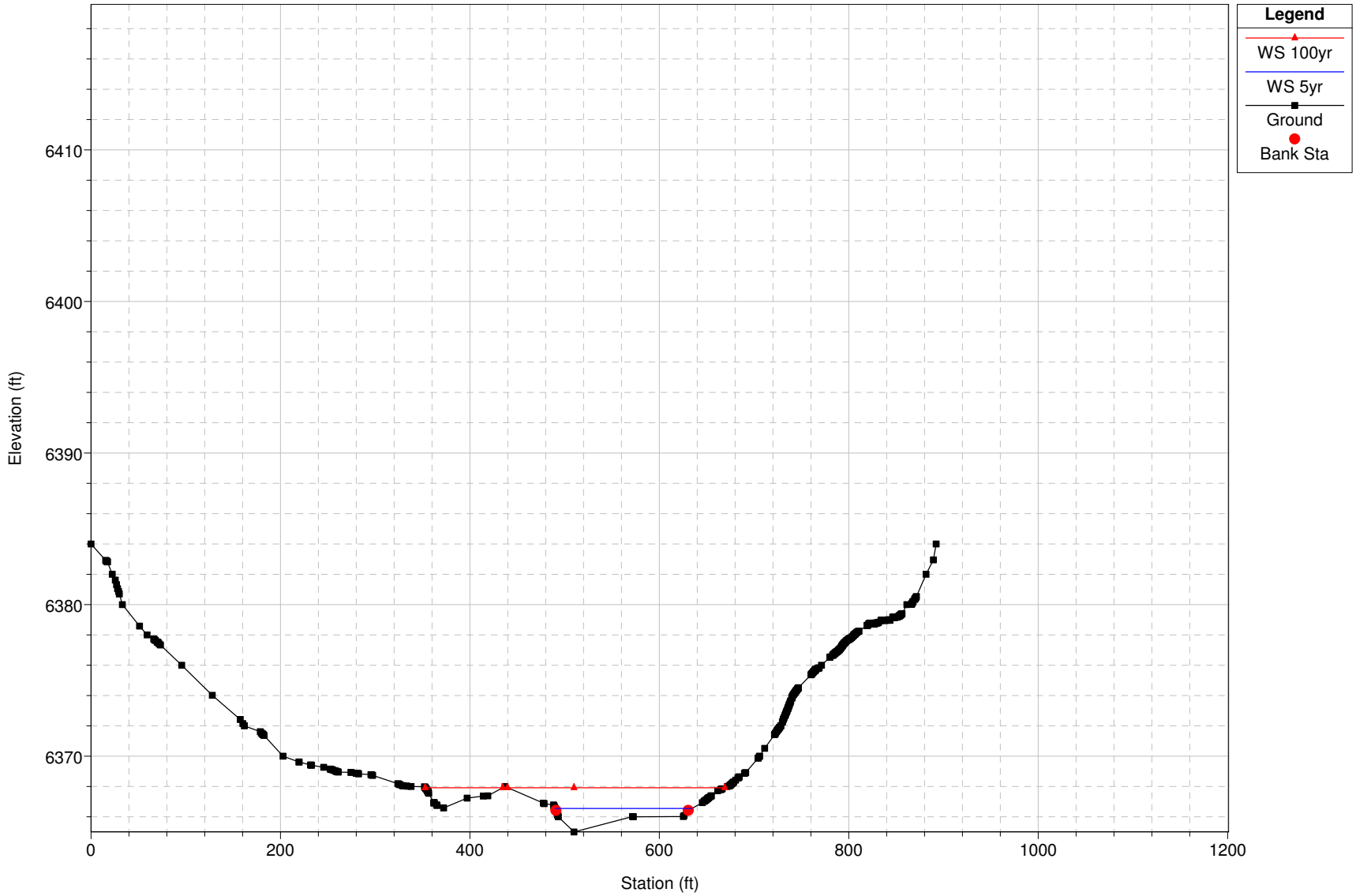
River = Pueblo Reach = reach_1 RS = 2000 coordinates at stations 491, 509, and 558 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

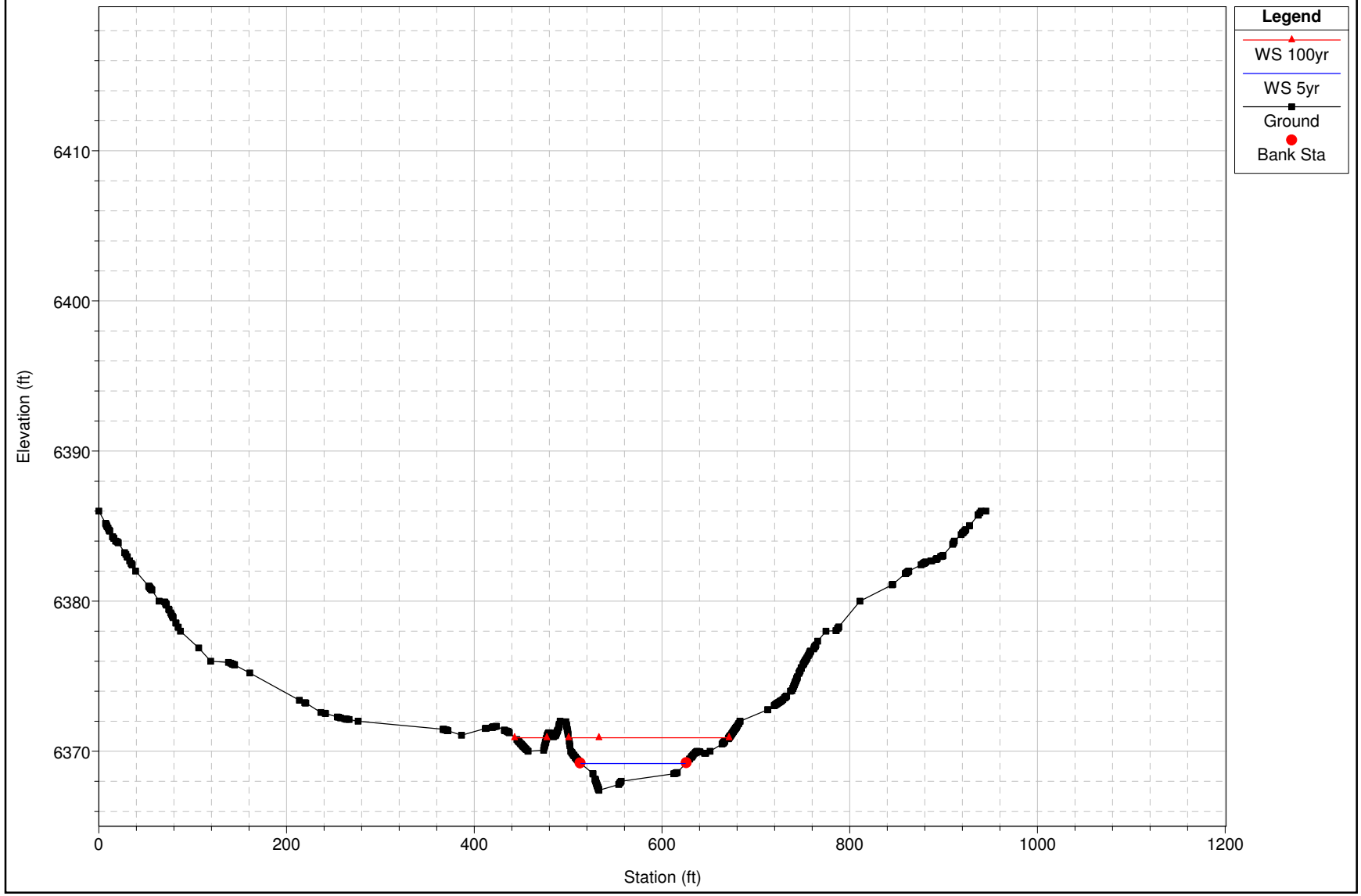
River = Pueblo Reach = reach_1 RS = 2100 coordinate at station 510 interpolated from topo



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

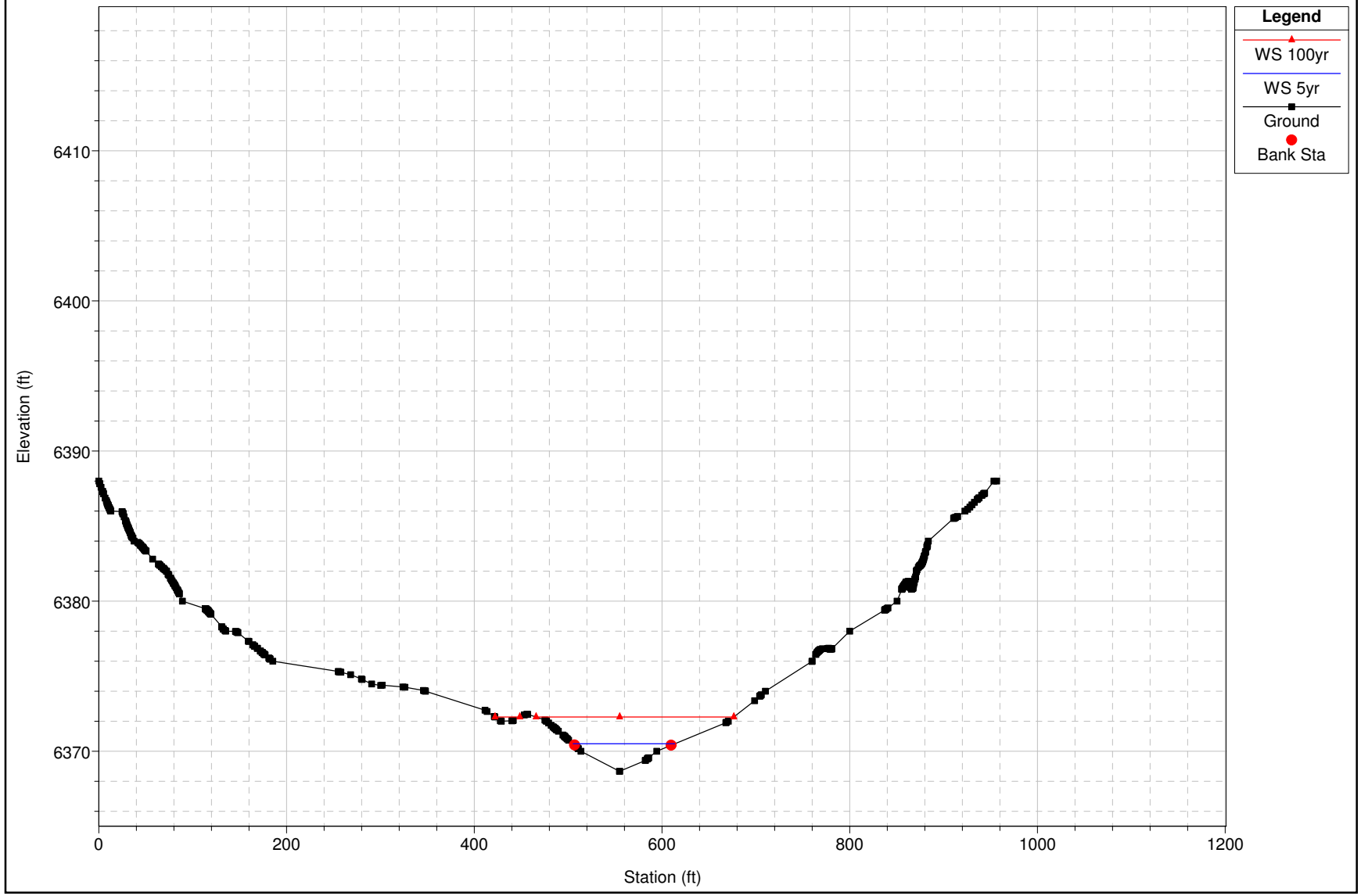
River = Pueblo Reach = reach_1 RS = 2200



1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

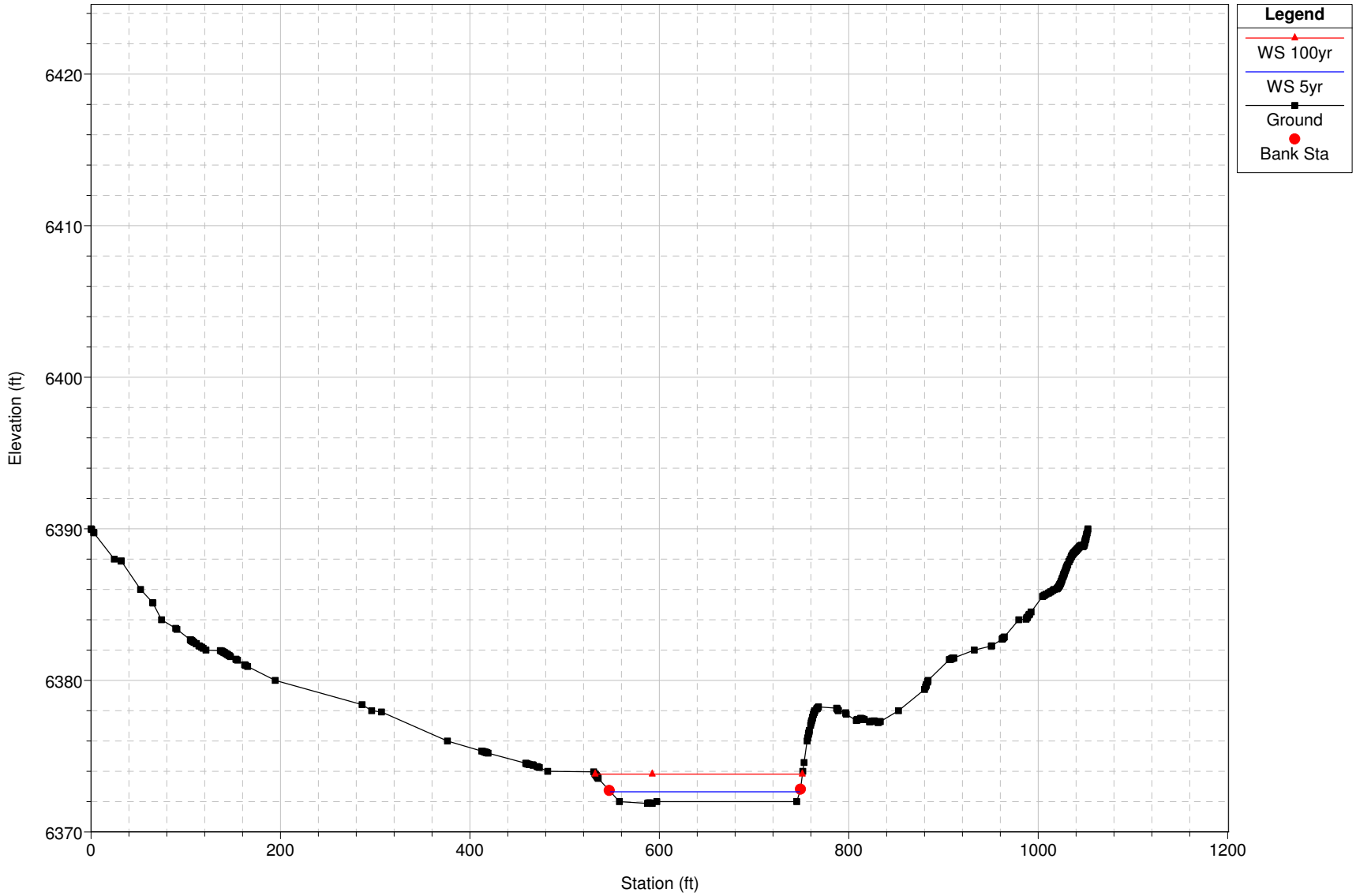
River = Pueblo Reach = reach_1 RS = 2300



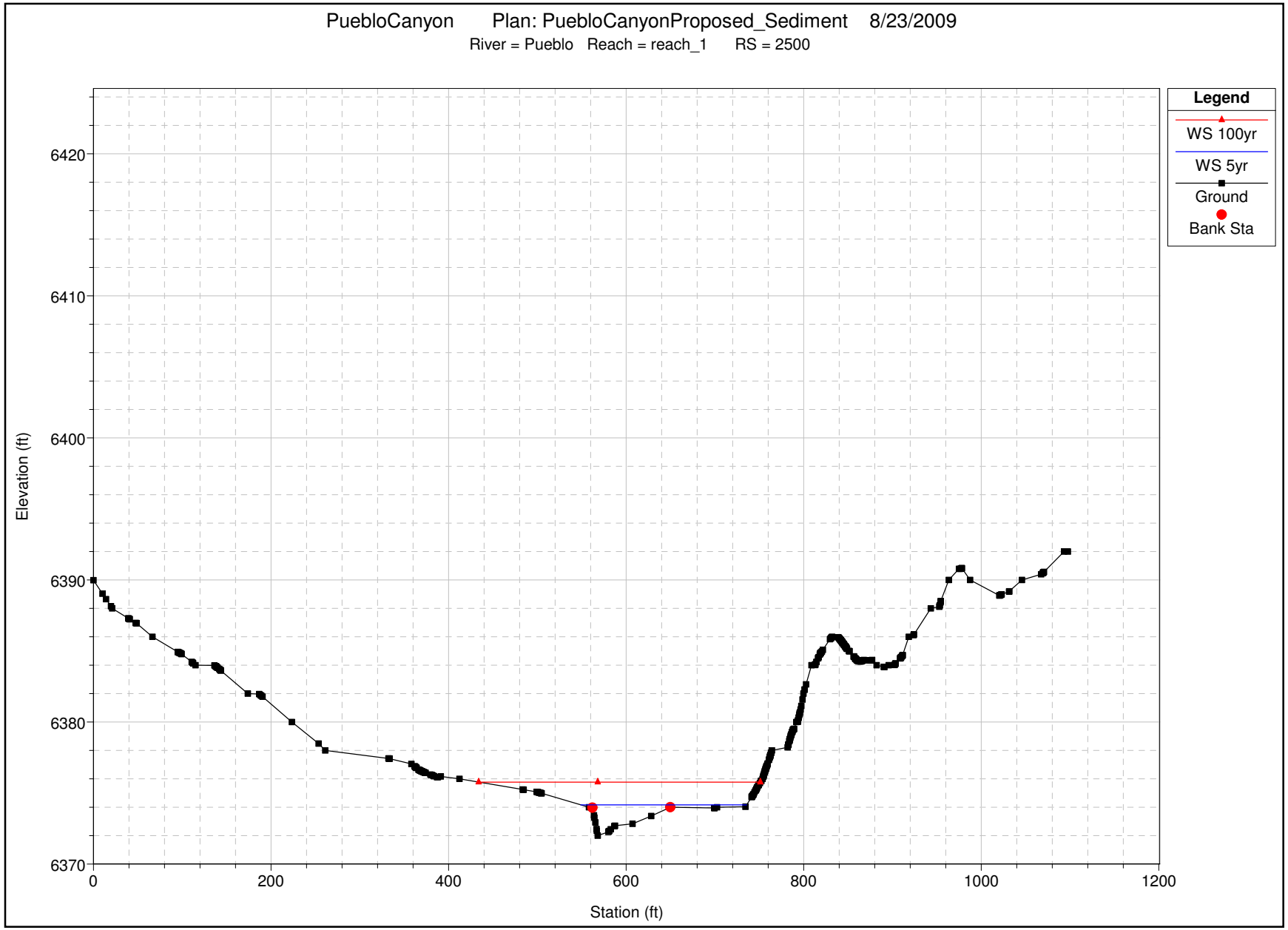
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

River = Pueblo Reach = reach_1 RS = 2400 coordinate at station 745 interpolated from topo



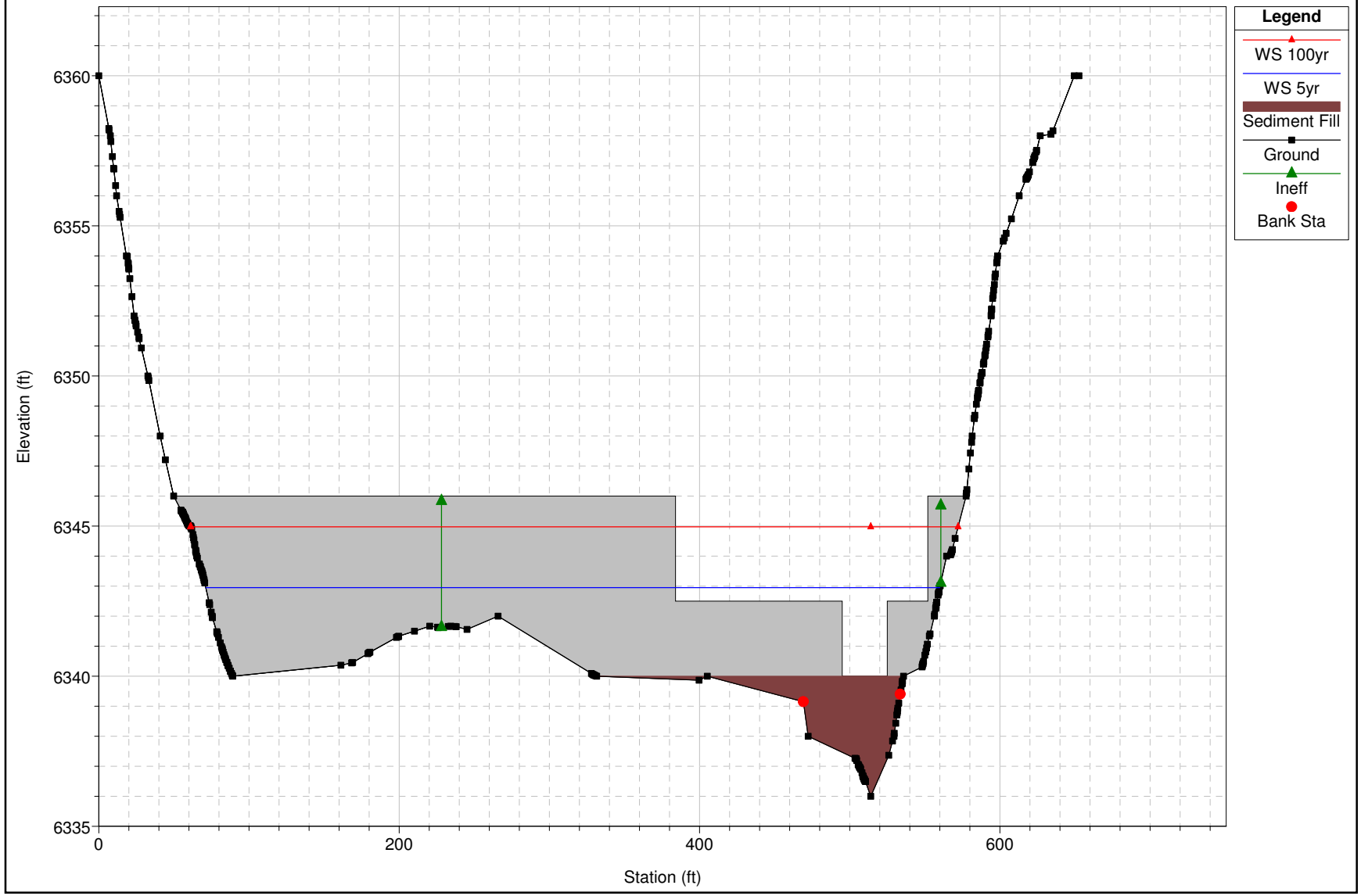
1 in Horiz. = 160 ft 1 in Vert. = 10 ft



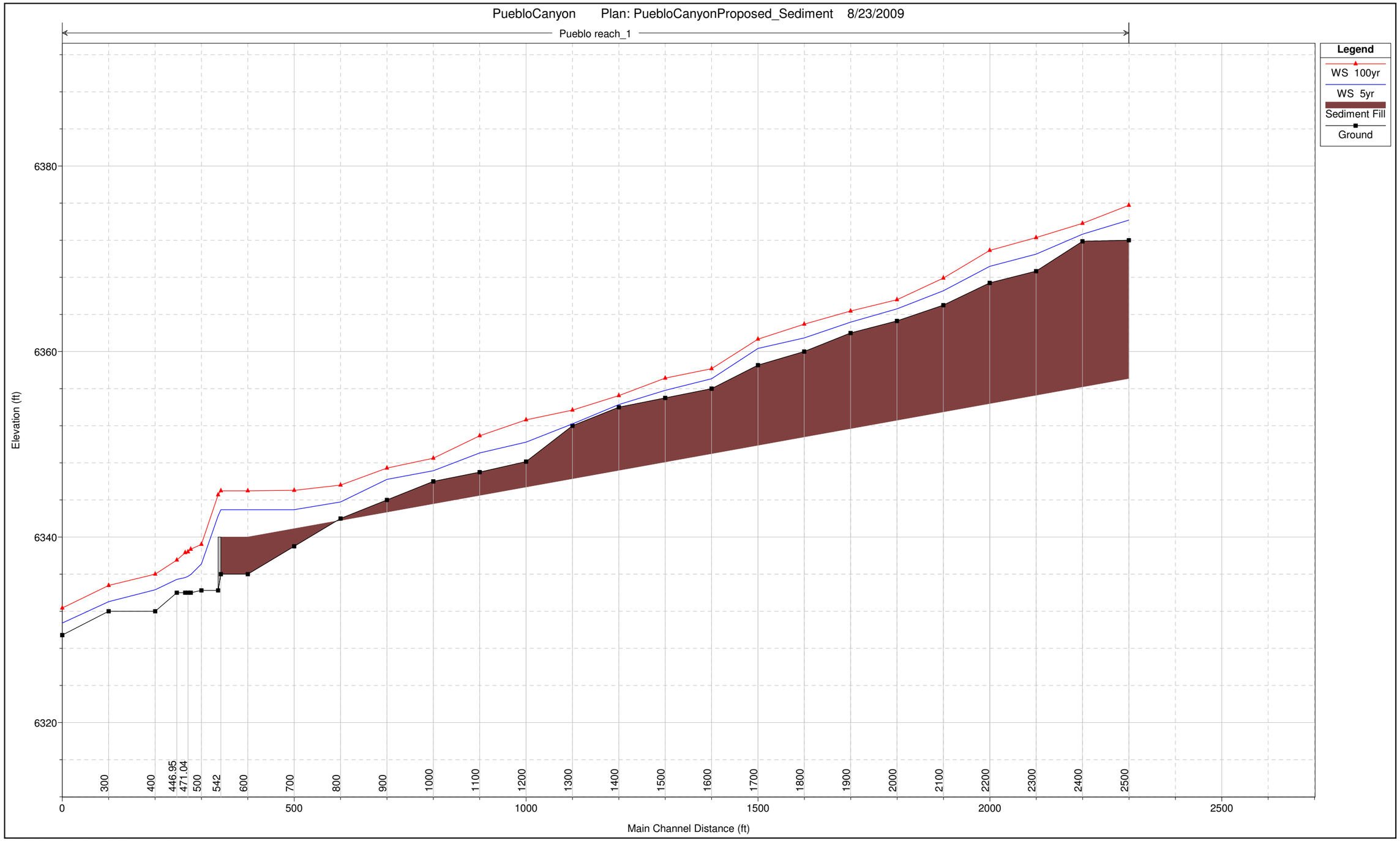
1 in Horiz. = 160 ft 1 in Vert. = 10 ft

PuebloCanyon Plan: PuebloCanyonProposed_Sediment 8/23/2009

River = Pueblo Reach = reach_1 RS = 542 IS



1 in Horiz. = 100 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 10 ft

HEC-RAS Plan: PuebloProp_Sed River: Pueblo Reach: reach_1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	2500	5yr	593.00	6372.00	6374.17	6374.17	6374.65	0.010216	5.60	120.82	186.93	0.91
reach_1	2500	100yr	2740.00	6372.00	6375.77	6375.77	6376.72	0.008008	8.76	512.16	317.47	0.92
reach_1	2400	5yr	593.00	6371.88	6372.66	6372.66	6372.98	0.015336	4.59	129.31	199.93	1.00
reach_1	2400	100yr	2740.00	6371.88	6373.81	6373.81	6374.69	0.010523	7.51	372.32	218.66	0.99
reach_1	2300	5yr	593.00	6368.66	6370.49	6370.48	6371.00	0.012972	5.68	104.56	108.23	1.00
reach_1	2300	100yr	2740.00	6368.66	6372.28	6372.28	6373.42	0.008091	8.84	394.21	237.02	0.93
reach_1	2200	5yr	593.00	6367.40	6369.18	6369.18	6369.67	0.013767	5.61	105.68	111.24	1.01
reach_1	2200	100yr	2740.00	6367.40	6370.91	6370.91	6372.02	0.008342	8.68	375.43	204.92	0.94
reach_1	2100	5yr	593.00	6365.00	6366.56	6366.56	6366.98	0.014336	5.19	114.68	144.75	1.01
reach_1	2100	100yr	2740.00	6365.00	6367.92	6367.92	6368.91	0.009899	8.29	428.38	311.39	0.99
reach_1	2000	5yr	593.00	6363.30	6364.60		6364.73	0.010082	3.86	243.13	304.09	0.82
reach_1	2000	100yr	2740.00	6363.30	6365.59	6365.42	6366.22	0.014994	8.53	601.25	451.25	1.16
reach_1	1900	5yr	593.00	6362.00	6363.17	6363.17	6363.51	0.025437	5.83	156.20	237.40	1.29
reach_1	1900	100yr	2740.00	6362.00	6364.37	6364.37	6365.04	0.014070	8.69	615.29	471.77	1.14
reach_1	1800	5yr	593.00	6360.00	6361.46	6361.45	6361.91	0.011359	5.48	127.81	168.98	0.94
reach_1	1800	100yr	2740.00	6360.00	6362.95	6362.95	6363.63	0.007479	7.57	652.93	515.07	0.87
reach_1	1700	5yr	593.00	6358.54	6360.34	6360.34	6360.62	0.013541	4.72	184.60	346.41	0.97
reach_1	1700	100yr	2740.00	6358.54	6361.34	6361.34	6362.00	0.011713	7.71	586.70	475.79	1.03
reach_1	1600	5yr	593.00	6356.00	6357.08		6357.23	0.007387	3.98	240.64	285.61	0.74
reach_1	1600	100yr	2740.00	6356.00	6358.16	6357.93	6358.75	0.011040	7.85	591.40	359.38	1.01
reach_1	1500	5yr	593.00	6355.00	6355.81	6355.59	6356.00	0.024357	4.23	172.73	230.33	1.17
reach_1	1500	100yr	2740.00	6355.00	6357.14	6356.72	6357.60	0.011342	7.05	628.64	410.46	1.00
reach_1	1400	5yr	593.00	6354.00	6354.29		6354.44	0.011313	1.44	191.22	152.19	0.67
reach_1	1400	100yr	2740.00	6354.00	6355.26	6355.19	6355.85	0.031851	7.18	450.55	375.55	1.48
reach_1	1300	5yr	593.00	6352.00	6352.20	6352.07	6352.41	0.046939	2.28	160.45	249.75	1.28
reach_1	1300	100yr	2740.00	6352.00	6353.69	6353.02	6354.01	0.011192	6.53	739.45	488.86	0.98
reach_1	1200	5yr	593.00	6348.13	6350.23	6350.23	6350.82	0.009772	6.51	127.04	127.58	0.92
reach_1	1200	100yr	2740.00	6348.13	6352.63	6352.63	6353.36	0.004827	8.55	783.20	508.74	0.76
reach_1	1100	5yr	593.00	6347.00	6349.06	6349.06	6349.63	0.011726	6.27	116.26	121.13	0.98
reach_1	1100	100yr	2740.00	6347.00	6350.91	6350.91	6351.68	0.006497	8.51	677.58	456.38	0.85
reach_1	1000	5yr	593.00	6346.00	6347.14	6347.00	6347.47	0.012283	5.63	172.32	182.89	0.97
reach_1	1000	100yr	2740.00	6346.00	6348.51	6348.51	6349.16	0.010250	8.98	694.64	470.13	1.02
reach_1	900	5yr	593.00	6344.00	6346.22	6346.22	6346.64	0.006026	5.58	187.18	340.53	0.74
reach_1	900	100yr	2740.00	6344.00	6347.44	6347.44	6348.15	0.007937	9.09	726.49	478.95	0.93
reach_1	800	5yr	593.00	6342.00	6343.79	6343.79	6344.40	0.012282	6.31	94.92	94.25	1.00
reach_1	800	100yr	2740.00	6342.00	6345.60	6345.60	6346.30	0.006099	7.96	701.31	483.82	0.81
reach_1	700	5yr	593.00	6340.90	6342.96		6343.01	0.000902	2.38	554.24	478.47	0.29
reach_1	700	100yr	2740.00	6340.90	6345.04		6345.14	0.000880	3.77	1573.35	500.45	0.33
reach_1	600	5yr	593.00	6340.00	6342.95	6340.72	6342.97	0.000185	1.39	828.38	488.66	0.14
reach_1	600	100yr	2740.00	6340.00	6344.98	6341.81	6345.07	0.000580	3.48	1502.27	511.06	0.27
reach_1	542		Inl Struct									
reach_1	500	5yr	593.00	6334.25	6337.10	6337.10	6337.64	0.012936	5.93	104.48	117.20	1.00
reach_1	500	100yr	2740.00	6334.25	6339.21		6340.07	0.005599	8.01	486.82	223.20	0.79
reach_1	477.05	5yr	593.00	6334.00	6335.96	6335.96	6336.67	0.011786	6.75	88.96	68.01	1.00
reach_1	477.05	100yr	2740.00	6334.00	6338.69	6338.69	6339.91	0.005503	9.43	447.90	246.94	0.82
reach_1	471.04	5yr	593.00	6334.00	6335.77	6335.77	6336.44	0.012139	6.58	90.36	70.18	1.01
reach_1	471.04	100yr	2740.00	6334.00	6338.40	6338.39	6339.62	0.005614	9.28	427.86	237.29	0.82
reach_1	465.04	5yr	593.00	6334.00	6335.64	6335.64	6336.31	0.012085	6.57	90.78	71.41	1.00
reach_1	465.04	100yr	2740.00	6334.00	6338.31	6338.31	6339.57	0.005623	9.35	410.42	243.51	0.82
reach_1	446.95	5yr	593.00	6334.00	6335.43	6335.43	6336.04	0.012631	6.29	94.25	78.05	1.01
reach_1	446.95	100yr	2740.00	6334.00	6337.51	6337.51	6339.01	0.008639	10.00	321.54	156.71	0.98

HEC-RAS Plan: PuebloProp_Sed River: Pueblo Reach: reach_1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
reach_1	400	5yr	593.00	6332.00	6334.32	6334.25	6334.76	0.010839	5.31	112.29	110.46	0.91
reach_1	400	100yr	2740.00	6332.00	6336.01	6336.01	6337.35	0.009300	9.33	308.96	150.46	0.99
reach_1	300	5yr	593.00	6332.00	6333.04	6333.04	6333.54	0.013700	5.74	112.03	123.74	1.02
reach_1	300	100yr	2740.00	6332.00	6334.78	6334.78	6335.88	0.008421	8.86	403.63	200.40	0.95
reach_1	200	5yr	593.00	6329.43	6330.74	6330.74	6331.20	0.014192	5.65	124.15	144.01	1.03
reach_1	200	100yr	2740.00	6329.43	6332.35	6332.35	6333.52	0.010087	9.25	374.91	167.78	1.02

CONSTRUCTION PLANS FOR:

LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES

DP CANYON AND PUEBLO CANYON
LOS ALAMOS, NEW MEXICO

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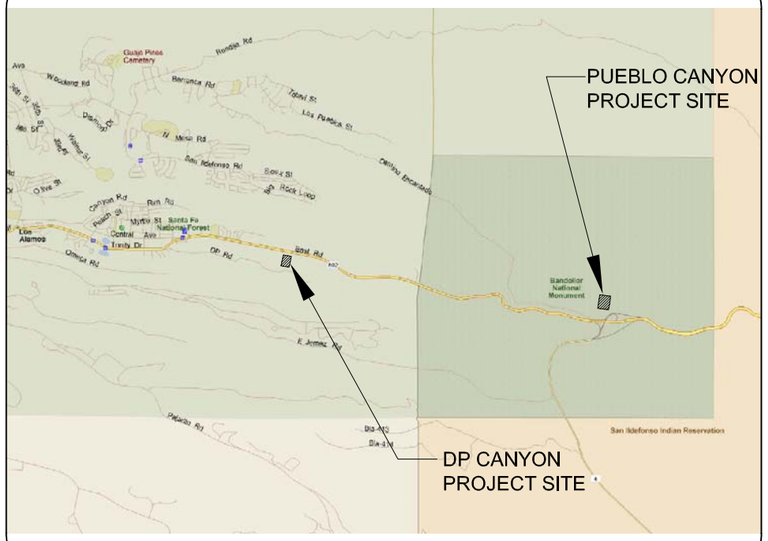
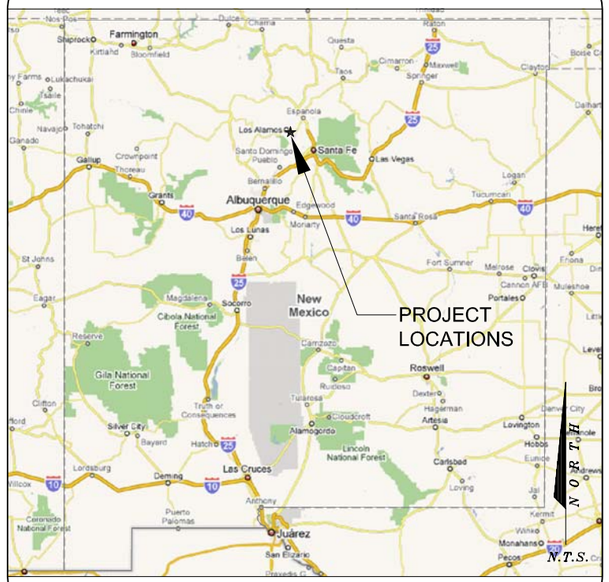
LOCATION MAP



VICINITY MAP



PREPARED FOR:
LOS ALAMOS NATIONAL LABORATORY
P.O. BOX 1663
LOS ALAMOS, NM 87545

PREPARED BY:

PBS&J
CONSULTING ENGINEERS
101 ARTHUR ANDERSEN PARKWAY, SUITE 260
SARASOTA, FLORIDA 34232
(941) 378-0272 (VOICE)
(941) 371-0297 (FAX)

KBR
GOVERNMENT AND INFRASTRUCTURE
2451 CRYSTAL DRIVE
ARLINGTON, VIRGINIA 22202
(703) 526-7500

08/28/2009	ALL	JVC
DATE:	SHEETS	BY:

REVISIONS

LOS ALAMOS
NATIONAL LABORATORY
GRADE CONTROL STRUCTURES

JOB NO.100005632

DATE: 08/28/2009 SHT. 1 OF 15

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GENERAL CONSTRUCTION NOTES

1. ALL ELEVATIONS REFER TO THE NORTH AMERICAN DATUM (1983).

2. LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES AND OTHER FEATURES AFFECTING THIS WORK PRIOR TO CONSTRUCTION.

3. THE CONTRACTOR SHALL CHECK PLANS FOR CONFLICTS AND DISCREPANCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE OWNER'S ENGINEER OF ANY CONFLICT BEFORE PERFORMING ANY WORK IN THE AFFECTED AREA.

4. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION IN AREAS OF BURIED UTILITIES AND SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT MARKING THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION.

5. ANY WELLS DISCOVERED DURING EXCAVATION, EARTHMOVING OR CONSTRUCTION MUST BE REPORTED TO THE APPROPRIATE GOVERNMENTAL AGENCY OFFICE WITHIN 24 HOURS OF DISCOVERY. ANY WELLS DISCOVERED ON THE SITE THAT HAVE NO USE MUST BE PLUGGED BY A LICENSED WELL DRILLING CONTRACTOR .

6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BECOME FAMILIAR WITH THE PERMIT AND INSPECTION REQUIREMENTS OF THE VARIOUS GOVERNMENTAL AGENCIES. THE CONTRACTOR SHALL SCHEDULE INSPECTIONS ACCORDING TO AGENCY INSTRUCTION.

7. ALL SPECIFICATIONS AND DOCUMENTS REFERRED TO SHALL BE OF LATEST REVISIONS AND/OR LATEST EDITION.

8. ALL WORK PERFORMED SHALL COMPLY WITH THE REGULATIONS AND ORDINANCES OF THE GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE WORK.

9. CONTRACTOR SHALL SUBMIT FOR APPROVAL TO THE OWNER'S ENGINEER SHOP DRAWINGS ON ALL PRECAST AND MANUFACTURED ITEMS PRIOR TO ORDERING MATERIALS. FAILURE TO OBTAIN APPROVAL BEFORE INSTALLATION MAY RESULT IN REMOVAL AND REPLACEMENT AT CONTRACTOR'S EXPENSE.

10. AT LEAST 3 WORKING DAYS PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL NOTIFY THE OWNER AND APPROPRIATE AGENCIES. NOTIFICATION SHALL INCLUDE THE CONTRACTOR'S NAME, STARTING DATE, PROJECTED SCHEDULE, AND OTHER INFORMATION AS REQUIRED. ANY WORK PERFORMED PRIOR TO NOTIFYING THE OWNER OR WITHOUT AGENCY INSPECTOR PRESENT MAY BE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.

11. ALL DISTURBED AREAS WITHIN PUBLIC RIGHT-OF-WAY ARE TO BE RESTORED TO ORIGINAL CONDITION OR BETTER.

12. THE CONTRACTOR IS RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT OF ALL PROPERTY, ABOVE AND BELOW GROUND, AFFECTED BY THIS WORK. ALL PROPERTY SHALL BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN EXISTING CONDITIONS BEFORE CONSTRUCTION COMMENCED UNLESS SPECIFICALLY EXEMPTED BY THE PLANS. ADDITIONAL COSTS ARE INCIDENTAL TO OTHER CONSTRUCTION.

13. ALL DISTURBED AREAS ASSOCIATED WITH CONSTRUCTION, WHICH ARE NOT TO BE SODDED, ARE TO BE SEEDED AND MULCHED TO THE LOCAL GOVERNING BODY'S STANDARDS AND MAINTAINED UNTIL A SATISFACTORY STAND OF GRASS ACCEPTABLE TO THE OWNER HAS BEEN OBTAINED. ANY WASHOUTS, REGRADING, RESEEDING, GRASSING, AND OTHER EROSION WORK REQUIRED, WILL BE PERFORMED BY THE CONTRACTOR/SUBCONTRACTOR UNTIL THE SYSTEM IS ACCEPTED FOR MAINTENANCE BY THE OWNER.

15. AS-BUILT DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORDING INFORMATION ON A SET OF THE APPROVED PLANS CONCURRENTLY WITH CONSTRUCTION PROGRESS. WITHIN TWO (2) WEEKS FOLLOWING FINAL INSPECTION THE CONTRACTOR SHALL SUBMIT ONE (1) SET OF AS-BUILT DRAWINGS TO THE ENGINEER. THE FINAL RECORD DRAWINGS SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:

A. DRAWINGS TO BE THREE-MIL BLACK LINE MYLAR.
B. DRAWINGS TO BE LEGIBLY MARKED TO RECORD ACTUAL CONSTRUCTION.
C. DRAWINGS SHALL SHOW ACTUAL LOCATION OF ALL UNDERGROUND WORK.
D. DRAWINGS SHALL CLEARLY SHOW ALL FIELD CHANGES OF DIMENSION AND DETAIL INCLUDING CHANGES MADE BY FIELD ORDER OR BY CHANGE ORDER.
E. DRAWINGS SHALL CLEARLY SHOW ALL DETAILS NOT ON ORIGINAL CONTRACT DRAWINGS BUT CONSTRUCTED IN THE FIELD. ALL EQUIPMENT AND PIPING RELOCATION SHALL BE CLEARLY SHOWN.
F. LOCATIONS OF ALL FEATURES SHALL BE SHOWN. ALL VALVES SHALL BE REFERENCED FROM AT LEAST TWO (2) AND PREFERABLY THREE (3) PERMANENT POINTS.
G. DRAWINGS TO BE SIGNED AND SEALED BY A LICENSED SURVEYOR.

16. ALL CONCRETE STRUCTURES SHALL BE MADE OF 3000 PSI CONCRETE PER DOT STANDARD SPECIFICATIONS UNLESS OTHERWISE NOTED ON THE PLANS.

SITE CLEARING PREPARATION NOTES

1. THE CONTRACTOR IS TO PREPARE THE SITE PRIOR TO BEGINNING INFRASTRUCTURE CONSTRUCTION IN ACCORDANCE WITH SOILS TESTING REPORT. COPIES OF THE SOILS REPORT ARE AVAILABLE THROUGH THE OWNER OR THE SOILS TESTING COMPANY.

2. CONTRACTOR SHALL CLEAR AND GRUB ONLY THOSE PORTIONS OF THE SITE NECESSARY FOR CONSTRUCTION. DISTURBED AREAS WILL BE SEEDED, MULCHED, OR PLANTED WITH OTHER APPROVED LANDSCAPE MATERIAL IMMEDIATELY FOLLOWING CONSTRUCTION.

3. THE TOP 4" TO 6" OF GROUND REMOVED DURING CLEARING AND GRUBBING SHALL BE STOCKPILED AT A SITE DESIGNATED BY THE OWNER TO BE USED FOR LANDSCAPING PURPOSES, UNLESS OTHERWISE DIRECTED BY THE OWNER.

4. ALL CONSTRUCTION DEBRIS AND OTHER WASTE MATERIAL SHALL BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH APPLICABLE REGULATIONS.

5. CONTRACTOR TO OBTAIN ALL NECESSARY PERMITS AND APPROVALS PRIOR TO REMOVING ANY EXISTING STRUCTURES.

6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY ALL UTILITY COMPANIES TO DISCONNECT OR REMOVE THEIR FACILITIES PRIOR TO REMOVING OR DEMOLISHING ANY EXISTING STRUCTURES FROM THE SITE.

7. THE LOCATION OF ALL EXISTING UTILITIES SHOWN ON THE PLANS HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR/SUBCONTRACTOR. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ACCURACY PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY. IT SHALL BE THE CONTRACTOR'S/SUBCONTRACTOR'S RESPONSIBILITY TO NOTIFY THE VARIOUS UTILITIES AND TO MAKE THE NECESSARY ARRANGEMENTS FOR ANY RELOCATIONS OF THESE UTILITIES WITH THE OWNER OF THE UTILITY. THE CONTRACTOR/SUBCONTRACTOR SHALL EXERCISE CAUTION WHEN CROSSING ANY UNDERGROUND UTILITY, WHETHER SHOWN ON THE PLANS OR LOCATED BY THE UTILITY COMPANY. ALL UTILITIES WHICH INTERFACE WITH THE PROPOSED CONSTRUCTION SHALL BE RELOCATED BY THE RESPECTIVE UTILITY COMPANIES AND THE CONTRACTOR/SUBCONTRACTOR SHALL COOPERATE WITH THE UTILITY COMPANIES DURING RELOCATION OPERATIONS. ANY DELAY OR INCONVENIENCE CAUSED TO THE CONTRACTOR/SUBCONTRACTOR BY THE VARIOUS UTILITIES SHALL BE INCIDENTAL TO THE CONTRACT AND NO EXTRA COMPENSATION WILL BE ALLOWED.

8. ALTHOUGH NOT ANTICIPATED, THE LOCATION OF ANY EXISTING UNDERGROUND UTILITY LINES, WELLS OR OTHER BURIED PIPING OR STRUCTURES ASSOCIATED WITH PAST SITE USE WITHIN THE CONSTRUCTION AREA SHOULD BE ESTABLISHED PRIOR TO CONSTRUCTION. PROVISIONS SHOULD THEN BE MADE TO RELOCATE ANY INTERFERING UTILITY LINES WITHIN THE CONSTRUCTION AREA TO APPROPRIATE LOCATIONS. IN THIS REGARD, IT SHOULD BE NOTED THAT IF ABANDONED UNDERGROUND PIPES ARE NOT PROPERLY REMOVED OR PLUGGED, THEY MAY SERVE AS CONDUITS FOR SUBSURFACE EROSION, WHICH SUBSEQUENTLY MAY RESULT IN EXCESSIVE SETTLEMENTS.

9. SITE CLEARING, GRUBBING AND DEMOLITION SHALL INCLUDE THE REMOVAL OF TREES, GROUND BRUSH, ORGANIC SOILS, ROOT MATS, EXISTING STRUCTURES, PAVEMENT, UTILITIES OR OTHER DELETERIOUS MATERIALS ENCOUNTERED. CLEARING AND GRUBBING SHALL BE REVIEWED BY THE OWNER'S REPRESENTATIVE PRIOR TO BEGINNING CONSTRUCTION AT THE SITE. AS A MINIMUM, THE CLEARING OPERATIONS SHALL EXTEND AT LEAST 5 FEET BEYOND THE BUILDING PERIMETERS. ANY EXCAVATIONS OR CAVITIES FORMED BY THE REMOVAL OF ORGANIC MATERIAL, GROUND BRUSH OR STUMPS SHOULD BE FILLED WITH CLEAN, COMPACTED STRUCTURAL FILL.

GRADING NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING EXCAVATIONS AGAINST COLLAPSE AND WILL PROVIDE BRACING SHEETING OR SHORING AS NECESSARY. TRENCHES SHALL BE KEPT DRY WHILE PIPE AND APPURTENANCES ARE BEING PLACED. DEWATERING SHALL BE USED AS REQUIRED.

2. CONTRACTOR IS TO PROVIDE EROSION CONTROL BARRIERS (HAY BALES OR SILTATION CURTAIN) TO PREVENT SILTATION OF ADJACENT PROPERTY, STREETS, STORM SEWERS, WATERWAYS, AND EXISTING WETLANDS PER THE CONSTRUCTION DRAWINGS. IN ADDITION, CONTRACTOR SHALL PLACE STRAW, MULCH, OR OTHER SUITABLE MATERIAL ON GROUND IN AREAS WHERE CONSTRUCTION RELATED TRAFFIC IS TO ENTER AND EXIT THE SITE. IF, IN THE OPINION OF THE OWNER'S REPRESENTATIVE OR GOVERNMENTAL AGENCY THAT EXCESSIVE QUANTITIES OF EARTH ARE TRANSPORTED OFF-SITE EITHER BY NATURAL DRAINAGE OR BY VEHICULAR TRAFFIC, THE CONTRACTOR IS TO REMOVE SAID EARTH TO THE SATISFACTION OF THE ENGINEER AND/OR GOVERNING OFFICIALS. SEE SWPPP NARRATIVE FOR ADDITIONAL INFORMATION.

3. IF WIND EROSION BECOMES SIGNIFICANT DURING CONSTRUCTION, THE CONTRACTOR SHALL STABILIZE THE AFFECTED AREA USING SPRINKLING, IRRIGATION, OR OTHER ACCEPTABLE METHODS.

4. THERE IS TO BE NO DISCHARGE (I.E. PUMPING, SHEET FLOW, SWALE, DITCH, ETC.) INTO EXISTING DITCHES OR CANALS WITHOUT THE USE OF SETTLING PONDS. IF THE CONTRACTOR DESIRES TO DISCHARGE INTO THE EXISTING DITCHES OR CANALS A SETTLING POND PLAN PREPARED BY THE CONTRACTOR MUST BE SUBMITTED TO AND APPROVED BY THE OWNER'S REPRESENTATIVE AND APPROPRIATE GOVERNMENTAL AGENCY PRIOR TO CONSTRUCTION.

5. ANY VEGETATION FROM CLEARING/GRUBBING SHALL BE DISPOSED OF OFF-SITE.

PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, Florida 34232
Ph. (941) 378-0272
Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J
5300 West Cypress Street, Suite 200, Tampa, Fl 33607
FBPR Certificate of Authorization No.: 24

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	GENERAL NOTES
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1 ISSUED FOR NMED PERMITTING 08/28/2009
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JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-001

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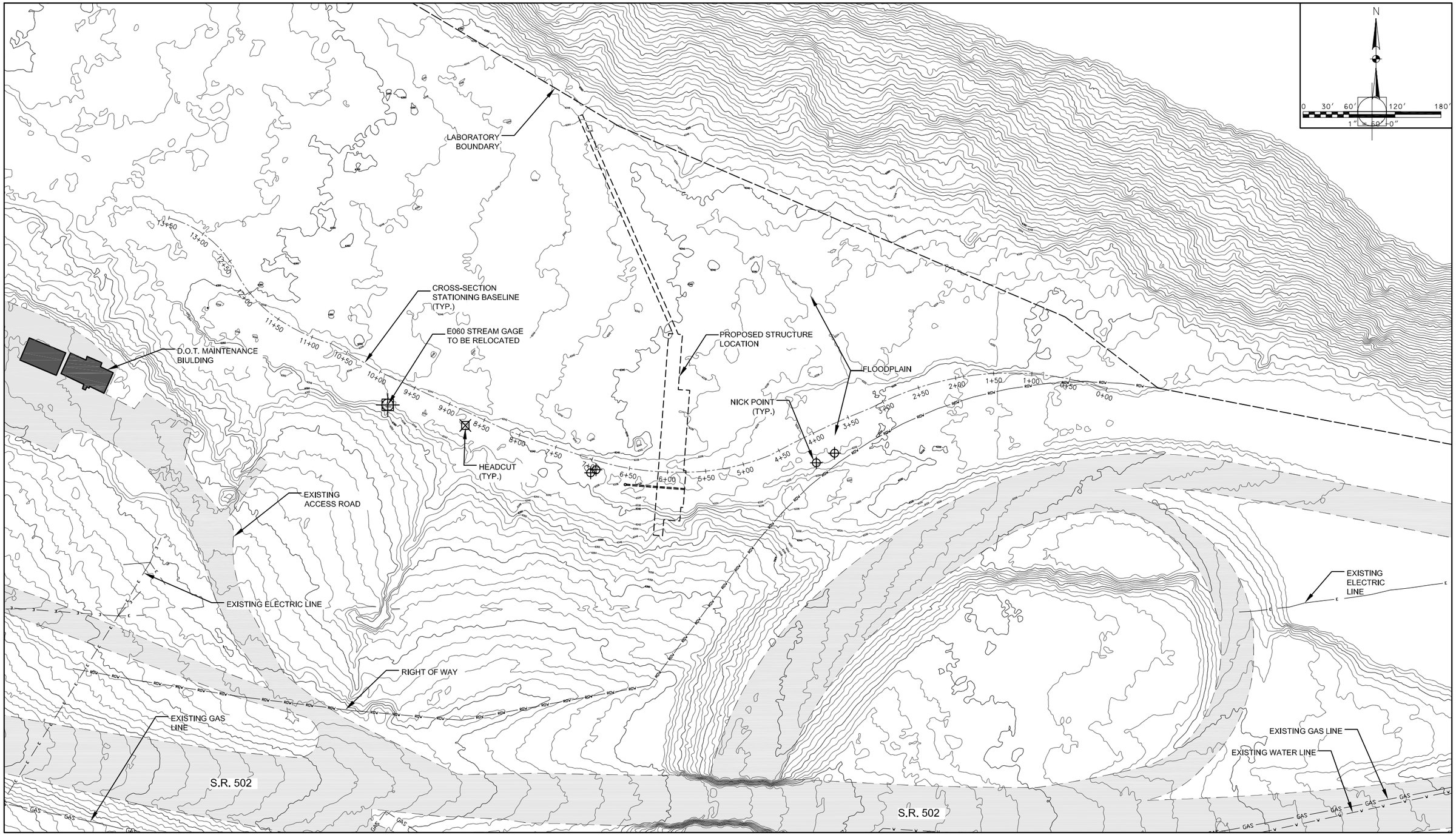

User Name: 22190
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PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, Florida 34232
Ph. (941) 378-0272

Post Buckley Schuh & Jernigan, Inc,. d/b/a PBS&J
5300 West Cypress Street, Suite 200, Tampa, Fl 33607
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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON EXISTING CONDITIONS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1 ISSUED FOR NMED PERMITTING 08/28/2009
2
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JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-101

PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, Florida 34232
Ph. (941) 378-0272
Post Buckley Schuh & Jernigan, Inc,. d/b/a PBS&J
5300 West Cypress Street, Suite 200, Tampa, Fl 33607
FBPR Certificate of Authorization No.: 24

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON OVERALL SITE PLAN WITH AERIAL
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1 ISSUED FOR NMED PERMITTING 08/28/2009
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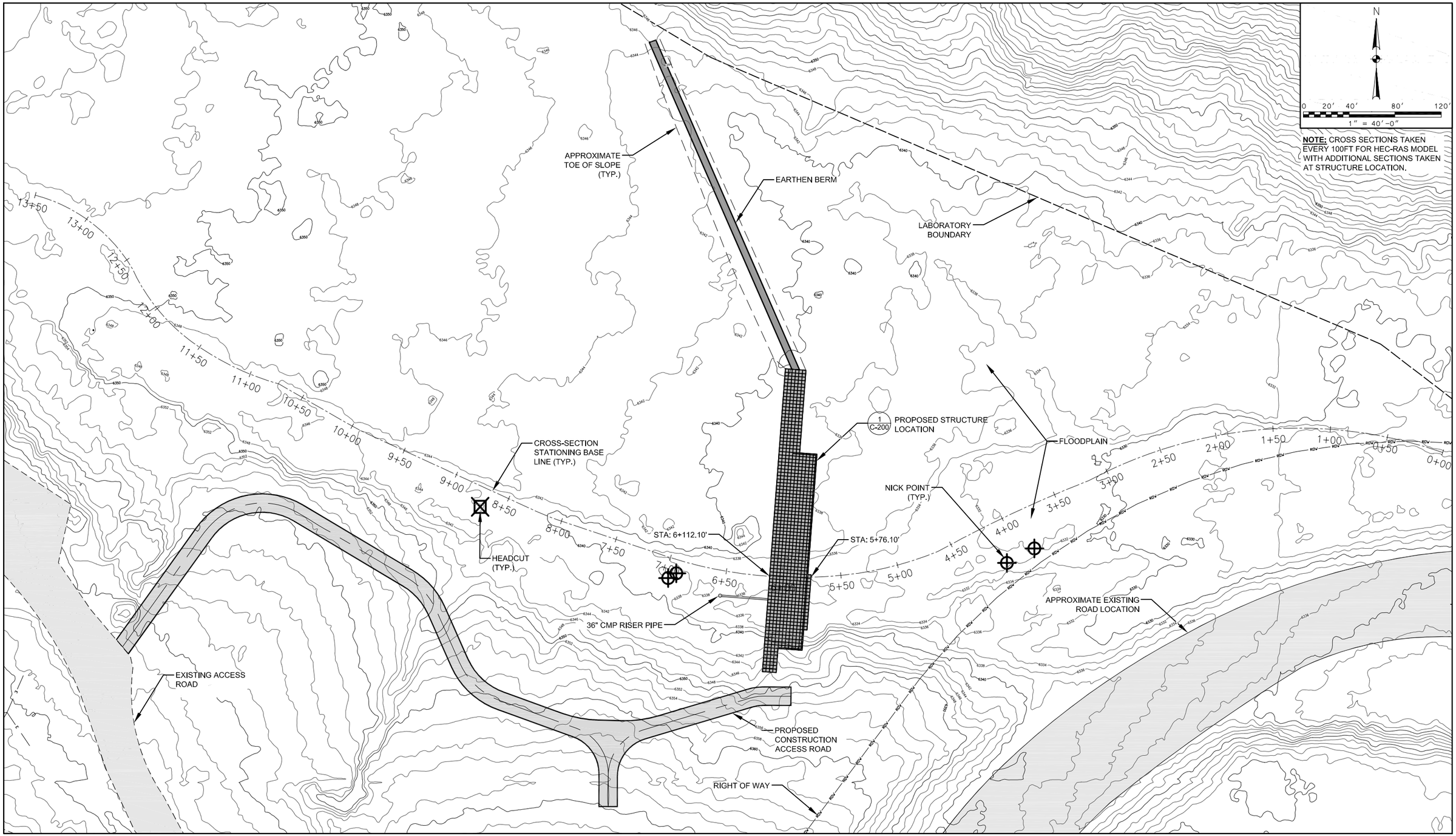
JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-102

User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-102 - PUEBLO CANYON OVERALL WITH AERIAL.dwg Aug 28, 2009 - 11:50am



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KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON ENLARGED SITE PLAN
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
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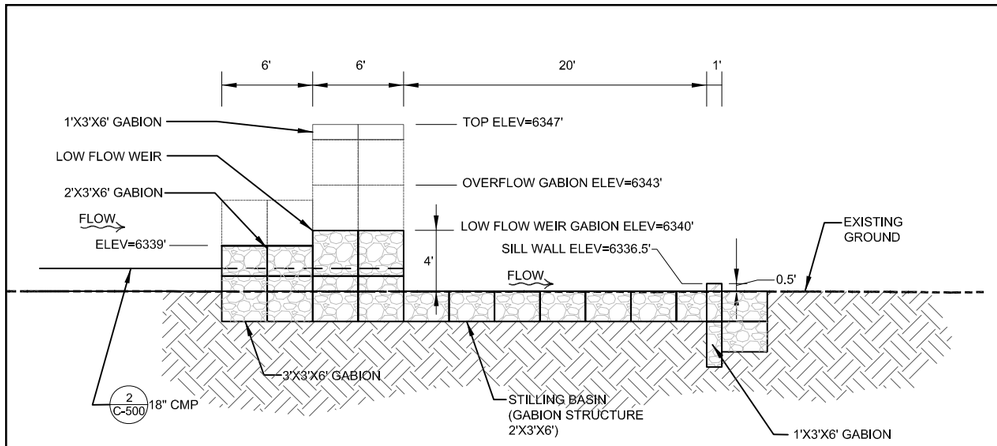
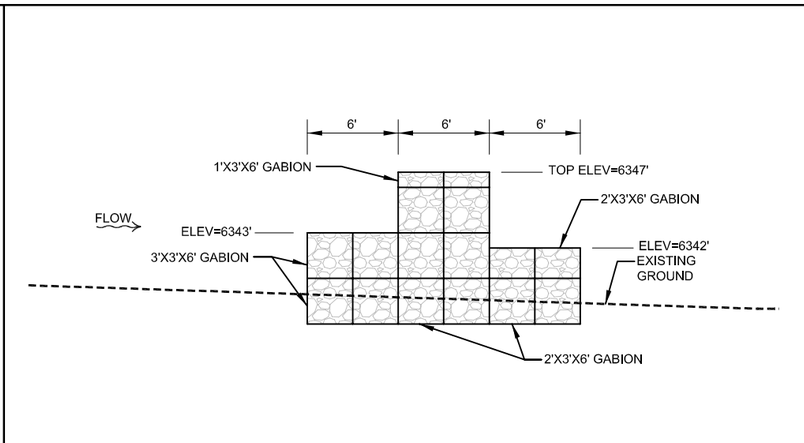
JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-103

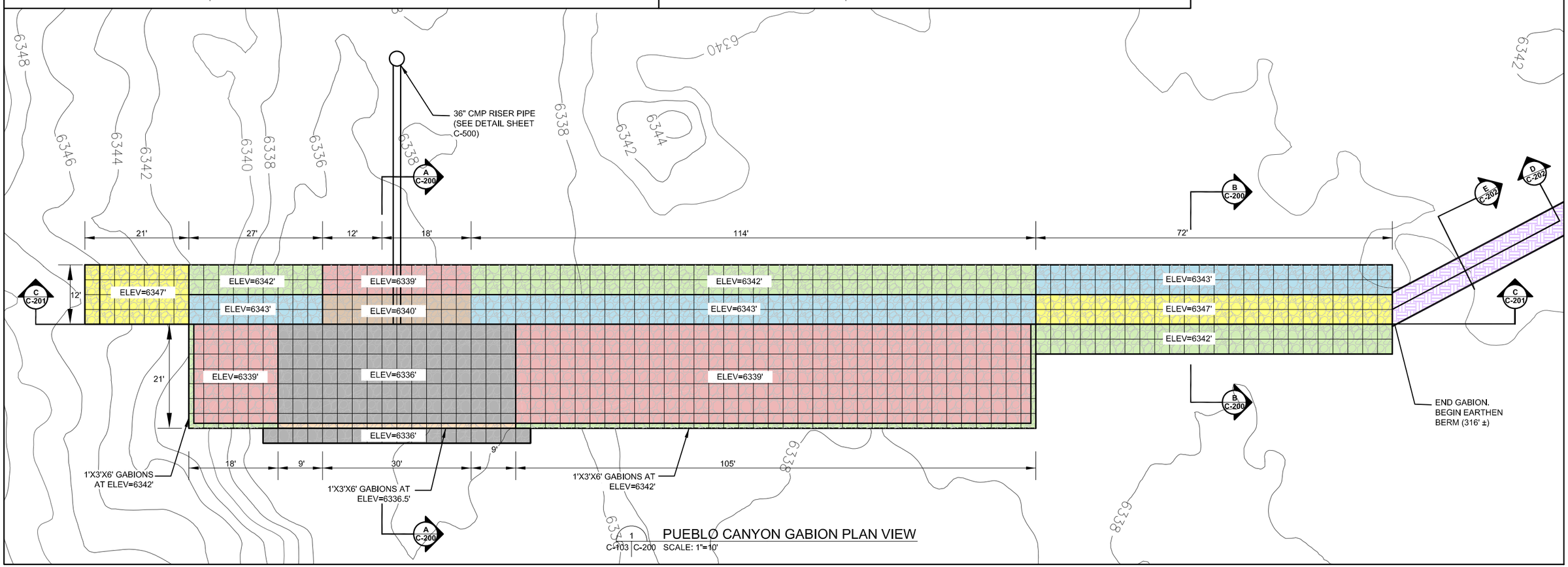
User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-103 - PUEBLO CANYON SITE PLAN.dwg Aug 28, 2009 - 11:51am



A C-200 | C-200 PROFILE SECTION A-A
SCALE: N.T.S.



B C-200 | C-200 PROFILE SECTION B-B
SCALE: N.T.S.



1 C-103 | C-200 PUEBLO CANYON GABION PLAN VIEW
SCALE: 1"=10'

User Name: 22190
Drawing Name: \\Sorlsd01\common\100005632 Los Alamos\Sheets\C-200 - PUEBLO CANYON CROSS SECTIONS.dwg Aug 28, 2009 - 11:52am

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	PUEBLO CANYON CROSS SECTIONS

ORIGINAL DATE: 08/24/09
REVISIONS:
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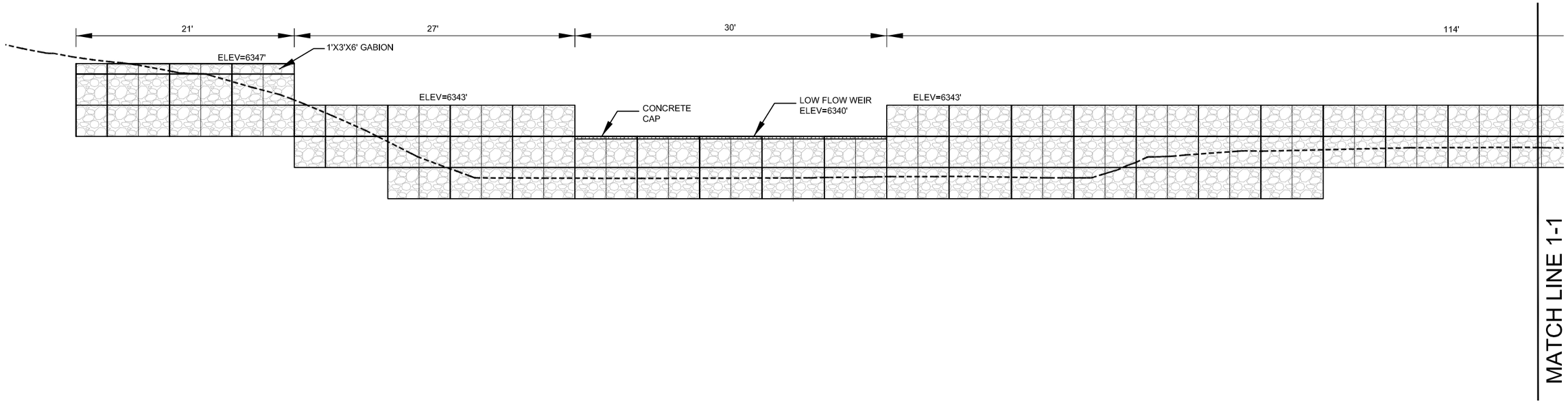
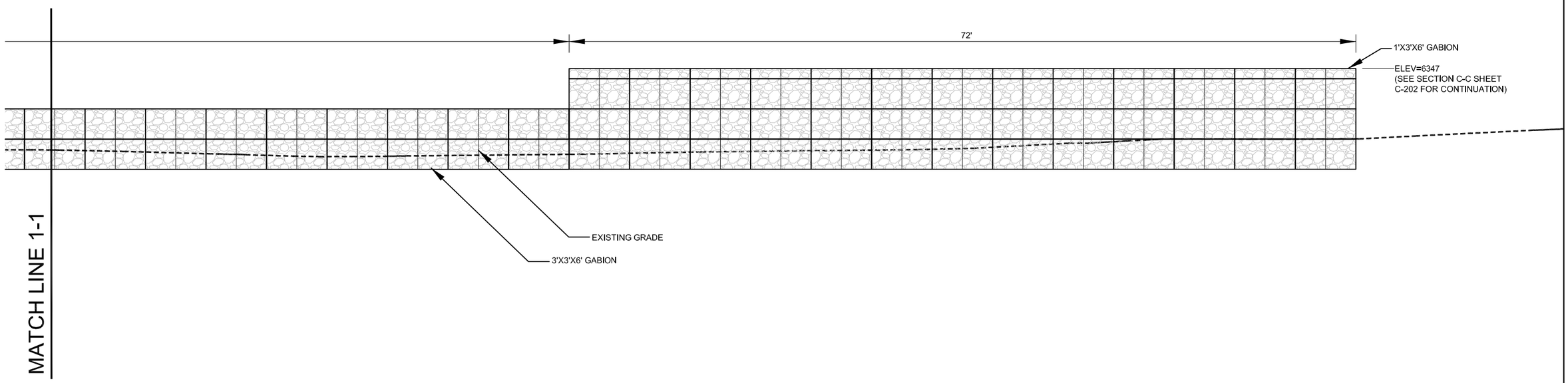
JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-200





C
C-200 | C-201 PUEBLO CANYON GABION CROSS SECTION B-B
SCALE: 1"=5'

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KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	PUEBLO CANYON CROSS SECTIONS

ORIGINAL DATE: 08/24/09
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JOB NO. 100005632
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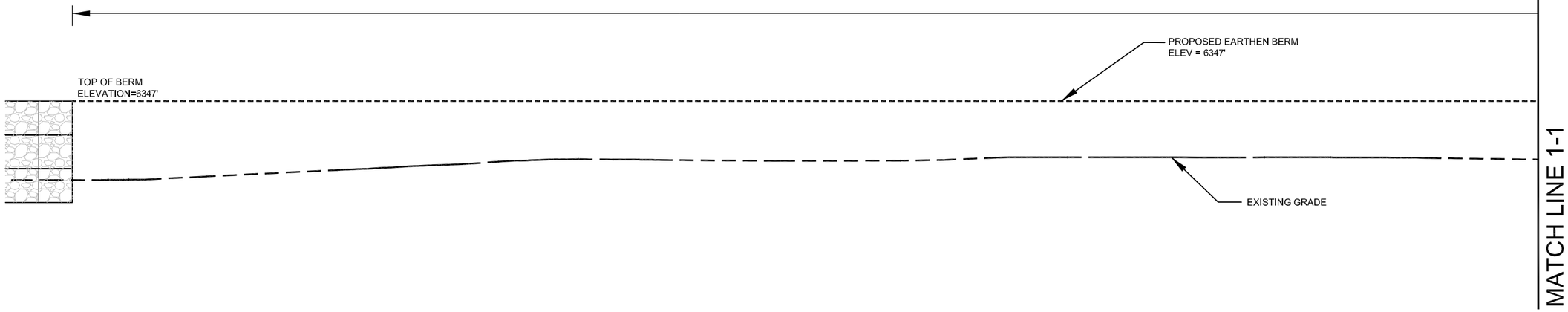
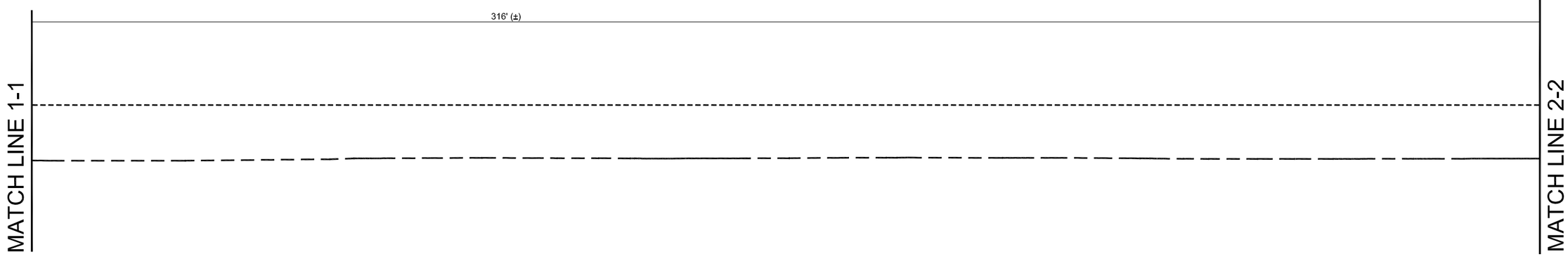
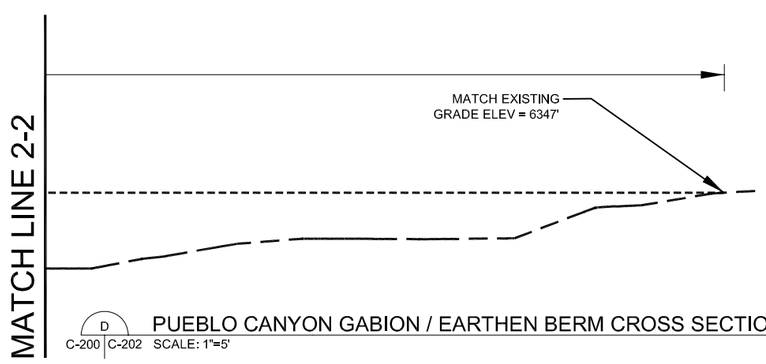
PE RMP
CHECKED IMT
QC MS
SHEET C-201

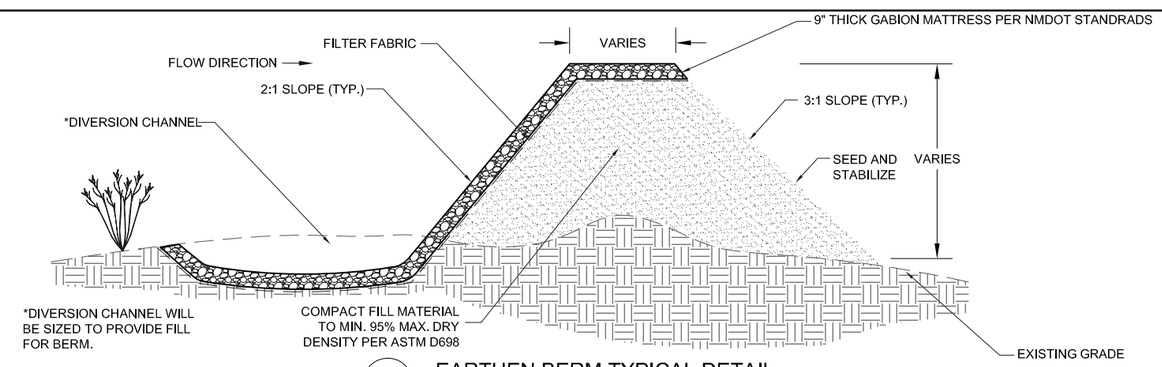
User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-200 - PUEBLO CANYON CROSS SECTIONS.dwg Aug 28, 2009 - 11:53am







D
C-200 | C-202 PUEBLO CANYON GABION / EARTHEN BERM CROSS SECTION C-C
SCALE: 1"=5'



1 EARTHEN BERM TYPICAL DETAIL
SCALE: NTS

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	PUEBLO CANYON CROSS SECTIONS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
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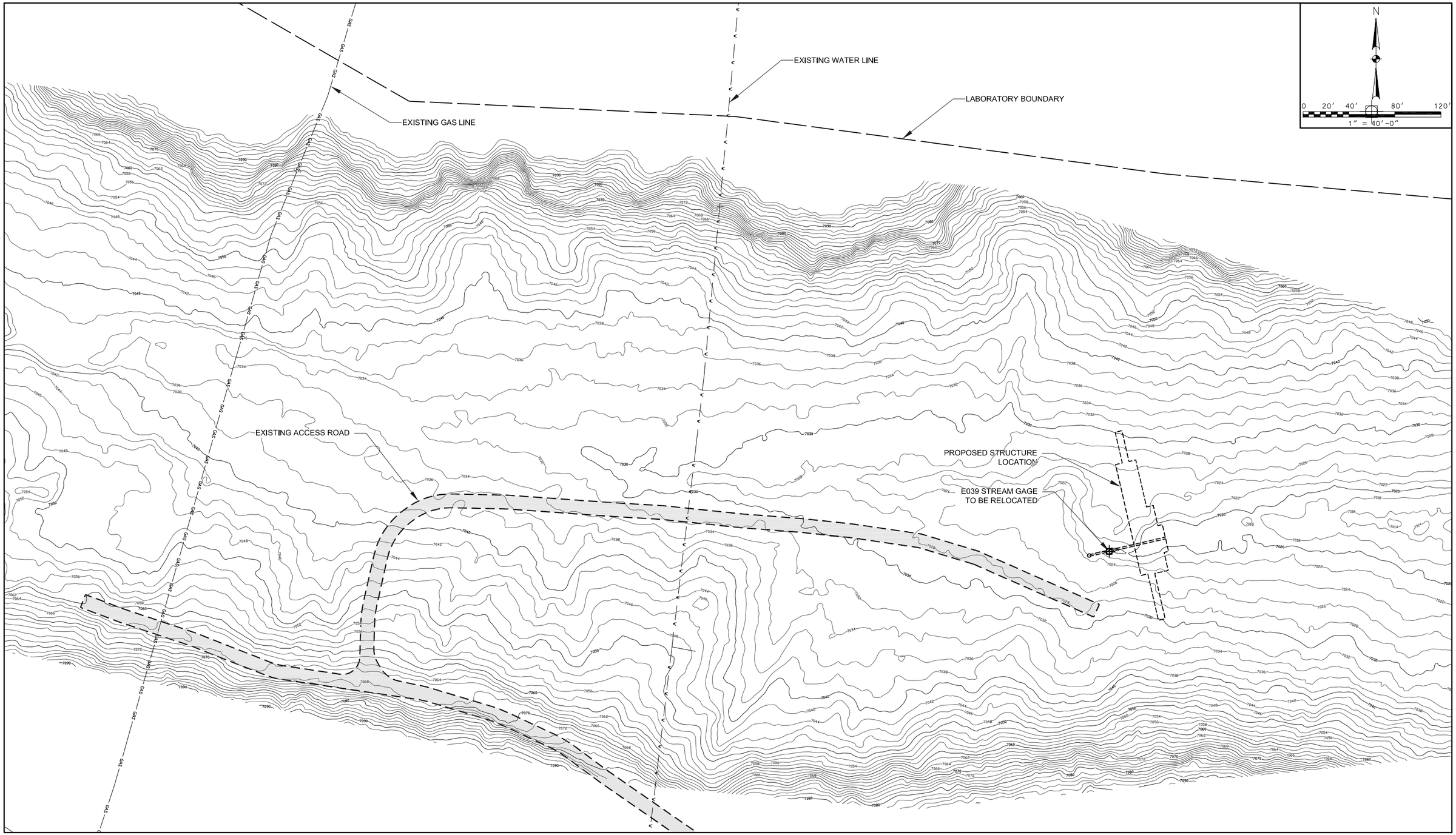
JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-202

User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-200 - PUEBLO CANYON CROSS SECTIONS.dwg
Aug 28, 2009 - 11:53am



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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	DP CANYON EXISTING CONDITIONS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
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JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-301

User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-301 - DP CANYON EXISTING CONDITIONS.dwg Aug 28, 2009 - 1:48pm

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	DP CANYON
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	OVERALL SITE PLAN WITH AERIAL

ORIGINAL DATE: 08/24/09
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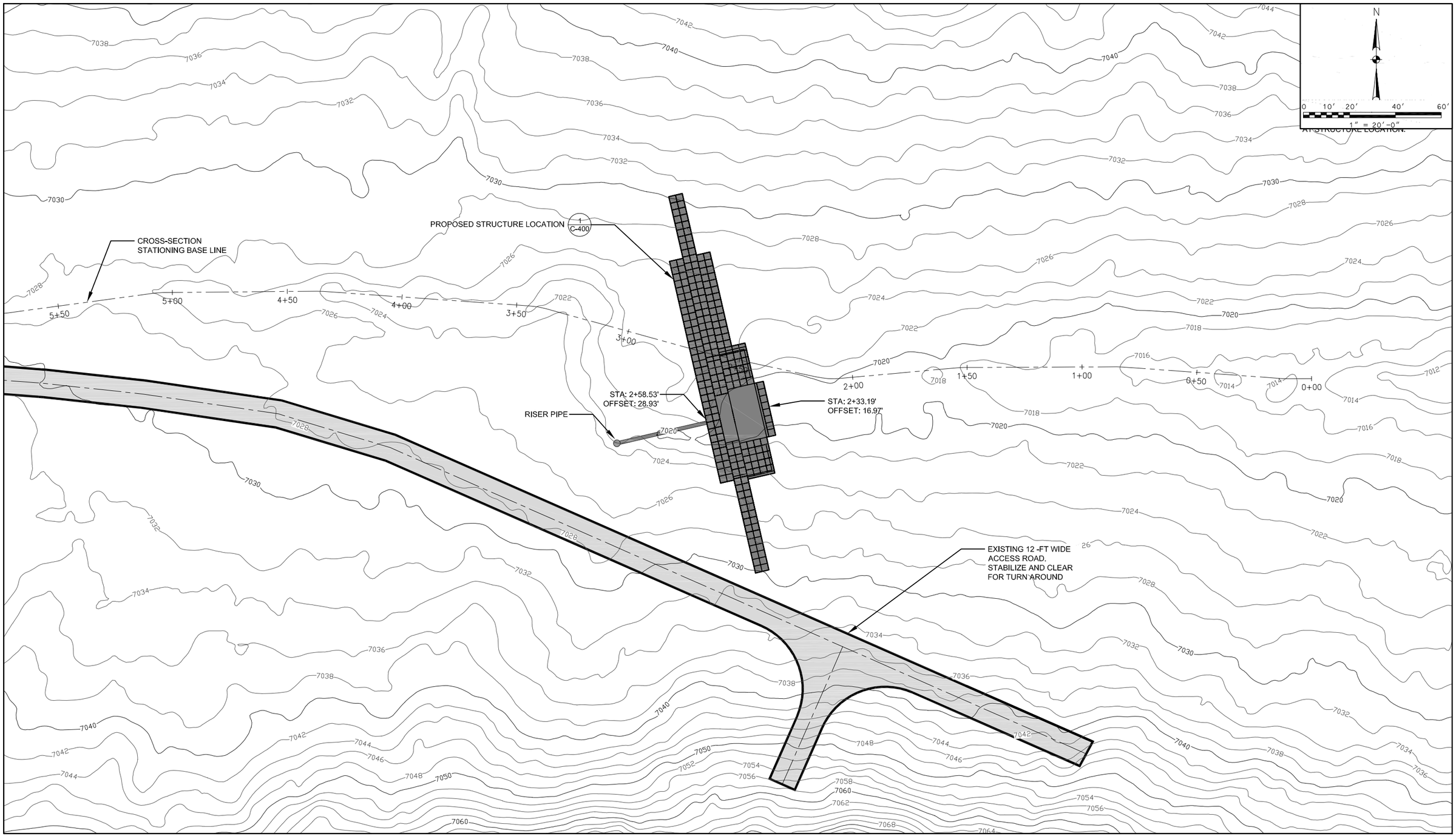
JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-302

User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-302 - DP CANYON OVERALL WITH AERIAL.dwg Aug 28, 2009 - 11:55am



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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	DP CANYON ENLARGED SITE PLAN
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
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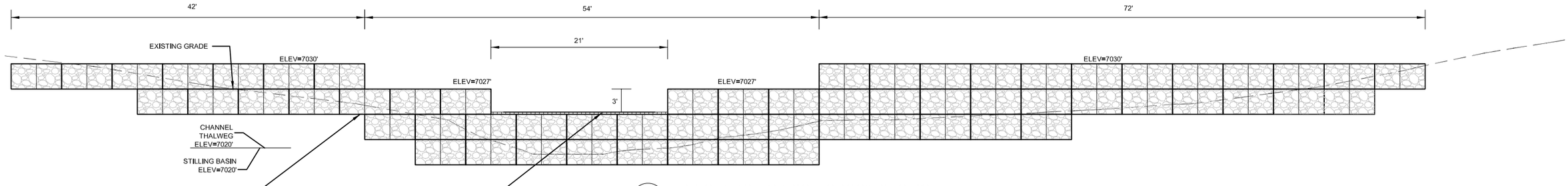
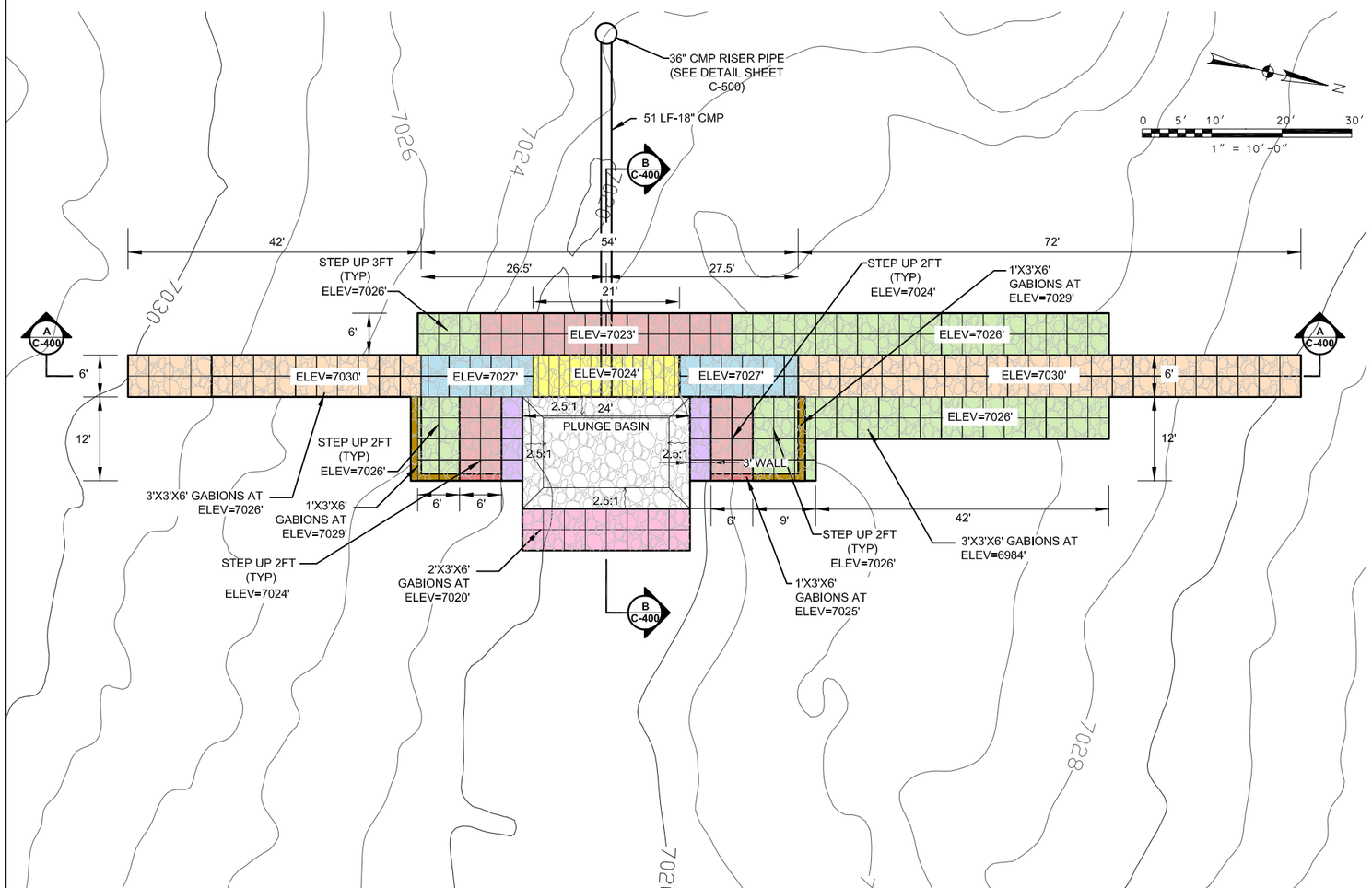
JOB NO. 100005632
DATE 08/27/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-303

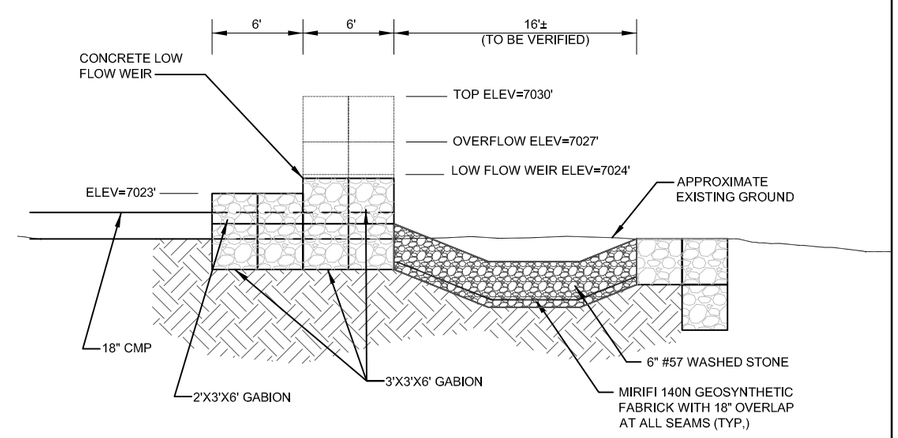
User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-303 - DP CANYON SITE PLAN.dwg
Aug 28, 2009 - 11:56am



A C-400 | C-400 DP CANYON GABION CROSS SECTION A-A
SCALE: 1" = 6'



1 C-400 | C-400 DP CANYON GABION PLAN VIEW
SCALE: 1" = 10'



B C-400 | C-400 PROFILE SECTION B-B
SCALE: N.T.S.

User Name: 22190
Drawing Name: \\Sarfs01\common\100005632 Los Alamos\Sheets\C-400 - DP CANYON CROSS SECTIONS.dwg Aug 28, 2009 - 11:56am

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	DP CANYON CROSS SECTIONS

ORIGINAL DATE: 08/24/09
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PE RMP
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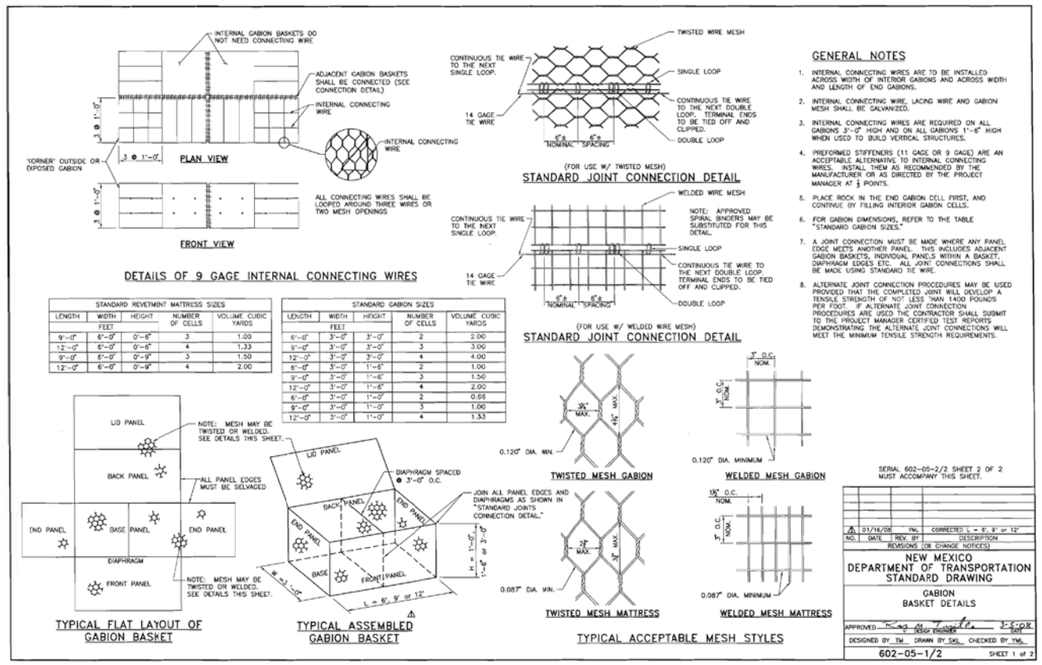
SHEET C-400

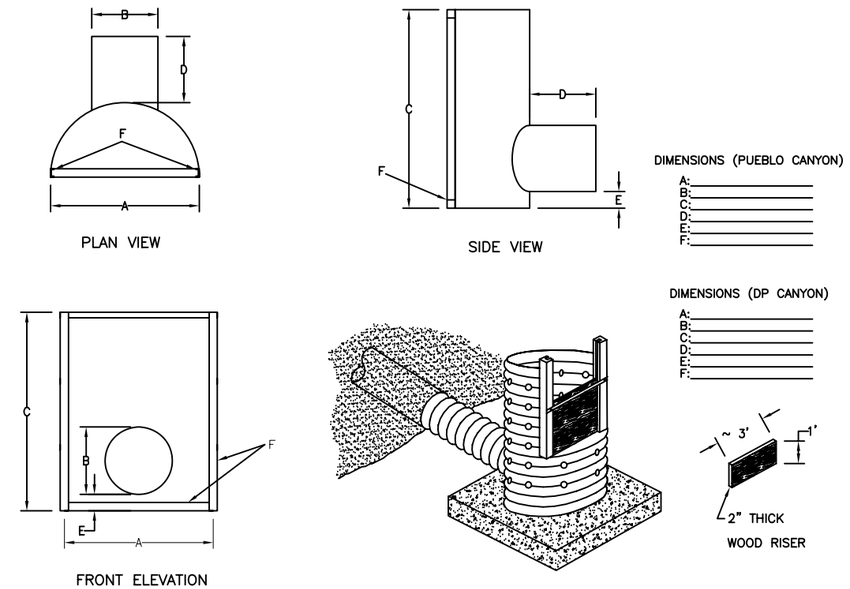


STANDARD REVETMENT MATTRESS SIZES				
LENGTH	WIDTH	HEIGHT	NUMBER OF CELLS	VOLUME CUBIC YARDS
FEET				
9'-0"	6'-0"	0'-6"	3	1.00
12'-0"	6'-0"	0'-6"	4	1.33
9'-0"	6'-0"	0'-9"	3	1.50
12'-0"	6'-0"	0'-9"	4	2.00

STANDARD GABION SIZES				
LENGTH	WIDTH	HIHGHT	NUMBER OF CELLS	VOLUME CUBIC YARDS
FEET				
6'-0"	3'-0"	3'-0"	2	2.00
9'-0"	3'-0"	3'-0"	3	3.00
12'-0"	3'-0"	3'-0"	4	4.00
6'-0"	3'-0"	1'-6"	2	1.00
9'-0"	3'-0"	1'-6"	3	1.50
12'-0"	3'-0"	1'-6"	4	2.00
6'-0"	3'-0"	1'-0"	2	0.66
9'-0"	3'-0"	1'-0"	3	1.00
12'-0"	3'-0"	1'-0"	4	1.33

1 GABION BASKET DETAIL (NMDOT)

C-103 C-500 SCALE: NTS
C-303



2 RISER PIPE DETAILS

C-200 C-500 SCALE: NTS
C-400

User Name: 22190
Drawing Name: \\Serfs01\common\100005632 Los Alamos\Sheets\C-500 - GENERAL DETAILS.dwg Aug 28, 2009 - 11:57am

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	GENERAL DETAILS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
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PE RMP
CHECKED IMT
QC MS
SHEET C-500

TEMPORARY EROSION & SEDIMENT CONTROL MEASURES (T.E.S.C.M.)

GENERAL NOTES

1. THE SOIL RETENTION BLANKET INSTALLATION DETAILS SHOWN FOR CULVERT PROTECTION SHALL BE USED FOR ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES UTILIZING SOIL RETENTION BLANKETS UNLESS OTHERWISE NOTED.
2. ROCK PLATING USED IN THE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHOWN ON THESE SHEETS SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES UNLESS OTHERWISE INDICATED.
3. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES PLACED WITHIN THE CONSTRUCTION CLEAR ZONE SHALL BE INSTALLED WITH 8:1 SLOPES PARALLEL TO TRAFFIC AND 4:1 SLOPES PERPENDICULAR TO TRAFFIC.
4. SEDIMENT TRAPS SHALL BE CLEANED OF ACCUMULATED SEDIMENT WHEN APPROXIMATELY 50% FILLED.
5. CHECK DAMS SHALL BE CLEANED OF ACCUMULATED SEDIMENT WHEN THE DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE CHECK DAM.
6. CULVERT PROTECTIONS SHALL BE INSTALLED UPON INITIATION OF EARTH WORK ACTIVITIES AND MAINTAINED AS MUCH AS PRACTICAL UNTIL STABILIZATION IS COMPLETED AND ACCEPTED. CULVERT PROTECTIONS MAY BE REMOVED FOR PERIODS OF TIME AS REQUIRED DURING CONSTRUCTION TO COMPLETE ADJACENT IMPROVEMENTS.
7. THE CONTRACTOR MAY CONSTRUCT AN EARTH DIKE AS SHOWN, OR RELOCATE THE CHECK DAMS AS CONSTRUCTION PROGRESSES. NO DIRECT PAYMENT SHALL BE MADE FOR RELOCATION OF THE CHECK DAMS.
8. STRAW BALES ARE NOT INTENDED FOR USE ON NEW MEXICO DEPARTMENT OF TRANSPORTATION PROJECTS.

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

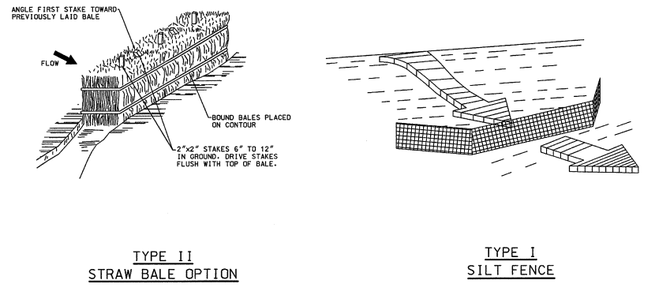
TEMPORARY EROSION & SEDIMENT CONTROL MEASURES

APPROVED Raymond A. Van Horn 11/24/97
DESIGN ENGINEER DATE

DESIGNED BY___ DRAWN BY ___ CHECKED BY ___

603-01-1/7 SERIAL 1 OF 7

1 T.E.S.C.M. NOTES (NMDOT)
SCALE: NTS



TYPE II
STRAW BALE OPTION

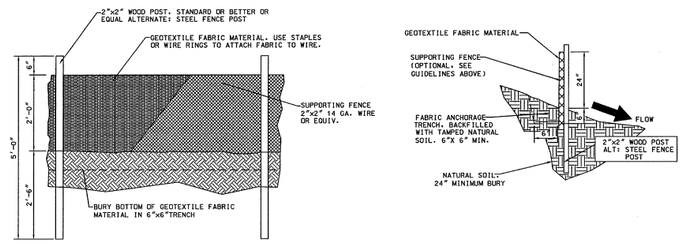
TYPE I
SILT FENCE

NOTES: SILT FENCE AND CHECK DAM

THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE POST SPACING FOR SILT FENCES TO MINIMIZE MAINTENANCE.

1. POST SPACING SHALL BE 4 FT. MAXIMUM WITHOUT SUPPORTING FENCE. 10 FT. MAXIMUM WITH SUPPORTING FENCE.
2. POSTS FOR 4 FT. MAXIMUM POST SPACING SHALL BE 2 INCH SQUARE NOMINAL SIZE OR HEAVIER WOOD POSTS. OR STANDARD "T" OR "U" SECTION STEEL POSTS WEIGHING NOT LESS THAN 2 LBS. PER. LINEAR FOOT.

   POSTS FOR 10 FT. MAXIMUM POST SPACING SHALL BE 4 INCH SQUARE NOMINAL SIZE OR HEAVIER WOOD POSTS. OR STEEL POSTS AS SPECIFIED ABOVE.
3. SUPPORTING FENCE SHALL BE WIRE MESH (14 GA. MIN., 1 INCH MAX. MESH OPENINGS). SNOW FENCE. PLASTIC FENCE OR APPROVED.
4. SUPPORTING FENCE SHALL BE FASTENED SECURELY TO POSTS WITH STAPLES OR WIRE TIES. GEOTEXTILE FABRIC SHALL BE FASTENED SECURELY TO SUPPORTING FENCE WITH WIRE TIES SPACED AT 2 FT. CENTERS ALONG THE TOP AND MID-SECTION. WHEN A SUPPORTING FENCE IS NOT USED. GEOTEXTILE FABRIC SHALL BE SECURELY FASTENED TO POSTS WITH STAPLES OR WIRE TIES.
5. WHEN SILT FENCE IS USED FOR CHECK DAMS INSTALLED IN DITCHES. A SUPPORTING FENCE SHALL BE PROVIDED. WITH MAXIMUM POST SPACING OF 10 FT.
6. STANDARD "T" OR "U" SECTION STEEL POSTS SHALL NOT BE USED WITHIN THE CONSTRUCTION CLEAR ZONE RECOVERY AREA.
7. STRAW BALES ARE NOT INTENDED FOR USE ON NEW MEXICO DEPARTMENT OF TRANSPORTATION PROJECTS.



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NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

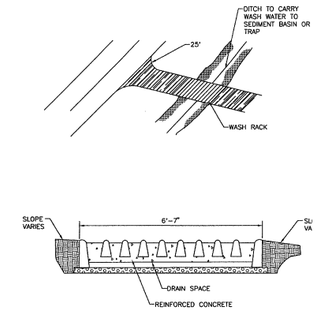
TEMPORARY EROSION & SEDIMENT CONTROL MEASURES
SILT FENCE

APPROVED Raymond A. Van Horn 11/24/97
DESIGN ENGINEER DATE

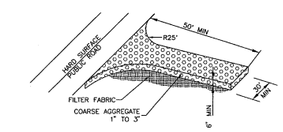
DESIGNED BY___ DRAWN BY___ CHECKED BY___

603-01-3/7

2 T.E.S.C.M. SILT FENCE (NMDOT)
SCALE: NTS



WASH RACK



OFFSITE TRACKING PREVENTION

NO.	DATE	REV. BY	DESCRIPTION
			REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

T.E.S.C.M.
OFFSITE TRACKING
PREVENTION ~~& DIVERSION DIKE~~

APPROVED Raymond A. Van Horn 11/24/97
DESIGN ENGINEER DATE

DESIGNED BY___ DRAWN BY ___ CHECKED BY ___

603-01-7/7 SHEET 7 OF 7

3 T.E.S.C.M. OFFSITE TRACKING PREVENTION (NMDOT)
SCALE: NTS

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Sarasota, Florida 34232
Ph. (941) 378-0272
Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J
5300 West Cypress Street, Suite 200, Tampa, Fl 33607
FBPR Certificate of Authorization No.: 24

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	S.W.P.P.P. DETAILS
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1 ISSUED FOR NMED PERMITTING 08/28/2009
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JOB NO. 100005632
DATE 08/27/2009
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OWNER'S REQUIREMENTS

SITE DESCRIPTION

PROJECT NAME AND LOCATION:
LOS ALAMOS SEDIMENT GRADE CONTROL STRUCTURES
LOS ALAMOS, NEW MEXICO

SEE USACOE 404 PERMIT FOR ADDITIONAL INFORMATION

OWNER NAME AND ADDRESS:
LOS ALAMOS NATIONAL LABORATORY
P.O. BOX 1663
LOS ALAMOS, NEW MEXICO 87545

DESCRIPTION:

THIS PROJECT WILL CONSIST OF:
THE CONSTRUCTION OF TWO GABION STORMWATER CONTROL STRUCTURES

SOIL DISTURBING ACTIVITIES WILL INCLUDE:
CLEARING AND GRUBBING; INSTALLING A STABILIZED CONSTRUCTION ENTRANCE; PERIMETER AND OTHER EROSION AND SEDIMENT CONTROLS; GRADING; EXCAVATION FOR GABION INSTALLATION, AND BANK STABILIZATION IMPROVEMENTS.

RUNOFF COEFFICIENT:
SEE USACOE 404 PERMIT FOR ADDITIONAL INFORMATION

SOILS:
SEE USACOE 404 PERMIT FOR ADDITIONAL INFORMATION

SITE MAPS:
* SEE CONSTRUCTION PLANS

GRADES, AREAS OF SOILS, DISTURBANCE, LOCATION OF SURFACE WATERS, WETLANDS, PROTECTED AREAS, MAJOR STRUCTURAL AND NONSTRUCTURAL CONTROLS AND STORM WATER DISCHARGE POINTS:

* SEE CONSTRUCTION PLANS AND USACOE 404 PERMIT FOR ADDITIONAL INFORMATION

SITE AREA:

1. TOTAL AREA OF SITE = SEE CONSTRUCTION PLANS
2. TOTAL AREA TO BE DISTURBED = SEE CONSTRUCTION PLANS

SEE USACOE 404 PERMIT FOR ADDITIONAL INFORMATION

(1) A DRAINAGE REPORT MAY BE OBTAINED FROM PBS&J (SEE TITLE BLOCK FOR ADDRESS)

CONTROLS

THIS PLAN UTILIZES BEST MANAGEMENT PRACTICES TO CONTROL EROSION AND TURBIDITY CAUSED BY STORM WATER RUN OFF. THE CONSTRUCTION PLANS HAVE BEEN PREPARED TO INSTRUCT THE CONTRACTOR ON PLACEMENT OF THESE CONTROLS. IT IS THE CONTRACTORS RESPONSIBILITY TO INSTALL AND MAINTAIN THE CONTROLS AS PER PLAN AS WELL AS ENSURING THE PLAN IS PROVIDING THE PROPER PROTECTION AS REQUIRED BY FEDERAL STATE AND LOCAL LAWS. REFER TO "CONTRACTOR'S REQUIREMENTS" FOR A VERBAL DESCRIPTION OF THE CONTROLS THAT MAY BE IMPLEMENTED.

STORM WATER MANAGEMENT

DISTURBED AREAS SHALL BE STABILIZED IMMEDIATELY AFTER GRADING IS COMPLETE. WHERE PRACTICAL, ACCUMULATED SEDIMENT WILL BE REMOVED FROM CONSTRUCTION AREAS AND GRADED AS APPROPRIATE. WHEN UPSLOPE AREAS ARE STABILIZED, THE ACCUMULATED SEDIMENT WILL BE REMOVED AND THE AREAS ON THE SIDE OF THE SLOPE WILL BE PLANTED WITH VEGETATION.

TIMING OF CONTROL MEASURES

REFER TO "CONTRACTOR'S REQUIREMENTS" FOR THE TIMING OF CONTROL/MEASURES.

CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS

IN AN EFFORT TO ENSURE COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS REGARDING EROSION AND TURBIDITY CONTROLS, THE FOLLOWING PERMITS HAVE BEEN OBTAINED.

DOT DRAINAGE CONNECTION PERMIT	N/A
C.O.E. DREDGE/FILL PERMIT	N/A
USACOE 404 PERMIT	YES

GENERAL

THE CONTRACTOR SHALL AT A MINIMUM IMPLEMENT THE CONTRACTOR'S REQUIREMENT OUTLINED IN THIS NARRATIVE AND THOSE MEASURES SHOWN ON THE EROSION AND TURBIDITY CONTROL PLAN. IN ADDITION, THE CONTRACTOR SHALL UNDERTAKE ADDITIONAL MEASURES REQUIRED TO BE IN COMPLIANCE WITH APPLICABLE PERMIT CONDITIONS AND STATE WATER QUALITY STANDARDS.

CONTRACTOR'S REQUIREMENTS

SEQUENCE OF MAJOR ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

1. INSTALL STABILIZED CONSTRUCTION ENTRANCE.
2. INSTALL SILT FENCES AND HAY BALES AS REQUIRED .
3. CLEAR AND GRUB FOR DIVERSION SWALES.
4. CONSTRUCTION TEMPORARY STORMWATER REDIRECTION SWALES.
5. CONTINUE CLEARING AND GRUBBING.
6. STOCK PILE TOP SOIL IF REQUIRED.
7. PERFORM PRELIMINARY GRADING ON SITE AS REQUIRED.
8. STABILIZE DENOTED AREAS AND STOCKPILES AS SOON AS PRACTICABLE.
9. DITCH BANK IMPROVEMENTS
10. INSTALL GABION CONTROL STRUCTURES
11. BACKFILL AND COMPACT.
12. COMPLETE GRADING AND INSTALL PERMANENT SEEDING/SOD AND PLANTING.
13. REMOVE ACCUMULATED SEDIMENT.
14. WHEN ALL CONSTRUCTION ACTIVITY IS COMPLETE AND THE SITE IS STABILIZED, REMOVE ANY TEMPORARY DIVERSION SWALES/DIKES AND RESEED/SOD AS REQUIRED

TIMING OF CONTROLS/MEASURES

AS INDICATED IN THE SEQUENCE OF MAJOR ACTIVITIES, THE SILT FENCES, HAY BALES, AND STABILIZED CONSTRUCTION ENTRANCE WILL BE CONSTRUCTED PRIOR TO CLEARING OR GRADING OF ANY OTHER PORTIONS OF THE SITE. STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICAL IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. ONCE CONSTRUCTION ACTIVITY CEASES PERMANENTLY IN AN AREA, THAT AREA WILL BE STABILIZED PERMANENTLY IN ACCORDANCE WITH THE PLANS. AFTER THE ENTIRE SITE IS STABILIZED, THE ACCUMULATED SEDIMENT WILL BE REMOVED FROM THE SEDIMENT TRAPS AND THE EARTH DIKE/SWALES WILL BE REGRADED/REMOVED AND STABILIZED IN ACCORDANCE WITH THE SEDIMENT AND EROSION CONTROL PLAN.

CONTROLS

IT IS THE CONTRACTOR'S RESPONSIBILITY TO IMPLEMENT THE EROSION AND TURBIDITY CONTROLS AS SHOWN IN THE SEDIMENT AND EROSION CONTROL PLAN. IT IS ALSO THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THESE CONTROLS ARE PROPERLY INSTALLED, MAINTAINED AND FUNCTIONING PROPERLY TO PREVENT TURBID OR POLLUTED WATER FROM LEAVING THE PROJECT SITE. THE CONTRACTOR WILL ADJUST THE EROSION AND TURBIDITY CONTROLS SHOWN ON THE SEDIMENT AND EROSION CONTROL PLAN AND ADD ADDITIONAL CONTROL MEASURES, AS REQUIRED TO ENSURE THE SITE MEETS ALL FEDERAL, STATE AND LOCAL EROSION AND TURBIDITY CONTROL REQUIREMENTS IMPOSED ON THE PROJECT SITE BY THE REGULATORY AGENCIES.

EROSION AND SEDIMENT CONTROLS
STABILIZATION PRACTICES

1. STRAW BALE BARRIER: STRAW BALE BARRIERS CAN BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WITH THE FOLLOWING LIMITATIONS:
   A. WHERE THE MAXIMUM SLOPE BEHIND THE BARRIER IS 33 PERCENT.
   B. IN MINOR SWALES OR DITCH LINES WHERE THE MAXIMUM CONTRIBUTING DRAINAGE AREA IS NO GREATER THAN 2 ACRES.
   C. WHERE EFFECTIVENESS IS REQUIRED FOR LESS THAN 3 MONTHS
   D. EVERY EFFORT SHOULD BE MADE TO LIMIT THE USE OF STRAW BALE BARRIERS CONSTRUCTED IN LIVE STREAMS OR IN SWALES WHERE THERE IS THE POSSIBILITY OF A WASHOUT. IF NECESSARY, MEASURES SHALL BE TAKEN TO PROPERLY ANCHOR BALES TO INSURE AGAINST WASHOUT.
2. FILTER FABRIC BARRIER: FILTER FABRIC BARRIERS CAN BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WITH THE FOLLOWING LIMITATIONS:
   A. WHERE THE MAXIMUM SLOPE BEHIND THE BARRIER IS 33 PERCENT.
   B. IN MINOR SWALES OR DITCH LINES WHERE THE MAXIMUM CONTRIBUTING DRAINAGE AREA IS NO GREATER THAN 2 ACRES.
3. BRUSH BARRIER WITH FILTER FABRIC: BRUSH BARRIER MAY BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WHERE ENOUGH RESIDUE MATERIAL IS AVAILABLE ON SITE.
4. LEVEL SPREADER: A LEVEL SPREADER MAY BE USED WHERE SEDIMENT -FREE STORM RUNOFF IS INTERCEPTED AND DIVERTED AWAY FROM THE GRADED AREAS ONTO UNDISTURBED STABILIZED AREAS. THIS PRACTICE APPLIES ONLY IN THOSE SITUATIONS WHERE THE SPREADER CAN BE CONSTRUCTED ON UNDISTURBED SOIL AND THE AREA BELOW THE LEVEL RECONCENTRATE AFTER RELEASE.
5. STOCKPILING MATERIAL: NO EXCAVATED MATERIAL SHALL BE STOCKPILED IN SUCH A MANNER AS TO DIRECT RUNOFF DIRECTLY OFF THE PROJECT SITE INTO ANY ADJACENT WATER BODY OR STORM WATER COLLECTION FACILITY.
6. EXPOSED AREA LIMITATION: THE SURFACE AREA OF OPEN, RAW ERODIBLE SOIL EXPOSED BY CLEARING AND GRUBBING OPERATIONS OR EXCAVATION AND FILLING OPERATIONS SHALL NOT EXCEED 10 ACRES. THIS REQUIREMENT MAY BE WAIVED FOR LARGE PROJECTS WITH AN EROSION CONTROL PLAN WHICH DEMONSTRATES THAT OPENING OF ADDITIONAL AREAS WILL NOT SIGNIFICANTLY AFFECT OFF-SITE DEPOSIT OF SEDIMENTS.
7. TEMPORARY SEEDING: AREAS OPENED BY CONSTRUCTION OPERATIONS AND THAT ARE NOT ANTICIPATED TO BE RE-EXCAVATED OR DRESSED AND RECEIVE FINAL GRASSING TREATMENT WITHIN 30 DAYS SHALL BE SEEDED WITH A QUICK GROWING GRASS SPECIES WHICH WILL PROVIDE AN EARLY COVER DURING THE SEASON IN WHICH IT IS PLANTED AND WILL NOT LATER COMPETE WITH THE PERMANENT GRASSING.
9. TEMPORARY GRASSING: THE SEEDED OR SEEDED AND MULCHED AREA (S) SHALL BE ROLLED AND WATERED OR HYDROMULCHED OR OTHER SUITABLE METHODS IF REQUIRED TO ASSURE OPTIMUM GROWING CONDITIONS FOR THE ESTABLISHMENT OF A GOOD GRASS COVER.
10. TEMPORARY REGRASSING: IF, AFTER 14 DAYS FROM SEEDING, THE TEMPORARY GRASSED AREAS HAVE NOT ATTAINED A MINIMUM OF 75 PERCENT GOOD GRASS COVER, THE AREA WILL BE REWORKED AND ADDITIONAL SEED APPLIED SUFFICIENT TO ESTABLISH THE DESIRED VEGETATIVE COVER.
11. MAINTENANCE: ALL FEATURES OF THE PROJECT DESIGNED AND CONSTRUCTED TO PREVENT EROSION AND SEDIMENT SHALL BE MAINTAINED DURING THE LIFE OF THE CONSTRUCTION SO AS TO FUNCTION AS THEY WERE ORIGINALLY DESIGNED AND CONSTRUCTED.
12. PERMANENT EROSION CONTROL: THE EROSION CONTROL FACILITIES OF THE PROJECT SHOULD BE DESIGNED TO MINIMIZE THE IMPACT ON THE OFFSITE FACILITIES.
13. PERMANENT SEEDING: ALL AREAS WHICH HAVE BEEN DISTURBED BY CONSTRUCTION WILL, AT MINIMUM, BE SEEDED. THE SEEDING MIX MUST PROVIDE BOTH LONG-TERM VEGETATION AND RAPID GROWTH SEASONAL VEGETATION. SLOPES STEEPER THAN 4:1 SHALL BE SEEDED AND MULCHED OR SODDED.

STRUCTURAL PRACTICES

1. TEMPORARY DIVERSION DIKE: TEMPORARY DIVERSION DIKES MAY BE USED TO DIVERT RUNOFF THROUGH A SEDIMENT-TRAPPING FACILITY.
2. SEDIMENT BASIN: WILL BE CONSTRUCTED AT THE COMMON DRAINAGE LOCATIONS THAT SERVE AN AREA WITH 10 OR MORE DISTURBED ACRES AT ONE TIME, THE PROPOSED STORM WATER PONDS (OR TEMPORARY PONDS) WILL BE CONSTRUCTED FOR USE AS SEDIMENT BASIN. THESE SEDIMENT BASINS MUST PROVIDE A MINIMUM OF 3,600 CUBIC FEET OF STORAGE PER ACRE DRAINED UNTIL FINAL STABILIZATION OF THE SITE. THE 3,600 CUBIC FEET OF STORAGE AREA PER ACRE DRAINED DOES NOT APPLY TO FLOWS FROM OFFSITE AREAS AND FLOWS FROM ONSITE AREAS THAT ARE EITHER UNDISTURBED OR HAVE UNDERGONE FINAL STABILIZATION WHERE SUCH FLOWS ARE DIVERTED AROUND BOTH THE DISTURBED AREA AND THE SEDIMENT BASIN. ANY TEMPORARY SEDIMENT BASINS CONSTRUCTED MUST BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR STRUCTURAL FILL. ALL SEDIMENT COLLECTED IN PERMANENT OR TEMPORARY SEDIMENT TRAPS MUST BE REMOVED UPON FINAL STABILIZATION.

OTHER CONTROLS

WASTE DISPOSAL

WASTE MATERIALS

ALL WASTE MATERIALS EXCEPT LAND CLEARING DEBRIS SHALL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS. THE DUMPSTER WILL BE EMPTIED AS NEEDED AND THE TRASH WILL BE HAULED TO A STATE APPROVED LANDFILL. ALL PERSONNEL WILL BE INSTRUCTED REGARDING THE CORRECT PROCEDURE FOR WASTE DISPOSAL. NOTICES STATING THESE PRACTICES WILL BE POSTED AT THE CONSTRUCTION SITE BY THE CONSTRUCTION SUPERINTENDENT. THE INDIVIDUAL WHO MANAGES THE DAY-TO-DAY SITE OPERATIONS WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED.

HAZARDOUS WASTE

ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF IN THE MANNER SPECIFIED BY LOCAL OR STATE REGULATION OR BY THE MANUFACTURER. SITE PERSONNEL WILL BE INSTRUCTED IN THESE PRACTICES BY THE SITE SUPERINTENDENT. THE INDIVIDUAL, WHO MANAGES DAY-TO-DAY SITE OPERATIONS WILL BE RESPONSIBLE FOR SEEING THAT THESE PRACTICES ARE FOLLOWED.

SANITARY WASTE

ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NEEDED TO PREVENT POSSIBLE SPILLAGE. THE WASTE WILL BE COLLECTED AND DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL WASTE DISPOSAL REGULATIONS FOR SANITARY SEWER OR SEPTIC SYSTEMS.

OFFSITE VEHICLE TRACKING

A STABILIZED CONSTRUCTION ENTRANCE WILL BE PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS. THE PAVED STREET ADJACENT TO THE SITE ENTRANCE WILL BE SWEPT DAILY TO REMOVE ANY EXCESS MUD, DIRT OR ROCK TRACKED FROM THE SITE. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARPAULIN.

INVENTORY FOR POLLUTION PREVENTION PLAN

THE MATERIALS OR SUBSTANCES LISTED BELOW ARE EXPECTED TO BE PRESENT ON SITE DURING CONSTRUCTION:

CONCRETE	FERTILIZERS
TAR	PETROLEUM BASED PRODUCTS
DETERGENTS	CLEANING SOLVENTS
PAINTS	

SPILL PREVENTION

MATERIAL MANAGEMENT PRACTICES

THE FOLLOWING ARE THE MATERIAL MANAGEMENT PRACTICES THAT WILL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES TO STORM WATER RUNOFF.

GOOD HOUSEKEEPING

THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ONSITE DURING THE CONSTRICTION PROJECT.

* AN EFFORT WILL BE MADE TO STORE ONLY ENOUGH PRODUCT REQUIRED TO DO THE JOB.
* ALL MATERIALS STORED ONSITE WILL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR APPROPRIATE CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE.
* PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH THE ORIGINAL MANUFACTURER'S LABEL.
* SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER.
* WHENEVER POSSIBLE, ALL OF A PRODUCT WILL BE USED UP BEFORE DISPOSING OF THE CONTAINER.
* MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.
* THE SITE SUPERINTENDENT WILL INSPECT DAILY TO ENSURE MATERIALS ONSITE RECEIVE PROPER USE AND DISPOSAL.

HAZARDOUS PRODUCTS

THESE PRACTICES ARE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS.

* PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS UNLESS THEY ARE NOT RESEALABLE.
* ORIGINAL LABELS AND MATERIAL SAFETY DATA WILL BE RETAINED; THEY CONTAIN IMPORTANT PRODUCT INFORMATION.
* IF SURPLUS PRODUCT MUST BE DISPOSED OF, MANUFACTURER'S OR LOCAL AND/OR STATE RECOMMENDED METHOD FOR PROPER DISPOSAL WILL BE FOLLOWED.

PRODUCT SPECIFIC PRACTICES
THE FOLLOWING PRODUCT SPECIFIC PRACTICES WILL BE FOLLOWED ONSITE:

PETROLEUM PRODUCTS

ALL ONSITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT SUBSTANCES USED ONSITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

FERTILIZERS

SEE LANDSCAPE SPECIFICATIONS.

PAINTS

ALL CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE. EXCESS PAINT WILL NOT BE DISCHARGED TO THE STORM SEWER SYSTEM BUT WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURES' INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.

CONCRETE TRUCKS

CONCRETE TRUCKS WILL NOT BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER ON THE SITE.

SPILL CONTROL PRACTICES

IN ADDITION TO THE GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THE PREVIOUS SECTIONS OF THIS PLAN, THE FOLLOWING PRACTICES WILL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:

MANUFACTURERS' RECOMMENDED METHODS FOR SPILL CLEANUP WILL BE CLEARLY POSTED ON SITE AND SITE PERSONNEL WILL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEANUP SUPPLIES.

MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP WILL BE KEPT IN THE MATERIAL STORAGE AREA ONSITE. EQUIPMENT AND MATERIALS WILL INCLUDE BUT NOT BE LIMITED TO BROOMS, DUST PANS, MOPS, RAGS, GLOVES, GOGGLES, LIQUID ABSORBENT (LE. KITTY LITTER OR EQUAL), SAND, SAWDUST, AND PLASTIC AND METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE.

ALL SPILLS WILL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY.

THE SPILL AREA WILL BE KEPT WELL VENTILATED AND PERSONNEL WILL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE.

SPILL OF TOXIC OR HAZARDOUS MATERIAL WILL BE REPORTED TO THE APPROPRIATE STATE OR LOCAL GOVERNMENT AGENCY, REGARDLESS OF THE SIZE OF THE SPILL.

THE SPILL PREVENTION PLAN WILL BE ADJUSTED TO INCLUDE MEASURES TO PREVENT THIS TYPE OF SPILL FROM REOCCURRING AND HOW TO CLEAN UP THE SPILLS IF THERE IS ANOTHER ONE. A DESCRIPTION OF THE SPILL, WHAT CAUSED IT, AND THE CLEANUP MEASURES WILL ALSO BE INCLUDED.

THE SITE SUPERINTENDENT RESPONSIBLE FOR THE DAY-TO-DAY SITE OPERATIONS WILL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR. HE/SHE WILL DESIGNATE AT LEAST ONE OTHER SITE PERSONNEL WHO WILL RECEIVE SPILL PREVENTION AND CLEANUP TRAINING. THESE INDIVIDUALS WILL EACH BECOME RESPONSIBLE FOR A PARTICULAR PHASE OF PREVENTION AND CLEANUP. THE NAMES OF RESPONSIBLE SPILL PERSONNEL WILL BE POSTED IN THE MATERIAL STORAGE AREA AND IF APPLICABLE, IN THE OFFICE TRAILER ONSITE.

SPILL CONTROL PRACTICES

EROSION AND SEDIMENT CONTROL INSPECTION AND MAINTENANCE PRACTICES

THE FOLLOWING ARE INSPECTION AND MAINTENANCE PRACTICES THAT WILL BE USED TO MAINTAIN EROSION AND SEDIMENT CONTROLS.

* NO MORE THAN 10 ACRES OF THE SITE WILL BE DENUDED AT ONE TIME WITHOUT WRITTEN PERMISSION FROM THE ENGINEER.
* ALL CONTROL MEASURES WILL BE INSPECTED BY THE SUPERINTENDENT, THE PERSON RESPONSIBLE FOR THE DAY TO DAY SITE OPERATION OR SOMEONE APPOINTED BY THE SUPERINTENDENT, AT LEAST ONCE A WEEK AND FOLLOWING ANY STORM EVENT OF 0.25 INCHES OR GREATER.
* ALL TURBIDITY CONTROL MEASURES WILL BE MAINTAINED IN GOOD WORKING ORDER; IF REPAIR IS NECESSARY, IT WILL BE INITIATED WITHIN 24 HOURS OF REPORT.
* BUILT UP SEDIMENT WILL BE REMOVED FROM SILT FENCE WHEN IT HAS REACHED ONE-THIRD THE HEIGHT OF THE FENCE.
* SILT FENCE WILL BE INSPECTED FOR DEPTH OF SEDIMENT, TEARS, TO SEE IF THE FABRIC IS SECURELY ATTACHED TO THE FENCE POSTS, AND TO SEE THAT THE FENCE POSTS ARE FIRMLY IN THE GROUND.
* THE SEDIMENT BASINS WILL BE INSPECTED FOR THE DEPTH OF SEDIMENT, AND BUILT UP SEDIMENT WILL BE REMOVED WHEN IT REACHES 10 PERCENT OF THE SEEDING CAPACITY OR AT THE END OF THE JOB.
* DIVERSION DIKES/SWALES WILL BE INSPECTED AND ANY BREACHES PROMPTLY REPAIRED.
* TEMPORARY AND PERMANENT SEEDING AND PLANTING WILL BE INSPECTED FOR BARE SPOTS, WASHOUTS, AND HEALTHY GROWTH.
* A MAINTENANCE INSPECTION REPORT WILL BE MADE AFTER EACH INSPECTION. A COPY OF THE REPORT FORM TO BE COMPLETED BY THE INSPECTOR IS ATTACHED. THE REPORTS WILL BE KEPT ON SITE DURING CONSTRUCTION AND AVAILABLE UPON REQUEST TO THE OWNER, ENGINEER OR ANY FEDERAL, STATE OR LOCAL AGENCY APPROVING SEDIMENT AND EROSION PLANS, OR STORM WATER MANAGEMENT PLANS. THE REPORTS SHALL BE MADE AND RETAINED AS PART OF THE STORM WATER POLLUTION PREVENTION PLAN FOR AT LEAST THREE YEARS FROM THE DATE THAT THE SITE IS FINALLY STABILIZED AND THE NOTICE OF TERMINATION IS SUBMITTED. THE REPORTS SHALL IDENTIFY AND INCIDENTS OF NON-COMPLIANCE.
* THE SITE SUPERINTENDENT WILL SELECT UP TO THREE INDIVIDUALS WHO WILL BE RESPONSIBLE FOR INSPECTIONS, MAINTENANCE AND REPAIR ACTIVITIES, AND FILLING OUT THE INSPECTION AND MAINTENANCE REPORT.
* PERSONNEL SELECTED FOR INSPECTION AND MAINTENANCE RESPONSIBILITIES WILL RECEIVE TRAINING FROM THE SITE SUPERINTENDENT. THEY WILL BE TRAINED IN ALL THE INSPECTION AND MAINTENANCE PRACTICES NECESSARY FOR KEEPING THE EROSION AND SEDIMENT CONTROLS USED ONSITE IN GOOD WORKING ORDER.

NON-STORM WATER DISCHARGES

IT IS EXPECTED THAT THE FOLLOWING NON-STORM WATER DISCHARGES WILL OCCUR FROM THE SITE DURING THE CONSTRUCTION PERIOD:

* WATER FROM WATER LINE FLUSHING.
* PAVEMENT WASH WATERS (WHERE NO SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE OCCURRED).
* UNCONTAMINATED GROUNDWATER (FROM DEWATERING EXCAVATION).

ALL NON-STORM WATER DISCHARGES WILL BE DIRECTED TO THE SEDIMENT BASIN PRIOR TO DISCHARGE.

CONTRACTOR'S CERTIFICATION

I CERTIFY UNDER PENALTY OF LAW THAT I UNDERSTAND THE TERMS AND CONDITIONS OF THE GENERAL NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT THAT AUTHORIZES THE STORM WATER DISCHARGE ASSOCIATED WITH INDUSTRIAL ACTIVITY FROM THE CONSTRUCTION SITE IDENTIFIES AS PART OF THIS CERTIFICATION.

SIGNATURE	BUSINESS NAME AND ADDRESS OF CONTRACTOR & ALL SUBS	RESPONSIBLE FOR/DUTIES

OWNER AND ENGINEER CERTIFICATION

WE THE UNDERSIGNED ACKNOWLEDGE THE APPLICABILITY OF THIS SWPPP AS IT PERTAINS TO LOCAL, STATE AND FEDERAL RULES. ANY REQUIRED REVISIONS AND ADDITIONS NECESSARY FOR CONSTRUCTION MEANS AND METHODS WILL BE SUBMITTED TO THE AGENCIES.

OWNER

ENGINEER

PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, Florida 34232
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LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	STORMWATER POLLUTION PREVENTION PLAN (S.W.P.P.P.) NARRATIVE

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