Restoration Plan for Priority I – Interstate 40 Subreach Sites, NMISC's Angostura/Albuquerque Reach Habitat Restoration Project in Bernalillo County, New Mexico

JUNE 2026

PREPARED FOR

New Mexico Interstate Stream Commission, Middle Rio Grande Conservancy District, and Bureau of Reclamation

PREPARED BY

SWCA Environmental Consultants

RESTORATION PLAN FOR PRIORITY I – INTERSTATE 40 SUBREACH SITES, NMISC'S ANGOSTURA/ALBUQUERQUE REACH HABITAT RESTORATION PROJECT IN BERNALILLO COUNTY, NEW MEXICO

MRGCD License No: Pending

Prepared for

New Mexico Interstate Stream Commission
5550 San Antonio Drive Northeast
Albuquerque, New Mexico 87109-4127

Middle Rio Grande Conservancy District
P.O. Box 581
Albuquerque, New Mexico 87103

Bureau of Reclamation
Upper Colorado Basin Region
Albuquerque Area Office
555 Broadway Boulevard Northeast, Suite 100
Albuquerque, New Mexico 87102

Prepared by

SWCA Environmental Consultants
7770 Jefferson Street, Northeast, Suite 410
Albuquerque, New Mexico 87109
(505) 254-1115
www.swca.com

SWCA Project No. 80467-013

June 2026

CONTENTS

1 Introduction 1
1.1 Background 1
1.2 Priority I Project Overview 1
1.3 Design Methodology 1
1.4 Federal, State, and Local Agency Involvement 2
2 Restoration Activities Plan 5
2.1 Priority I Acreages of Surface Disturbance 5
2.2 Bankline Modification 6
2.3 Island Destabilization 6
2.4 Flow-Through Channels 7
2.5 Backwater Channels 8
2.6 Confluence Maintenance 8
2.7 Jetty Jack Removal 8
2.8 Large Woody Debris Placement 9
2.9 Vegetation 10
2.9.1 Existing Tree Avoidance 10
2.9.2 Vegetation Removal During Construction 10
2.9.3 Vegetation Management Post-Construction 10
2.9.4 Revegetation 11
2.10 Pedestrian Access Trails 12
2.11 Access Road Plan 13
2.12 Spoil Plan 14
2.13 Staging Area Plan 15
3 Project Construction 16
3.1 Preconstruction Activities 16
3.1.1 Worker Awareness and Safety Training 16
3.1.2 Surveys and Staking 16
3.1.3 Preconstruction Resource Surveys and Regulatory Compliance Actions 17
3.2 Construction Activities 19
3.2.1 Site Access and Preparation 19
3.2.2 Cleanup 20
4 Monitoring and Maintenance 21
4.1 Ecological Reference 21
4.2 Performance Standards 22
4.3 Post-construction Performance Monitoring 26
4.3.1 Qualitative Monitoring 26
4.3.2 Quantitative Monitoring 28
4.4 Reporting 29
4.4.1 Qualitative Memoranda 29
4.4.2 Annual Reports 29
4.5 Recommended Maintenance Activities 30
4.5.1 Maintenance Schedule 30
4.5.2 Responsible Parties 30

4.5.3 Channel Maintenance Zones 30
4.5.4 Nonnative Vegetation Management 32
4.6 Adaptive Management Strategy 32
5 Project Design Features and Environmental Commitments 35
5.1 General and Public Safety 35
5.2 Wildlife and Special-Status Species 37
5.3 Soils, Water, and Vegetation Resources 39
5.4 Air Quality 42
5.5 Cultural Resources 43
6 Literature Cited 45

Appendices

Appendix A. Priority I Design Package

Figures

Figure 1.1. Project area. 4
Figure 3.1. Amphibious excavator working in the channel during construction of the Phase IIa restoration sites in the Middle Rio Grande I-40 subreach (SWCA 2010). 20
Figure 3.2. Bulldozer excavating soils from a side channel during construction of the Phase IIa restoration sites in the Middle Rio Grande I-40 subreach (SWCA 2010). 21

Tables

Table 1.1. Summary of Permits or Authorizations Required 3
Table 2.1. Priority I Sites Proposed Action Components 5
Table 2.2. Priority I Proposed Access Road Plan 14
Table 2.3. Priority I Spoil Pile Quantities and Surface Disturbance 15
Table 3.1. Anticipated Construction Vehicle/Equipment Roster 19
Table 4.1. Performance Standards for I-40 Subreach Sites 23
Table 4.2. Recommended Project Monitoring and Maintenance Schedule 27
Table 4.3. Adaptive Management/Remedial Actions 34

ACRONYMS AND ABBREVATIONS

2015 BA	*Joint Biological Assessment for Bureau of Reclamation, Bureau of Indian Affairs, and Non-federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico*
2016 BO	*Final Biological and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico*
ABQ	Albuquerque
ARIR	aquatic resources inventory report
BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMZ	channel maintenance zone
CWA	Clean Water Act
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GSA	GeoSystems Analysis, Inc.
I-40	Interstate 40
IP	Individual Permit
LWD	large woody debris
MBTA	Migratory Bird Treaty Act
MRG	Middle Rio Grande
MRG project	Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project
MRGCD	Middle Rio Grande Conservancy District
NEPA	National Environmental Policy Act
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMISC	New Mexico Interstate Stream Commission
NMMJM	New Mexico meadow jumping mouse
NMRipMap	New Mexico Riparian Habitat Map
NPDES	National Pollutant Discharge Elimination System
OHWM	ordinary high water mark
PCN	Preconstruction Notification
Priority I	Priority I Restoration Sites of the MRG project

Reclamation	Bureau of Reclamation
RGSM	Rio Grande silvery minnow
RTK	real-time kinematic
SHPO	State Historic Preservation Office
SWCA	SWCA Environmental Consultants
SWFL	southwestern willow flycatcher
SWQB	Surface Water Quality Bureau
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOTUS	waters of the United States
YBCU	yellow-billed cuckoo

1 INTRODUCTION

The New Mexico Interstate Stream Commission (NMISC) is planning habitat restoration in the Angostura/Albuquerque (ABQ) Reach to improve ecosystem function in riparian and river channel habitats. The project area is co-owned and managed by the Bureau of Reclamation (Reclamation), the Middle Rio Grande Conservancy District (MRGCD), and the City of Albuquerque Open Space Division. The NMISC is preparing information needed for a joint license agreement with the MRGCD and Reclamation to mobilize and construct Priority I restoration activities (Priority I) as part of a larger Middle Rio Grande (MRG) Angostura/Albuquerque Reach Habitat Restoration Project (MRG project).

This restoration plan describes activities to restore up to 21 sites within the Interstate 40 (I-40) subreach (from I-40 at River Mile 186.0 to the Avenida Dolores Huerta bridge at River Mile 181.6) located in Bernalillo County, i.e., the Priority I restoration sites of the MRG project (Priority I project or Proposed Action). This restoration plan is a requirement of the joint license agreement and expands upon the design details provided in the *Final Programmatic Environmental Assessment for the Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project* (Reclamation 2025a) written for National Environmental Policy Act (NEPA) analysis. The restoration plan contains construction specifications, a final design drawing/map package, the results of resource field survey and compliance efforts, and updated site-specific project design features/environmental commitments. The restoration sites will be constructed by order of priority, and a unique restoration plan will be created for each priority level.

1.1 Background

The MRG project is a riparian and floodplain habitat restoration project intended to benefit the Rio Grande silvery minnow (RGSM) (*Hybognathus amarus*) and other federally listed species that occur along the MRG, including the section of the Rio Grande between the Angostura and Isleta diversion dams (ABQ Reach). The MRG project aims to improve RGSM habitat and river function by enhancing flow efficiency and ecological conditions for RGSM and other endangered species, including the southwestern willow flycatcher (SWFL) (*Empidonax traillii extimus*) and yellow-billed cuckoo (YBCU) (*Coccyzus americanus*). It also seeks to partially offset hotter, drier climatic conditions by creating floodplain habitat that can be inundated at lower spring runoff flows. These efforts contribute to the commitments made under the U.S. Fish and Wildlife Service's (USFWS's) 2016 *Final Biological and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico* (2016 BO) (USFWS 2016) and through the Middle Rio Grande Endangered Species Collaborative Program wherein both governmental and non-governmental entities work cooperatively to address Endangered Species Act (ESA)–related issues in the MRG.

In addition to benefiting federally listed species, the MRG project is expected to support rapid reestablishment of wetlands within project sites, improve wetland quality, and increase areas connected to groundwater. Post-construction elevations will be suitable for wetland development, allowing conditions to improve relative to preconstruction conditions. Construction will also reset the vegetation community, making infestations of invasive and noxious weeds easier to manage than under existing conditions.

The MRG project consists of 80 separate habitat restoration project areas that cover a maximum of 370 acres and span 19.6 miles on the east and west banks of and on islands within the channel of the MRG in the ABQ Reach, in Bernalillo and Sandoval Counties, New Mexico. The MRG project also includes proposed spoil and access road plans. The restoration sites are in the area that extends from the North Diversion Channel downstream to the south side of where Interstate 25 crosses the MRG, north of the Isleta Pueblo. The MRG project is on lands jointly managed by Reclamation and the MRGCD on the

MRG and does not overlap with Pueblo or private lands. The City of Albuquerque Open Space Division, the Village of Corrales, and the New Mexico State Land Office are also stakeholders with management responsibility of selected habitat restoration sites under review.

The MRG project would provide maintenance, adaptive management, and newly constructed restoration within and in addition to the existing project areas of the NMISC MRG Riverine Restoration Project, which included two main phases (Phase I and Phase II/IIa) initiated in 2005 with construction completed in 2009. Of the 80 proposed habitat restoration project areas, 34 envelop or partially overlap existing habitat restoration sites that have undergone NEPA analysis, including preparation of two environmental assessments (EAs), and associated review processes. NEPA analysis for the proposed project is in process.

The Section 404 Individual Permit (IP) program administered by the U.S. Army Corps of Engineers (USACE) filed previous NMISC activities as standard permits (SPA-2005-00470 and SPA-2006-00169). This project is requesting authorization for activities through a Section 404 Department of the Army Permit Application.

The purpose and goals of the MRG project are to

- create and improve habitat for federally listed species within the ABQ Reach by implementing various habitat restoration activities;
- conduct adaptive management and maintenance restoration activities near or within existing habitat restoration sites given the changed river and riparian conditions since original construction was completed between 2006 and 2009; and
- improve water conveyance and habitat conditions within the river channel by reducing channel narrowing and armoring of islands, bank-attached bars, and bank lines that potentially have increased net depletions, reduced safe channel capacity, and reduced aquatic species habitat.

The objectives (GeoSystems Analysis, Inc. [GSA] 2025) to achieve the goals are to

- increase the areal extent of inundated floodplain habitat under moderate discharge levels (1,500– 3,000 cubic feet per second [cfs]) to restore critical shallow-water spawning and rearing habitat for RGSM, and theoretically benefitting breeding SWFL by supporting hydric soil conditions necessary to maintain suitable riparian vegetation communities;
- enhance drainage of potentially entrapped water following higher discharge events (3,000– 5,000 cfs) to reduce prolonged stagnant conditions, minimize conveyance losses, and prevent the entrapment of larval fish;
- theoretically, improve the conveyance capacity of the Rio Grande mainstem channel at moderate discharge levels by lowering the surface elevation of islands and midchannel bars to reduce overbank seepage losses and facilitate downstream water delivery for Compact[1] compliance;
- reduce the overall evapotranspiration within a 600-foot-wide channel approximately centered along the current channel centerline by removing primarily exotic vegetation that has established within these geomorphic features over the past 10 to 20 years; and
- when applicable, improve the hydraulic function of previously constructed habitat restoration sites, primarily via removal of sediment that has accumulated in channel mouths and/or contributed to bankline aggradation, thereby maintaining floodplain connectivity and improving

[1] The Rio Grande Compact of 1939, a depletion measurement compact, limits the amount of surface water that can be depleted annually in the MRG based on the natural flow of the river.

overall site performance.

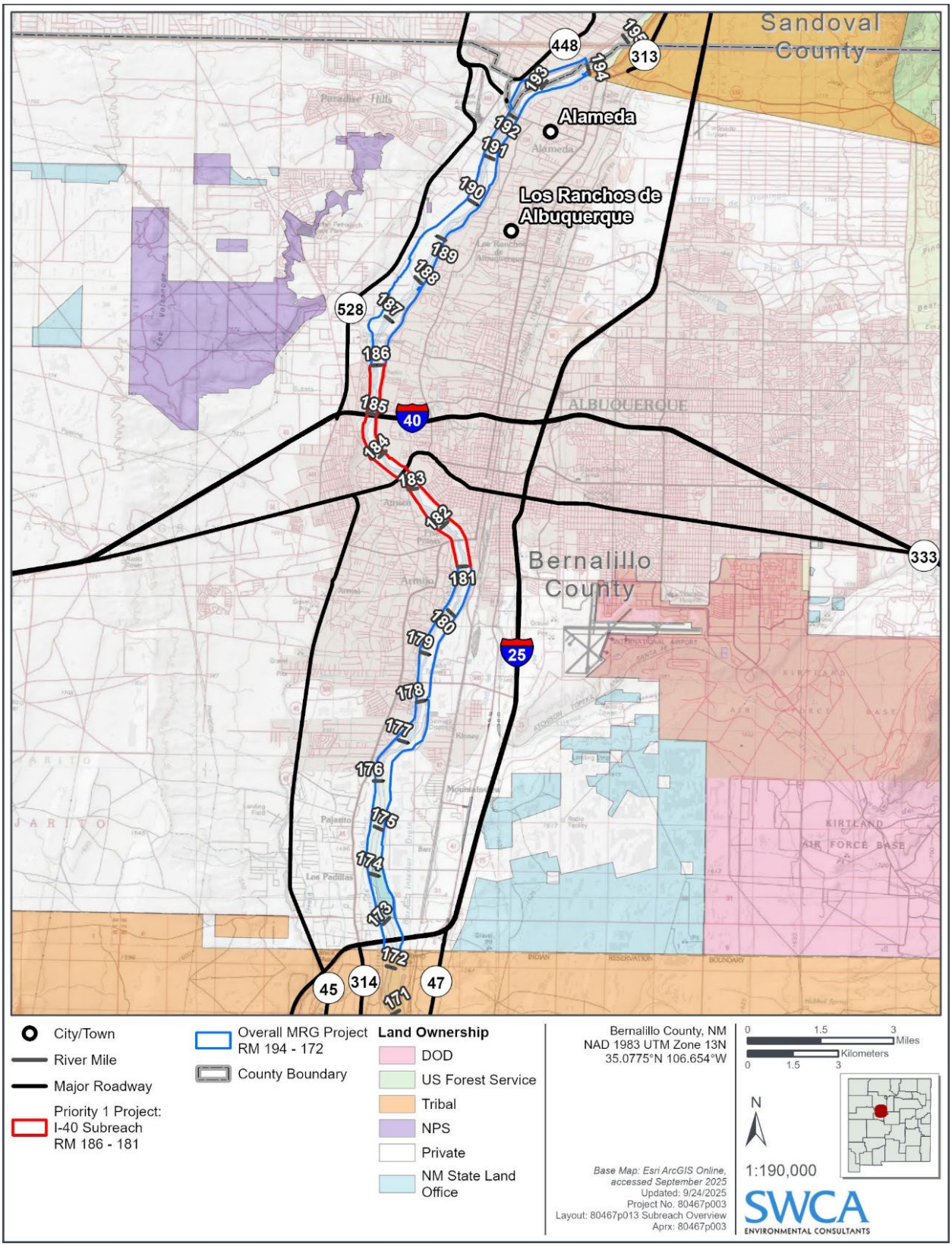


Figure 1.1. Project area.

1.2 Priority I Project Overview

The NMISC proposes to construct 21 Priority I restoration sites with associated access roads and spoil piles, located within the I-40 subreach from River Mile 181.6 to 186.0 (see Figure 1.1 below and Design Package in Appendix A).

For details on how the restoration sites were selected, see the MRG project's Programmatic EA (Reclamation 2025a). Information on Priority I restoration sites and surface disturbance is based on final project design. The Priority I project will result in a maximum of 58.5 acres of restoration site surface disturbance, 33 spoil piles of up to 25.6 acres of surface disturbance, 1.0 mile of new or modified roads and trails resulting in 9.7 acres of surface disturbance, and 0.2 acre of staging area, for a maximum total of 94.6 acres of surface disturbance. Restoration techniques involving earthwork and grading activities include construction of backwater channels and bankline modifications, island destabilization, confluence maintenance, and removal of jetty jack lines. Restoration techniques not involving earthwork or grading activities include placement of large woody debris (LWD), removal of nonnative vegetation, and closures of unauthorized pedestrian social trails. For more information, see Section 2 below.

Construction activities for the Priority I project are expected to occur between September 2026 and April 2027, and take approximately 30–60 days to complete. Construction activities are expected to commence once all environmental (federal, state, and local) permit and compliance actions are complete. Construction activities are slated to occur outside the normal breeding and nesting season for birds protected by the Migratory Bird Treaty Act (MBTA) including SWFL and YBCU (April 15–September 1 for work in suitable SWFL or YBCU habitat) (see design feature Bird-1 in Section 5). Any activities during nesting season would require pre-construction surveys. Subsequent maintenance activities (maintenance of already constructed sites) could occur if monitoring results reveal deteriorating conditions (see Section 4). These activities would only occur during late fall or early winter. The total duration for project follow-up adaptive management and maintenance activities is anticipated for up to 25 years (life of the project). Future maintenance activities authorizations are dependent on funding and agency approvals at the implementation level, and subsequent reviews of future maintenance proposals. These activities could occur for up to 25 years, or more, pending compliance requirements for maintenance activities.

The project would consist of the following:

- Construction of backwaters and bankline modifications at 10 Priority I restoration sites
- Confluence maintenance and vegetation removal at seven Priority I restoration sites
- Removal of jetty jack lines at two Priority I restoration sites
- Use of existing access roads and trails with most requiring widening and additional vegetation removal for vehicle access, as well as creation of new access roads and a trail
- The creation of up to 33 spoil pile sites with beneficial uses of spoil
- Staging area

1.3 Design Methodology

The proposed earthwork and grading restoration activities and geographic locations, including bankline modification, island destabilization, flow-through channels, backwater channels, confluence maintenance, and jetty jack removal areas, were determined by combining the NMISC's habitat restoration goals with the following methodologies:

- Hydrologic models of surface water and groundwater were used to understand how the river restoration activities could impact the riparian zone. Hydrologic models included the following:
    - MIKE SHE, an integrated groundwater/surface water model originally developed by Système Hydrologique Européen, with additional development and maintenance by Dansk Hydraulisk Institute. MIKE SHE–predicted water surface elevations at a range of discharges were used to assign post-excavation elevation targets within each proposed habitat restoration feature.
    - The 2-D Hydrologic Engineering Center River Analysis System (HEC-RAS) model informed the inundation patterns, including frequency and duration, within the MRG. Tailwater conditions from the Rio Grande were incorporated, and several scenarios regarding storm and flood events were considered. The model also supported understanding the velocity within the proposed habitat restoration project areas, including erosive thresholds based on velocity.
- High-resolution (e.g., 1-foot) LiDAR topographic data acquired during 2022 (Reclamation 2022) were used to 1) detect existing depressions that could be targeted for excavation to minimize the area and volume of soil disturbance and 2) directly measure sediment accumulation by comparing different LiDAR sources acquired over the past 10 years.
- Real-time kinematic (RTK) survey data were acquired by GSA in spring 2024 at sites where relatively high sedimentation occurred after the 2022 LiDAR data were acquired.
    - Predicted excavation quantities were derived from a topographic model that combines the 2022 LiDAR data with 2024 RTK surveys.
- Nonnative vegetation cover using recent noxious weeds mapping (GSA 2024a) and the New Mexico Riparian Habitat Map (NMRipMap) (Muldavin et al. 2023) were acquired.
- Ravennagrass (*Saccharum ravennae*) mapping was used to prioritize deeper excavations where ravennagrass occurs to ensure adequate depth of grading to remove the root zone and provide successful initial treatment.
    - Locations of other nonnative vegetation were prioritized for earthwork/grading restoration activities to promote ecological enhancement and the return of native vegetation.

The additional proposed restoration activities, including LWD placement, nonnative vegetation treatment, and pedestrian access trail plans, are being proposed as part of the habitat restoration goals associated with the project.

1.4 Federal, State, and Local Agency Involvement

Due to the proposed restoration sites on lands managed by the Reclamation and the MRGCD, the agencies have the responsibility of deciding whether to grant a license agreement. Reclamation and the MRGCD's decision is subject to the NEPA environmental review process and other federal regulations. Coordination with the USACE, Bernalillo County, and other federal, state, and local entities will be conducted as part of this process. Additional coordination and collaboration between the NMISC and Reclamation, the MRGCD, USACE, City of Albuquerque Open Space Division, and the Bosque Ecosystem Monitoring Program regarding details of restoration activities are underway to ensure integration between existing and proposed restoration projects.

Table 1.1 lists the potential federal, state, and local permits, authorizations, and approvals that may apply to the proposed project. Applicable permits will be reviewed and updated as the studies and field assessments identify the full range of applicability of permits.

Table 1.1. Summary of Permits or Authorizations Required

Authorization	Agency Authority	Statutory Reference	Permit Trigger	Status
Federal				
NEPA	U.S. Department of Interior, Bureau of Reclamation	42 United States Code (USC) § 4321 et seq.	Proposed activity is on lands managed by a federal agency.	Programmatic NEPA analysis completed August 2025. Site-specific NEPA analysis pending.
ESA	USFWS	ESA (Public Law 93-205, as amended by Public Law 100-478; 16 USC 1531 et seq.; 50 Code of Federal Regulations [CFR] 17)	Potential for presence and/or take of a federally protected species.	Letter of Inclusion under the 2016 BO issued by the USFWS in August 2025.
MBTA	USFWS	16 USC 703−712; 50 CFR 21	Construction during the MBTA breeding season should be preceded by a preconstruction nest survey within 2 weeks of construction. Permit would be needed only if construction occurs during the MBTA nesting season (March 1–August 31) or in suitable SWFL or YBCU habitat (April 15–September 1); construction is planned to fall outside these seasons.	Construction planned outside of the breeding seasons.
Bald and Golden Eagle Protection Act (BGEPA)	USFWS	16 USC 668−668(d); 50 CFR 22	Potential for project activity to harm, harass, or otherwise disturb bald or golden eagles or their nests if they are detected in the project area.	No permit required unless eagles are observed nesting in the project area. No eagle nests were observed during biological surveys conducted within the project area in September and October 2023. If construction is scheduled to occur during the eagle breeding season (December through July), a preconstruction nesting survey should be conducted within 2 weeks prior to the start of work to verify whether eagle nests have been established in the project area since the previous surveys.
National Historic Preservation Act compliance, determination of effect concurrence	New Mexico State Historic Preservation Office (SHPO)	National Historic Preservation Act, American Indian Religious Freedom Act, and Native American Graves Protection and Repatriation Act	Federal nexus or discovery of human remains.	SHPO concurrence with Reclamation's determinations of eligibility and effect was received on May 19, 2025.
Clean Water Act (CWA) 404 Dredge and Fill Permit	USACE	33 USC 1344	Placement of dredge or fill in a water, wash, or wetlands connected to waters of the United States (WOTUS).	Permitting process is underway.

Authorization	Agency Authority	Statutory Reference	Permit Trigger	Status
CWA Section 402 permit; National Pollutant Discharge Elimination System (NPDES) 2022 Construction General Permit NMR100000	U.S. Environmental Protection Agency (EPA)	33 USC 1251 et seq., 40 CFR 122.26(a)(1)(v) or 40 CFR 122.26(b)(15)(ii)	Section 402 of the CWA requires operators to obtain NPDES permit coverage for stormwater discharges. In New Mexico, the NPDES permit program is administered by the EPA. The EPA has developed general permits for construction and industrial discharges. Depending on the discharge and activity type, and eligibility conditions, operators may apply for coverage under a Construction General Permit, a Multi-Sector General Permit, or an individual NPDES permit for stormwater discharges (among others). Eligible construction activities that will discharge surface stormwater runoff into a municipal separate stormwater sewer system or into WOTUS have been designated by the EPA as needing permit coverage, will disturb 1 acre or more, or disturb less than 1 acre but are a part of a common plan of development that will disturb a total of more than 1 acre may be eligible for coverage under the EPA's Construction General Permit.	Pending.
USACE Section 408; Request to Alter USACE Civil Works Projects	USACE	33 USC 408	Section 408 requires USACE approval for any proposed alteration, use, or occupation of a Civil Works project owned or operated by the USACE that could impact its usefulness or public interest.	Permission process is underway.
State				
Incidental take permit	New Mexico Energy, Minerals and Natural Resources Department Forestry Division	19.21.2 New Mexico Administrative Code (NMAC)	Project activities that result in the displacement or removal of any state endangered plant species.	No permit required.
CWA Section 401 permit	New Mexico Environment Department (NMED) Surface Water Quality Bureau	New Mexico Water Quality Act, New Mexico Ground and Surface Water Protection Regulations (20.6.2.2001–2003 NMAC)	Proposed federal permitting actions that may result in a discharge into WOTUS, including CWA permitting under Sections 402 and 404.	Pending.
CWA Section 402 permit (NPDES)	NMED Surface Water Quality Bureau, Point Source Regulation Section	New Mexico Water Quality Act	Reviews and administers federally issued NPDES permits for surface stormwater runoff discharge.	Pending.
NMAC	New Mexico SHPO	New Mexico Statutes 18-6-1 through 18-6-17, as amended through 2005	Federal nexus or discovery of human remains.	SHPO concurrence received May 19, 2025.

Authorization	Agency Authority	Statutory Reference	Permit Trigger	Status
New Mexico Wildlife Conservation Act	New Mexico Department of Wildlife	17-2-41 New Mexico Statutes Annotated 1978	Desktop review indicates that there are four state-listed threatened or endangered species with the potential to occur within the project area (SWCA Environmental Consultants 2024).	The New Mexico Department of Wildlife issued comments on the Programmatic EA, which were incorporated into the final design for Priority I. No additional permit or authorization is required.
Local (Bernalillo County)				
Temporary Construction Noise Permit	Bernalillo County	Ordinance 30-122	Required for noise generated by construction within, or within a 500-foot radius of, a residential zone.	Pending.
Fugitive Dust Control Construction Permit	Bernalillo County Air Control Board	20.11.20 NMAC	Required for active operations or inactive disturbed surface areas of 0.75 acre or more to prevent the release of fugitive dust.	Pending.

2 RESTORATION ACTIVITIES PLAN

2.1 Priority I Acreages of Surface Disturbance

Table 2.1 below details the acreage of surface disturbance for each type of restoration activity for the Priority I project. Nonnative vegetation removal is anticipated to occur within all restoration sites. One site, 183p9_W_1, will be a nonnative vegetation removal site only. For details on surface disturbance from access roads and spoil piles, see Sections 2.11 and 2.12, respectively.

Table 2.1. Priority I Sites Proposed Action Components

Restoration Project Area Identification (ID)	River Mile	Restoration Activities	Surface Disturbance (acres)	Sediment Excavation (cubic yards)
185p5_E_1	185.5	Backwater	0.5	1,776.3
185p4_E_1	185.4	Backwater, bankline modification	5.3	5,840.80
185p4_E_2	185.4	Jetty jack removal	0.4	–
185p1_E_1	185.1	Backwater	0.1	630.0
184p7_E_1	184.7	Backwater, bankline modification	13.9	20,349.0
184p5_E_1	184.5	Backwater	3.1	11,633.2
184p5_I_1	184.5	Island destabilization	1.5	2,570.9
184p3_E_1	184.3	Bankline modification	2.9	8,101.4
183p9_W_1	183.9	Nonnative vegetation removal	6.2	–
183p7_W_1	183.7	Confluence maintenance (mouth cleanout)	0.1	174.2
183p7_E_1	183.7	Flow-through channel, bankline modification	2.6	8,003.5
183p7_E_2	183.7	Bankline modification	0.7	2,172.6

Restoration Project Area Identification (ID)	River Mile	Restoration Activities	Surface Disturbance (acres)	Sediment Excavation (cubic yards)
183p5_I_1	183.5	Island destabilization	0.4	966.7
183p5_W_1	183.5	Confluence maintenance (mouth cleanout)	0.1	165.8
183p3_W_1	183.3	Confluence maintenance (mouth cleanout)	0.1	188.5
183p0_W_1	183.0	Confluence maintenance (mouth cleanout)	0.1	77.2
182p9_E_1	182.9	Backwater, bankline modification	15.8	25,505.4
182p9_E_2	182.9	Jetty jack removal	0.3	–
182p3_W_1	182.3	Confluence maintenance (mouth cleanout)	0.1	156.0
182p0_E_1	182.0	Backwater, bankline modification	4.2	5,048.9
181p7_W_1	181.7	Confluence Maintenance (mouth cleanout)	0.1	101.4
Total			**58.5**	**93,461.8**

Note: Acres are subject to change and will be finalized as engineering designs near completion.

2.2 Bankline Modification

In the MRG, and especially in the ABQ Reach, the floodplain is often disconnected from the river channel during spring runoff. In areas of channel degradation, riverbanks are frequently vertical, which limits overbank flooding and contributes to declining wetland condition and function. Existing wetlands within the project area show signs of hydrologic disconnection and degradation. Proposed bankline modifications are intended to improve wetland quantity and quality by increasing floodplain connectivity, inundation frequency, and soil moisture relative to preconstruction conditions..

Bankline modifications are proposed at seven sites within the Priority I project area and will involve two primary techniques: floodplain terracing and bank lowering. These actions will remove vegetation and excavate sediment to reduce bank and floodplain elevations, promoting more frequent overbank flooding. Floodplain terraces will be constructed to target elevations designed to increase inundation at flows between approximately 1,000 and 2,500 cfs. These measures will be implemented only where they do not increase flood risk or adversely affect levee systems and may help reduce flood pressure on levees. Lowered and terraced banks will remove bankline berms and create additional low-velocity nursery and spawning habitat that becomes inundated across a range of flows, thereby increasing habitat availability during low to moderate runoff conditions.

Bankline modifications will also reduce infestations of nonnative invasive and noxious plant species by resetting site conditions for native riparian vegetation and enabling active invasive species management following excavation. Excavated wetlands are expected to reestablish rapidly through natural processes as modified elevations improve flood potential and hydrologic connectivity.

2.3 Island Destabilization

Historically, the Rio Grande functioned as a wider, braided river system with numerous islands and bar complexes that dynamically formed and shifted, allowing sediment and water to move downstream (Reclamation 2018; Schmidt et al. 2003). Following the federal listing of the RGSM in the mid-1990s, channel maintenance activities such as island mowing ceased. As a result, islands and bank-attached bars became increasingly vegetated, often with nonnative species (Reclamation 2018). Combined with factors such as reduced peak flows, increased low flows, prolonged drought, dam and diversion operations,

coarsening bed material, and reduced sediment supply, these features have become stable, vegetated islands that narrow and deepen the river channel (Porter and Massong 2004; Richard 2001; Schmidt et al. 2003). Island destabilization, particularly on islands that have the potential to become or have become permanent channel features, may assist in alleviating adverse changes to RGSM main channel habitat and improve the quality and quantity of available main channel habitat (USFWS 2003). Island destabilization can be accomplished by planned physical disturbance, such as removing vegetation and destabilizing soil and sediment, mowing vegetation, root-plowing vegetation and sediment, and raking vegetation and surface sediment (Braun et al. 2015). Once dense vegetation becomes established, root systems stabilize sediments and make islands resistant to erosion by river flows alone (Harvey 2022; Reclamation 2007). The persistence of these islands reduces aquatic habitat and limits the channel's capacity to convey water and sediment during spring runoff, contributing to further island formation and increasing flood risk to adjacent levees.

The conceptual design for vegetated island modification and evaluation considers potential increased sediment retention in modified portions of the river as well as potential flow-through at a range of velocities and depths. Island destabilization activities would involve cutting vegetation and excavating a portion of the island or the entire island to encourage inundation to begin at approximately 1,500 cfs. The target post-construction elevation intends to achieve full inundation of the island at approximately 3,000 cfs. Vegetation removal would be accomplished by root-plowing the island in the treatment area to a depth that would remove all vegetation in that area. The ground surface of the excavated area would be such that inundation during lower river flows would provide RGSM habitat over a wider range of flows, particularly 2,000 to 3,000 cfs.

Island destabilization activities would be applied to two islands within the channel in locations where elevations exceed the river's ordinary high water mark (OHWM). Following construction, these areas will be lowered to elevations within the OHWM, allowing them to inundate at lower flows than their preconstruction elevations. Island destabilization areas post-construction will establish through natural processes.

2.4 Flow-Through Channels

Flow-through channels are low-velocity, ephemeral channels that are connected to the main river channel across bars and islands. These channels are normally dry but carry high-discharge flows from the main channel, characteristically during spring snowmelt and summer monsoon events. These channels typically carry water at lower velocities than the main channel and may include mesohabitats, such as pools and backwaters, suitable for RGSM.

Modification of an ephemeral flow-through channel would require removing vegetation, most likely along the edges of vegetated islands that are not connected to the bank, and disturbing sediment or soil. The channels would be excavated to a depth that would allow water to flow at moderate discharges (1,500–2,000 cfs). Channels may also be excavated along sediment bars that are now connected to the banks. This type of feature provides habitat for RGSM larval development and refuge for young RGSM. Additionally, certain sites are designed such that the downstream portion of an existing channel will be lowered to better support backwater habitat, while other portions of the channel are regraded to better expand inundation potential at lower discharges. Flow-through channel activities are planned at one site within Priority I. Flow-through channels are anticipated to need some routine maintenance post-construction (see Section 4.5.3)

2.5 Backwater Channels

The creation of moderate- to high-flow backwater channels would involve removing riverbank and inland vegetation and excavating soils to prescribed depths. Backwater channels with no upstream inlet would be constructed on the bottom of large point bars (at existing low-velocity areas) and islands at a range of elevations that allow for inundation at a range of river flows beginning as low as approximately 800 cfs. Backwater channels would slope slightly, with the downstream end lower in elevation than the upstream end, thereby increasing the amount of RGSM habitat available at a range of river flows. Backwater channels are anticipated to need some routine maintenance post-construction (see Section 4.5.3). While backwater channels may temporarily create open water features, natural processes are anticipated to reestablish wetlands and natural conditions. This technique would be used to increase the amount of low-flow and no-flow habitat areas available to RGSM. The technique is intended to retain drifting RGSM eggs and to provide RGSM rearing habitat and shallow, low-velocity habitats with abundant food supplies for developing RGSM larvae. Backwater channel activities are planned at seven sites within Priority I.

2.6 Confluence Maintenance

Confluence maintenance, or "mouth cleanout" takes place at the mouth of a tributary of an existing flow-through channel that has become plugged with sediment, debris, and vegetation, reducing flow and sediment delivery to the Rio Grande. Excavating the materials that plug the mouth would reconnect tributaries to the river, increasing eddies where adult RGSM and larvae aggregate and creating egg retention sites (Tetra Tech 2004). While these features are small in area, they would allow flow through naturally formed and previously constructed channels that are restricted of inlet flow in preconstruction conditions.

Confluence maintenance is planned at six sites within Priority I. The existing high-flow channels have been mapped by GSA, and sediment excavation will align with them. Channel crossings will be manually selected to minimize disturbance to features and will be rehabilitated as needed following excavation.

2.7 Jetty Jack Removal

Lateral constraints, such as jetty jacks and the densely vegetated natural levees that form around them, decrease the potential for lateral migration of the channel and natural bank erosion processes, ultimately creating a narrower, more linear, and deeper river channel. Removal of non-essential jetty jacks would increase the connectivity between the river channel and floodplain by allowing for natural river processes to create wider and more diverse channel and floodplain features, yielding increased low-velocity habitat for all life stages of RGSM. Removal of non-essential jetty jacks also provides improved conditions for wildland fire management by allowing firefighters and equipment to navigate more easily through the area. Jetty jacks can also be difficult for recreationalists to navigate. Wiring creates a tripping hazard, sharp edges of the steel angles and wires can be difficult to see by faster-moving recreationists such as cyclists and equestrians who may collide with them, and the rusted metal poses a risk for tetanus infection. Jetty jacks also detract from the natural beauty of the bosque.

Bankline jetty jack removal is proposed at two locations within Priority I, and only in areas where levees would not be put at risk or where river control activities would not be affected (USACE 2009). Non-essential jetty jacks would be removed by an excavator, and the remaining void would be filled with excavated soil to bring the elevation of the void to the level of the surrounding ground. Excavated jetty jacks would be dismantled and stockpiled on-site for 14 calendar days for the MRGCD to claim if desired, and unclaimed materials would be removed from the project area for disposal in coordination

with the MRGCD (USACE 2009). Any jetty jacks not removed from the site will remain fully intact, and broken cable or snapped wires resulting from extraction will be repaired. Tieback jetty jacks in the project area will be removed and will end at the existing tiebacks in order to minimize the need for installation of new anchors. If tieback lines must be removed, new buried anchors will be installed to ensure the remaining jetty jacks cannot migrate (USACE 2009).

Jetty jacks within the project area are either owned or under the authority of the USACE, Reclamation, or the MRGCD, who entered into a tri-party agreement ensuring a cooperative effort for jetty jack removal (USACE 2009). The NMISC has initiated a conversation with the three agencies concerning jetty jack removal as part of the project, and a consensus agreement would be reached before removing the jetty jacks in accordance with the agreement (USACE 2009). Jetty jack removal will follow the known caveats from the agreement, and additional caveats may be added upon future consultation with the agencies regarding bankline jetty jacks.

2.8 Large Woody Debris Placement

LWD placement involves installing root wads, trees, and large branches within the main river channel or along banks to create aquatic habitat. LWD has been identified as suitable habitat for the Rio Grande silvery minnow (RGSM) (USFWS 2003), particularly for young-of-year individuals that occupy shallow, low-velocity areas with fine substrates (Pease et al. 2006). Deposits of woody debris commonly create these conditions, and all life stages of RGSM show an affinity for low- to moderate-velocity eddies formed by debris accumulations (USFWS 2010).

Historically, the MRG supplied abundant LWD as bank erosion and lateral channel migration transported woody material from the riparian zone into the river. However, channel modification and upstream dams constructed for flood control and water delivery have stabilized the river and reduced floodplain connectivity. In the ABQ Reach, channel incision and the absence of overbank flooding have greatly reduced the recruitment of LWD to the river, resulting in limited woody habitat within the modern channel.

The Priority I project would position LWD on or near the riverbank within 10 restoration sites. LWD would be trenched into the bank, and between one-quarter and one-third of the material would be buried under sediment and tamped to hold the LWD in place long term and prevent displacement. LWD placement would avoid built infrastructure, including diversion dams, bridges, and river gages, and will be installed with agency coordination and approval prior to placement. Large nonnative Siberian elm trees (*Ulmus pumila*) that have been removed from the floodplain would constitute most of the LWD for the project. Additional species such as cottonwood (*Populus* L.) and Russian olive (*Elaeagnus angustifolia*) may be considered for LWD if they were felled or trimmed during restoration activities. The exact selection of tree species from woody debris generated during restoration activities will be determined on-site during construction, and additional information, such as the size and volume of LWD, will be included in construction specifications.

Trees selected for LWD would not be stored within 2 feet of the drip line of any trees to mitigate the potential of ladder fuels. Rootwads would be placed in areas cleared of dry and flammable vegetative material.

2.9 Vegetation

2.9.1 Existing Tree Avoidance

An estimate of existing tree density within restoration sites (vegetated islands, bank-attached bars, and floodplain terraces) was developed using a combination of available data models (GSA 2024b). Data reviewed included Hink and Ohmart vegetation mapping (Middle Rio Grande Endangered Species Collaborative Program 2024), NMRipMap (Muldavin et al. 2023), aerial photography captured by uncrewed aerial vehicle drones, including photographs from the ravennagrass drone mapping (GSA 2024a), and field verification. Areas dominated by mature Rio Grande cottonwood (*Populus deltoides* var. *wislizenii*) or Goodding's willow (*Salix gooddingii*) were identified for avoidance, including a cottonwood preservation zone established within restoration site 182p9_E_1, where vegetation removal and excavation would be excluded. Additional tree preservation areas will be established during implementation and field-fitting of the site-specific designs, including avoidance of healthy, native, seed-bearing aged trees. Nonnative mature trees, mostly Russian olive, saltcedar (*Tamarix ramosissima*), and Siberian elm will be removed during construction and restoration implementation, estimated at a density of approximately 25 per acre. Dense bands of native willows (*Salix* spp.) occur along banklines within some restoration sites; if necessary, these would also be removed as part of restoration activities. Native willow species are expected to regenerate quickly and naturally as the shallow depth of excavation would preserve the seed bank and trigger rhizomatic resprouting of willow stems (GSA 2024b) (for more information, see Section 2.9.3).

2.9.2 Vegetation Removal During Construction

Construction of restoration features would require almost complete excavation and removal of existing vegetation to achieve the design elevations. Vegetation communities in these areas are largely dominated by nonnative invasive plants, and the clearance of these infestations would create opportunities to promote recruitment of native riparian plant species while actively managing for nonnative plants post-construction. Large-diameter nonnative vegetation, such as trees and large shrubs, would be removed using an excavator fitted with an extraction bucket to mechanically remove woody nonnative vegetation, including rootwads, or would be bulldozed during excavation. Immediately following construction, restoration areas are anticipated to have little to no remaining vegetation, however, rhizomes from excavated willows are expected to survive and reestablish quickly. Vegetation within the cottonwood preservation zone established within restoration site 182p9_E_1 would remain in place.

2.9.3 Vegetation Management Post-Construction

Section 4 outlines vegetation monitoring and maintenance activities intended to ensure successful establishment of a healthy riparian vegetation community post-construction. The Priority I project areas will require nonnative vegetation treatment activities, and the focus will be on invasive woody species and noxious herbaceous weeds, including ravennagrass. Ravennagrass forms dense stands that quickly crowd out native vegetation, forms impenetrable monocultures, and provides little habitat for birds and wildlife (Washington State Noxious Weed Control Board 2025). The ability for ravennagrass to outcompete surrounding vegetation may mean that current areas of suitable habitat for SWFL and YBCU will be degraded by ravennagrass infestations if not treated. Nonnative species are scattered throughout the project area, and approximately 31.4 acres are mapped as dominated by nonnative vegetation. These 31.4 acres are classified by the NMRipMap as Lowland Introduced Riparian Woodland and Scrub or Semi-Natural Riparian Woodland and Scrub (Muldavin et al. 2023).

Large-diameter nonnative vegetation, such as trees and large shrubs, would be removed using an excavator fitted with an extraction bucket to mechanically remove woody nonnative vegetation, including rootwads, or would be bulldozed during excavation. Additionally, cut-stump treatment may be used for dense stands of large-diameter nonnative vegetation, and foliar herbicide application may be used for sparse stands. For smaller nonnative vegetation, the expected removal method would include chemical herbicide treatment, mechanical removal of all biomass, or mastication, where standing biomass is ground and chipped. Mechanical removal of ravennagrass (including root and rhizome fragments) would be implemented to treat that species. Mechanical methods may involve root-plowing or raking using a bulldozer, mowing, chainsaw, or extraction. The root-plowing or raking method would be limited to areas where on-site sediment disposal is expected.

Nonnative species that are not selected for use as LWD would be removed, hauled off-site, or mulched on-site to reduce the fuel load prior to any on-site storage of vegetative materials. Any nonnative vegetative material that is cut on-site (and not used for LWD) would be either 1) piled overnight and then hauled off or 2) mulched on-site to a fine consistency or size. Any nonnative vegetative material cut on-site and piled overnight would be piled at no higher than chest height (4.5 feet) and not within 2 feet of the dripline of standing trees. Mulch would not be placed within 2 feet of the dripline of native cottonwood or willow (*Salix spp.*) trees and would be scattered at a depth not to exceed 2 inches, where applied.

All nonnative tree removal would be planned to occur outside the breeding bird season. If nonnative tree removal occurs during the migratory bird nesting season (i.e., February 15–August 31) or during the raptor nesting and breeding season (March–May), a focused avian nesting survey will be performed by a qualified wildlife biologist within 2 days prior to nonnative tree removal in compliance with the MBTA. If nesting birds are detected, the nest location will be protected until fledging has occurred and the young are no longer dependent on the nest structure or parents for survival. Per the Bald and Golden Eagle Protection Act (BGEPA), all project activities would occur at least 660 feet away from any known bald eagle nest and 1 mile away from any golden eagle nest within the project footprint. Results will be documented and forwarded to the permitting agencies.

2.9.4 Revegetation

Several methods of revegetation will be used for different elements of the Priority I project, including vegetation replacement through passive restoration and seeding. At this time, no planting of container plants or live stakes has been proposed. However, if monitoring (see Section 4.3) shows that the passive restoration and seeding methods described below are not successful, planting and additional seeding may be considered as adaptive management. Maintaining channel maintenance zones, outlined in Section 4.5.3, will require ongoing sedimentation excavation and repeated vegetation removal to maintain function of restoration features and will not include revegetation efforts following their implementation.

2.9.4.1 PASSIVE RESTORATION

Replacement of native vegetation in the Priority I restoration areas will be achieved using passive restoration, which allows natural processes to restore degraded ecosystems. For the Priority I project, passive restoration will harness natural recruitment from nearby native plant species in order to replace native vegetation that is removed during project implementation. Passive restoration offers many benefits, such as lower cost because there is less human intervention, natural resilience as local plants produce locally adapted progeny, and potential biodiversity enhancement as a wider variety of plants may reestablish compared to actively planted sites with a limited plant palette. Native willow species, particularly coyote willow (Salix exigua), are common throughout the project area and concentrated in lower elevations where excavation will be shallower. This is expected to preserve the seed bank and

trigger rhizomatic resprouting of willow stems (GSA 2024b), replacing thickets of decadent willow with new growth. Additionally, willows have a rapid growth rate, with active growth occurring during spring and summer, so willows limbed or removed during the late fall and winter are expected to begin regenerating in the following spring and summer (Natural Resources Conservation Service 2024).

Passive restoration (natural recruitment) has successfully been used at other restoration sites in the Rio Grande, including eight sites constructed in 2019 between River Miles 93 and 116 as part of the NMISC and Reclamation habitat restoration project in the San Acacia Reach (GSA 2023). Monitoring results from 2019 to 2022 showed an increase in cottonwood, coyote willow, and Gooding's willow seedlings in all but one site, possibly due to scouring and erosion which may have uprooted established seedlings. The monitoring results for all sizes of these species (seedlings, saplings, poles, mature trees) showed a proportional increase or constant value at all but two sites, including the site previously mentioned and a second site with significant motor vehicle use. Proportional increases were primarily attributed to successful seedling recruitment and rhizomatous spread (GSA 2023).

The native species associated with the various vegetation types present within the project area that are expected to naturally recruit include the following:

- **Lowland Riparian Shrubland**: Coyote willow, willow baccharis (*Baccharis salicina*), and mule fat (*Baccharis salicifolia*)
- **Lowland Riparian Forest and Woodlands:** Cottonwood and Gooding's willow
- **Lowland Dry Meadow and Grassland:** Saltgrass (*Distichlis spicata*), alkalis sacaton (*Sporobolus airoides*), and foxtail barley (*Hordeum jubatum*)
- **Lowland Marshes and Wet Meadows:** Common threesquare (*Schoenoplectus pungens*), common spikerush (*Eleocharis palustris*), cattail (*Typha* spp.). and woolly sedge (*Carex pellita*)
- **Semi-Natural Riparian Woodland and Scrub:** Cottonwood and coyote willow

2.9.4.2 SEEDING

The NMISC and/or their contractors and restoration partners will seed the access roads and spoil piles with native grasses. Seeding with native grasses would occur along access roadsides (see design feature Vegetation-5 in Section 5) and per the vegetation activities outlined in Sections 2.11, 2.12, and 4.6. All spoil piles that will remain within the project area after initial construction activities will also be seeded with native grasses. Seeding with native grasses will reduce infestation by invasive and noxious weeds and support the minimization of erosion and dust creation within and surrounding the project areas.

2.9.4.3 REPLACEMENT

The NMISC and/or their contractors and restoration partners will adhere to the best management practices listed by the USFWS (USFWS 2025a) and based on the 2016 BO, which states that restoration projects shall replace native plants at a 10:1 ratio for healthy plans and a 5:1 ratio for small or unhealthy plants. Vegetation replacement will consist of passive restoration and seeding. If monitoring (see Section 4.3) shows that the passive restoration and seeding methods are not successful, planting and additional seeding may be considered as adaptive management (see Section 4.6).

2.10 Pedestrian Access Trails

The project would not include pedestrian trail closures. An existing crusher fine trail will be damaged during restoration and rerouted around the restoration site (see Section 2.11). The reroute will be done in

coordination with the City of Albuquerque Open Space Division and will include educational signage (see Section 3.2.1).

2.11 Access Road Plan

The Proposed Action requires the use of existing access roads and trails and proposes the creation of new access roads and trails and temporary low-flow access, for construction and maintenance activities. The use of existing access roads and trails would be prioritized over the creation of new access to avoid and minimize disturbance to riparian habitat and native vegetation to the greatest extent possible.

During construction, approved contractors would use existing access roads and trails, modified existing access roads and trails, proposed new access roads and trails, and temporary low-flow access routes to islands as defined below:

- **Existing access roads with no modifications**: To the extent possible, the existing access roads with no need for modifications, totaling approximately 29,923.10 linear feet within the project areas, would be used during construction. Existing access roads include two-track ungraded dirt roads and well-defined off-highway roads (graded dirt and/or cement roads), including levee roads. No new surface disturbance will occur. Access roads within this category would not require widening, grading, or vegetation removal.
- **Existing access roads and trails with modifications:** Two-track roads and bare earth, asphalt, and gravel trail systems would need to be upgraded to accommodate construction equipment and safe access for construction contractors. These roads and trails may be widened up to 14 feet for one-way traffic, totaling approximately 9,900.00 linear feet and a maximum of 3.42 acres of surface disturbance. Modifications could include widening, grading, and vegetation removal, including tree limbing. Any access road and trail upgrades, including native vegetation removal, would be minimized to the greatest extent possible to preserve the bosque, including upland and riparian habitat.
- **Existing access roads and trails with modifications and additional vegetation removal:** Two- track roads and bare earth, asphalt, and gravel trail systems surrounded by dense, obstructive vegetation would need to be upgraded to accommodate construction equipment and safe access for construction contractors. These roads and trails may be widened up to 14 feet for one-way traffic, totaling approximately 7,735.60 linear feet and a maximum of 2.25 acres of surface disturbance. Modifications could include grading and vegetation removal, including tree limbing. Additional vegetation removal outside the widened roads would be necessary, up to a maximum of 5.5 feet on each side of the road or trail (totaling a maximum width of 25 feet of disturbance) and yielding a maximum of 2.08 acres of additional vegetation removed. Any access road and trail upgrades, including native vegetation removal, would be minimized to the greatest extent possible to preserve the bosque, including upland and riparian habitat.
- **Proposed new access roads and trails**: New access roads and trails, totaling approximately 2,836.50 linear feet within the project areas, may be required during construction of the project. The access roads would be graded to 14 feet wide for one-way traffic, totaling a maximum of 0.94 acres of surface disturbance. This includes the reroute of an existing crusher fine trail that would be damaged during restoration activities. Apart from the crusher fine trail reroute, additional vegetation removal outside the widened roads may be necessary, up to 5.5 feet on each side of the road or trail (totaling a maximum width of 25 feet of disturbance) and yielding a maximum of 0.89 acres of additional vegetation removed. Native tree species would be avoided to the greatest extent possible. The access roads would remain for the 25-year duration of project activities.

- **Low-flow temporary access routes:** During periods of low river flow, the two island sites will be accessed through the river channel from the east bank, totaling approximately 392.10 linear feet. Access routes within this category are temporary, will not result in surface disturbance, and would not require widening, grading, or vegetation removal. Approximately 354 round trips will be taken by construction vehicles to haul excavated materials from both island sites.

Table 2.2 captures the maximum linear footage and acreage of each access road type.

Table 2.2. Priority I Proposed Access Road Plan

Access Road Type	Length (feet)	Surface Disturbance (acres)	Additional Vegetation Removal (acres)
Existing access roads and trails, no modifications needed	29,923.10	0.00	0.00
Existing access roads and trails, widened to 14 feet	9,900.00	3.42	0.00
Existing access roads and trails, widened to 14 feet with additional vegetation removal	7,735.60	2.25	2.08
Subtotal	***47,558.70***	***5.67***	***2.08***
Proposed new access roads and trails	2,836.50	0.94	0.89
Proposed reroute of crusher fine trail	448.30	0.15	0.00
Subtotal	***3,284.70***	***1.09***	***0.89***
Low-flow temporary access routes	392.10	0.00	0.00
Total	**51,235.60**	**6.76**	**2.98**

Construction of new roads and trails, as well as the modification of existing roads and trails, would be completed by ripping soils after construction to avoid soil compaction. Reseeding with native grasses would occur along roadsides (see design feature Vegetation-5 in Section 5) and per vegetation activities outlined in Sections 2.9.4.2, 2.12, and 4.6.

2.12 Spoil Plan

The Proposed Action includes the need to place excavated soil and materials in upland areas during construction (Table 2.3). Spoil pile depths would range between 6 inches and 3 feet depending on location. The locations of spoil piles are shown in the design plan. Final locations for spoil piles will be reviewed and authorized by Reclamation and the MRGCD, and the exact placement of the spoil could be subject to change during preconstruction review. The MRGCD guidance on construction methods for spoil on the levees or riverside drains would be followed by the NMISC, its contractors, and partners.

Table 2.3. Priority I Spoil Pile Quantities and Surface Disturbance

Nearest River Mile	Number of Spoil Piles	Surface Disturbance (acres)
182	8	5.88
183	12	10.21
184	5	3.37
185	4	2.36
186	4	3.78
Total	**33**	**25.60**

On-site or off-site alternate beneficial spoil uses or areas may be identified by stakeholder agencies for the following types of areas before, during, and after construction, if and where approved by the appropriate agencies:

- Assist City of Albuquerque revegetation and/or weed control efforts
- Improve or create new turnaround areas for emergency vehicles
- Repair roads
- Improve parking areas
- Assist with erosion control measures (silt fencing support) during construction
- Spread within the floodplain away from wetted areas
- Level excavated areas after jetty jack removal
- Remain within the designated areas for the above future uses
- Promote better drainage

Selected spoil locations identified through coordination with the MRGCD and the City of Albuquerque Open Space Division would be seeded with native grasses and forbs to control erosion and promote the establishment of native vegetation (see Sections 2.9.4.2, 2.11, and 4.6).

If river conditions allow, some excavated sediment from island restoration activities could be placed into the river for movement downstream, pending approval from Reclamation and the USACE. Design features captured in Section 5 would be followed to allow sediment into the river.

2.13 Staging Area Plan

A construction staging area will be necessary for the temporary organized storage of construction equipment and materials. The staging area may also serve as a location for assembling the construction crew at the start of each workday to review restoration site plans, environmental commitments, and safety procedures. The proposed staging area for Priority I project is on the south side of I-40, in cleared areas within and adjacent to an existing access road that will not require modification, as well as along a small section of the lower levee road. The staging area will result in 0.22 acre of surface disturbance.

At the end of the Priority I project construction period, all equipment, materials, and trash will be removed from the staging area.

3 PROJECT CONSTRUCTION

This section describes the activities that are anticipated to occur before and during project construction. As project engineering becomes finalized, the following descriptions will be updated and revised as appropriate.

3.1 Preconstruction Activities

3.1.1 Worker Awareness and Safety Training

Construction personnel would receive environmental training prior to commencing work on the project. Training would emphasize compliance with all environmental laws, including the project design factors and environmental protection measures captured in the Programmatic EA (Reclamation 2025a). Project-specific requirements and local issues would be addressed as necessary. Topics covered in the training would include terms and conditions of the joint license agreement, roles and responsibilities, communication protocols, flagging and signage, limits of disturbance, access and travel restrictions, and any resource mitigation or monitoring plans. Trainings would be conducted at the construction contractor's offices or in the field as needed to address specific and immediate issues that come up during the workday. Remedial training would be given to individuals and crews who are involved in noncompliant activities. A master list of all project personnel that have completed the training would be kept by the construction contractor and furnished to Reclamation and the MRGCD upon request.

In addition, all construction and operation practices would be governed by standardized codes of safe practices (safety plans) prepared by the individual contractors and subcontractors outlined in a health and safety plan. Copies of the safety plans would be kept on-site during construction and operations. All construction activities would be carried out in safe and healthful working conditions as outlined by the Occupational Safety and Health Administration's guidelines in addition to specific health and safety information, including a description of the safety requirements specifically associated with construction activities (e.g., improve construction areas, fire protection), and notification procedures for emergencies, in accordance with the NMISC's safety guidelines, would be followed.

All construction and operation personnel would be required to wear hard hats, safety glasses, and high-visibility vests.

3.1.2 Surveys and Staking

Ahead of construction activities, staking would be conducted to field-verify and mark the project area boundary, including the restoration areas, the access roads, and the spoil piles. Additionally, sensitive environmental features, such as cottonwood preservation areas, would be mapped and marked for construction crews and environmental preconstruction monitoring would be conducted (as necessary).

3.1.2.1 EDUCATIONAL SIGNAGE AND TRAIL REROUTE

Prior to construction, educational signage would be created to inform the public of the crusher fine trail reroute and habitat restoration activities. The project would not impede long-term recreational access

within the bosque, as the formally established trail system would remain unchanged after construction activities. No new trails would be constructed as part of the Proposed Action.

3.1.3 Preconstruction Resource Surveys and Regulatory Compliance Actions

The NMISC and their contractors are completing regulatory compliance with the ESA, Clean Water Act (CWA) Sections 401 (Water Quality Certification), 402 (NPDES), 404 (dredge and fill), and 408 (Request to Alter USACE Civil Works Projects), and the National Historic Preservation Act for the Priority I sites. Detailed resource survey and permitting actions are described below.

3.1.3.1 GENERAL BIOLOGICAL RESOURCES AND ENDANGERED SPECIES ACT COMPLIANCE

SWCA Environmental Consultants (SWCA) completed a general biological resources survey of restoration sites within the Priority I project on August 25 and 26, 2023, and in September and October 2023 (SWCA 2024). Project engineers and the NMISC's contractors have coordinated with agency staff to avoid or minimize impacts on biological resources, to the extent practicable.

The NMISC was a partner during development of the *Joint Biological Assessment for Bureau of Reclamation, Bureau of Indian Affairs, and Non-federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico* (2015 BA) (Reclamation 2015) and, subsequently, a non-federal partner of the 2016 BO (USFWS 2016). The 2016 BO governs ESA-covered activities and compliance actions, including habitat restoration, with associated compliance measures (Reasonable and Prudent Measures 2.1–2.4 and Reasonable and Prudent Measures 8.1, 8.3–8.5) and conservation measures (51–57 and 78) for the benefit of the SWFL, YBCU, New Mexico meadow jumping mouse (NMMJM) (*Zapus hudsonius luteus*), and RGSM. Any compliance actions for habitat restoration are the responsibility of Reclamation in accordance with the 2016 BO.

To support ESA compliance actions for the Priority I application, the NMISC and Reclamation, as the lead agency, developed and submitted a Letter of Inclusion for 2016 BO–listed species to the USFWS and received concurrence on September 12, 2025, for anticipated impacts to RGSM, SWFL, and YBCU (USFWS 2025a). The analysis in the Programmatic EA (Reclamation 2025a) also included the monarch butterfly (*Danaus plexippus*), a species proposed for listing as threatened under the ESA; however, this species is not covered under the 2016 BO, and as a proposed species, USFWS consultation is not required unless the project is expected to jeopardize the continued existence of the species. Analysis in the Programmatic EA concluded that the project may affect but is not likely to jeopardize the continued existence of monarch butterfly (Reclamation 2025a).

3.1.3.2 AQUATIC RESOURCES AND CLEAN WATER ACT SECTIONS 401, 402, 404, AND 408 COMPLIANCE

The NMISC and SWCA attended meetings with the USACE Albuquerque District on September 20, 2023, January 6 and June 12, 2025, and March 27, 2026, to discuss the permitting approach, in accordance with CWA Section 404. The USACE confirmed that the IP will satisfy the NMISC CWA Section 404/401 permitting requirements.

SWCA completed an aquatic resources survey within the Priority I project, using a combination of desktop and field data, in August, September, and October 2023 (SWCA 2025). SWCA verified National Wetland Inventory data for wetland boundaries (USFWS 2025b).

SWCA prepared an aquatic resources inventory report (ARIR) (SWCA 2025) summarizing the field aquatic resources findings, including mapping of potential jurisdictional WOTUS and flood zones. The ARIR will be included as an Appendix to the IP submission to the USACE and New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB). The Section 404(b)(1) Alternatives Analysis will be included with the IP to demonstrate analysis of the Least Environmentally Damaging Practicable Alternative. The IP will be submitted to the USACE for review, in accordance with the USACE guidelines, as well as the NMED SWQB for Water Quality Certification (Section 401) compliance review.

Both agencies may conduct their respective public interest review processes concurrently and accept public comments during the public notice period. Following completion of the public notice period and review of comments, the USACE would issue a permit decision document outlining any required compliance measures for construction and monitoring activities for the Priority I project area (see Section 4 for detailed monitoring and maintenance efforts). NMED SWQB would issue a Clean Water Act Section 401 Water Quality Certification (or waiver or denial) identifying any conditions necessary to ensure compliance with state water quality standards, which would be incorporated into the USACE permit.

SWCA prepared a Section 408 request for USACE review concurrent with Section 404 review and will complete NPDES requirements under Section 402 prior to construction activities.

3.1.3.3 CULTURAL RESOURCES AND NATIONAL HISTORIC PRESERVATION ACT COMPLIANCE

SWCA completed a cultural resources desktop review and coordinated with Reclamation on cultural resources requirements. The NMISC's permitted archaeologist contractors completed site visits and updates on seven cultural resources including two jetty jack segments. Recording standards met the level of requirement of the federal regulations guiding the protection of historic properties (36 CFR 800).

A standard inventory report was prepared and submitted to the reviewing agencies following federal guidelines. Following the report review, Reclamation sent a letter of request for Section 106 consultation for the project, seeking concurrence from the New Mexico Historic Preservation Division with their eligibility determinations and findings of effect (Reclamation 2025b). The New Mexico Historic Preservation Division concurred with the letter in support of overall project permitting on May 19, 2025. Reclamation conducted all necessary consultations with interested parties under Section 106 in May and June of 2025. No additional comments or concerns were received. The Section 106 consultation effort for Priority I is complete (Reclamation 2025c).

Project engineers would work with consultant archaeologists to either avoid or minimize impacts on any identified cultural resource, to the extent practicable, and would continue to work with agency archaeologists, as needed.

3.1.3.4 NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

Reclamation signed and published the Finding of No Significant Impact and Final Programmatic EA in July 2025 (Reclamation 2025a). The Programmatic EA disclosed the maximum potential impacts from the restoration of up to 80 sites in the MRG. Reclamation will review the Priority I action for site-specific impacts to consider if the Programmatic EA was adequate in its analysis of impacts specific to Priority I. Reclamation may document their review in the form of a Determination of NEPA Adequacy, or other documentation, or could determine that supplemental NEPA is required.

3.2 Construction Activities

Following preconstruction activities, construction would be conducted in a sequential set of tasks performed by multiple crews (approximately five to 15 persons). In general, construction would be sequenced in the following manner: installation of temporary erosion control measures, clearing/grubbing/vegetation removal, demolition (or removal) of jetty jacks, excavation and storage/off-site removal of sediment, installation and establishment of permanent control measures, revegetation (where determined), and post-construction monitoring as required by the 5-year monitoring requirement per the CWA Section 404 IP until success criteria (e.g. vegetation species establishment) are met. Within bankline areas and on vegetated islands, construction would proceed behind a permeable barrier left in place to minimize impacts to RGSM and water quality impacts.

Prior to construction activities each day, the NMISC or their contractor(s) would measure and record the following: water constituents, including air temperature, water temperature, turbidity, pH, salinity, dissolved oxygen, and specific conductivity. Additionally, the nearest gage data would be downloaded to determine the maximum, minimum, and median average daily flow.

The NMISC and/or their contractors would pump water from the Rio Grande into side drain channels to fill water trucks. This method can be used for dust abatement measures and/or to water grasses, shrubs, etc. should watering be necessary.

Table 3.1 outlines the typical specifications of vehicles expected to participate in the construction activities. These numbers are estimates; conditions during construction would dictate equipment allocation. For equipment refueling, the NMISC's contractor would implement standard refueling procedures for heavy equipment outside the project areas and away from the Rio Grande and the associated riparian habitat.

Table 3.1. Anticipated Construction Vehicle/Equipment Roster

Construction Activity	Vehicle/Equipment Type
Site access/preparation/land clearing/construction	Brush hog
	Bulldozer
	Backhoe
	Excavator (land)
	Amphibious excavator (in river)
	Bucket truck
	Pickup trucks

3.2.1 Site Access and Preparation

Construction of the proposed project would begin with clearing and grading the proposed access roads to allow entry to individual project areas as captured in the access road plan (see Section 2.1.11 and the Design Package in Appendix A). The access roads would be level with existing topography depending on the terrain, site constraints, and equipment requirements. Vegetation disturbance would be minimized to the greatest extent possible to minimize impacts to the riparian areas.

Individual restoration project areas would be cleared using the appropriate equipment, which could range from a brush hog flail-type mower to a bulldozer to blade the area required to provide a safe working

space for placing equipment, vehicles, and materials for construction activities. The work area would be cleared of vegetation only to the extent necessary. Any chemical treatments or herbicide application would comply with the laws and procedures of federal and state land-managing agencies (see Design Package in Appendix A).

The excavator (land), amphibious excavator (Table 3.1), and bulldozer (Figure 3.2) would be used to excavate soils and vegetation within the restoration project areas. The amphibious excavator allows for construction activities within the river.

Excess soil from the restoration project areas and access roads would be placed at the designated spoil locations outlined in the Design Package (Appendix A). When grading must occur to create a safe, level working space for construction, existing soil could be used in a cut/fill. Construction would include contouring at specified topographies to ensure adequate restoration and inundation targets to gain ecological lift.

3.2.2 Cleanup

All restoration project areas, the staging area, and the access road would be kept in an orderly condition throughout the construction of the proposed project. All refuse and trash would be removed and disposed of in an approved manner. Trash and refuse would be contained temporarily at a designated site until it can be hauled away to an approved landfill. There would be no open burning within the project areas.



Figure 3.1. Amphibious excavator working in the channel during construction of the Phase IIa restoration sites in the Middle Rio Grande I-40 subreach (SWCA 2010).



Figure 3.2. Bulldozer excavating soils from a side channel during construction of the Phase IIa restoration sites in the Middle Rio Grande I-40 subreach (SWCA 2010).

4 MONITORING AND MAINTENANCE

This comprehensive monitoring and maintenance section has been prepared to be consistent with the purpose and goals outlined by the NMISC and CWA regulatory guidelines, as well as recommendations received from stakeholders and during agency review.

The project planning team has valuable experience and lessons learned from previous restoration efforts, including the importance of follow-up monitoring and maintenance, which are applied to this project. Monitoring a restoration project is needed to understand the effectiveness of the restoration efforts and whether any follow-up maintenance or adaptive management is needed. Maintenance is required for the project to be successful and achieve its goals, including longevity.

4.1 Ecological Reference

Given the degraded and impacted nature of the Rio Grande through this reach and throughout much of the MRG, the project does not have an intact, undisturbed ecological reference site available to reference project design. However, the NMISC has applied lessons learned to the design plan from previously completed restoration projects in the ABQ reach and other reaches, including eight San Acacia Reach restoration sites constructed in 2019 between Rio Grande River Miles 93 and 116, which were utilized for reference in developing the Performance Standards outlined in Section 4.2 and Table 4.1, as well as the Adaptive Management Strategy in Section 4.6. Monitoring results from the San Acacia Reach restoration sites are included in the *2022 Annual Monitoring Results and Maintenance Plan for San Acacia Reach Restoration Sites* (GSA 2023).

Floodplain habitat is critical to RGSM, and mechanically restored floodplains from past projects in the MRG have shown to be suitable habitat for RGSM in moderate- to high-flow years, including in 2016, 2017, and 2019, when some or most of the previously constructed restoration sites were inundated and recruitment of RGSM was generally high based on October catch rates (SWCA 2023). Bankline modifications, flow-through channels, backwater channels, and confluence maintenance are all proposed Priority I components that have shown to benefit moderate- to high-flow RSGM floodplain habitat at previously constructed projects.

4.2 Performance Standards

Performance standards have been established for the restoration project as a means of tracking the progress and performance of the physical, hydrological, and biological conditions of the restoration areas (see Table 4.1). Project performance will be evaluated four times annually during qualitative monitoring visits and annually during quantitative monitoring visits unless otherwise specified. If the project, or any portion of the project, at any time does not appear to be on a trajectory to meet the final performance standards, the NMISC will identify remedial actions (adaptive management) to ensure conformance to these goals and the 5-year timeline.

Table 4.1. Performance Standards for I-40 Subreach Sites

Applicable Project Activities	Performance Standard	Method Used to Assess Performance	Year 1	Year 2	Year 3	Year 4	Year 5
Primary Performance Standards							
Hydrologic Connectivity							
Bankline modification	Inundation occurs between 1,000 and 2,000 cfs	Gage readings and satellite imagery analysis	Inundation occurred at least once annually when MRG experienced flows between 1,000 and 2,000 cfs.				
Island destabilization	Inundation occurs between 1,500 and 3,000 cfs	Gage readings and satellite imagery analysis	Inundation occurred at least once annually when MRG experienced flows between 1,500 and 3,000 cfs.				
Flow-through channels	Inundation occurs between 1,500 and 2,000 cfs	Gage readings and satellite imagery analysis	Inundation occurred at least once annually when MRG experienced flows between 1,500 and 2,000 cfs.				
Backwater channels	Inundation occurs at 800 cfs	Gage readings and satellite imagery analysis	Inundation occurred at least once annually when MRG experienced flows of 800 cfs.				
Confluence maintenance	Inundation occurs at 1,000 cfs	Gage readings and satellite imagery analysis	Inundation occurred at least once annually when MRG experienced flows of 1,000 cfs.				
Channel maintenance zones These zones will be determined during the first year of monitoring by completing topographic surveys to determine sediment accumulation and where excavation should occur to ensure restoration site functionality.	Inundation occurs at design	Topographic surveys and aerial imagery	Inundation to occur at design for each restoration activity.				
Geomorphology/Topography (see Section 4.3.2.3 for more detail)							
• Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance	No severe deposition	RTK-GPS measurements of topography	At least 60% of the feature is inundating as designed.				
• Jetty jack removal • Spoil piles	No severe erosion	RTK-GPS measurements of topography	No more than 20% change from as-built in any year.				

Applicable Project Activities	Performance Standard	Method Used to Assess Performance	Year 1	Year 2	Year 3	Year 4	Year 5
Channel maintenance zones These zones will be determined during the first year of monitoring by completing topographic surveys to determine sediment accumulation and where excavation should occur to ensure restoration site functionality.	Identification to ensure sediment maintenance	RTK-GPS measurements of topography	Complete topographic survey during Year 1 to determine where sediment is accumulating		At least 60% of the feature is inundating as designed.		
Native Vegetation*							
• Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance • Jetty jack removal	Native woody vegetation frequency	Frequency grid Percent of absolute cover for cottonwood and willow	5% of grids	10% of grids	25% of grids	35% of grids	45% of grids
• Channel maintenance zones	No vegetation	Absence of vegetation during ground truth surveys			No vegetation		
• Spoil piles • Access roads	Absolute cover of native vegetation	Ocular estimates	5%	10%	15%	20%	25%
Nonnative Vegetation							
• Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance • Jetty jack removal	Invasive woody vegetation frequency – Siberian elm (*Ulmus pumila*), tree of heaven (*Ailanthus altissima*)	Frequency grid	0% of grids in any year				
• Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance • Jetty jack removal	Invasive woody vegetation frequency – saltcedar (*Tamarix ramosissima*), Russian olive (*Elaeagnus angustifolia*), mulberry (*Morus* spp.)	Frequency grid	<5% of grids in any year				

Applicable Project Activities	Performance Standard	Method Used to Assess Performance	Year 1	Year 2	Year 3	Year 4	Year 5
• Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance • Jetty jack removal	Noxious herbaceous species vegetation frequency	Frequency grid	0% of grids in any year				
• Spoil piles • Access roads	Absolute cover of nonnative vegetation – Russian thistle (*Salsola* spp.) and burningbush (*Bassia scoparia*)	Ocular estimates	<5% absolute cover of nonnative vegetation, including annual weeds, in any year				
• Spoil piles • Access roads	Absolute cover of noxious weeds (New Mexico Department of Agriculture–listed noxious weed species)	Ocular estimates	0% absolute cover of noxious weeds in any year				
Secondary Performance Standards[†]							
• Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance	Presence of adult or larval RGSM	Incidental observations	Presence of adult or larval RGSM in any year				
All project activities • Bankline modification • Island destabilization • Flow-through channels • Backwater channels • Confluence maintenance • Spoil piles • Access roads	Presence of SWFL or YBCU or monarch butterfly	Incidental observations	Presence of SWFL or YBCU, or monarch butterfly, in any year				

*Native vegetation standards do not apply to channel maintenance zones that should be kept free of sediment and vegetation.

[†]Secondary performance standards do not have to be met for the project to be successful, but if they are met, indicate success of the project.

4.3 Post-construction Performance Monitoring

Following installation of the restoration sites, both *qualitative* and *quantitative* monitoring will be used to track progress toward project performance standards. Monitoring will focus on hydrologic connectivity, erosion and sedimentation, native vegetation recovery, and nonnative vegetation management. The recommended timing of monitoring and maintenance activities is provided in Table 4.2

4.3.1 Qualitative Monitoring

The goal of qualitative monitoring is to proactively assess site conditions to address issues before they become a problem. Qualitative monitoring will be performed throughout the installation period and the 5-year maintenance and monitoring period. Each qualitative visit will focus on the presence of native and nonnative plant species, any significant disease or pest problems, and any constructed areas exhibiting signs of erosion or destabilization. An important feature of the qualitative monitoring is effective coordination with the installation and maintenance contractor(s) to exchange information, provide feedback, and agree on priority maintenance items and potential remedial measures as needed.

During installation, the project areas will be inspected on a weekly basis and then at least four times during the growing season (every March, May, July, and September) each year of the 5-year maintenance and monitoring period (assuming performance standards are met in Year 5). During each qualitative site visit, a site overview of the restoration areas will be conducted to evaluate the following:

- Overall site conditions
- General condition of native plants, including plant health/vigor and mortality
- Native plant recruitment
- Presence and type of terrestrial fauna using the restoration area
- Potential issues, including hydrology, invasive nonnative species of concern (e.g., ravennagrass), vandalism, and other problems that need to be addressed by the installation or maintenance contractor

In addition, coordination with the installation or maintenance contractor will occur as follows:

- Schedule upcoming maintenance based on the maintenance needs and priorities at each restoration area
- Walk the restoration areas, including access roads and spoil piles, to identify any problem issues, including erosion issues, occurrence of invasive nonnative species, and potential human impacts such as vandalism
- Provide support to field maintenance crew in the identification of common native and nonnative species

Table 4.2. Recommended Project Monitoring and Maintenance Schedule

Monitoring Tasks	Installation	Year 1	Year 2	Year 3	Year 4	Year 5
Qualitative site visits	Weekly	Up to four visits (March, May, July, and September)				
Photo points	Weekly	May and September				
Gage monitoring	N/A	Daily during spring runoff				
Satellite analysis	N/A	As needed during spring runoff				
RTK-GPS surveys	At completion of installation	As needed during channel maintenance zone maintenance				
Vegetation frequency grids	N/A	Annually during peak growing season (June, July, or August depending on weather)				
Maintenance Tasks						
Invasive/noxious vegetation management (mechanical and chemical)	N/A	Up to four visits (April, June, August, and October)				
Trash removal	N/A	As needed up to four visits (April, June, August, and October)				
Adaptive management	N/A	As needed				

Note: N/A = not applicable

4.3.2 Quantitative Monitoring

Quantitative monitoring will consist of photographic documentation, hydrologic connectivity (inundation) monitoring, geomorphology (topographic) monitoring, and vegetation monitoring. Methods for each monitoring type are provided below.

4.3.2.1 PHOTOGRAPHIC DOCUMENTATION

Permanent stations for photographic documentation will be established at each restoration area, before construction begins, using a GPS unit with an average accuracy of 0.99 meter. Permanent stations will ensure photographs will be taken from the same photo point, at the same time of year, and facing the same compass direction. The photographs will be used to document the existing conditions before construction, the installation process, and the vegetation establishment over the 5-year maintenance and monitoring period. Photographs will be taken twice a year (May and September) at these fixed photo points, catalogued, and included in annual reports.

4.3.2.2 HYDROLOGIC CONNECTIVITY

Inundation tracking of the restoration areas will begin when spring snowmelt runoff at the nearest U.S. Geological Survey (USGS) stream gage (gage 08330000 Rio Grande at Albuquerque) measures 800 cfs and will continue until 3,000 cfs is measured at the USGS stream gage. The gage should be checked daily (via USGS website: https://waterdata.usgs.gov/nwis/rt) during spring runoff. At 800 cfs flow, satellite images, acquired via Planet Scope subscription or a similar resource, will be analyzed for the inundation extent of the backwater channel restoration areas. When the USGS stream gage measures 1,000 to 2,000 cfs, satellite images will be analyzed to record inundation of bankline modification and flow-through channel restoration areas, which were designed to inundate at those flows. When the gage records 1,500 to 3,000 cfs, satellite images will be used to determine the inundation extent of islands that were destabilized. This monitoring will occur every year during spring runoff during the 5-year maintenance and monitoring period. The inundation at each restoration area will be compared to the flows documented to ensure that inundation is occurring as designed and the restoration areas are meeting the inundation performance standards.

4.3.2.3 GEOMORPHOLOGY/TOPOGRAPHY

Topographic surveys using RTK-GPS survey equipment will be used to document the topography of each restoration area after construction for as-built conditions. These RTK-GPS surveys will be repeated as needed during the maintenance of channel maintenance zones to document any changes in geomorphology or topography due to erosion or sedimentation. The RTK-GPS surveys will be used to monitor geomorphic changes and to quantify volumes of excavation needed within channel maintenance zones outlined in Section 4.5.3. Erosion rather than sedimentation will be the issue of concern for the jetty jack removal areas and spoil piles. If these restoration areas show the variation is greater than 20%, then the restoration area requires sediment maintenance. All restoration areas will be part of the RTK-GPS surveys to ensure that all features are functioning as designed.

4.3.2.4 VEGETATION

See Project Design Feature "**Vegetation–9**" in Section 5.3 for vegetation replacement ratios. To measure vegetation, both native and nonnative frequency, a grid with 20 × 20–foot squares will be overlayed on each restoration area, except spoil piles and access roads (GSA 2019). The procedure is intended to be rapid and only species presence is noted in each grid square at each restoration area. However, cottonwood and willow seedlings and saplings are monitored in greater detail and are counted in each grid

square, and a percentage of absolute cover for cottonwoods and willows will be estimated. The frequency of native, nonnative woody (various species), and nonnative herbaceous species is calculated by the number of grid squares occupied by the vegetation type of interest divided by the total number of grid squares for that restoration area. The frequency and cover estimates are then compared to the appropriate performance standard (native vs nonnative and the correct year [see Table 4.1]) to determine if success is achieved. Additionally, the frequency of cottonwoods in a restoration area will be compared to the frequency identified for that area prior to construction to determine if success standards for replacement have been achieved. Vegetation monitoring should be repeated at the same time each year of the 5-year maintenance and monitoring period to avoid seasonal variation in the data. Vegetation monitoring will occur once a year during the peak growing season (June, July, or August depending on precipitation).

Vegetation monitoring of the spoil piles and access roads will occur using ocular estimates of absolute cover of both native and nonnative species. The cover estimate will then be compared to the appropriate performance standard (native vs. nonnative and the correct year) to determine if project goals have been met and success has been achieved. Monitoring of the spoil piles and access roads will occur annually during the quantitative vegetation monitoring visit of the other restoration areas.

4.4 Reporting

4.4.1 Qualitative Memoranda

Following each qualitative site visit, a short memorandum will be prepared. These memoranda will focus on issues such as recommendations for invasive and noxious weeds management, trash removal, and pest control. These memoranda will be shared and discussed with the maintenance contractor to ensure that all recommended remedial actions are clear and scheduled promptly.

4.4.2 Annual Reports

Annual monitoring reports will be submitted to Reclamation, the MRGCD, USACE Albuquerque District, and the NMED SWQB by the end of each calendar year following the completion of that year's monitoring activities. Table 4.1 identifies the performance standards that must be met for sign-off by the agencies and that will be included in the annual reports to the USACE and NMED. The secondary performance standards (presence of wildlife) are not required to be met for site sign-off, but if RGSM, SWFL, or YBCU are observed, the restoration is successful. Per the USACE Regulatory Guidance (USACE 2008),the annual report will include a narrative letter report that includes, at a minimum:

- Photo points
  - The same locations shall be photographed annually and displayed in the monitoring report.
  - Differences shall be prominently noted, both in the report text and annotated in the photograph captions.
  - Submitted photographs should be formatted to print on a standard 8.5 × 11–inch piece of paper, dated, and clearly labeled with the direction from which the photograph was taken.
  - The photograph location points should also be identified on the appropriate maps.
- Monitoring results and comparison to performance standards.
- Discussion of any unusual events that might have impacted or may impact the project areas in the future, such as upstream landslides, unusually large snowpack, large-scale erosion event, or drought.

- Dates of any recent corrective or maintenance activities conducted since the previous report submission, and specific recommendations for any additional corrective or remedial actions.

4.5 Recommended Maintenance Activities

To meet the project goals and performance standards described above, the project area will require regular maintenance. The maintenance program will begin immediately after construction and installation have been completed and will concentrate on the first few seasons of growth to control invasive and noxious weeds, promote native plant establishment, and ensure all grading/earthwork restoration actions are performing as intended. The maintenance contractor will be responsible for the 5-year maintenance and monitoring period, which will begin after installation of the restoration areas and continue to the end of Year 5. As a guideline, the maintenance contractor is expected to perform maintenance up to four times during the growing season (April, June, August, and October) for the 5-year maintenance and monitoring period (assuming performance standards are met in Year 5). Maintenance may be needed more frequently to perform remedial measures (e.g., weeds management, erosion control, or sediment cleanout). The maintenance contractor will coordinate with the NMISC regularly to determine priority maintenance activities during the different periods of the plan. The primary maintenance obligations are discussed in the following sections.

4.5.1 Maintenance Schedule

Invasive and noxious vegetation management and treatment inspections will be conducted by the maintenance contractor as needed every April, June, August, and October. Recommendations for maintenance efforts will be based upon site inspections, which will occur during the growing season as needed every March, May, July, and September.

4.5.2 Responsible Parties

The NMISC or its designee will be responsible for short-term (Years 1–5) monitoring and maintenance, as well as long-term maintenance. The NMISC is actively working with other partners such as the MRGCD and City of Albuquerque Open Space Division on options for long-term maintenance agreements and partnerships. Funding amounts for short-term and long-term maintenance activities for Priority I are currently not known. Though not specific to Priority I, the NMISC holds a cooperative agreement with the MRGCD to allocate funds from the Fund A23H2373 Capital Appropriate Project for coordinated water management actions and river channel maintenance and infrastructure projects to aid recovery of listed endangered species and to increase water conveyance to Elephant Butte Reservoir (New Mexico Office of the State Engineer 2024). This fund may be used for short- and long-term monitoring and maintenance.

4.5.3 Channel Maintenance Zones

Channel maintenance zones (CMZs) are critical to maintaining the long-term performance of the constructed restoration features outlined in Sections 2.2 through 2.6. The purpose of CMZs is to maintain the hydrologic function of the restoration features in areas where sediment can accumulate post-construction and restrict the features' ability to convey water and inundate as designed. CMZs include constructed features' inlets/outlets and bankline berms formed along their boundary with the OHWM where sediment is frequently deposited.

Impacts associated with CMZ maintenance are limited to two activity types, sediment excavation and temporary heavy equipment access. Approximately 14.3% of the total restoration excavation area is

anticipated to occur within CMZ areas where sediment may accumulate over time and may require periodic re-excavation to maintain the hydraulic function of the constructed features. An additional 4.4% of the restoration excavation area is anticipated to occur within temporary equipment access areas used to facilitate the CMZ excavation activities. These activities are anticipated to affect a small portion of the overall restoration footprint, while the remaining areas will remain undisturbed and allowed to reestablish through natural processes.

CMZ maintenance is periodic and proposed to occur once during the permit's anticipated 5-year duration. While the need for CMZ maintenance is dependent on the rate of sediment deposition, it is anticipated within this timeframe based on past experiences on the San Acacia Reach (GSA 2023). The proposed vegetation management maintenance activities in Section 4.5.4 will be prioritized in CMZs as a preventative, routine action to discourage vegetation recruitment and sedimentation.

During post-construction monitoring, the NMISC and/or their contractors will perform topographic surveys (see Section 4.3.2.3) to determine where sediment is accumulating within the constructed channels and restricting their functionality. Areas where sediment accumulation is observed to restrict channel conveyance or inundation will be identified and managed as CMZs. CMZs will be managed to limit persistent vegetation establishment that could trap sediment and will require occasional excavation and vegetation removal during maintenance activities. If less than 60% of a feature is inundating as designed, the feature will require maintenance within the CMZs. These areas will be mapped and captured in the monitoring reports. For monitoring that is required for Years 2 through 5, these areas will need no vegetation cover.

CMZ areas will require re-entry of heavy equipment for periodic maintenance; however, disturbance outside of CMZ areas within reestablishing wetlands and riparian areas is not anticipated for routine maintenance. Equipment will remain within the designated CMZ boundaries to avoid unnecessary disturbance to adjacent wetlands and riparian vegetation. CMZs near backwater channel inlets/outlets will remain devoid of woody vegetation and sediment to keep the inlet/outlets open.

Spoil resulting from CMZs will be distributed within adjacent areas on the channel side of the river within the river's OHWM. Spoil placement on the channel side of the river is intended to increase maintenance efficiency while minimizing disturbance by avoiding repeated re-entry of heavy equipment into adjacent wetlands or riparian areas that would be required to deposit spoil outside of the riparian area. Excavated materials are expected to consist primarily of vegetation and river deposits such as sand, gravel, and silt. CMZs will likely be primarily composed of riverine sediments, and minimal organic, fine sediment soils from adjacent wetlands are anticipated to be excavated.

Placement of CMZ spoil along the channel side may affect local sediment storage and routing. The ABQ Reach is experiencing a sediment deficit, with reduced sediment supply, channel incision, bed coarsening, and channel narrowing documented in literature (Ortiz 2003; Brown et al. 2022; Reclamation 2025d). CMZ periodic maintenance is expected to have localized, short-term effects on sediment deposition, vegetation establishment, and turbidity while helping to preserve the hydraulic connectivity and inundation function of constructed restoration features under existing sediment-deficit conditions. Continued post-construction monitoring and topographic surveys would be used to evaluate whether maintenance remains confined to designated CMZ areas and whether any unintended bed lowering or channel adjustment occurs outside those areas (see Section 4.3.2.3).

Placement of spoil material will be conducted in a manner intended to minimize short-term turbidity impacts to the Rio Grande and remain consistent with applicable water quality standards under 20.6.2.4.13.J NMAC. Where appropriate, spoil material may be distributed across multiple elevations within the OHWM to reduce the likelihood that spoil material could be mobilized simultaneously during a single high-flow event. Additional turbidity management measures, such as timing maintenance during

periods of naturally elevated flows or turbidity, may be considered if necessary to minimize potential impacts to aquatic resources.

4.5.4 Nonnative Vegetation Management

All vegetation removal identified as needed based on monitoring triggers (see Section 4.3) will occur in the fall/winter after the breeding bird season has ended, which also corresponds to when the seeds are not present. The following are general recommendations for nonnative plant removal that may be modified as appropriate.

4.5.4.1 NONNATIVE TREES

Woody nonnative trees such as saltcedar, Russian olive, and Siberian elm may reestablish within the restoration sites. Removal or treatment methods could include chemical or mechanical removal. Removal or treatment methods may be modified with approval from the NMISC or its designee. All herbicides used within the excavated habitat should be approved for aquatic use. For dense stands, cut stump may be used whereby the trunks are cut and herbicide is immediately applied to the fresh cut. For sparse stands, foliar spray may be more appropriate and efficient. For both methods, follow-up treatment of resprouts will likely be required. Mechanical removal using heavy equipment followed by repeated herbicidal application to resprouts. Entire trees can be easily removed using a trackhoe with a thumb bucket. Alternatively, the trees can be removed with a root-plow pulled by a bulldozer. This method is most effective when the soil is relatively dry and must be combined with a program of scheduled follow-up sprout treatments such as hand-pulling and/or herbicidal application. The trees can also be removed by using a skid steer or site preparation tractor equipped with a forestry mulching attachment such as a hydro-ax.

All methods will require a staging area to accommodate heavy equipment and associated authorized support vehicles and to accommodate debris bins and haul trucks. Herbicidal application to resprouts may be accomplished by allowing the plants to grow to an appropriate size to allow for the herbicide to be suitably assimilated by the plant.

4.5.4.2 NONNATIVE SHRUBS/NONNATIVE PERENNIAL HERBS

Nonnative shrubs and perennial herbs can be treated with herbicide, and all will require follow-up treatment to prevent resprouting/reinfestation. Plants should be treated after bolting and before the seed is set.

4.5.4.3 NONNATIVE ANNUAL HERBS/GRASSES

Nonnative annual grasses and herbs should be removed by hand or mowed before seeds are set with follow-up spot treatment using hand removal or herbicide. Where possible, the maintenance contractor should take advantage of rain events to encourage germination of the nonnative seed bank and treat (i.e., grow and kill) when able to distinguish between native and nonnative species.

4.6 Adaptive Management Strategy

This adaptive management strategy accounts for unforeseen problems in the implementation, short-term development, and overall success of the project. The NMISC will ensure that personnel responsible for monitoring will be familiar with the restoration design and goals. The most critical time for adaptive management will be during implementation. Correcting problems at this early stage should reduce potential problems during site development. During implementation, the NMISC will monitor to provide

early detection of problems with the proposed site elevations and contours and will adapt the plan as needed with construction crews.

Interim performance standards are crucial to ensuring that restoration performance follows a trajectory to attain final performance success. Although not anticipated, if these interim performance standards are not achieved during annual monitoring, the NMISC will identify appropriate solutions to the problems that require substantial action (Table 4.3). Minor problems, such as trash, vandalism, isolated instances of plant mortality, or small-scale weed or pest infestations, will be rectified as they are discovered during routine site monitoring and maintenance and included in annual reporting.

In some cases when performance standards are not met, a site may be viewed as performing correctly, and performance standards may be determined to have been incorrectly estimated. In these cases, the NMISC may request that the performance standards be modified. If the restoration area has not met the performance criteria, and the criteria are considered accurate and reasonable, the maintenance and monitoring obligations may continue until performance criteria are achieved. The NMISC understands that failure of any significant portion of the restoration area may result in a requirement to replace that portion of the site and/or extend the monitoring and maintenance period until all success standards are met.

Table 4.3. Adaptive Management/Remedial Actions

Performance Standard	Final Year 5 Performance Standards	Trigger	Adaptive Management/Remedial Action
Hydrologic Connectivity			
Inundation occurs at the appropriate design flow	Inundation occurred at least once in Year 5 at appropriate design flow.	The site does not achieve the performance standard in any year.	Additional investigation into why the performance standard is not achieved. Channel maintenance zones may require excavation to reestablish proper design function (Section 4.5.3).
Geomorphology/Topography			
Geomorphology and topography support design function	At least 60% of the feature is inundating as designed.	Less than 60% of any feature is inundating in any year.	Channel maintenance zones will require excavation to reestablish proper design function (Section 4.5.3).
Native Vegetation			
Native woody frequency – all restoration areas but spoil piles	45% of grids have native woody vegetation	The frequency of native woody vegetation is not achieved in any year.	Planting or seeding will be considered in addition to passive revegetation.
Native cover – spoil piles	25% absolute native cover	Native cover is not achieved in any year.	Additional planting or seeding will be considered.
Nonnative Vegetation			
Nonnative woody frequency – all restoration areas but spoil piles	0% or <5% of grids have nonnative woody vegetation (depending on species)	Nonnative woody frequency standards are exceeded in any given year.	Additional maintenance visits focused on vegetation management will be performed.
Nonnative herbaceous frequency – all restoration areas by spoil piles	0% of grids have nonnative herbaceous vegetation	Nonnative herbaceous frequency standards are exceeded in any given year.	Additional maintenance visits focused on vegetation management will be performed.
Absolute cover of nonnative vegetation – spoil piles	<5% absolute cover of nonnative vegetation	Nonnative vegetation cover standards are exceeded in any given year.	Additional maintenance visits focused on vegetation management will be performed.
Absolute cover of noxious weeds – spoil piles	0% absolute cover of noxious weeds	Noxious weed cover standards are exceeded in any given year.	Additional maintenance visits focused on vegetation management will be performed.

5 PROJECT DESIGN FEATURES AND ENVIRONMENTAL COMMITMENTS

The following applicant-committed environmental protection measures have been incorporated into the project design of the Proposed Action to lessen or avoid impacts to resources. These design features are organized below under the resource they are designed to protect, although some of these measures are designed to protect or mitigate impacts to multiple resources. The design features incorporate applicable best management practices, which are industry- or agency-recommended construction methods that are routinely implemented to minimize impacts to resources.

5.1 General and Public Safety

Gen-1: Habitat restoration activities involving flow, elevation, sediment, habitat, surface water, and groundwater management planning have been incorporated into the project engineering design (see Appendix A).

Gen-2: All necessary permits for access points, staging areas, and study sites will be acquired prior to construction activity. The NMISC will facilitate preconstruction review meetings with interested parties and stakeholders, in advance of construction.

Gen-3: All work projects will have a contract in place for the rental of portable restroom facilities, with secondary containment, during the duration of the project.

Gen-4: Each individual operator will be briefed on local environmental considerations specific to the project tasks.

Gen-5: The NMISC and its contractors will have an on-site environmental monitor during all work activities that have the potential for adverse impacts in order to ensure compliance. Also, an environmental monitor will regularly assess other activities to ensure compliance.

Gen-6: The use of chemical herbicides or pesticides may be necessary to control undesirable plant species around stockpile sites and storage yards and also to prevent the spread of invasive species in areas cleared for maintenance activities. The NMISC will follow all state and federal laws and regulations applicable to the application of herbicides, including guidelines described by White (2007).

- Herbicides or pesticides will not be directly applied to or near water unless they are labeled for aquatic use and appropriate buffers (a minimum buffer of 20 feet for spot applications and 100 feet for ground applications) will be observed. Communication with the USFWS would occur prior to any application to sites with threatened or endangered wildlife species, and appropriate buffers (a minimum of 10 feet for spot applications and 90 feet for ground applications) will be observed around all known terrestrial habitats for federally or state-listed species. Reclamation and project partners will follow their agency's herbicide/pesticide guidance, if applicable.

- Herbicides or pesticides may be applied using low-pressure spray rigs mounted to off-highway vehicles, trucks and trailers with spray bars, or backpack sprayers (for spot applications). Treatments will be conducted by trained and approved personnel observing appropriate buffer distances and label directions.
- Herbicides will be applied directly to target plants rather than broadly to large areas whenever possible to avoid harming nearby non-target or native vegetation. The lowest concentration

possible that will still allow for achievement of the desired result will be used. When possible, herbicides will be applied in a mosaic pattern to avoid total loss of vegetation, alternating treated and non-treated sites between years.

- Treatment will not take place when winds exceed 10 miles per hour or when rain is forecasted for the local area within 48 hours of application. Care will be taken when mixing or applying any herbicide to avoid runoff onto the ground or into the water. Surfactants may also be added to certain herbicides to maximize herbicide/pesticide performance and minimize retreatments.
- Herbicides will be applied no later than 2 months before normal spring runoff and high-water tables are anticipated in the project area, and project partners will wait until streamflow is back below normal bankfull stage to consider applying herbicides in the late summer or fall.
- Herbicides will not be applied to vegetation that is being used by birds for nesting.

Gen-7: All project spoil and waste will be either disposed of off-site at approved locations or will be used on-site as appropriate to the project purpose, consistent with applicable environmental requirements.

Gen-8: Select restoration sites will be monitored for up to 15 years following initial construction to determine the effectiveness of the methods implemented and identify project-related hydrologic and geomorphic alterations. The monitoring will consist of biological, vegetation, geomorphic, and hydrologic monitoring, as appropriate to the project design and purpose.

Gen-9: Project activities will be scheduled to avoid times of predictable flooding to avoid working in high water (seasonal monsoons, snowmelt, or releases from dams).

Public-1: The public will be notified of project construction through informational fliers, signs posted in the area, letters to nearby residences, and/or posts to the NMISC's website.

Public-2: Temporary signage and site protection from public use, press releases, and online public notices will be used to notify the public of project area closures during construction.

Public-3: Unauthorized encampments that are in areas that could harm individuals or construction workers will be reported to the authorities for removal prior to work.

Public-4: All waste material associated with the project will be disposed of properly and not placed in identified floodway or wetland areas or in habitats for species listed under the ESA.

Public-5: To minimize noise disturbance impacts, implementation activities will be limited to the hours of 7 a.m. to 6 p.m., and all equipment and machinery used will meet all applicable local, state, and federal noise control regulations.

Public-6: All Occupational Safety and Health Administration and local municipality noise control ordinance requirements will be adhered to.

Restore-1: A comprehensive restoration plan(s) for each priority group will be developed prior to construction to meet permitting and compliance (CWA Section 404 and ESA) requirements for proposed habitat restoration project areas. This restoration plan is the basis of future plans for Priority Areas 2 through 5. Details on LWD placement, nonnative vegetation treatment, jetty jack removal, pedestrian access trail closure, and spoil will be captured within the implementation phase restoration plan and coordinated with the proper agency prior to construction. The restoration plan will provide a single document that contains performance standards, the monitoring methods, recommended maintenance, and adaptive management processes that can be implemented.

5.2 Wildlife and Special-Status Species

Bat-1: Light sources powered by batteries or cyalume glow sticks will be used when possible if artificial lighting is required. If the use of permanent outdoor lights cannot be avoided, all outdoor lighting will be designed in accordance with the New Mexico Night Sky Protection Act, which requires that outdoor lighting be fitted with shielding that directs light downward, rather than upward or laterally, to prevent sky glow and associated impacts to bats.

Bat-2: The Proposed Action will avoid surface disturbance near potential roost sites such as caves, mines, bridges, or other human-made structures especially from April through July. Roosting or hibernating bats will not be contacted or disturbed. Dead or injured bats will be reported to the New Mexico Environmental Department to facilitate contact with other appropriate personnel.

Bird-1: The Proposed Action will minimize impacts to birds protected by the MBTA (16 United States Code [USC] 703), including the federally listed endangered SWFL and the threatened YBCU, by conducting work activities outside the normal breeding and nesting season (April 15–September 1 for work in suitable SWFL or YBCU habitat).

- If reseeding or revegetation occurs, it may be accomplished by hand or by mechanized means. Planting via mechanized means includes using a handheld or tractor-mounted auger. If mechanized means are used for either reseeding or replanting in the April 15 to September 30 time frame, migratory nesting bird surveys will be conducted within 2 weeks prior to the work to determine if any breeding birds are present.

Bird-2: The Proposed Action will minimize impacts to the federally listed endangered SWFL and the threatened YBCU by working with agency partners to assess and monitor restoration activities and habitat suitability.

Bird -3: The Proposed Action will maintain compliance with BGEPA and MBTA, by conducting preconstruction surveys and pre-maintenance activity surveys for all migratory birds and raptors and to adhere to nest avoidance for all birds, including raptors and eagles, if project activities were to occur during MBTA and raptor nesting and breeding season (March–September).

- Per the BGEPA, all project activities would occur at least 660 feet away from any known bald eagle nest and 1 mile from any golden eagle nest within the project footprint.

- The Proposed Action would minimize impacts to raptors (including eagles) by avoiding large mature trees that support perching habitat during construction activities when feasible.

Fish-1: Any active RGSM monitoring and compliance during construction and maintenance activities will be submitted within a Letter of Delegation that will include a List of Authorized Individuals as qualified and permitted individuals, per USFWS, as a compliance action in accordance with the 2016 BO (USFWS 2016).

Fish-2: To allow fish time to leave the area before in-water work begins, equipment will initially enter the water slowly. In-water work will be fairly continuous during work days so that fish are less likely to return to the area once work has begun**.**

Fish-3: The NMISC will excavate an active bankline work area as few times as possible to minimize disturbance of sediment. When excavating along the wetted river channel, the following practices will be used to minimize disturbance of sediment:

- Minimize movement of excavator tracks
- Minimize excavator bucket contact with the riverbed when not excavating

Fish-4: Whenever possible, airboats will be operated through the center of the channel to minimize disturbance to aquatic species, including RGSM.

Fish-5: The NMISC and/or its contractors will monitor flows for 2 years following the construction of side channels and, if flows at the nearest gage exceed the target inundation flows, will monitor the side channel for RGSM entrapment in accordance with the appropriate protocol. After 2 years, it may be determined in coordination with USFWS that further monitoring is unnecessary.

Fish-6: If water is needed for dust abatement or to facilitate road grading, water may be pumped from the Rio Grande, irrigation drains, sumps, or secondary channels adjacent to the river. During irrigation season (March 1–October 31), water will not be pumped from the river but will be pumped from the irrigation drains if possible. Outside the irrigation season, an amount not to exceed 5% of river flows at the time of pumping may be drawn from the Rio Grande. Pumping is short duration (minutes) for filling whatever water transport equipment is used. Sumps or secondary channels adjacent to the river will be used whenever feasible. Pump intake pipes will use a 0.25-inch mesh screen at the opening of the intake hose to minimize entrainment of aquatic organisms.

Fish-7: The Proposed Action will minimize impacts to RGSM at restricted life stages (eggs and larvae) and their habitat by conducting work activities outside the spawning spring flows from May through June.

Fish-8: A fish exclusion zone will be established along the perimeter of the wetted river channel, adjacent to the active bankline construction zone to exclude fish from active work areas and thus avoid trapping, injuring, or causing mortality to RGSM or any other fish. Any fish within the exclusion zone will be removed immediately following installation. The exclusion zone will be installed approximately 10 feet into the river.

- Fish sampling will occur when the fish exclusion zone is established, relocating fish outside the zone, and then any time the exclusion zone is disturbed or breached during construction activities. This process will be repeated at each active bankline construction zone.

Monarch-1: The Proposed Action will avoid impacts to the monarch butterfly, a federally proposed threatened species, by conducting vegetation removal activities outside the normal breeding and migratory season in New Mexico (March 1–November 30) to the greatest extent practicable.

- If work is necessary between March 1 and November 30, suitable/occupied stands of milkweed will be avoided during the construction activities as much as possible. Coordination and consultation with the USFWS will occur prior to such work activities.
- The NMISC will conduct surveys to determine the presence of breeding monarchs before removal of any milkweed during March 1 through November 30. The NMISC and Reclamation will coordinate monitoring and work activities with the USFWS, as appropriate, if eggs, caterpillars, or monarchs are found.
- Stands of milkweed occupied by monarch butterflies within the project area will be fully avoided by construction activities within a 10-foot buffer erected with flagging and stakes. This avoidance area will be maintained either for the duration of construction or until all monarch eggs and caterpillars have developed into monarch butterflies and voluntarily left the stand of milkweed.
- The post-construction vegetation plan, including any potential revegetation actions of the project area, will be incorporated into the Restoration Plan (Restore-1). Vegetation actions will be

coordinated with the City of Albuquerque Open Space Division, the Village of Corrales, and the MRGCD. See Restore-1 above for additional information.

- The Restoration Plan (Restore-1) will be developed and detail the vegetation plan. If reseeding or revegetation occurs, it may be accomplished by hand or by mechanized means. Planting via mechanized means includes using a handheld or tractor-mounted auger. If mechanized means are used for either reseeding or replanting in the April 15 to August 15 time frame, migratory nesting bird surveys will be conducted within 2 weeks prior to the work to determine if any breeding birds are present. If birds are detected, the NMISC will coordinate with Reclamation and the USFWS to determine appropriate next steps.
- Native milkweed seeds and plants will be included in the revegetation plans to improve monarch butterfly habitat.

Mouse-1: The Proposed Action will avoid impacts to NMMJM by not conducting work activities from August 15 to October 31 if suitable NMMJM habitat is found during habitat surveys conducted prior to work.

- NMMJM habitat surveys will occur in early summer (June or July) or when vegetation that characterizes NMMJM habitat is most likely to be at its peak growth. If suitable NMMJM habitat is found, the NMISC will coordinate with Reclamation and the USFWS prior to work.
- Road maintenance such as grading and washout repair may be performed throughout the year to maintain safe access to and from the river, but vegetation control will not occur between April 15 and August 15 (or September 1 for work in suitable cuckoo habitat), as per Bird-1 above.

General Wildlife-1: To allow time for slower moving wildlife species (such as turtles, or other amphibians and reptiles) to exit the area, the construction contractor will be instructed to visually scan areas of ground disturbance prior to usage of heavy equipment, to allow for wildlife to move. If these species are observed and unable to move, they would be safely relocated to a nearby area.

5.3 Soils, Water, and Vegetation Resources

Soil-1: Off-road use of wheeled equipment will occur only when soils are not saturated to minimize soil compaction, soil displacement, and rutting and erosion. Equipment will be operated in an area as small as possible to minimize the disturbance of sediments. When operating equipment within the wetted channel, the following practices will be used to minimize the disturbance of sediments:

- Minimize movement of equipment
- Minimize contact with the riverbed when not operating equipment

Soil-2: Vehicles and equipment will be pressure-washed and/or steam-cleaned of soil and debris capable of transporting weed seed prior to beginning work in the bosque to prevent the spread of noxious weeds and to remove contaminants.

Soil-3: Excavated material will be stored in designated and approved spoil areas that were sited within upland locations to prevent sediment from entering the Rio Grande.

Soil-4: Sediment placement and quantity will be approved by the USACE.

Soil-5: Designated construction ingress, egress, and access road(s) will be outfitted with rock pads or similar design features to reduce tracking sediment off-site.

Soil-6: If erosion control blankets are used post-construction, the blanket edges will be buried or blankets without fused mesh corners (e.g., use woven mesh) will be used to reduce the chances of unintentional wildlife entanglement. The erosion control blankets will be inspected regularly after applying them to identify and release any wildlife that does become entangled.

Soil-7: Bare ground and the disturbance to bare ground will be minimized as much as possible to reduce erosion and control run-off of sediments.

Water-1: The NMISC will comply with all the requirements of the CWA and permits associated with the project, including reporting to the appropriate authorities as needed, and will not begin work until all required permits are obtained.

Water-2: The NMISC will comply with the requirements of Section 402 of the CWA and will obtain permits from the EPA for construction stormwater discharges.

- The NMISC will ensure the construction contractor develops and implements a stormwater pollution prevention plan and complies with the U.S. Environmental Protection Agency's (EPA's) construction general permit for compliance with CWA Section 402, National Pollutant Discharge Elimination System (NPDES) Stormwater Program.
- Appropriate erosion controls, such as silt fences or straw wattles, will be installed and maintained within and around the restoration project site, including all new and modified access roads, staging areas, and spoil piles, to manage stormwater runoff in accordance with the Stormwater Pollution Prevention Plan and construction general permit requirements.

Water-3: The NMISC will obtain the necessary CWA Sections 404/401 permits prior to construction and will comply with the requirements of the permits, including required reporting to the USACE and appropriate authorities as needed.

Water-4: Minimize impact of hydrocarbons: To minimize the potential for spills into or contamination of aquatic habitat:

- Complete a written log of inspections and maintenance throughout the project period.
- Hydraulic lines will be checked for leaks each morning and periodically throughout each workday. Any leaky or damaged hydraulic hoses will be replaced. Leaking equipment will not be used in or near surface water(s).
- If heavy equipment must be operated in flowing water, biodegradable hydraulic fluid will be used.
- All fueling will take place at least 100 feet from surface water and outside the active floodplain, where possible. All fueling will occur with a spill kit ready. If amphibious excavators are used, fueling will occur at the Rio Grande using airboats equipped with lined fuel containment. Whenever possible, airboats will be operated through the center of the channel to minimize disturbance to aquatic species, including RGSM.
- Fuel, oil, hydraulic fluid, lubricants, and other petrochemicals will be stored outside of the 100-year floodplain within a secondary containment system capable of containing twice the volume of the product.
- All equipment will undergo high-pressure spray cleaning and inspection off-site prior to initial operation in the project area.

- Equipment will be parked on predetermined locations on high ground away from the river overnight and on weekends and holidays. Equipment will not be parked or stored within a stream channel, floodplain, or wetland.
- Spill protection kits will be on-site, and operators will be trained in the correct deployment of the kits. Spills will be reported immediately to the NMED as required by the New Mexico Water Quality Control Commission Regulations.
- External hydraulic lines will be composed of braided steel covered with rubber. When there is an increased risk of puncture, such as during mastication while removing vegetation, external hydraulic lines will be covered with additional puncture-resistant material, such as steel-mesh guards or Kevlar, to offer additional protection.

Water-5: The NMISC and its contractors will visually monitor for water quality in the areas below the areas of river work before and during the workday. Water quality will be monitored during construction and after equipment operates in the river channel. Monitoring will include visual observations and may include direct sampling, as appropriate.

- If direct sampling is needed, water quality parameters to be tested include pH, temperature, dissolved oxygen, and turbidity. Parameters will be measured both upstream and downstream of the work area.
- Responses to changes in water-quality measures exceeding the applicable standards would include reporting the measurements to the NMED SWQB and moving construction activities away from the shore.

Water-6: Equipment will be removed from the channel in the event of high storm surges. Heavy equipment will be operated from the streambank or work platforms to avoid operating heavy equipment in flowing water whenever possible.

Water-7: Delineations of both state and federally jurisdictional wetlands will take place ahead of priority package design reviews, and wetland avoidance will be considered during the design phase. Impacts to wetlands will be minimized by using wetland mats, swamp mats, wooden mats, wide tires, tracks, or geotextile instead of road grading where possible, and soil ripping techniques will be used sparingly in wetlands when feasible. Work in wetlands will be avoided when soils are too saturated to support heavy machinery.

Water-8: Stream and wetland crossings will be limited to a single, narrow location that is perpendicular to the stream (or along a contour of a wetland).

Water-9: Flowing water that is diverted around the work area will remain within the existing channel and provide for aquatic life movement. Diversions will be non-erodible, such as sandbags, water bladders, concrete barriers, channel bypass pipe, or conveyance lined with geotextile or durable plastic sheeting. Unlined dirt cofferdams and trenches are not acceptable diversion structures.

Water-10: Upland buffers will be established and maintained between upland construction and all surface waters, including streams, arroyos, and wetlands. Silt fences, seed-free straw mulch, hydro-mulch, biodegradable straw wattles, erosion control fabrics, and other techniques will be employed, as appropriate, to protect waters from sedimentation and other pollutants. Temporary stabilization measures, such as silt fences and straw wattles, will be maintained until permanent stabilization is achieved.

Vegetation-1: Impacts to terrestrial and riparian habitats will be minimized by using existing roads whenever possible. In general, equipment operation will take place in the most open area available, and all efforts will be made to minimize damage to native vegetation and wetlands.

Vegetation-2: Vegetation control may consist of mechanical removal, herbicide, or mowing. Herbicides will be used when nonchemical methods are unsuccessful or are not economically feasible.

Vegetation-3: Native vegetation will be avoided to the extent possible. Native vegetation may be finely mulched and scattered selectively across the project area. If used, mulch will not be placed within 2 feet of the drip line of native cottonwood or willow trees and will be scattered at a depth not to exceed 2 inches. Native vegetation may be temporarily stockpiled and used to create dead tree snags or brush piles in the project area upon project completion.

Vegetation-4: Nonnative vegetation that is removed at work sites will be mulched or removed off-site to an approved location.

Vegetation-5: The post-construction vegetation plan, including any potential revegetation actions in the project area, have been incorporated into the Restoration Plan (Restore-1). Vegetation actions will be coordinated with the City of Albuquerque Open Space Division, the Village of Corrales, and the MRGCD, including nonnative weed treatment methods and areas, and native grass seed mixture.

Vegetation-6: Ravennagrass will be targeted for treatment within the proposed habitat restoration project areas, including on islands.

Vegetation-7: Following construction, native seed mixes appropriate for the project area will be utilized in disturbed areas that will be revegetated. All seed mixtures will be certified as weed-free in accordance with the Natural Resources Conservation Service and the Colorado Natural Areas Program seeding guidelines.

Vegetation-8: Areas dominated by mature Rio Grande cottonwood, Goodding's willow trees, or healthy and mature seed-bearing trees would be flagged and avoided during vegetation removal activities.

Vegetation-9: Native plant disturbance will be minimized to the extent possible, and per the stipulation in the Letter of Inclusion received for this project from the USFWS (USFWS 2025a), native plants will be replaced, per the methodologies described in Section 2.9.3, at a 10:1 ratio for healthy plants and a 5:1 ratio for small or unhealthy plants. Invasive species removed will be replaced with native species.

5.4 Air Quality

Air-1: Vehicle speed on levee roads will be limited to 15 miles per hour to minimize dust.

Air-2: If windy conditions exist, excavated sediment may be wetted during spreading and loading.

Air-3: All vehicles involved in implementation will be required to have passed a current New Mexico emissions test and have required emission control equipment.

Air-4: Vehicle and equipment running times will be minimized, and engines will be properly maintained.

Air-5: The NMISC or the construction contractor will obtain a Fugitive Dust Control Construction Permit, and the contractor will comply with the permit requirements to prevent the release of fugitive dust.[

Air-6: Water used in dust suppression shall not contain contaminants in concentrations that exceed surface water or groundwater standards at 20.6.4 NMAC and 20.6.2 NMAC.

5.5 Cultural Resources

Cultural-1: If intact, buried cultural deposits are discovered during project construction activities, the following requirements will apply:

- Upon notification by a recipient of an unexpected discovery, or if it appears that an undertaking has affected a previously unidentified property or affected a known historic property in an unanticipated manner, the NMISC will immediately notify Reclamation and will take the following actions:
    - Stop construction activities in the vicinity of the discovery.
    - Take all reasonable measures to avoid or minimize harm to the property until the NMISC has completed consultation with the State Historic Preservation Office (SHPO), appropriate Tribe(s), and any other consulting parties. Upon notification by the recipient of a discovery, the NMISC must immediately notify Reclamation, the SHPO, appropriate Tribe(s), and other consulting parties that may have an interest in the discovery, previously unidentified property, or unexpected effects, and consult to evaluate the discovery for National Register of Historic Places eligibility and/or the effects of the undertaking on historic properties.

This page intentionally left blank.

6 LITERATURE CITED

Braun, C.L., D.K. Pearson, M.D. Porter, and J.B. Moring. 2015. Physical Characteristics and Fish Assemblage Composition at Site and Mesohabitat Scales over a Range of Streamflows in the Middle Rio Grande, New Mexico, Winter 2011–12, Summer 2012. U.S. Geological Survey Scientific Investigations Report 2015–5025. Available at: https://pubs.usgs.gov/sir/2015/5025/pdf/sir2015-5025.pdf. Accessed May 2026.

Brown, J.E., A.M. Matherne, J.K. Reale, and K.E. Miltenberger. 2022. *Suspended-Sediment Transport and Water Management, Jemez Canyon Dam, New Mexico, 1948-2018*. U.S. Geological Survey Scientific Investigations Report 2022–5081. Reston, Virginia. Available at: https://apps.nationalmap.gov/downloader/#/. Accessed May 2026.

Bureau of Reclamation (Reclamation). 2007. *2007 Geomorphic Summary of the Middle Rio Grande; Velarde to Caballo*. Available at: https://webapps.usgs.gov/mrgescp/documents/Massong%20et%20al_2007_2007%20Geomorphic%20Summary%20of%20the%20MRG%20Velarde%20to%20Caballo.pdf. Accessed May 2026.

———. 2015. *Joint Biological Assessment for Bureau of Reclamation, Bureau of Indian Affairs, and Non-federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico.* August. Available at: www.usbr.gov/uc/albuq/envdocs/ba/MRG/index.html. Accessed May 2026.

———. 2018. Angostura Dam to Montaño Bridge: Geomorphic and Hydraulic Analysis. Albuquerque Area Office, Technical Services Division, Middle Rio Grande Project, NM. August 2018. Available at: www.usbr.gov/uc/envdocs/reports/AngosturaDamtoMontanoBridge-GeomorphicandHydraulicAnalysis.pdf. Accessed May 2026.

———. 2022. Contour_NMISC_1ft.shp, Contour_NMISC_2ft.shp. Shapefiles. Albuquerque, New Mexico: Bureau of Reclamation.

———. 2025a. *Final Programmatic Environmental Assessment for the Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project and Finding of No Significant Impact*. July 2025. Available at: https://www.usbr.gov/uc/DocLibrary/EnvironmentalAssessments/uc-ea-fonsi-middleriograndeangostura-habitatrestorationproject-508-20250700.pdf. Accessed May 2026.

———. 2025b. *Request for Section 106 Consultation for Proposed New Mexico Stream Commission's Albuquerque/Angostura Habitat Restoration Project, Priority-1 Sites in Bernalillo County, New Mexico*. ALB-702. April 30.

———. 2025c. Confirmation of Section 106 Consultation, John Cater.

———. 2025d. *Finding of No Significant Impact and Environmental Assessment for the Corrales River Mile 199 Project: Middle Rio Grande Project, Upper Colorado Basin Region, Albuquerque Area Office*. Prepared by Vernadero Group Inc. Available at: https://usbr.gov/uc/DocLibrary/EnvironmentalAssessments/uc-ea-fonsi-corralesrivermile199project-508-20250700.pdf. Accessed May 2026.

GeoSystems Analysis, Inc. (GSA). 2019. *Standard Operating Procedures for Documenting Presence and Distribution of Native and Non-Native Woody Plant Species at San Acacia Reach Restoration Sites*. Version 1. Technical memorandum. June 5, 2019.

———. 2023. *2022 Annual Monitoring Results and Maintenance Plan for San Acacia Reach Restoration Sites*. Final Report. Prepared for the New Mexico Interstate Stream Commission, Albuquerque, New Mexico. June 2023.

———. 2024a. RavennaDigitiz_InclFieldObs_04262024. Shapefile. Albuquerque, New Mexico: GeoSystems Analysis, Inc.

———. 2024b. Approximate tree density within New Mexico Interstate Stream Commission's Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project. Albuquerque, New Mexico: GeoSystems Analysis, Inc. December 2024.

———. 2025. Albuquerque Habitat Restoration Design Project Update Memo. July 10.

Harvey, M.H. 2022. *Hydrology and Geomorphology of the Middle Rio Grande. Management of Vegetated Islands and Bank-Attached Bars, Workshop, October 4, 2022*. Available at: https://webapps.usgs.gov/mrgescp/documents/2022-Vegetated-Islands-Workshop_Harvey_Hydrology-and-Geomorphology-of-the-MRG-Presentation.pdf. Accessed May 2026.

Muldavin, E., E. Milford, J. Triepke, C. Gonzalez, A. Urbanovsky, G. McCartha, A. Kennedy, Y. Chauvin, J. Smith, J. Leonard, L. Elliot, P. Hanberry, D. Diamond, and A.E. Clark. 2023. New Mexico Riparian Habitat Map (NMRipMap): Version 2.0 Plus. New Mexico Natural Heritage, Museum of Southwestern Biology, University of New Mexico; U.S. Department of Agriculture Forest Service, Southwest Region; Missouri Resource Assessment Partnership, University of Missouri; and U.S. Department of Agriculture Forest Service, Geospatial Technology and Applications Center, Salt Lake City, Utah. Available at: nhnm.unm.edu/riparian/nmripmap. Accessed May 2026.

Middle Rio Grande Endangered Species Collaborative Program. 2024. Hink and Ohmart Vegetation dataset. Adapted from V.C. Hink and R.D. Ohmart. 1984. Middle Rio Grande biological survey. Army Corps of Engineers Contract No. DACW47-81-C-0015. Albuquerque, NM.

Natural Resources Conservation Service. 2024. PLANTS Database. United States Department of Agriculture. Available at: https://plants.usda.gov/. Accessed May 2026.

New Mexico Office of the State Engineer. 2024. State of New Mexico Office of the State Engineer/Interstate Stream Commission Fund A23H2373 Capital Appropriation Project.

Ortiz, R.M. 2003. *Preliminary Geomorphic Assessment of the Bernalillo-Albuquerque Reach: Middle Rio Grande near Albuquerque, New Mexico*. Albuquerque, New Mexico: University of New Mexico, Department of Earth and Planetary Sciences. Available at: https://www.usbr.gov/uc/albuq/envdocs/techreports/geo-techRep/Geomorphology-Corrales/CR-Appdx-B.pdf. Accessed May 2026.

Pease, A.A., J.J. Davis, M.S. Edwards, and T.F. Turner. 2006. Habitat and resource use by larval and juvenile fishes in an arid-land river (Rio Grande, New Mexico). *Freshwater Biology*: 51:3. Available at: https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2427.2005.01506.x. Accessed May 2026.

Porter, M.D., and T.M. Massong. 2004. Habitat fragmentation and modifications affecting distribution of the Rio Grande silvery minnow. In *GIS/Spatial Analyses in Fishery and Aquatic Sciences*, edited by T. Nishida, P.J. Kailola, C.E. Hollingworth, pp. 421-432. Brighton, UK: International Symposium GIS/Spatial Analyses in Fishery and Aquatic Sciences.

Richard, G.A. 2001. Quantification and Prediction of Lateral Channel Adjustments Downstream from Cochiti Dam, Rio Grande, NM. Unpublished Ph.D. dissertation, Department of Civil Engineering, Colorado State University, Fort Collins.

Schmidt, J.C., Everitt, B.L., and G.A. Richard. 2003. Hydrology and Geomorphology of the Rio Grande and Implications for River Rehabilitation. In *Aquatic Fauna of the Northern Chihuahuan Desert*, edited by G.P. Garrett and N.L. Allan, pp. 25-45. Alpine, TX: Annual Symposium of the Desert Fishes Council.

SWCA Environmental Consultants (SWCA). 2010. *Middle Rio Grande Riverine Restoration Phase IIa Construction Summary Report, 1-40/Central Subreach*. Prepared for New Mexico Interstate Stream Commission. Albuquerque, New Mexico: SWCA Environmental Consultants. January 2010.

———. 2023. *Fish Use of Restored Floodplains in the Middle Rio Grande: A Synthesis Report of Fisheries Studies (2016-2021).* Prepared for New Mexico Interstate Stream Commission and Albuquerque-Bernalillo County Water Utility Authority. SWCA Environmental Consultants. November 2023.

———. 2024. *Biological Survey Report for the Priority I Interstate 40 Subreach Sites, New Mexico Interstate Stream Commission's Albuquerque/Angostura Reach Habitat Restoration Project in Bernalillo County, New Mexico*. Albuquerque, New Mexico: SWCA Environmental Consultants. March 2024.

———. 2025. *Aquatic Resources Inventory Report for the Priority I Interstate 40 Subreach Sites, New Mexico Interstate Stream Commission's Albuquerque/Angostura Reach Habitat Restoration Project in Bernalillo County, New Mexico*. Albuquerque, New Mexico: SWCA Environmental Consultants. August 2025.

Tetra Tech. 2004. *Habitat Restoration Plan for the Middle Rio Grande*. Prepared for Middle Rio Grande Endangered Species Act Collaborative Program, Habitat Restoration Subcommittee. Albuquerque, New Mexico: Tetra Tech.

U.S. Army Corps of Engineers (USACE). 2008. *Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources.* Regulatory Guidance Letter No. 08-03. October 10, 2008.

———. 2009. *Updated Authorization for Removal of Jetty Jacks – May 2009*. Albuquerque, New Mexico: U.S. Army Corps of Engineers, Albuquerque District; Bureau of Reclamation – Albuquerque Area Office; Middle Rio Grande Conservancy District.

———. 2021. *Guidelines for Nationwide Permit (NWP) 27, Aquatic Habitat Restoration, Establishment, and Enhancement Activities*. Albuquerque District. Available at: https://www.spa.usace.army.mil/Portals/16/docs/civilworks/regulatory/publicnotices/Nationwide%2027%20SPA%20Guidelines_November2021.pdf?ver=gpeFPSkwi_s0uy6ByfJbUA%3d%3d. Accessed May 2026.

U.S. Fish and Wildlife Service (USFWS). 2003. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Rio Grande Silvery Minnow. *Federal Register* 68(33):8087–8135.

———. 2010. *Rio Grande Silvery Minnow Recovery Plan (Hybognathus amarus): First Revision.* Available at: https://wildlife.dgf.nm.gov/download/rio-grande-silvery-minnow-recovery-plan/?ind=0&filename=Rio-Grande-Silvery-Minnow-Recovery-Plan.pdf&wpdmdl=46109&refresh=6939b9822fa951765390722. Accessed May 2026.

———. 2016. *Final Biological and Conference Opinion for Bureau of Reclamation, Bureau of Indian Affairs, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande, New Mexico*. Consultation Number 02ENNM00-2013-F-0033. December 2. Available at: www.fws.gov/media/final-biological-and-conference-opinion-bureau-reclamation-bureau-indian-affairs-and-non. Accessed May 2026.

———. 2025a. *Response to Notification of Included Project under the Middle Rio Grande Biological and Conference Opinion (02ENNM00-2013-F-0033) for the Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project, New Mexico.* September 12, 2025. New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

———. 2025b. National Wetlands Inventory. U.S. Fish and Wildlife Service Ecological Services. Available at: www.fws.gov/program/national-wetlands-inventory. Accessed May 2026.

Washington State Noxious Weed Control Board. 2025. Ravenna Grass. Available at: https://www.nwcb.wa.gov/weeds/ravenna-grass. Accessed May 2026.

White, J.A. 2007. Recommended Protection Measures for Pesticide Applications in Region 2 of the U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service, April. Available at: https://azdot.gov/sites/default/files/media/2022/10/USFWS-2007-Recommended-Protections-for-Pesticide-Applications-in-Region-2.pdf. Accessed May 2026.

APPENDIX A

Priority I Design Package

This page intentionally left blank.

GeoSystems Analysis, Inc.
Innovative Solutions

July 10, 2025

TO: Grace Haggerty

FROM: Chad McKenna, GeoSystems Analysis, Inc.

RE: Albuquerque Habitat Restoration Design Project Update Memo

In the spring and early summer of 2024, GeoSystems Analysis (GSA) developed conceptual designs and for constructing 80 habitat restoration projects located within the Angostura Reach through Albuquerque, New Mexico. The "study area" spanned a 20.5 river mile (RM) stretch of the Rio Grande between approximately one mile upstream of Alameda Bridge and one-half mile downstream of the Interstate 25 crossing. The design effort and supporting analyses were summarized in a memorandum submitted to New Mexico Interstate Stream Commission (NMISC) on June 25, 2025.

To advance the project towards construction and simplify the initial process of obtaining contractor bids, NMISC and GSA identified 21 "Priority 1" sites located between Campbell Road and Avenida Cesar Chavez Bridge. GSA created a 65% design package for the Priority 1 sites during the fall of 2024. The 65% design package provides greater design detail, increased map scale, survey monuments, cross sectional and longitudinal profiles, and specifies proposed locations for large woody debris for each Priority 1 site compared to design drawings provided for all 80 sites in the draft EA. Beyond those additions, the 65% design package also includes revised spoil locations and access routes in response to agency comments to the draft EA, subsequent site visits and meetings focused on refining spoil and access locations. This memorandum includes language from the July 11 memorandum when still relevant and accurate, plus, revises content to reflect updates and modifications in the 65% design package.

The primary functional objectives for habitat restoration sites identified and designed in this task order include:

- Increase the areal extent of inundated floodplain habitat under moderate discharge levels (1500-3000 cubic feet per second [cfs]) to restore critical shallow-water spawning and rearing habitat for the Rio Grande Silvery Minnow. Increasing the extent of floodplain inundation also benefits breeding Southwestern willow flycatchers by supporting hydric soil conditions necessary to maintain suitable riparian vegetation communities.

- Enhance drainage of potentially trapped water following moderate to high discharge events (3,000–5,000 cfs) to reduce prolonged stagnant conditions, minimize conveyance losses, and prevent the entrapment of larval fish.

- Theoretically, improve the conveyance capacity of the Rio Grande mainstem channel at moderate discharge levels by lowering the surface elevation of islands and midchannel bars to reduce overbank seepage losses and facilitate downstream water delivery for Compact compliance.

- Reduce overall evapotranspiration within a 600-foot-wide corridor, roughly centered on the existing channel, by removing primarily exotic vegetation that has become established within these geomorphic features over the past ten to twenty years. This management approach reduces overall evapotranspiration, potentially increasing downstream flow availability, and supports reestablishment of native riparian vegetation.

- When applicable, improve the hydraulic function of previously constructed habitat restoration sites, primarily via removal of sediment that has accumulated in channel mouths and/or contributed to bankline aggradation, thereby maintaining floodplain connectivity and improving overall site performance.

The following sections of this memorandum describe the approach for deriving GSA's conceptual designs. This memo is intended to supplement the Environmental Analysis report drafted by SWCA.

Field and Desktop Site Assessment

Rapid Site Assessment

Sites were selected using a combined desktop and field analytic approach. As an initial step, GSA biologists completed a rapid site reconnaissance with NMISC staff to evaluate construction potential at sites previously proposed by NMISC and SWCA. This visit focused on identifying potential constructability challenges, prioritizing locations for further evaluation, discussing overall project objectives and potential design components, and locating additional sites for further consideration. The sites visited with NMISC during the rapid site assessment were primarily located within previously constructed habitat restoration sites near Central Avenue in Albuquerque. After further discussion with NMISC, rapid site assessments were performed throughout the entire study area with the primary goal of locating additional sites throughout the city of Albuquerque with potential to meet the forementioned project objectives. The rapid site assessments initially focused on assessing sedimentation trends, vegetation community composition, noxious weed presence/absence, and identifying maintenance needs at previously constructed habitat restoration project sites.

Vegetation Mapping

Tetra Tech recently (2021) mapped woody vegetation communities in Rio Grande floodplain portions of Albuquerque using the Hink and Ohmart (1982, "H&O") mapping convention under a contract with the City of Albuquerque Open Space Division. GSA staff used this dataset (Tetra Tech 2021) to characterize woody vegetation types within floodplain areas; however, this coverage did not include islands within the city. To fill this data gap, GSA staff mapped H&O types on islands during an inflatable watercraft-based field effort. The vegetation maps used for design purposes combine H&O vegetation types from Tetra Tech 2021 and GSA 2024.

GSA also used a combination of remote sensing techniques and field validation to map the current distribution of ravennagrass (*Tripidium ravennae*) on islands, banklines, and recently established point bars throughout the city. Ravennagrass dominated areas were initially digitized on screen by closely reviewing digital orthophotography acquired during March 2022. The ravennagrass mapping was then further refined during multiple field verification efforts.

LiDAR Analysis

Multiple Light Detection and Ranging (LiDAR) derived Digital Elevation Models (DEMs) were used to qualitatively evaluate sedimentation and scour trends throughout the study area. Specifically, LiDAR-derived DEMs from 2010, 2012, 2018, and 2022 were "differenced" to generate multiple "DEMs of Difference" (DoD), allowing for the identification of general spatial trends in floodplain elevation over time. These results were generally used to assess the distribution and volume of sedimentation within different geomorphic

surfaces throughout the study area. GSA also used sedimentation trends within previously constructed habitat restoration sites to prioritize areas for ongoing maintenance and guide design concepts. Formal calculation of the Level of Detection (LoD) is a useful step when DEMs of difference are used to quantify elevation or volumetric change. However, in this analysis, the DoDs were used qualitatively to assess geomorphic trends along the reach (e.g., locations of bar growth or incision). As such, no thresholding or uncertainty masking was applied, and the DoDs were interpreted with an understanding that low-magnitude noise may be present.

The 2022 LiDAR DEM was also used to build a Relative Elevation Model (REM), also sometimes referred to as a Height Above River (HAR) raster. REMs are raster datasets that normalize adjacent floodplain land surface elevations to the measured water surface elevation (WSE) within a channel, or from a hydraulic model predicted WSE, by interpolating a WSE along virtual cross sections that span the entire floodplain and subtracting it from the bare-earth DEM. REMs can be useful to visualize fluvial landforms, floodplain depressions, terraces, and historic spoil areas that may be hard to discern from an aerial image, shaded relief map, or DEM alone. The 2022 LiDAR derived REMs were developed for the entire Albuquerque Reach. Amongst other utilities, this output was used to identify and target existing depressions for placing habitat restoration features to minimize required excavation volumes.

Topographic Field Surveys

GSA staff collected new high resolution topographic data with Hemisphere s321 and s631 Real Time Kinematic (RTK) devices to capture topographic changes that occurred after the 2022 LiDAR were acquired. The RTK surveys focused on portions of sites where recent sediment deposition was observed during the rapid site assessments (e.g. recent levied bankline deposits), and in some cases, throughout freshly deposited sandbars that formed over the past year (typically during spring runoff 2023).

After field data collection, RTK survey points were integrated (or mosaicked) with 2022 LiDAR data to build an updated topographic dataset that would later be used to calculate excavation volumes and produce excavation depth grids as shown in later sections of this memo.

Pre-Design Hydrodynamic Modeling

To support the conceptual designs, GSA subcontracted with the Danish Hydrology Institute (DHI) to construct and run three high-resolution (3 to 5 m) 2-D flood-routing models through the MRG from Alameda Bridge to the Narrows at Elephant Butte. The three models were split into three different geographic extents:

- Reach 1: Extends from north of Albuquerque near Alameda Bridge (river mile 193.5) downstream to Isleta Diversion near Isleta (river mile 169.3).
- Reach 2: Extends from Isleta Diversion Dam near Isleta (river mile 169.3) downstream to San Acacia Diversion Dam (river mile 116.2).
- Reach 3: Extends from San Acacia Diversion Dam (river mile 116.2) downstream to the north end of Elephant Butte Reservoir (river mile 40.3).

Hydrodynamic modeling was conducted using MIKE SHE and its associated model packages (i.e., MIKE 21). MIKE SHE is a fully hydrodynamic, integrated groundwater/surface water modeling tool originally developed by Système Hydrologique Européen (SHE), with additional development and maintenance by DHI. MIKE 21, a 2-D flood routing model, is another modeling tool within the DHI suite.

Simulated time-varying and spatially-varying net gains and losses to the MRG were conveyed from the Albuquerque Reach MIKE SHE model to the MIKE 21 models. The net gains and losses represent gains from baseflow and losses from the atmosphere (i.e. evapotranspiration) and the subsurface (e.g. to the

groundwater). The 2022 LiDAR served as the base topography for the floodplain. Pre-design channel bathymetry in both models was constructed using surveyed cross-section data from U.S. Bureau of Reclamation (USBR) rangelines. The most recent USBR rangeline data from 2014-2022 was prioritized for developing the channel bathymetry. Where recent data was missing, older rangeline data from 2006-2013 were incorporated. Cross-sections between the USBR rangelines were interpolated in MIKEHydro. The in-stream channel DEM was clipped using the left and right bank alignments from the 2022 LiDAR and mosaiced into the floodplain surface to produce a continuous elevation model for hydrodynamic modeling.

Hydraulic outputs from the Reach 1 MIKE 21 model were used to link predicted WSEs at a range of discharges to post-construction elevation targets within each proposed habitat restoration feature. Both models incorporated the inflow hydrograph from the Alameda Bridge from April 15, 2019, to May 15, 2019.

DHI provided GSA with time-varying grids at 1-hour timesteps from the MIKE 21 model in DFSU format. The DFSU's included the following attributes:

- Total water depth (m)
- Horizontal (u) velocity (m/s)
- Vertical (v) velocity (m/s)
- Water surface elevation (m)
- Depth-averaged flow velocity (m/s)

QGIS, a free and open-source geographic information system software, was used in conjunction with DHI's "2D Visualization Driver for QGIS" to export total water depth and water surface elevation grids at specific time stamps. Once the plug in was installed in QGIS, the water depth and WSE grids were fixed to specific timesteps associated with the inflow hydrograph and exported as a GIS-ready raster format and metric units were converted to feet. These M21 water depth and elevation grids were then used to create the habitat restoration design contours and design elevation points.

The exported MIKE 21 grids only provided WSE and depth values for cells predicted to inundate at a specific discharge, so GSA created interpolated raster surfaces covering the entire floodplain with MIKE 21 outputs when flow was near the following discharges: 800 cfs, 1000 cfs, 1500 cfs, 2,000 cfs, and 3,000 cfs. As the modeled hydrograph did not include discharge values as low as 800 cfs, the WSEs at that discharge were extrapolated based on the relationship between discharge and water surface elevation from the other 4 discharge values. The modeled WSE surfaces were used to assign gridded post-construction design elevations tailored to specific target discharges. For each feature, the design ensured a minimum of 0.5 ft of inundation at each target discharge. For example, if a feature was designed to activate at 1,000 cfs, its target elevations were set to 0.5 ft below the modeled WSE at that discharge.

To convert the interpolated WSEs into design elevations, each restoration feature was first divided into polygons based on the target inundation level at each discharge. Then, a dense point grid was generated within all restoration features and spatially joined with the polygon subdivisions, resulting in a point grid with a design discharge assigned to each point. This point grid was used to extract WSE values from all five interpolated rasters. After data cleaning, the attribute table for the point grid included three key fields: design discharge, sampled WSE, and design elevation. The design elevation was calculated by subtracting 0.5 ft from the sampled WSE to ensure a minimum water depth of 0.5 ft at each discharge. The resulting point grid containing design elevation values was used with the Topo to Raster tool in ArcGIS Pro to generate a continuous elevation surface in the footprint of each restoration feature. The feature design elevations were then mosaicked with existing DEMs and bathymetric models to represent the final design surface.

Habitat Restoration Conceptual Designs

GSA's conceptual designs created multiple types of habitat restoration features within 79 total project sites. Design details, including project area map sets displaying habitat restoration features, post-construction contours and elevation grids, site excavation depths, and post-construction longitudinal and cross-sectional profiles are provided in Appendix A. In some cases, the habitat restoration site designs included multiple types of habitat restoration features. In the MRG, and especially in the ABQ Reach, the floodplain is primarily disconnected from the channel during flows less than approximately 3,000 cfs. Thus, most features were designed to entirely inundate at this discharge.

GSA designed a total of five unique habitat restoration features:

1. Bankline modification
2. Flow through channel
3. Backwater
4. Confluence maintenance

Bankline Modification

Areas selected for bankline modification included bank-attached bars that either recently formed (primarily during spring runoff 2023) and/or when topographic data analysis detected recent formation of bankline berms – or aggraded bank-attached bars –immediately adjacent to the active channel. The narrow bankline berms impede low to moderate flows from reaching the floodplain while also trapping water in the floodplain following high runoff events. The bankline modification design involves a combination of overall bankline lowering and building terrace steps targeted to inundate at different discharges. Floodplain terraces are designed to increase inundation at discharges between 1,000 and 2,500 cubic feet per second (cfs). The lowered floodplain terraces would remove bankline levees and would provide additional low-velocity nursery and spawning habitat at relatively low discharges. Lowering and terracing the bank would increase areal extent of spawning and larval rearing habitats at low to moderate average runoff conditions. Bankline modification would occur at thirty-three areas.

Flow-through Channels

Flow-through channels are low-velocity, ephemeral channels that are connected to the main river channel across bars and islands. These channels are normally dry but carry high discharge flows from the main channel, usually during spring snowmelt and summer monsoon events. These channels typically carry water at lower velocities than the main channel and may include mesohabitats suitable for RGSM, such as pools and backwaters.

Modification of an ephemeral flow-through channel would require removing vegetation, most likely along the edges of vegetated islands that are not connected to the bank, and disturbing sediment or soil. The channels would be excavated to a depth that would allow water to flow at moderate discharges (1,500–2,000 cfs). Channels may also be excavated along sediment bars that are now connected to the banks. This type of feature provides habitat for RGSM larval development and refuge for young RGSM. Modification of flow-through channels would be applied to nine areas within four of the five project subreaches.

Backwater Channels

The creation of moderate- to high-flow backwater channels would involve the removal of riverbank and inland vegetation, and the excavation of soils to prescribed depths. Backwater channels with no upstream inlet would be constructed on the bottom of large point bars (at existing low-velocity areas) and islands at a range of elevations that allow for inundation at a range of river flows beginning as low as approximately 800 cfs. Backwater channels would slope slightly, with the downstream end lower in elevation than the upstream end, thereby increasing the amount of RGSM habitat available at a range of river flows.

This technique would be used to increase the amount of low-flow and no-flow habitat areas available to RGSM. The technique is intended to retain drifting RGSM eggs and to provide RGSM rearing habitat and shallow, low-velocity habitats with abundant food supplies for developing RGSM larvae. Forty-one backwater channels would be created.

Inlet Cleanout

Inlet cleanout takes place at the mouth of previously constructed high flow channels that have become plugged with sediment, debris, and vegetation which has reduced inundation at the original design discharge and limiting overall functionality. Excavating the materials that plug the mouth would reconnect tributaries to the river, increasing eddies where adult RGSMs and larvae aggregate and creating egg retention sites. Inlet cleanout would occur at seven areas.

Design Contours

As mentioned previously, GSA developed a spatial method for assigning post-construction elevations based on modeled water surface elevations (WSEs) from the MIKE 21 hydraulic model. WSE rasters were created for key discharges (800 to 3000 cfs), and a dense point grid was used to extract elevation targets that would ensure at least 0.5 ft of inundation at each discharge. These point-based elevations were then turned into continuous surfaces using Topo to Raster and combined with existing DEM and bathymetry layers to produce the final design surface. The final design surface was then used with the Contour tool in ArcGIS Pro to generate design elevation contours for each restoration feature at 0.5 ft intervals.

Excavation Volume Calculations

The final design DEM for the restoration features was further used to calculate excavation volumes for each feature. The LiDAR-derived DEM across the entire reach was updated in several small locations where RTK surveys indicated some change in topography between the LiDAR acquisition in 2022 and the restoration feature design stage in 2024. This updated pre-design DEM was then differenced from the restoration feature design DEM (with the design DEM being subtracted from the pre-design DEM). This resulted in an output raster showing the number of vertical feet of sediment, per pixel, that needs to be removed to match the feature designs. Each pixel of the differenced DEM was in 3ft × 3ft horizontal spatial resolution, or 1 square yard, thus the raster was divided by 3 to convert the vertical resolution to yards, thereby expressing the sediment removal needed in cubic yards. Afterwards, the sum of the differenced DEM was calculated in each restoration feature, resulting in an output of cubic yards of sediment that needs removal from every feature to match the feature designs.

Conceptual Design Package

Results from the final design surfaces, excavation depth rasters, and supporting field visits were used to develop a conceptual design package intended to guide construction of the proposed habitat restoration features. The conceptual design package can be found in Appendix A.

The design package includes overall site maps showing the locations of all restoration features, potential spoil areas, and proposed access roads. These maps provide a broad overview of the site layouts and help inform construction logistics. For each individual restoration site, a set of detailed design maps were developed. These include:

- Post-construction contour and elevation maps based on the final design surfaces;
- Excavation depth maps showing the difference between existing terrain and design elevations;
- Habitat restoration feature maps showing longitudinal profiles, cross-sections, grading benchmarks, and large woody debris locations; and

- A series of pre- and post-construction longitudinal profile and cross-section graphs for each site.

Post-Design Hydraulic Modeling

NMISC staff developed a 2-D HEC-RAS model of the project reach using the same spatial extent as the Reach 1 MIKE 21 models that informed the initial design process (from just north of Alameda Bridge south to Isleta Diversion Dam) to evaluate the proposed design topography. The same bathymetric inputs were used across both modeling platforms, and simulations were run with both pre-construction and post-construction topographies. The 2019 hydrograph used in the MIKE models was also applied in the HEC-RAS model runs. Water depth grids were exported for time steps corresponding to discharges near 1,000, 2,000, and 3,000 cfs and intersected with restoration feature boundaries to calculate the percentage of each feature inundated at each discharge.

Model results indicated that the post-design topography consistently produced greater inundation of restoration features across the entire reach compared to the pre-design condition (Table 1). At lower discharges around 1,000 cfs, some individual features showed slightly reduced inundation in the design model, which may be attributed to differences in modeling environments or minor changes in island topography. Nonetheless, the overall pattern clearly demonstrated improved inundation performance in the design scenario, with especially pronounced differences at discharges of 2,000 cfs and above.

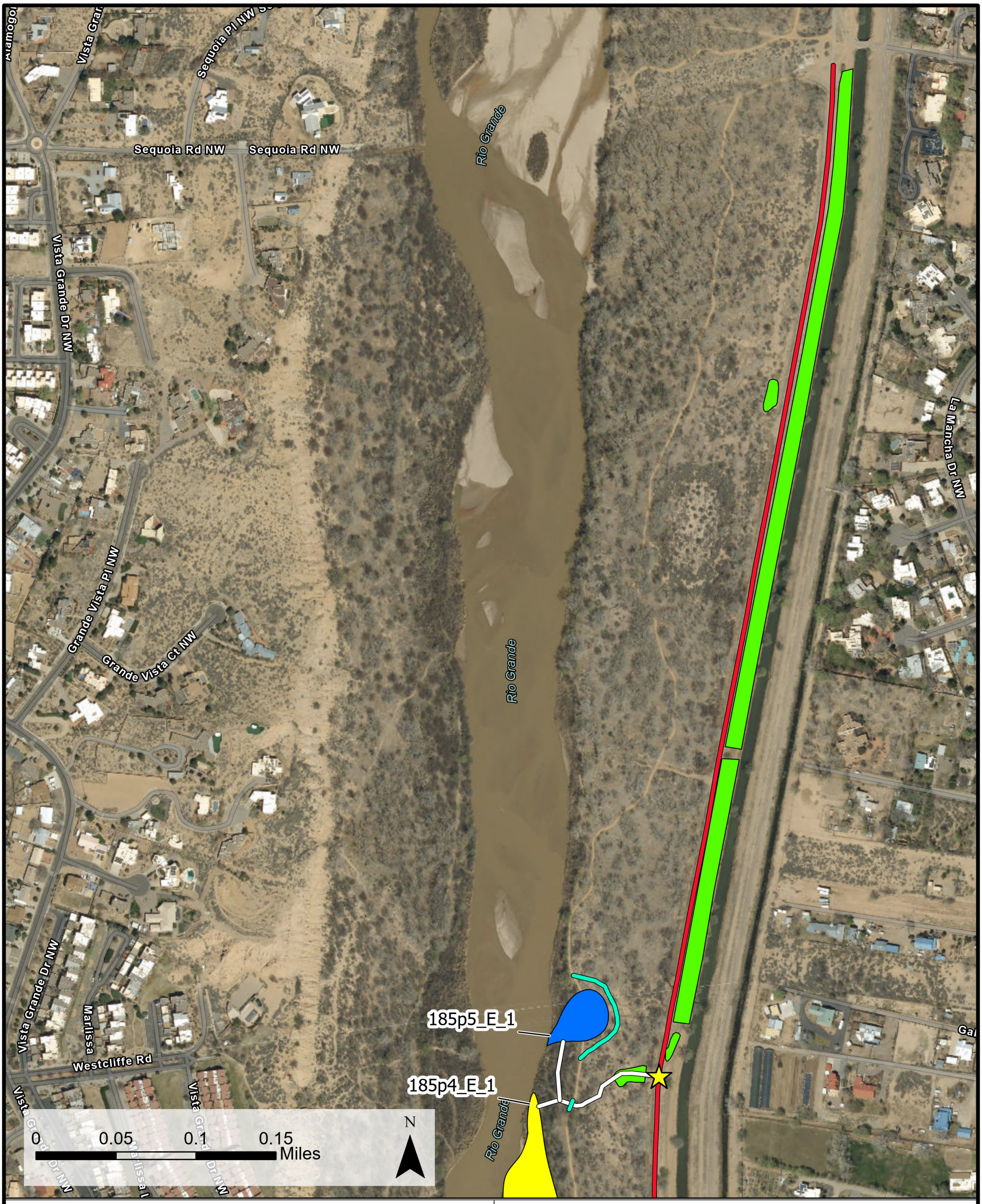
Table 1 - The percentage of each habitat restoration feature inundated at various target discharges as modeled in a 2-D HEC-RAS model.

Feature ID	Feature Type	Approximate Discharge at Alameda Gage					
		1,000 cfs		2,000 cfs		3,000 cfs	
		Model Bathymetry					
		Pre-Design	Design	Pre-Design	Design	Pre-Design	Design
181p7_W_1	Confluence Maintenance	25.3%	39.9%	67.8%	99.4%	84.7%	100.0%
182p0_E_1	Backwater	2.9%	41.4%	55.1%	99.9%	82.9%	100.0%
182p0_E_2	Bankline Modification	10.0%	5.4%	51.7%	73.1%	77.4%	99.1%
182p2_I_1	Island Destabilization	17.4%	35.6%	37.6%	99.9%	82.8%	100.0%
182p3_I_1	Backwater	3.9%	69.2%	77.1%	100.0%	97.2%	100.0%
182p3_W_2	Confluence Maintenance	8.2%	3.8%	42.3%	97.9%	79.9%	99.2%
182p4_I_1	Island Destabilization	19.6%	37.1%	41.5%	86.4%	87.5%	99.9%
182p4_I_2	Backwater	0.0%	8.6%	79.1%	99.7%	97.6%	99.9%
182p5_E_2	Backwater	3.3%	25.5%	70.3%	100.0%	95.6%	100.0%
182p5_I_1	Backwater	29.0%	50.8%	68.6%	100.0%	95.0%	100.0%
182p6_E_1	Backwater	7.5%	34.3%	65.4%	100.0%	89.7%	100.0%
182p7_E_1	Backwater	1.9%	30.2%	62.4%	99.9%	77.8%	99.9%
182p8_E_1	Backwater	3.1%	12.2%	69.2%	100.0%	99.5%	100.0%
182p9_E_1	Bankline Modification	2.6%	17.0%	30.7%	73.8%	73.5%	99.9%
182p9_E_2	Jetty Jack Removal	0.0%	34.0%	57.9%	100.0%	100.0%	100.0%
183p0_W_1	Confluence Maintenance	5.5%	49.6%	84.7%	99.2%	100.0%	100.0%
183p3_W_1	Confluence Maintenance	2.1%	89.9%	11.0%	97.3%	62.4%	98.6%
183p5_I_1	Island Destabilization	27.8%	91.3%	41.4%	100.0%	57.7%	100.0%
183p5_W_2	Confluence Maintenance	8.5%	36.2%	65.9%	99.2%	92.3%	99.5%
183p6_E_1	Bankline Modification	0.5%	0.9%	3.4%	64.3%	20.8%	99.5%
183p7_E_1	Confluence Maintenance	0.0%	80.0%	2.5%	97.1%	40.8%	98.6%
183p7_E_2	Bankline Modification	1.2%	1.8%	2.0%	92.3%	3.7%	99.8%
183p9_E_1	Flowthrough Channel	1.8%	17.6%	12.8%	97.9%	60.5%	99.3%
183p9_W_2	Bankline Modification	0.5%	12.6%	3.9%	55.5%	13.4%	99.5%
184p3_E_1	Bankline Modification	3.2%	6.2%	7.1%	71.3%	37.0%	99.1%
184p5_E_2	Backwater	1.0%	0.2%	2.3%	99.4%	10.4%	99.6%
184p5_I_1	Island Destabilization	44.0%	92.5%	52.5%	100.0%	70.2%	100.0%
184p6_E_1	Backwater	4.1%	<0.1%	17.6%	98.6%	20.0%	99.3%
184p6_E_2	Backwater	1.7%	6.2%	67.1%	99.9%	98.5%	99.9%
184p7_E_1	Bankline Modification	1.2%	16.7%	16.8%	66.2%	81.5%	99.7%
185p1_E_2	Backwater	2.9%	4.5%	14.3%	95.1%	17.7%	98.3%
185p1_I_1	Island Destabilization	5.9%	47.1%	33.8%	91.3%	87.0%	99.9%
185p2_E_1	Backwater	21.7%	8.4%	58.7%	97.9%	88.7%	99.8%
185p4_E_1	Bankline Modification	10.2%	11.2%	54.3%	76.2%	93.0%	98.2%
185p4_E_2	Jetty Jack Removal	0.0%	0.0%	0.0%	0.0%	0.7%	0.1%
185p5_E_1	Backwater	0.5%	33.9%	7.7%	99.6%	40.9%	99.9%
Average Inundation (All Features)		**7.75%**	**30.1%**	**39.9%**	**89.7%**	**67.2%**	**96.9%**

These results suggest that overall, the proposed restoration features function as intended, enhancing

overbank connectivity and habitat inundation at target flows. Importantly, they also provide a level of validation for the novel design methodology used in this project, which relied on interpolated model outputs and gridded elevation targets rather than traditional CAD-based design. The approach's scalability and adaptability allow for efficient refinement of individual features and seamless integration with evolving design criteria, making it a valuable tool for future large-scale habitat restoration efforts. Ultimately, the design improvements achieved through this process are expected to support more frequent and sustained inundation of critical habitat areas, while also contributing to increased conveyance capacity within the mainstem channel—advancing both ecological and hydraulic objectives for the reach.

APPENDIX A. DESIGN PACKAGE MAPS



Legend

- HR Sites
- Crusher Fine Trail Rebuild
- Spoil Area
- New Ramp Location

HR Features

- Backwater
- Bankline Modification

Access Road Type

- Existing Road- No Modification
- Proposed New Road

Title
Site Locations, Access Roads, and Spoil Areas upstream of River Mile 185

Project Name
NMISC ABQ Habitat Restoration

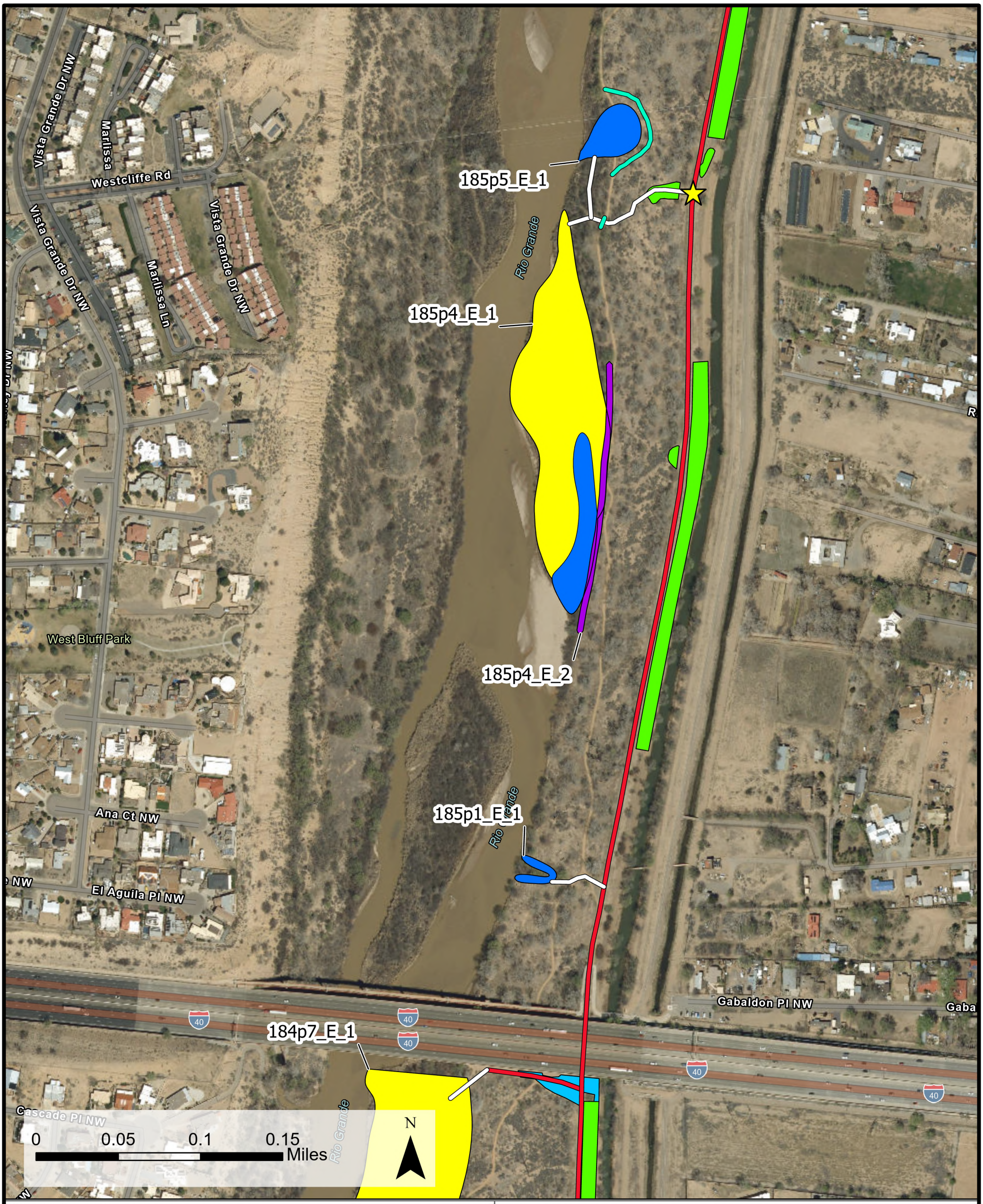
Client Name
New Mexico Interstate Stream Commission

Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

- HR Sites
- Crusher Fine Trail Rebuild
- Spoil Area
- Staging Area
- New Ramp Location

Access Road Type

- Existing Road- No Modification
- Proposed New Road

HR Features

- Backwater
- Bankline Modification
- Jetty Jack Removal

Title
Site Locations, Access Roads, Spoil Areas, and Crusher Fine Trail Rebuild near River Mile 185

Project Name
NMISC ABQ Habitat Restoration

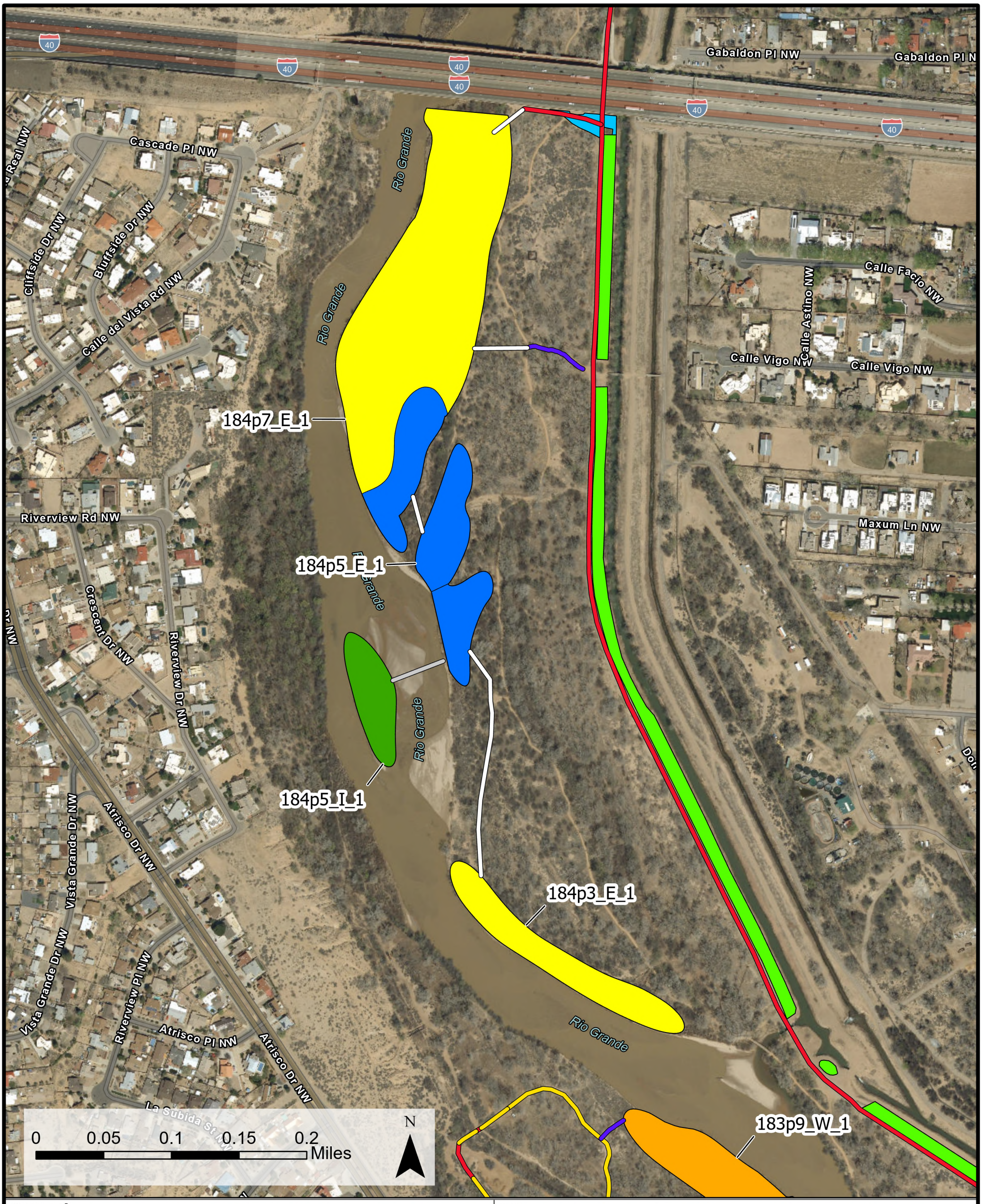
Client Name
New Mexico Interstate Stream Commission

Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

- HR Sites
- Spoil Area
- Staging Area

Access Road Type

- Existing Road- No Modification
- Existing Road- Veg Removal
- Existing Trail- Veg Removal
- Low-Flow Temporary Access
- Proposed New Road

HR Features

- Backwater
- Bankline Modification
- Island Destabilization
- Vegetation Removal

Title
Site Locations, Access Roads, and Spoil Areas near River Mile 184

Project Name
NMISC ABQ Habitat Restoration

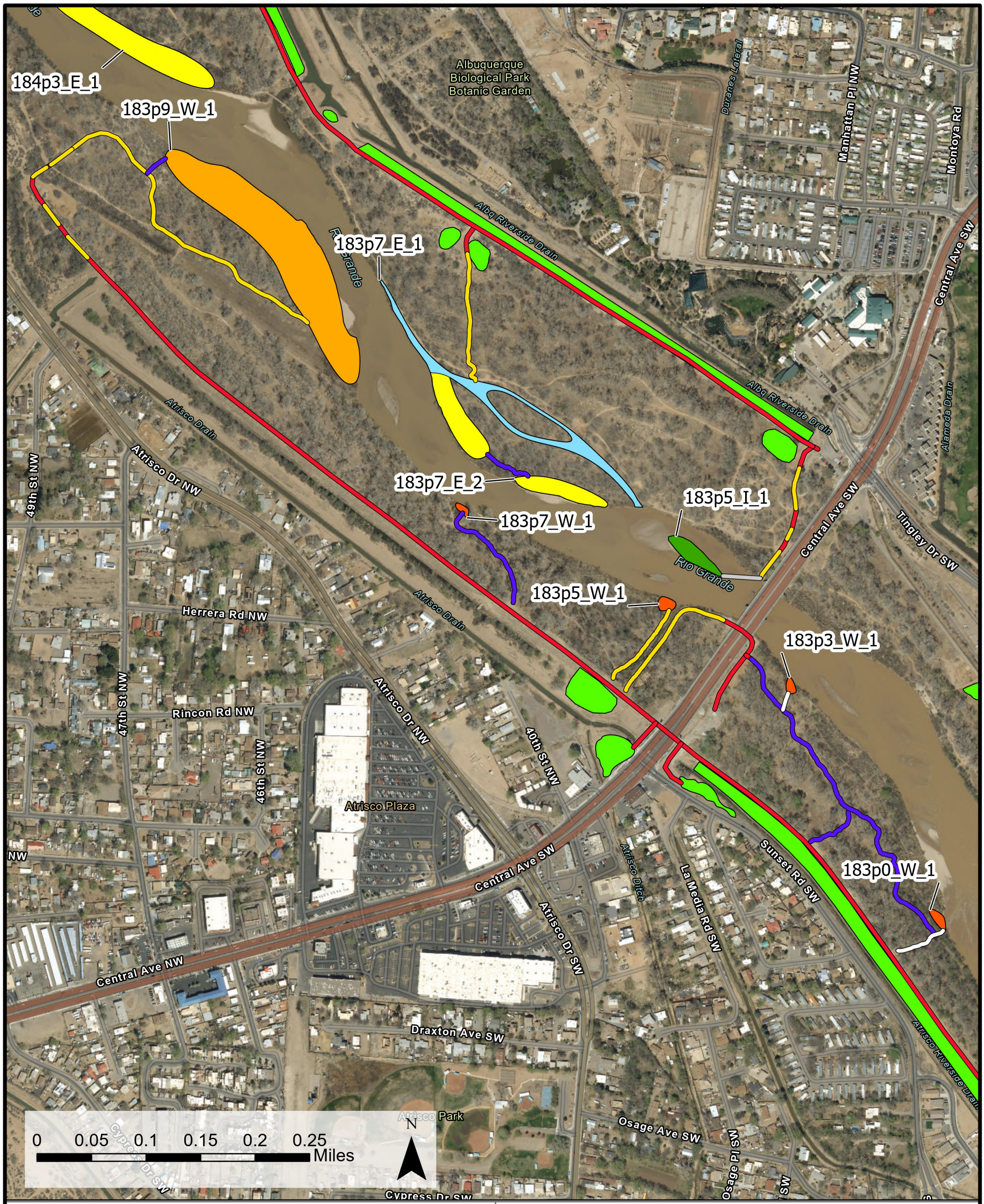
Client Name
New Mexico Interstate Stream Commission

Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

- HR Sites
- Spoil Area

Access Road Type

- Existing Road- No Modification
- Existing Road- Veg Removal
- Existing Trail- Veg Removal
- Low-Flow Temporary Access
- Proposed New Road

HR Features

- Bankline Modification
- Flowthrough Channel
- Island Destabilization
- Mouth Cleanout
- Vegetation Removal

Title

Site Locations, Access Roads, and Spoil Areas near River Mile 183

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

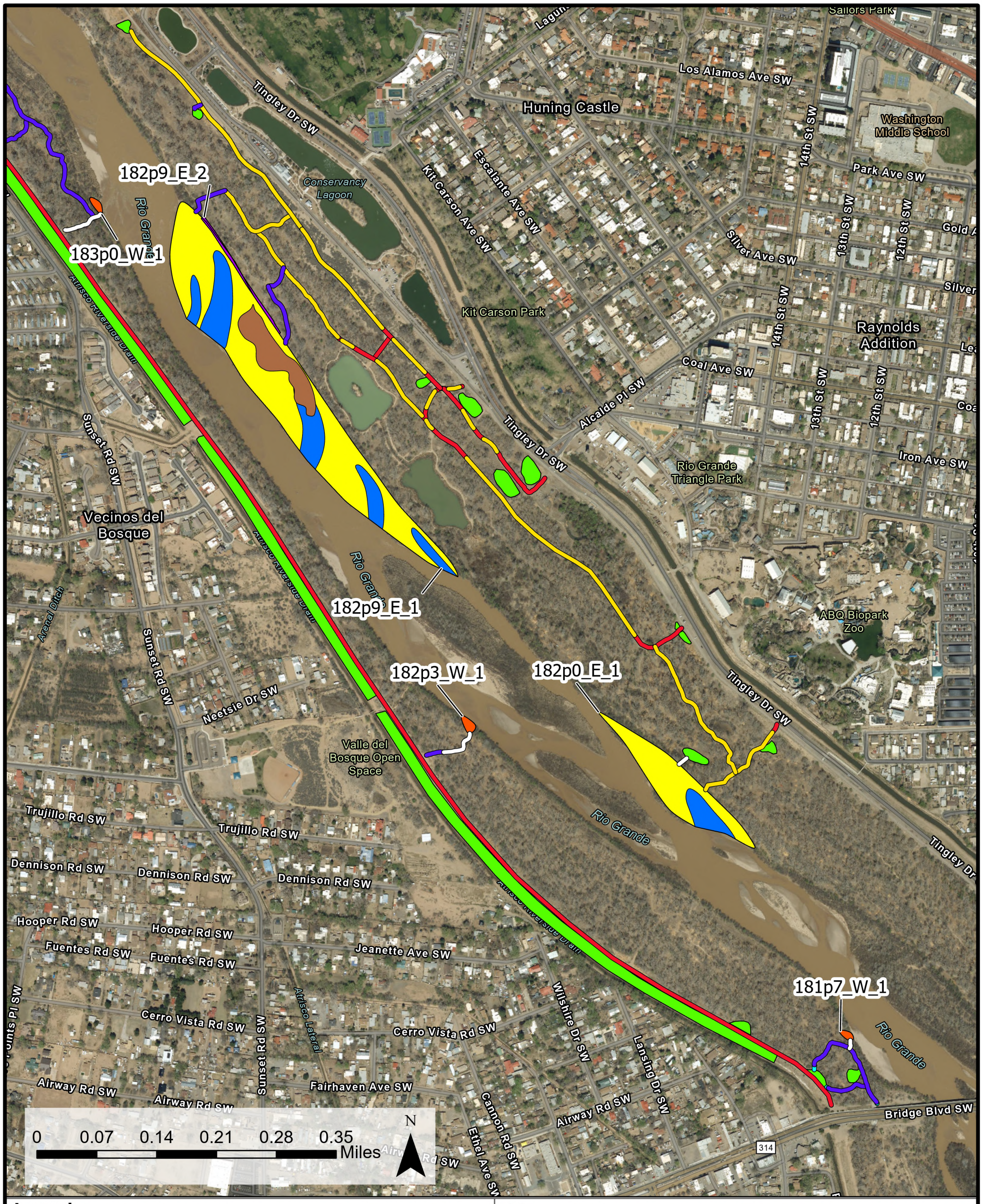
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

- HR Sites
- Spoil Area

Access Road Type

- Existing Road- No Modification
- Existing Road- Veg Removal
- Existing Trail- No Modification
- Existing Trail- Veg Removal
- Proposed New Road

HR Features

- Backwater
- Bankline Modification
- Jetty Jack Removal
- Mouth Cleanout
- Cottonwood Preservation

Title

Site Locations, Access Roads, Spoil Areas, and Cottonwood Preservation near River Mile 182

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

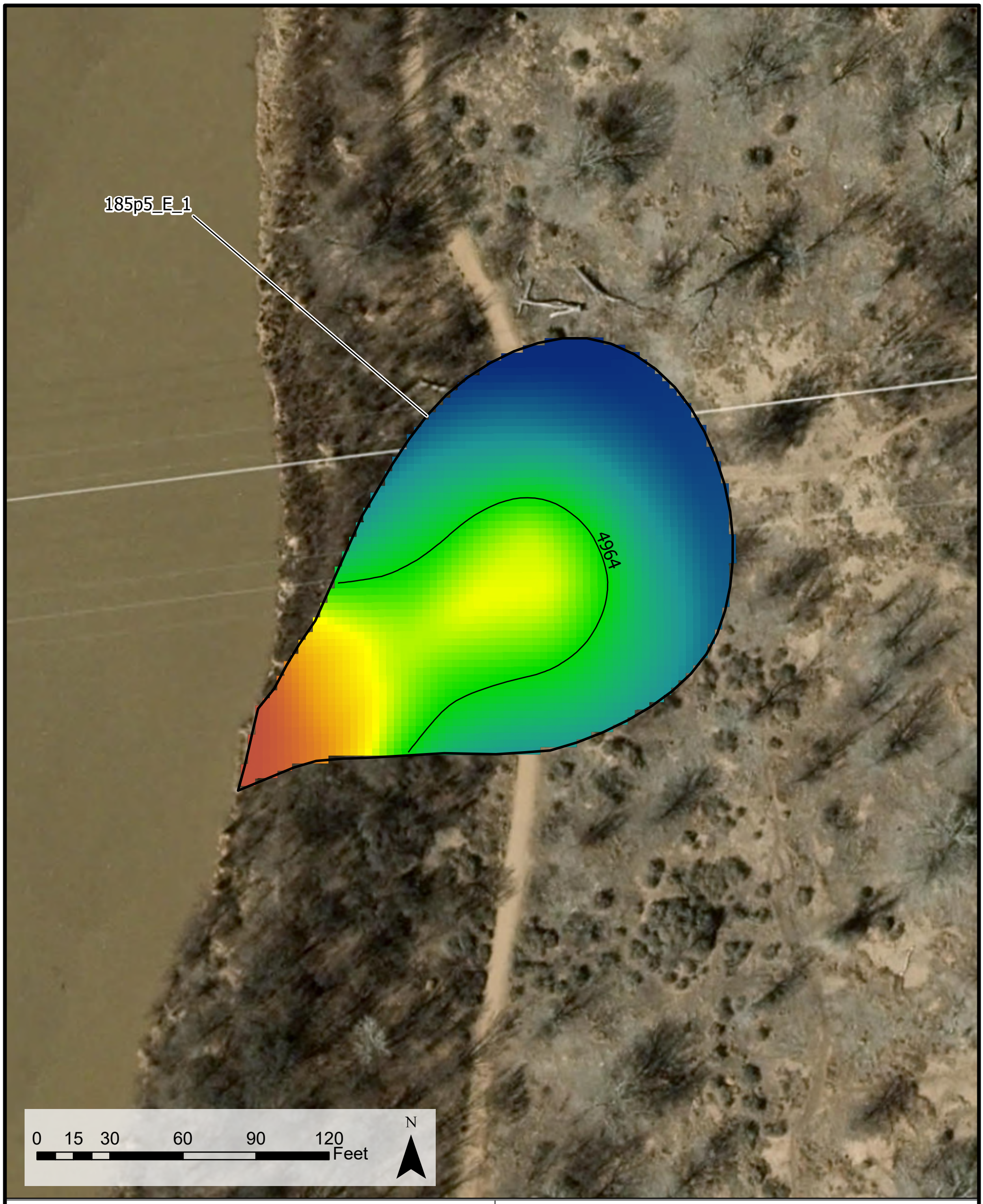
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc. *Innovative Solutions*



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4964.25

4963.6

Title

Site 185p5_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

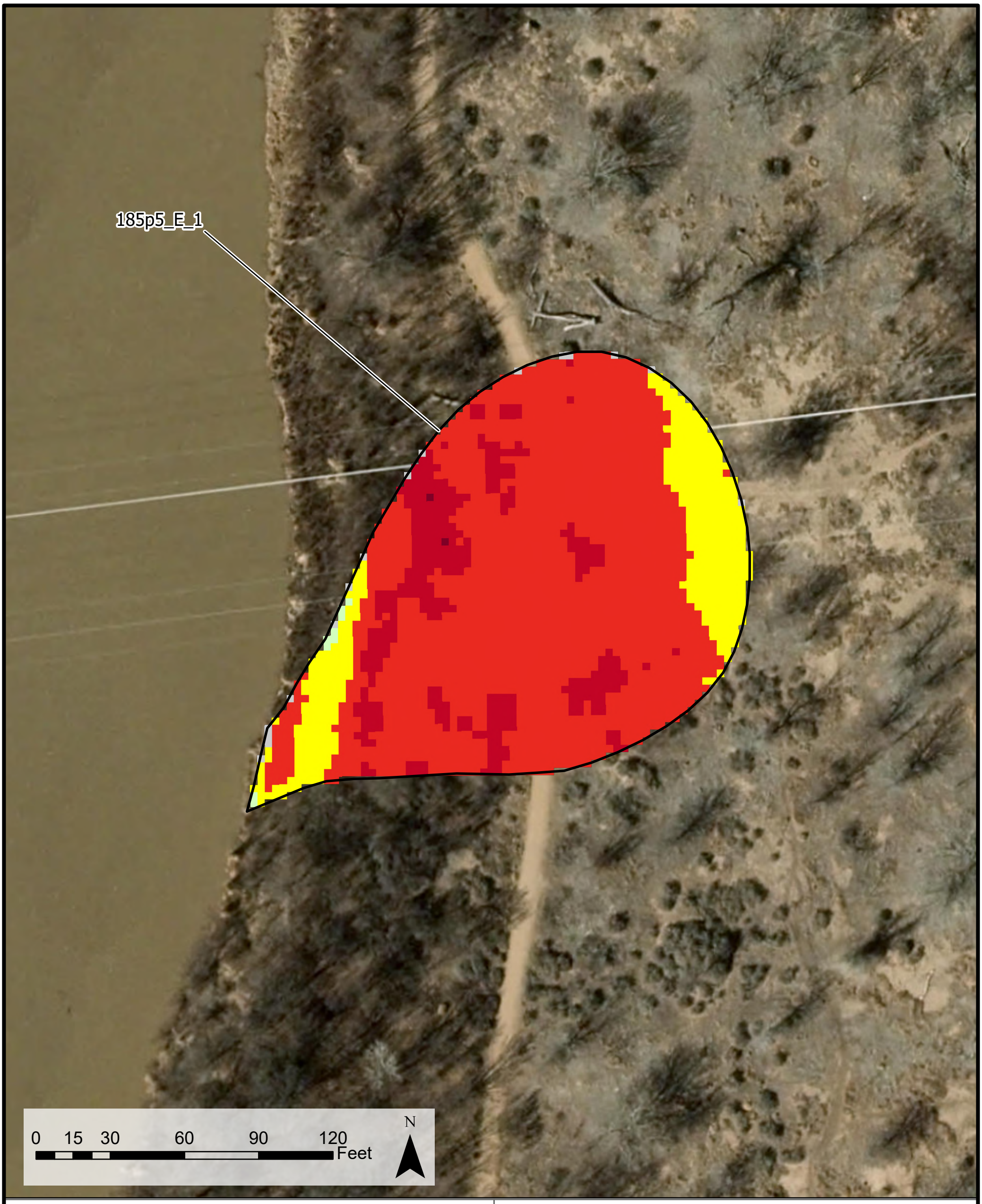
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-3.7

Title
Site 185p5_E_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

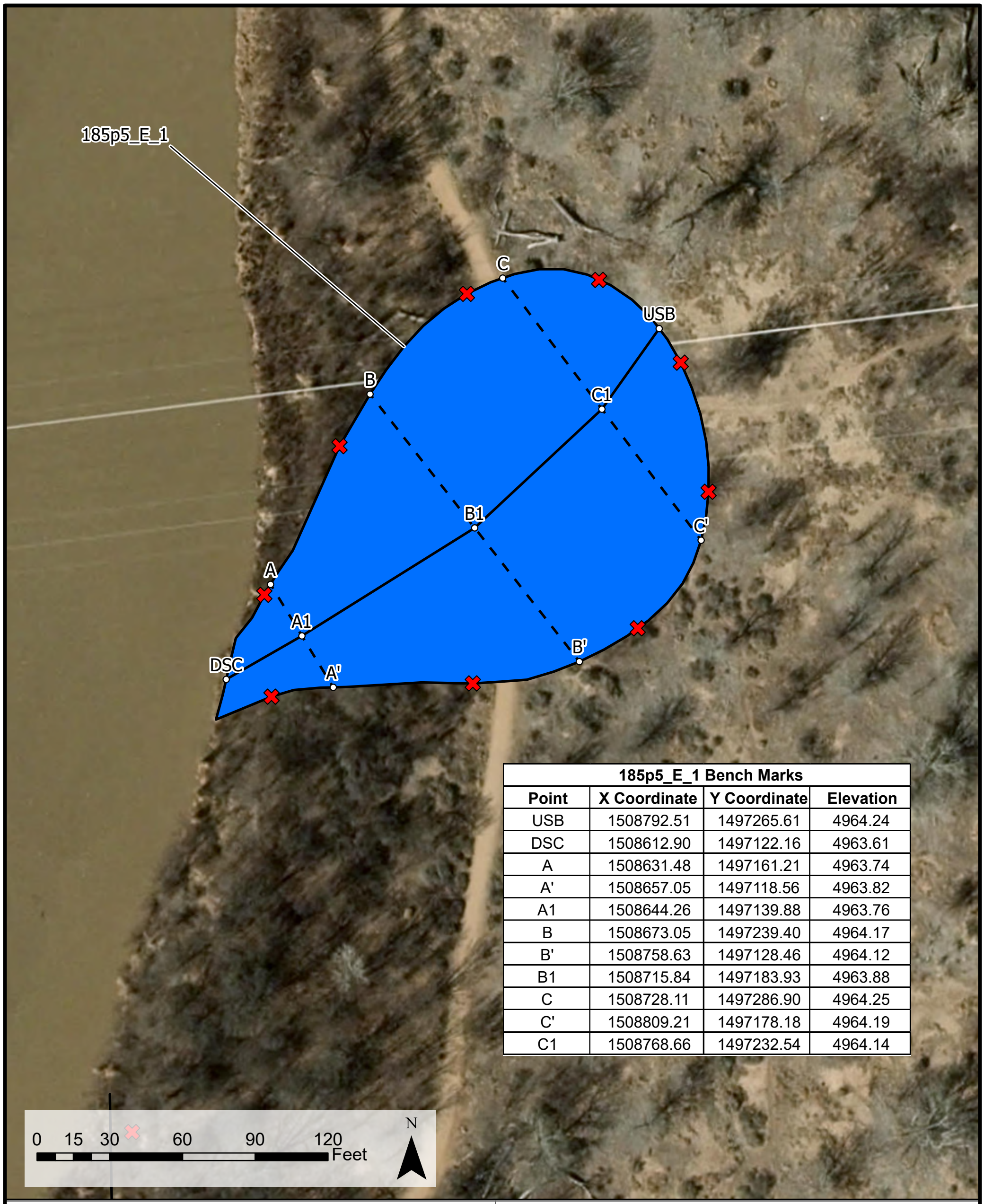
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



185p5_E_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1508792.51	1497265.61	4964.24
DSC	1508612.90	1497122.16	4963.61
A	1508631.48	1497161.21	4963.74
A'	1508657.05	1497118.56	4963.82
A1	1508644.26	1497139.88	4963.76
B	1508673.05	1497239.40	4964.17
B'	1508758.63	1497128.46	4964.12
B1	1508715.84	1497183.93	4963.88
C	1508728.11	1497286.90	4964.25
C'	1508809.21	1497178.18	4964.19
C1	1508768.66	1497232.54	4964.14

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Backwater

Title

Site 185p5_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

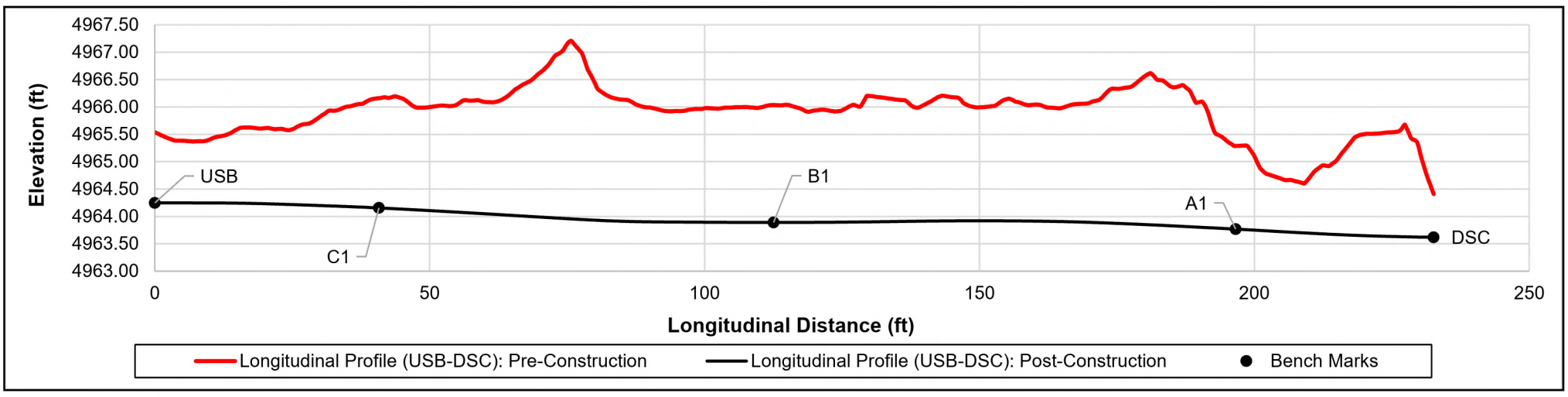
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

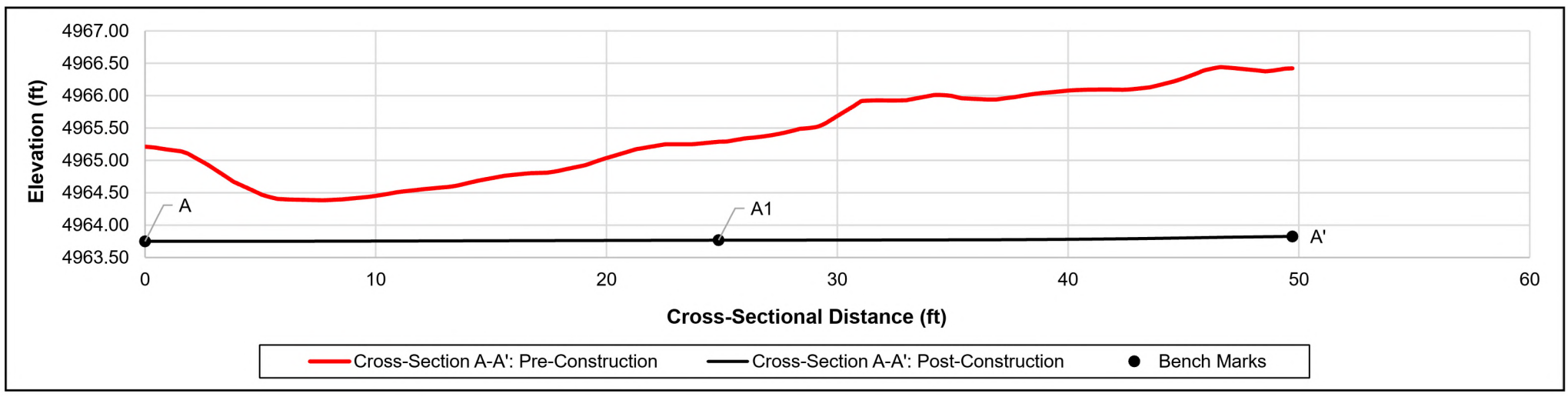
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

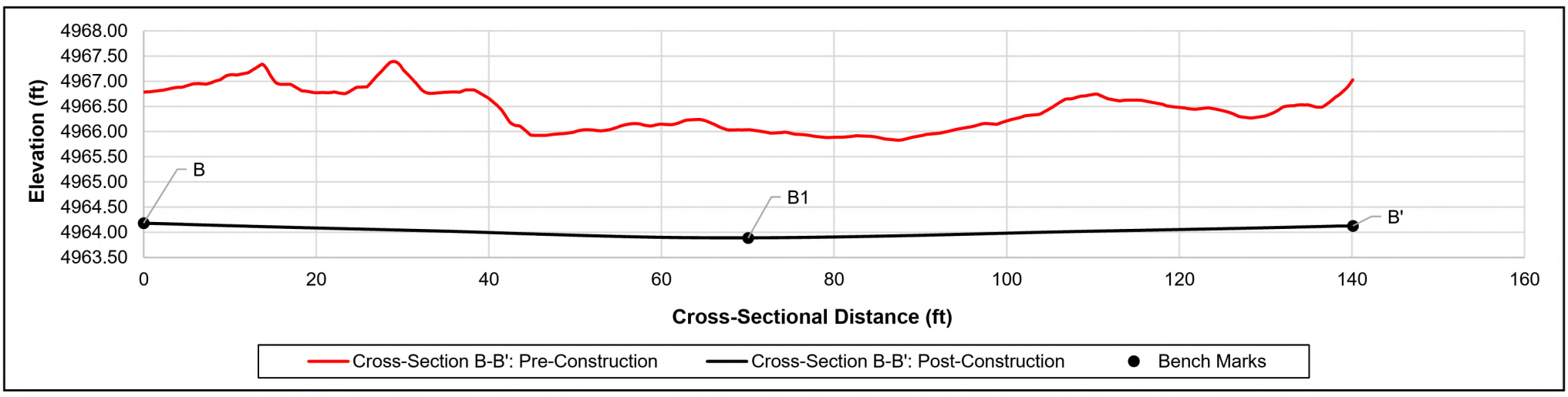
Longitudinal Profile (USB-DSC)



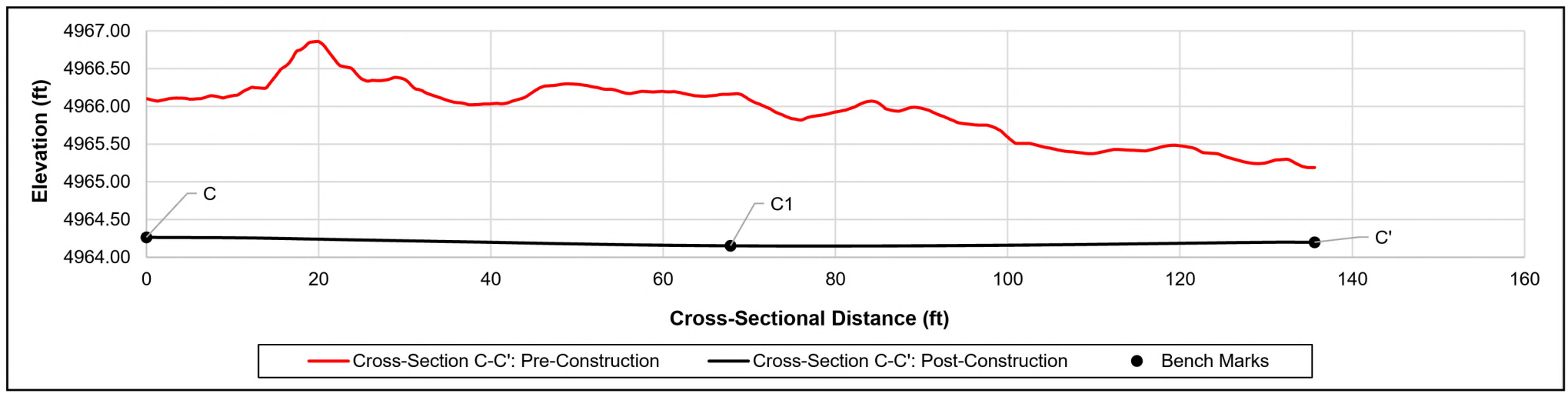
Cross-Section A-A'



Cross-Section B-B'



Cross-Section C-C'

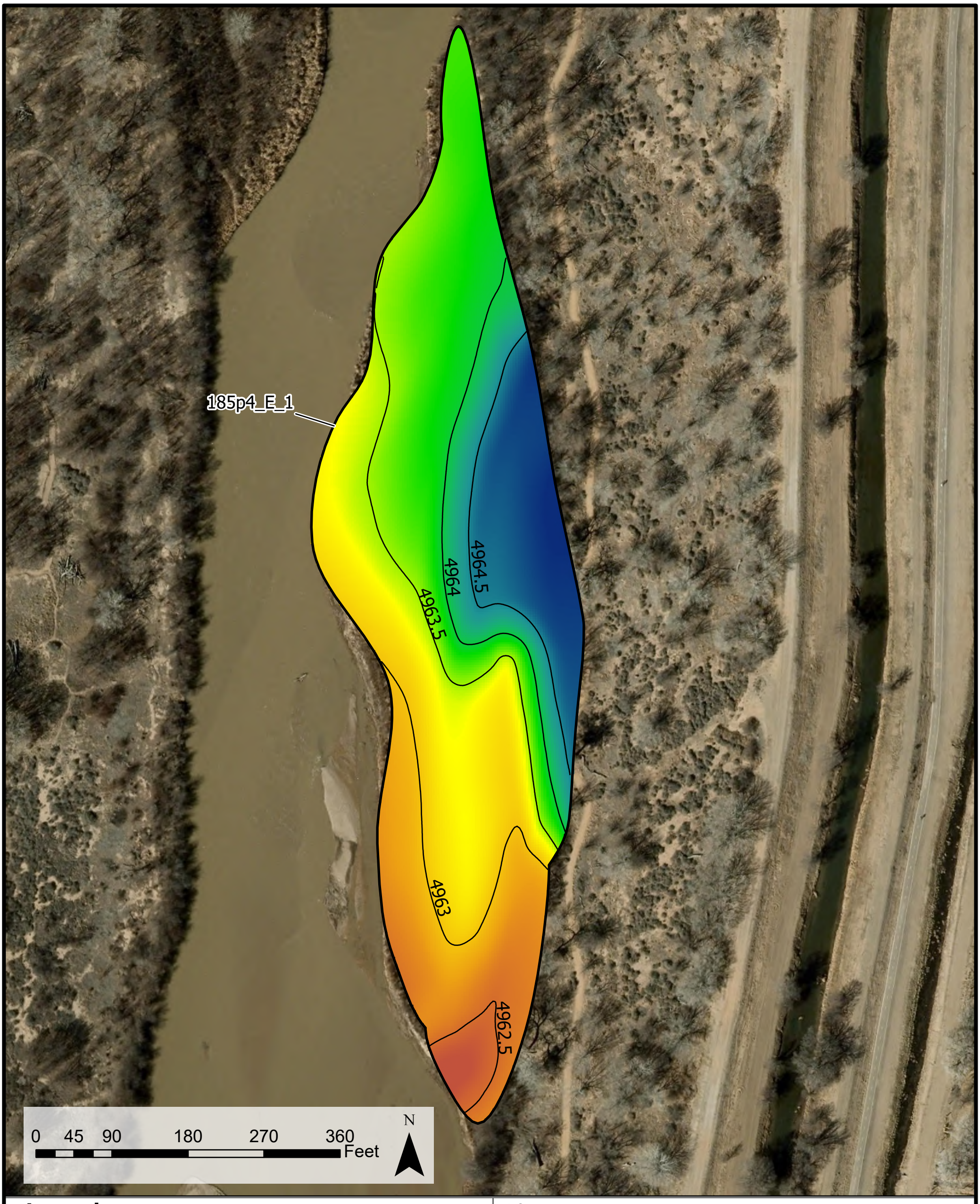


Notes:

USB = Upstream Boundary, DSC = Downstream Channel Connection Point, Letters A through C represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4964.98

4962.16

Title

Site 185p4_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

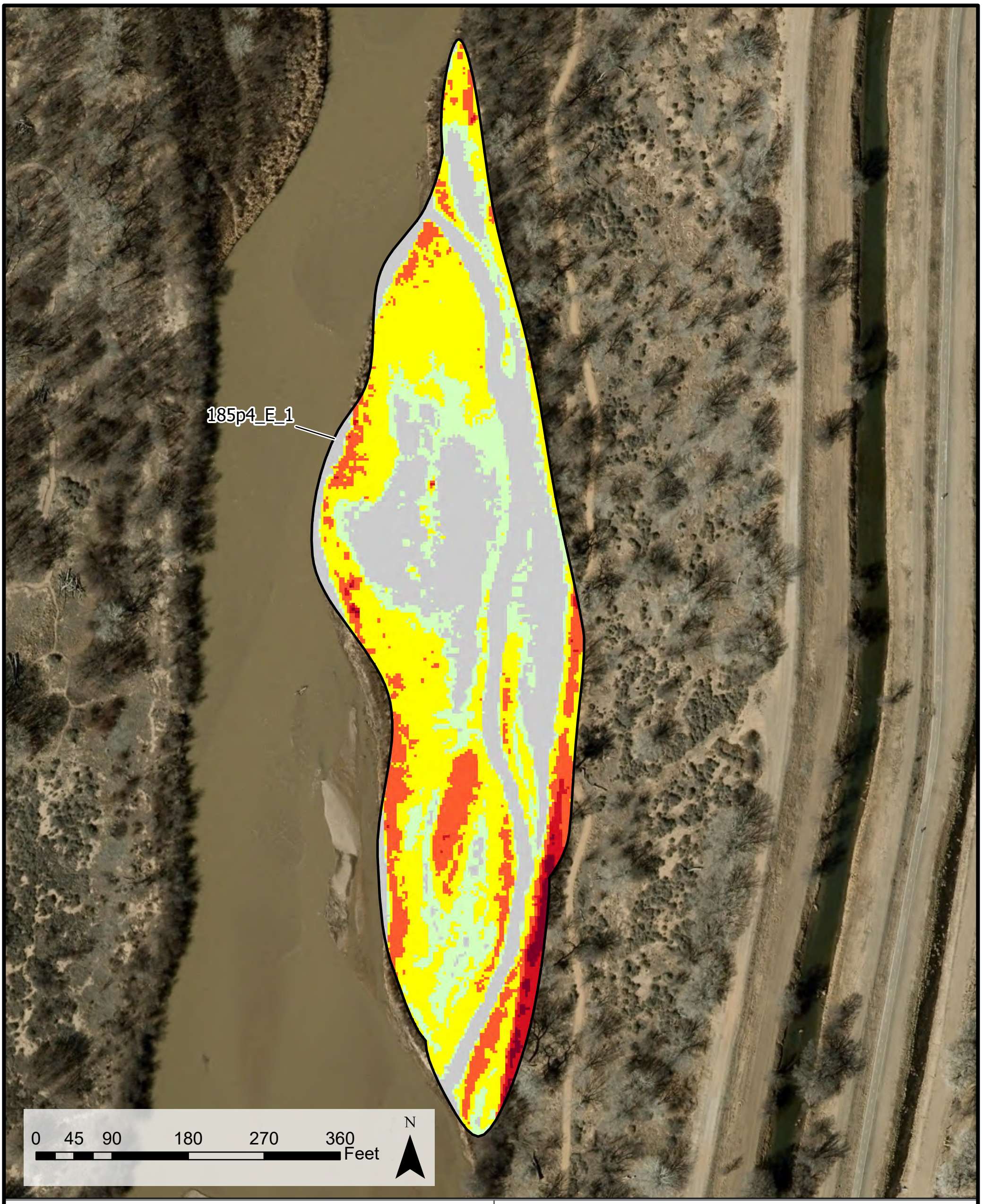
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0 - 0.5
- 0.5 - 1.5
- 1.5 - 2.5
- 2.5 - 3.5
- 3.5 - 4.5

Title
Site 185p4_E_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

Spatial Reference

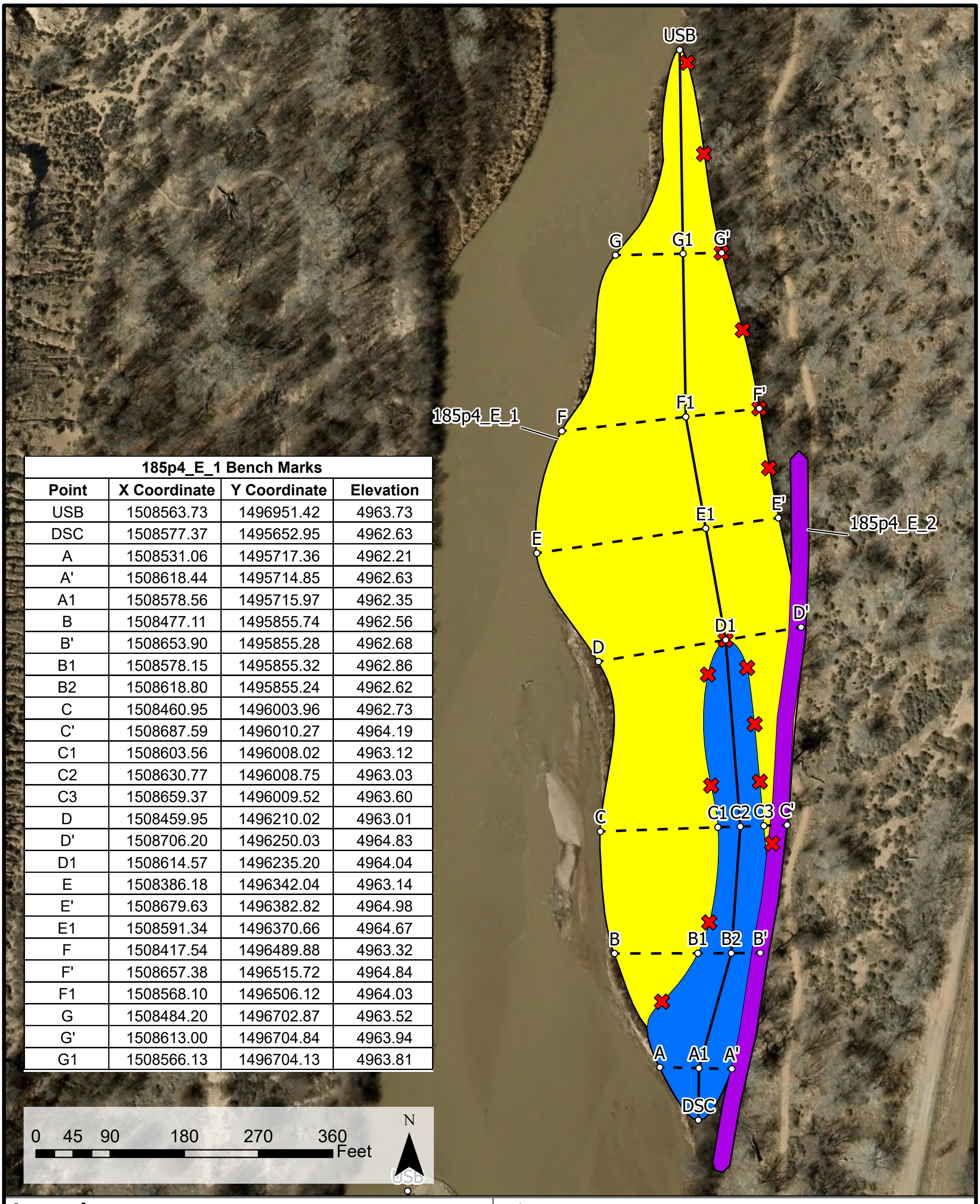
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

185p4_E_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1508563.73	1496951.42	4963.73
DSC	1508577.37	1495652.95	4962.63
A	1508531.06	1495717.36	4962.21
A'	1508618.44	1495714.85	4962.63
A1	1508578.56	1495715.97	4962.35
B	1508477.11	1495855.74	4962.56
B'	1508653.90	1495855.28	4962.68
B1	1508578.15	1495855.32	4962.86
B2	1508618.80	1495855.24	4962.62
C	1508460.95	1496003.96	4962.73
C'	1508687.59	1496010.27	4964.19
C1	1508603.56	1496008.02	4963.12
C2	1508630.77	1496008.75	4963.03
C3	1508659.37	1496009.52	4963.60
D	1508459.95	1496210.02	4963.01
D'	1508706.20	1496250.03	4964.83
D1	1508614.57	1496235.20	4964.04
E	1508386.18	1496342.04	4963.14
E'	1508679.63	1496382.82	4964.98
E1	1508591.34	1496370.66	4964.67
F	1508417.54	1496489.88	4963.32
F'	1508657.38	1496515.72	4964.84
F1	1508568.10	1496506.12	4964.03
G	1508484.20	1496702.87	4963.52
G'	1508613.00	1496704.84	4963.94
G1	1508566.13	1496704.13	4963.81



Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Backwater
- Bankline Modification
- Jetty Jack Removal

Title

Site 185p4_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

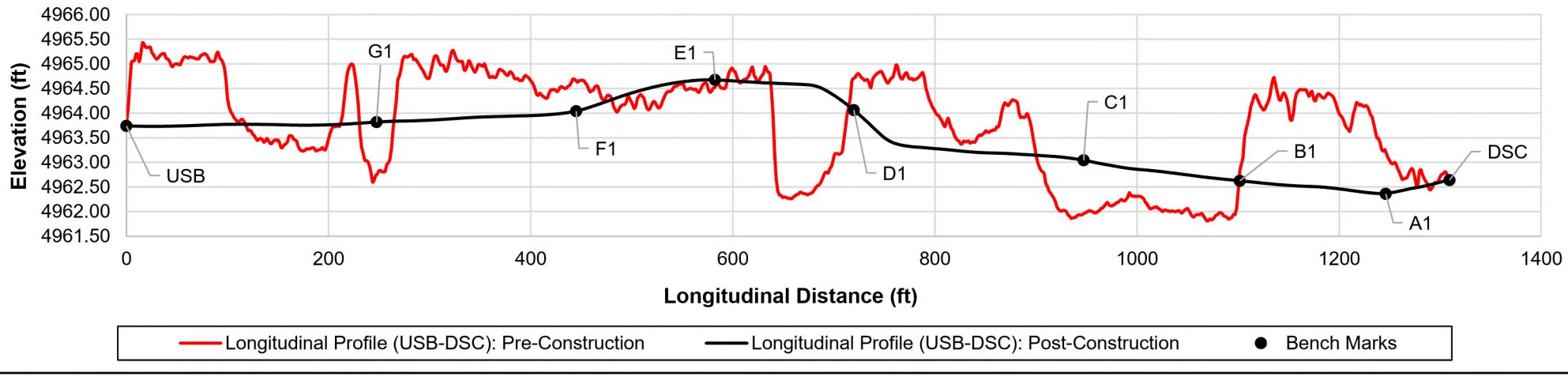
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

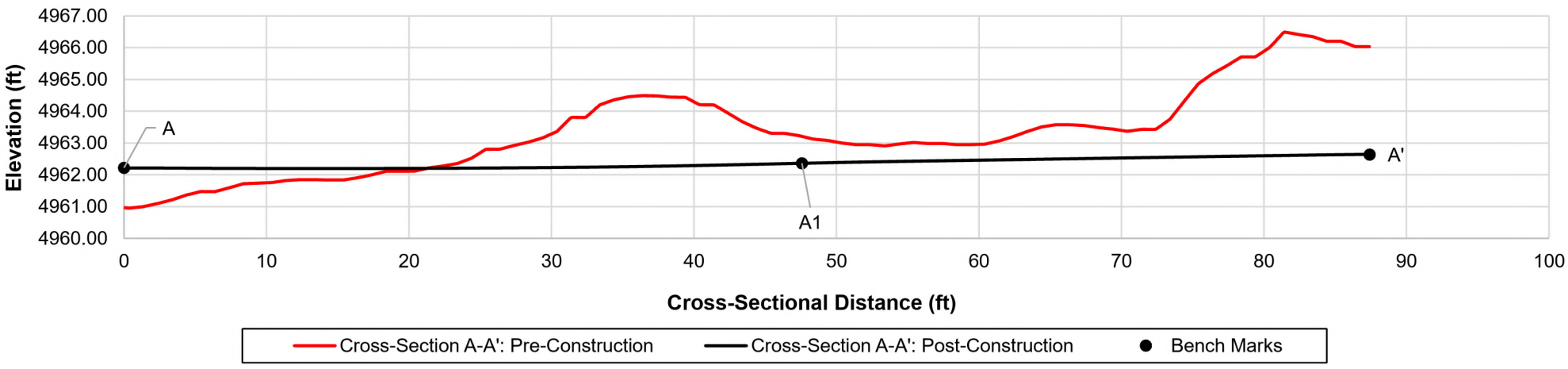
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

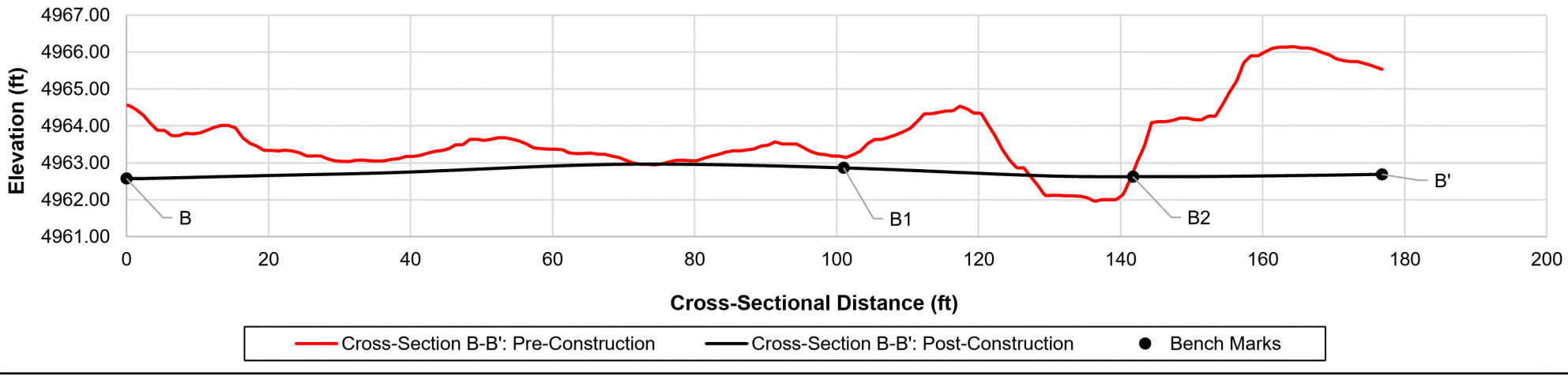
Longitudinal Profile (USB-DSC)



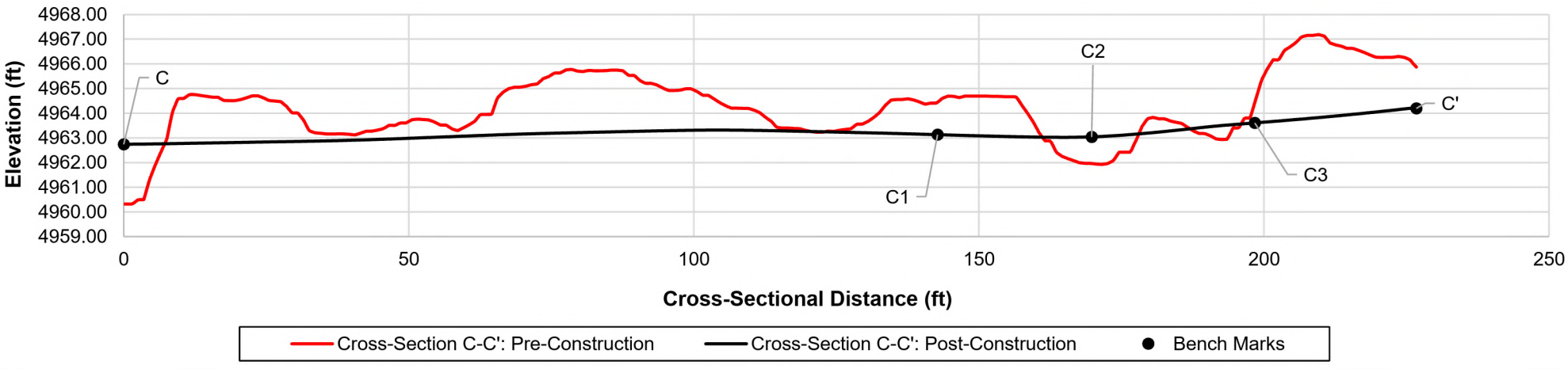
Cross-Section A-A'



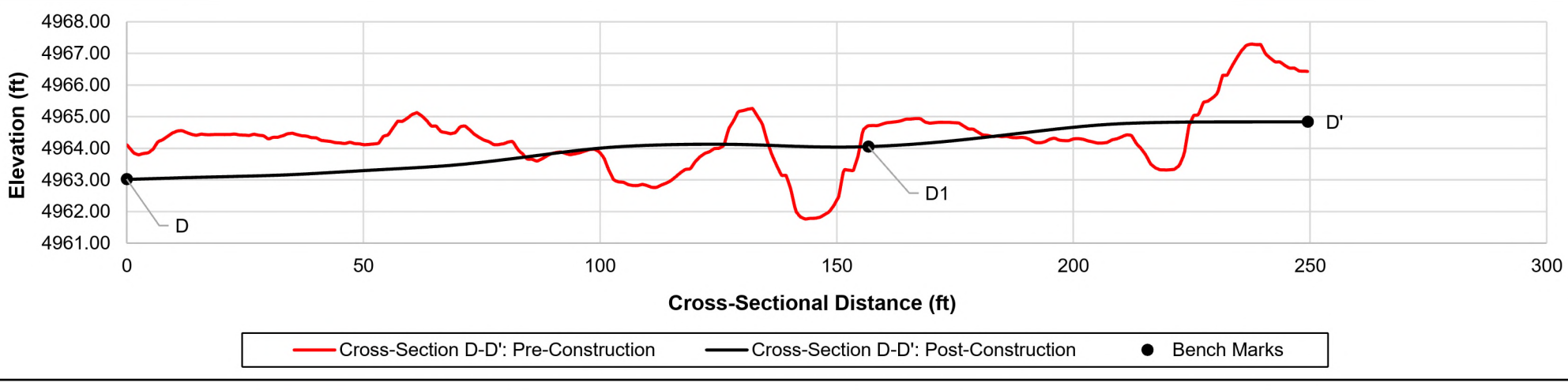
Cross-Section B-B'



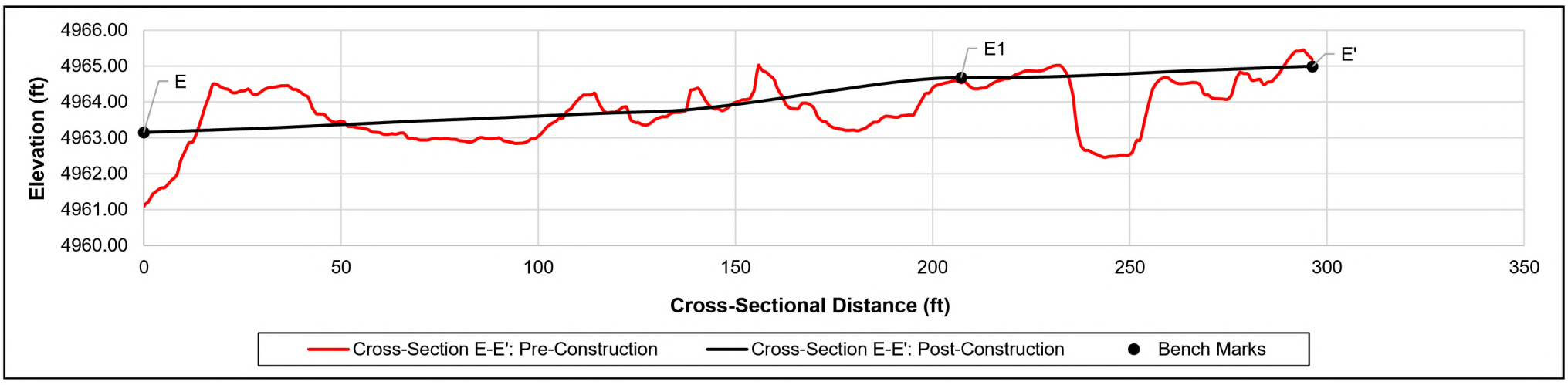
Cross-Section C-C'



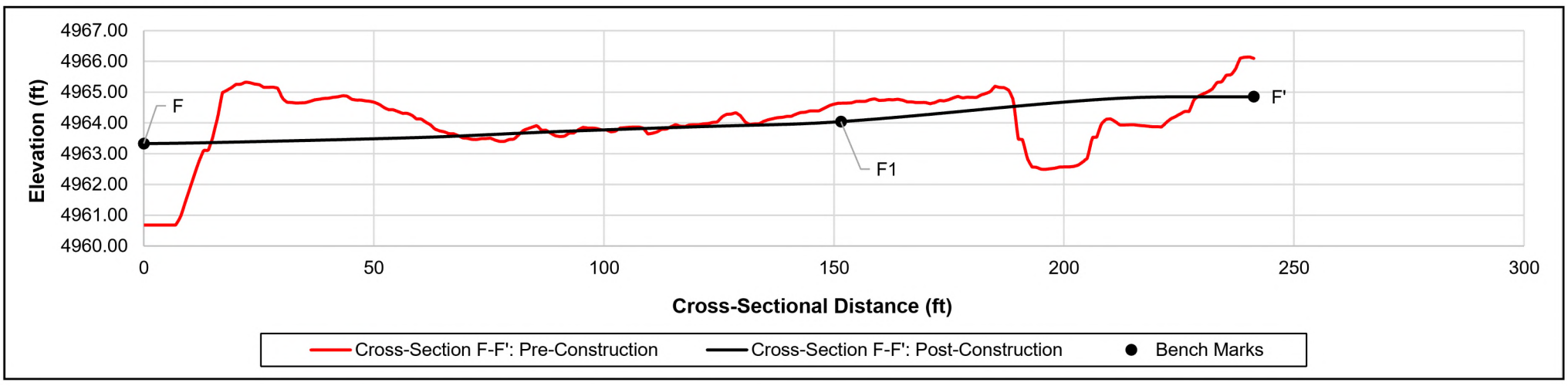
Cross-Section D-D'



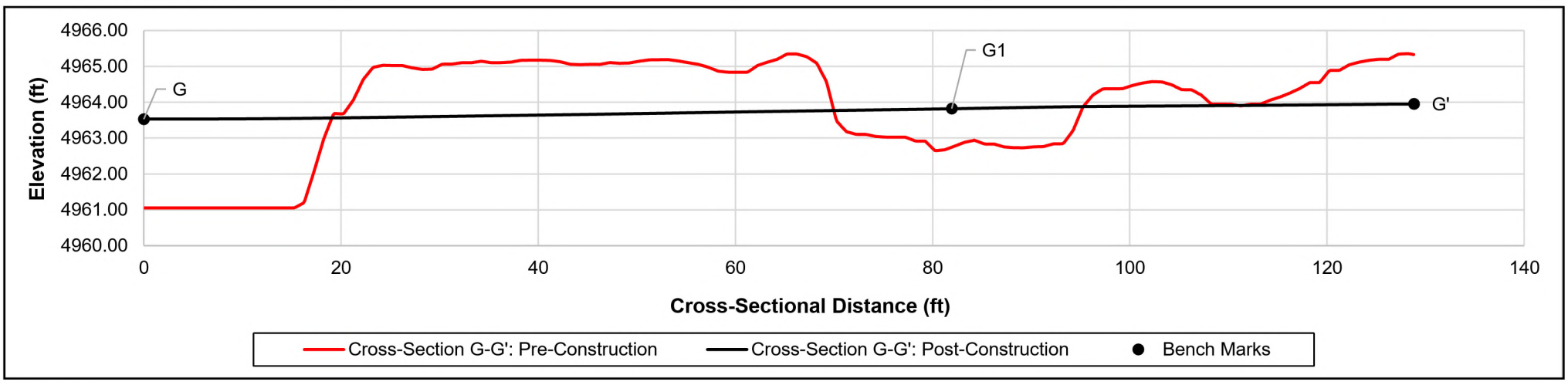
Cross-Section E-E'



Cross-Section F-F'



Cross-Section G-G'

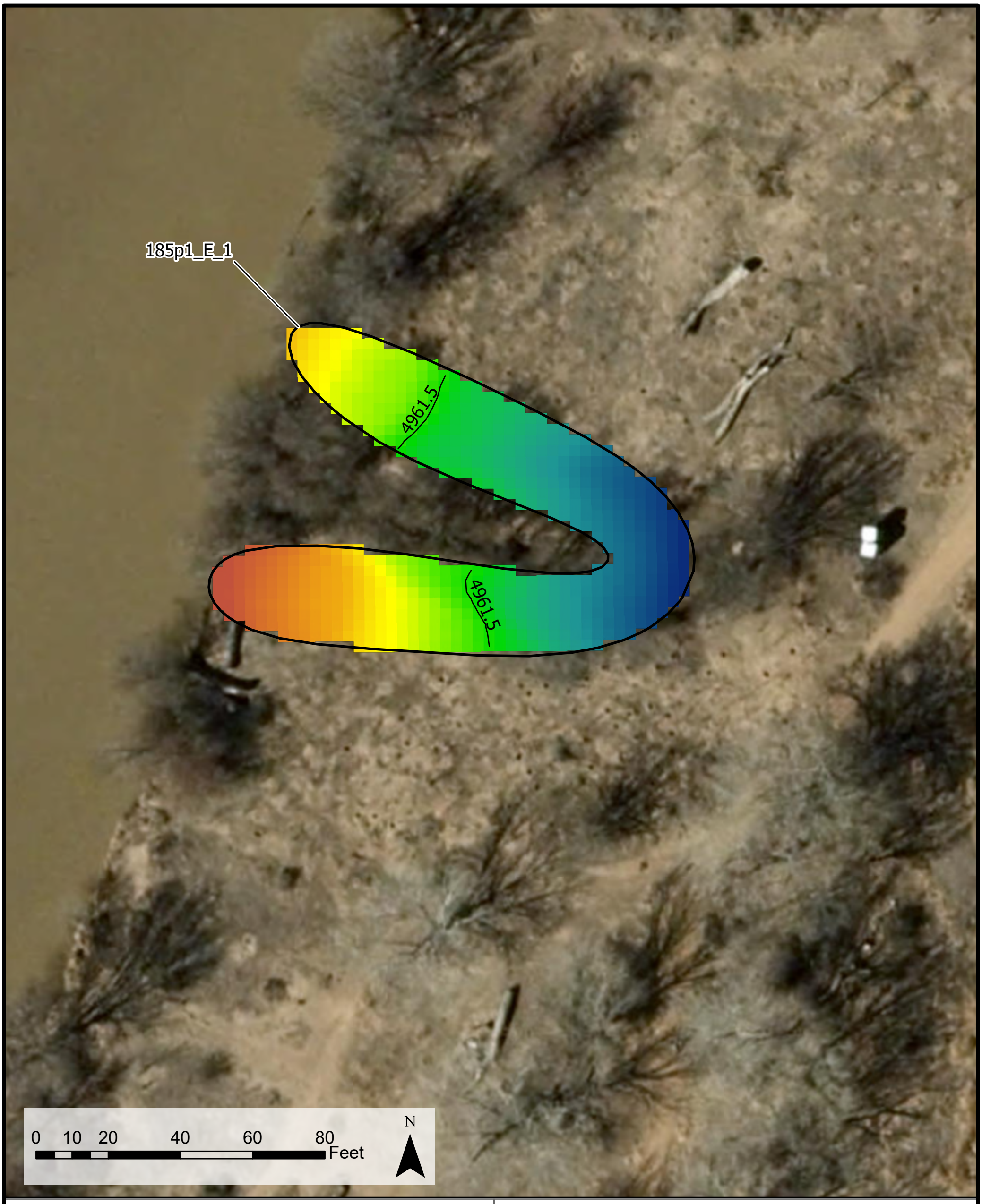


Notes:

USB = Upstream Boundary, DSC = Downstream Channel Connection Point, Letters A through G represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4961.63

4961.31

Title

Site 185p1_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

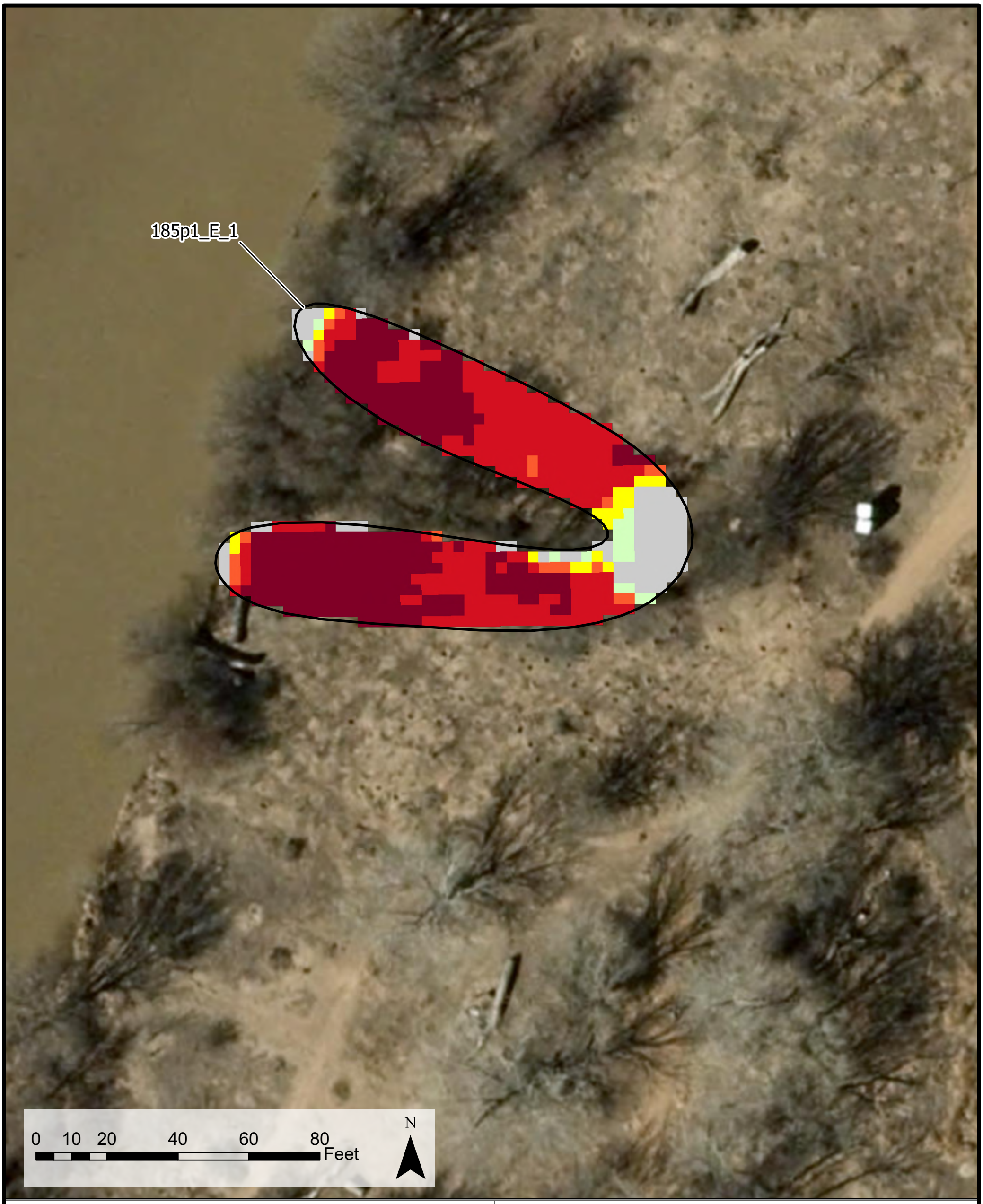
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.5

2.5-3.5

3.5-4.7

Title

Site 185p1_E_1 Excavation Depths

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

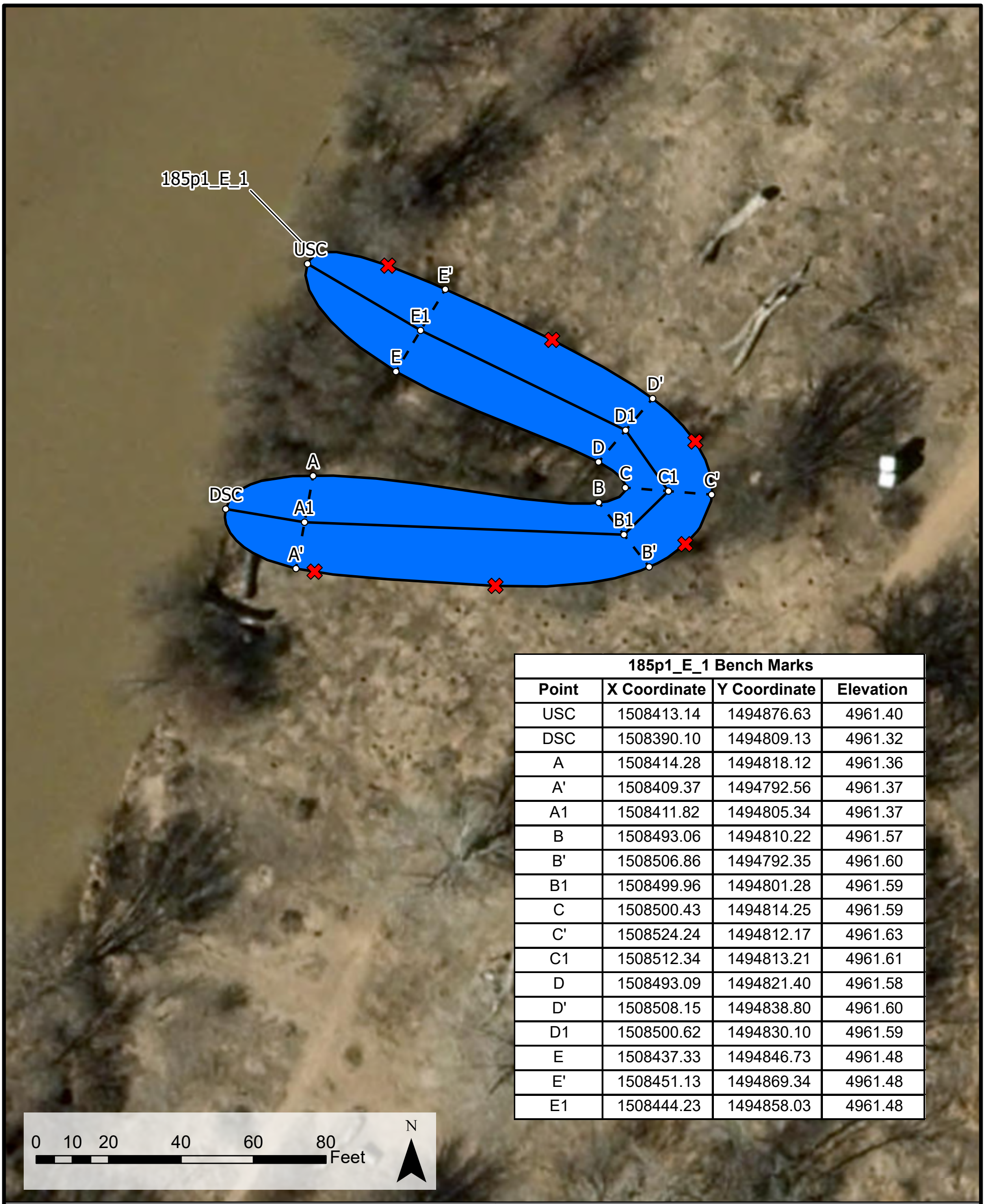
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



185p1_E_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USC	1508413.14	1494876.63	4961.40
DSC	1508390.10	1494809.13	4961.32
A	1508414.28	1494818.12	4961.36
A'	1508409.37	1494792.56	4961.37
A1	1508411.82	1494805.34	4961.37
B	1508493.06	1494810.22	4961.57
B'	1508506.86	1494792.35	4961.60
B1	1508499.96	1494801.28	4961.59
C	1508500.43	1494814.25	4961.59
C'	1508524.24	1494812.17	4961.63
C1	1508512.34	1494813.21	4961.61
D	1508493.09	1494821.40	4961.58
D'	1508508.15	1494838.80	4961.60
D1	1508500.62	1494830.10	4961.59
E	1508437.33	1494846.73	4961.48
E'	1508451.13	1494869.34	4961.48
E1	1508444.23	1494858.03	4961.48

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features
- Backwater

Title
Site 185p1_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

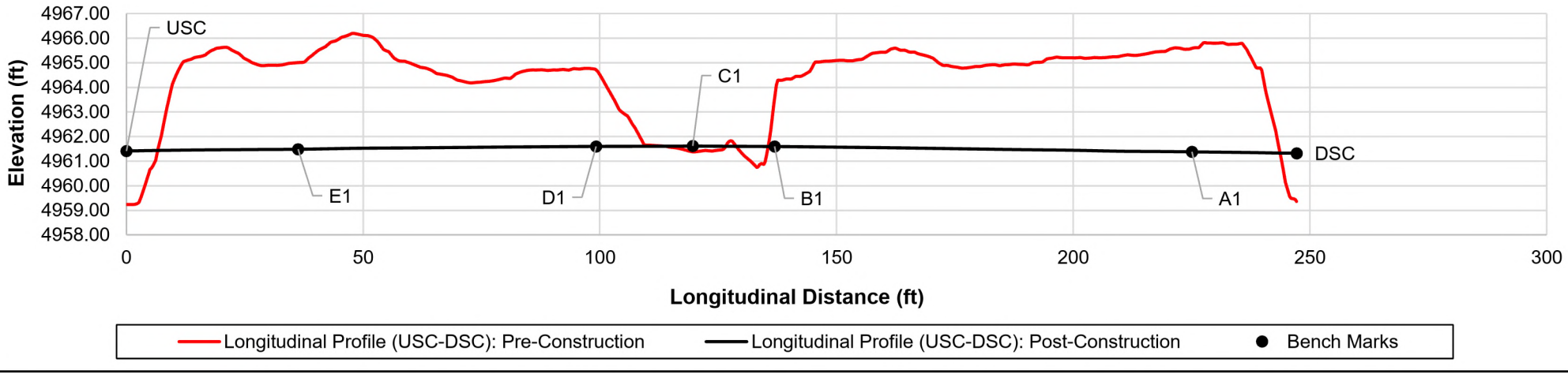
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

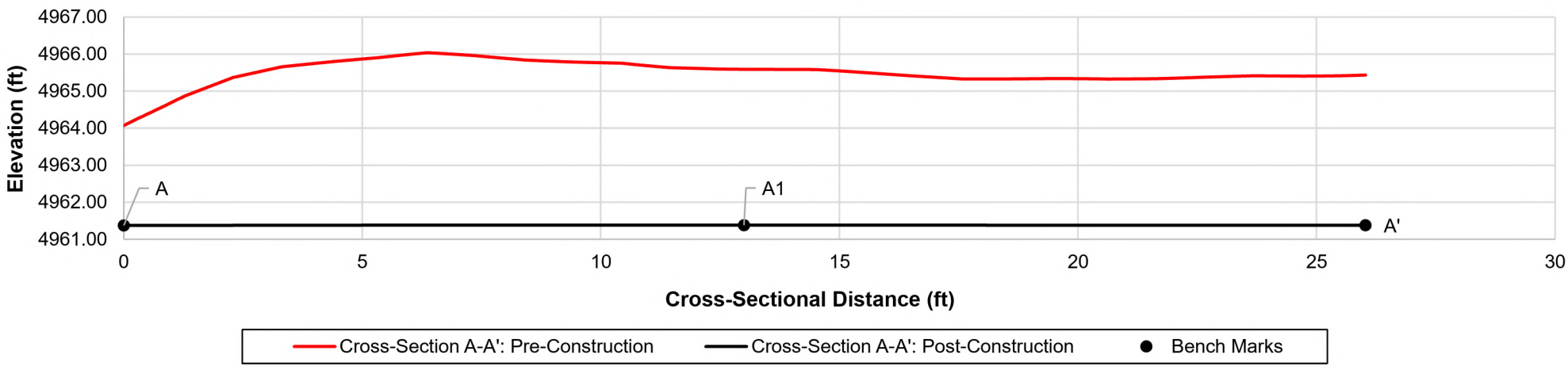
Revision: 0

GSA GeoSystems Analysis, Inc. *Innovative Solutions*

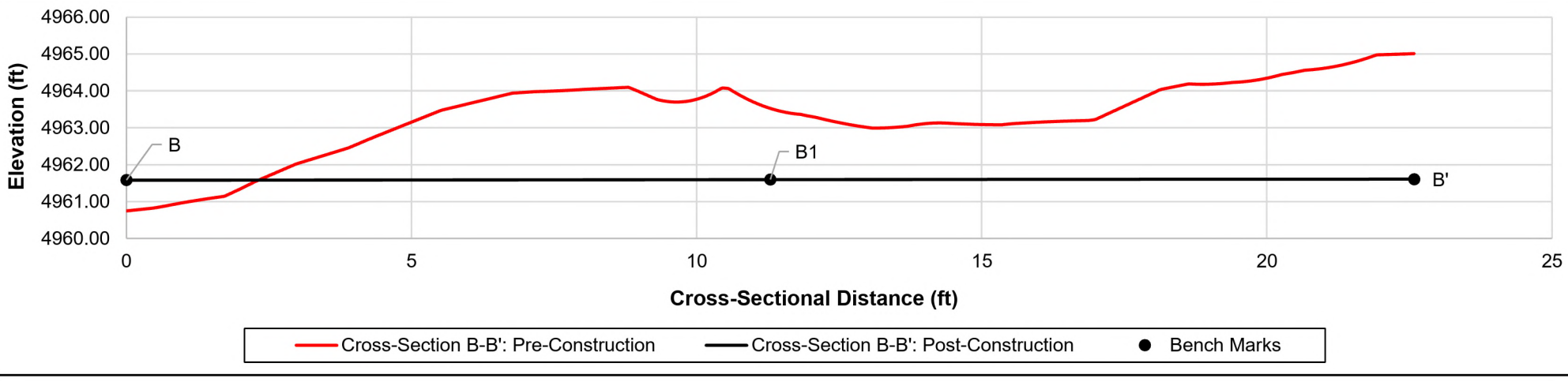
Longitudinal Profile (USC-DSC)



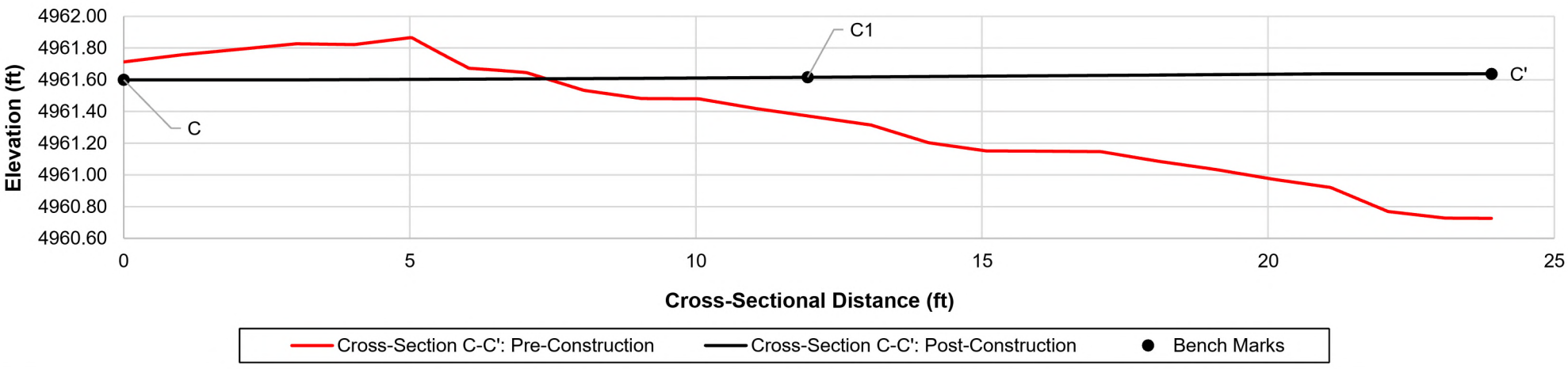
Cross-Section A-A'



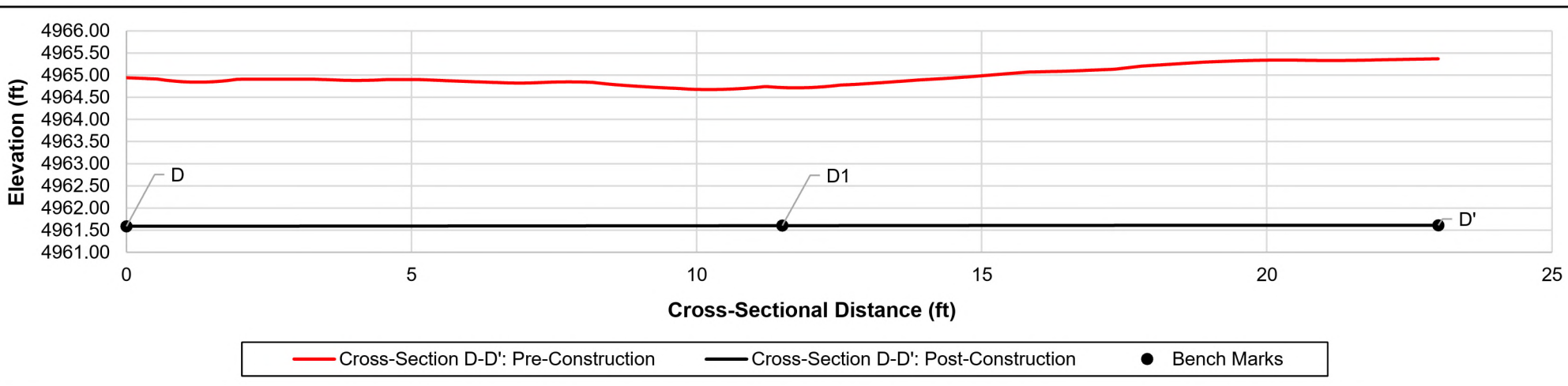
Cross-Section B-B'



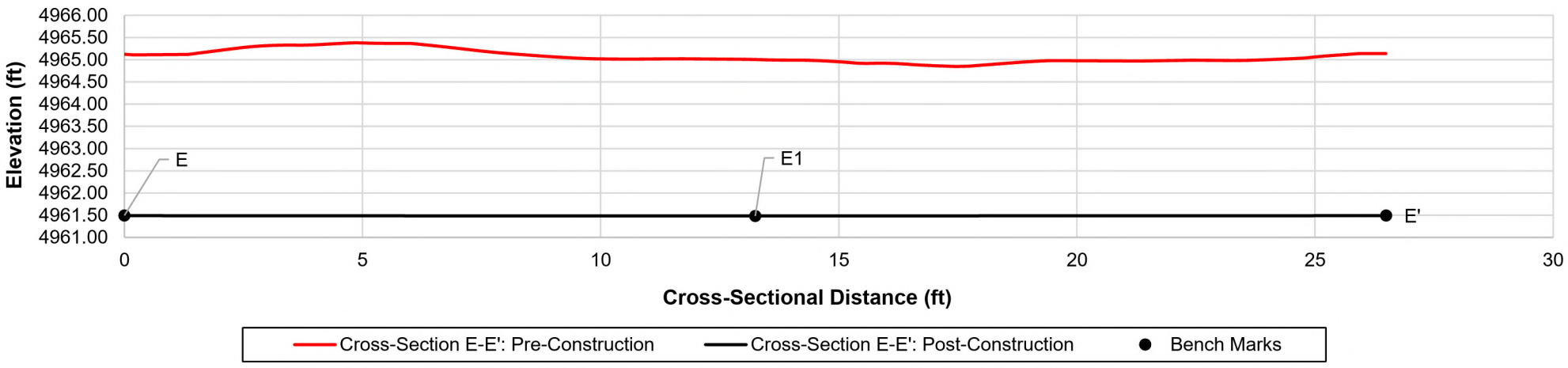
Cross-Section C-C'



Cross-Section D-D'



Cross-Section E-E'

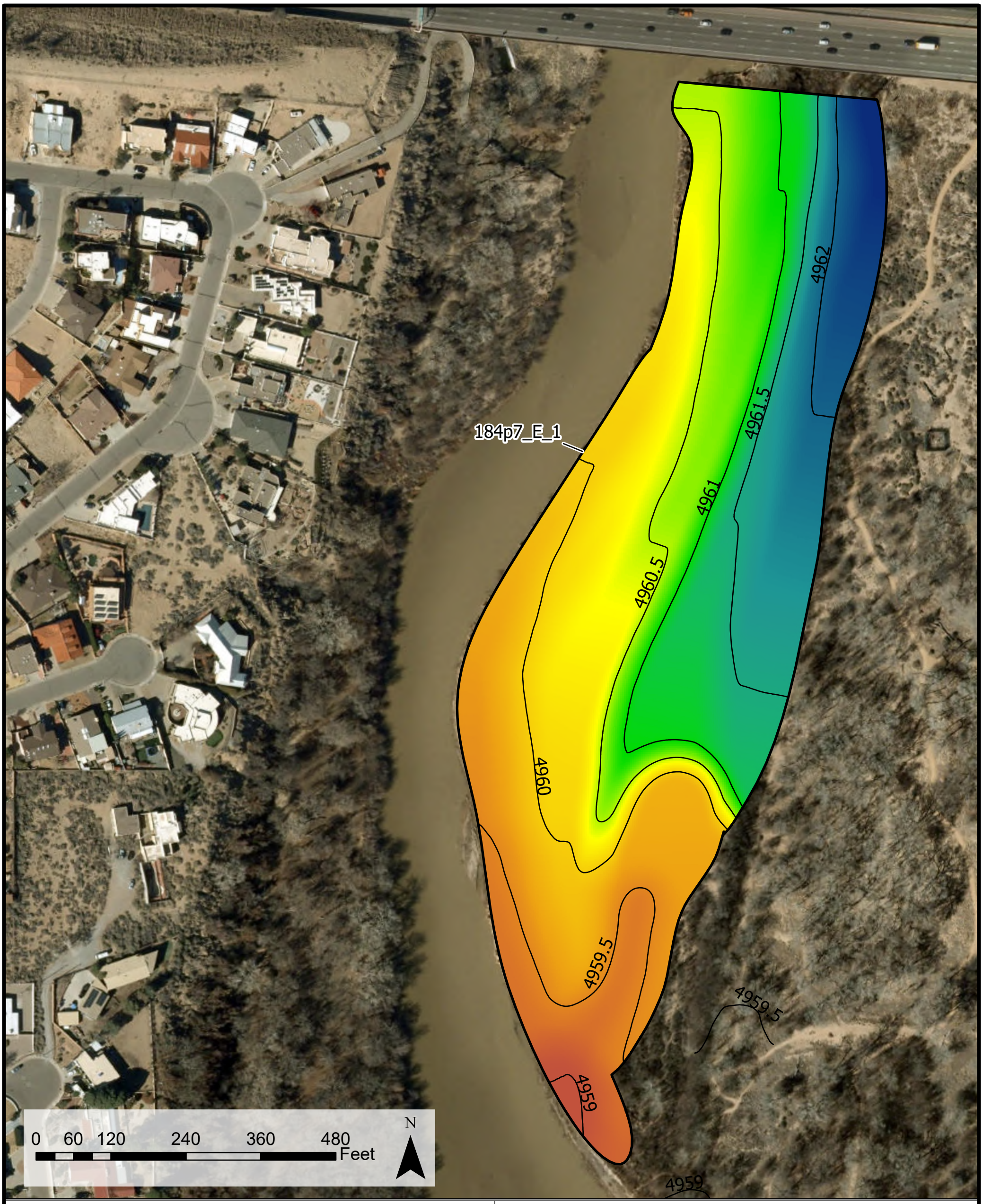


Notes:

USC = Upstream Channel Connection Point, DSC = Downstream Channel Connection Point, Letters A through E represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4962.46

4958.97

Title

Site 184p7_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

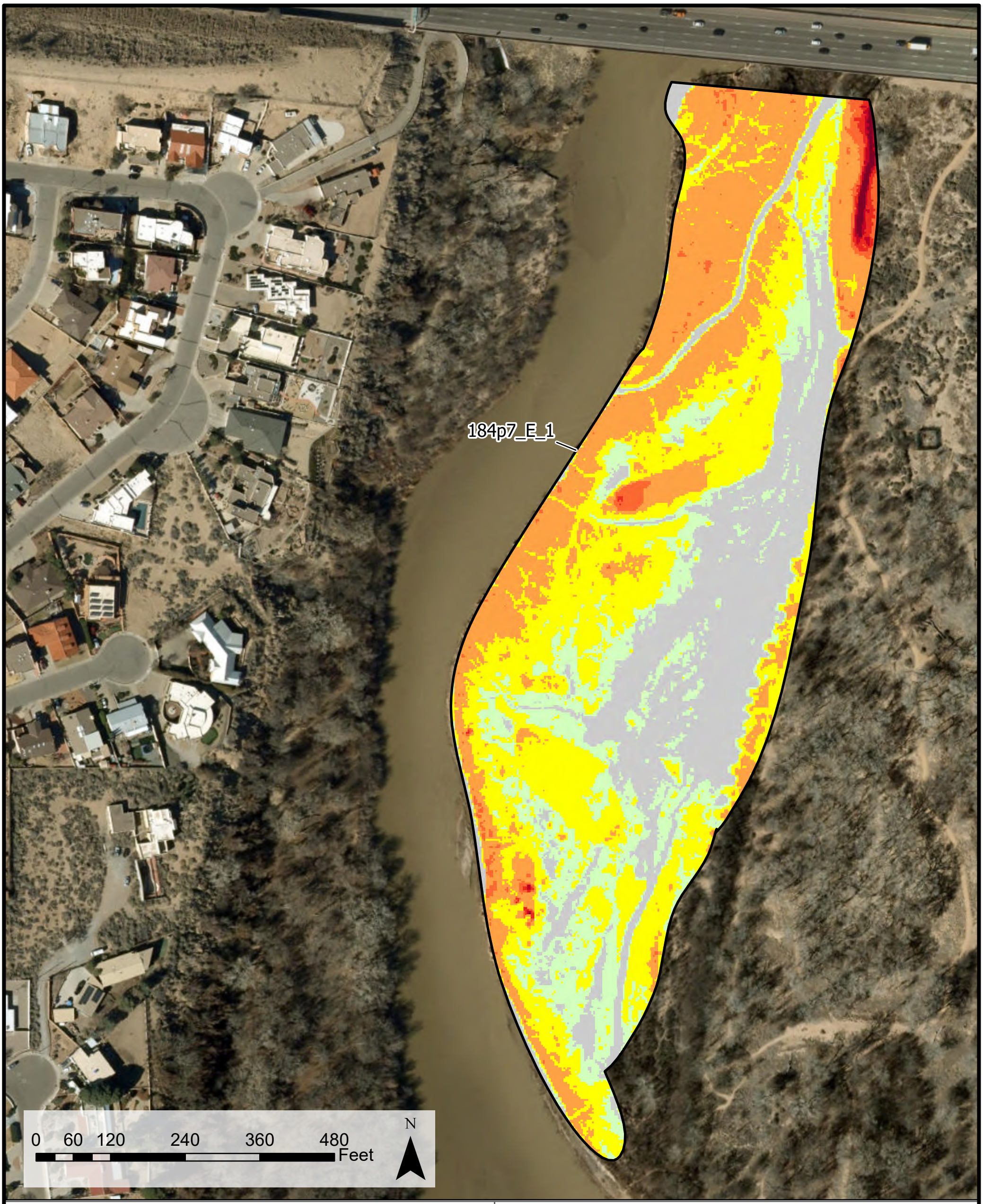
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.5
- 5.5-6.7

Title
Site 184p7_E_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

Spatial Reference

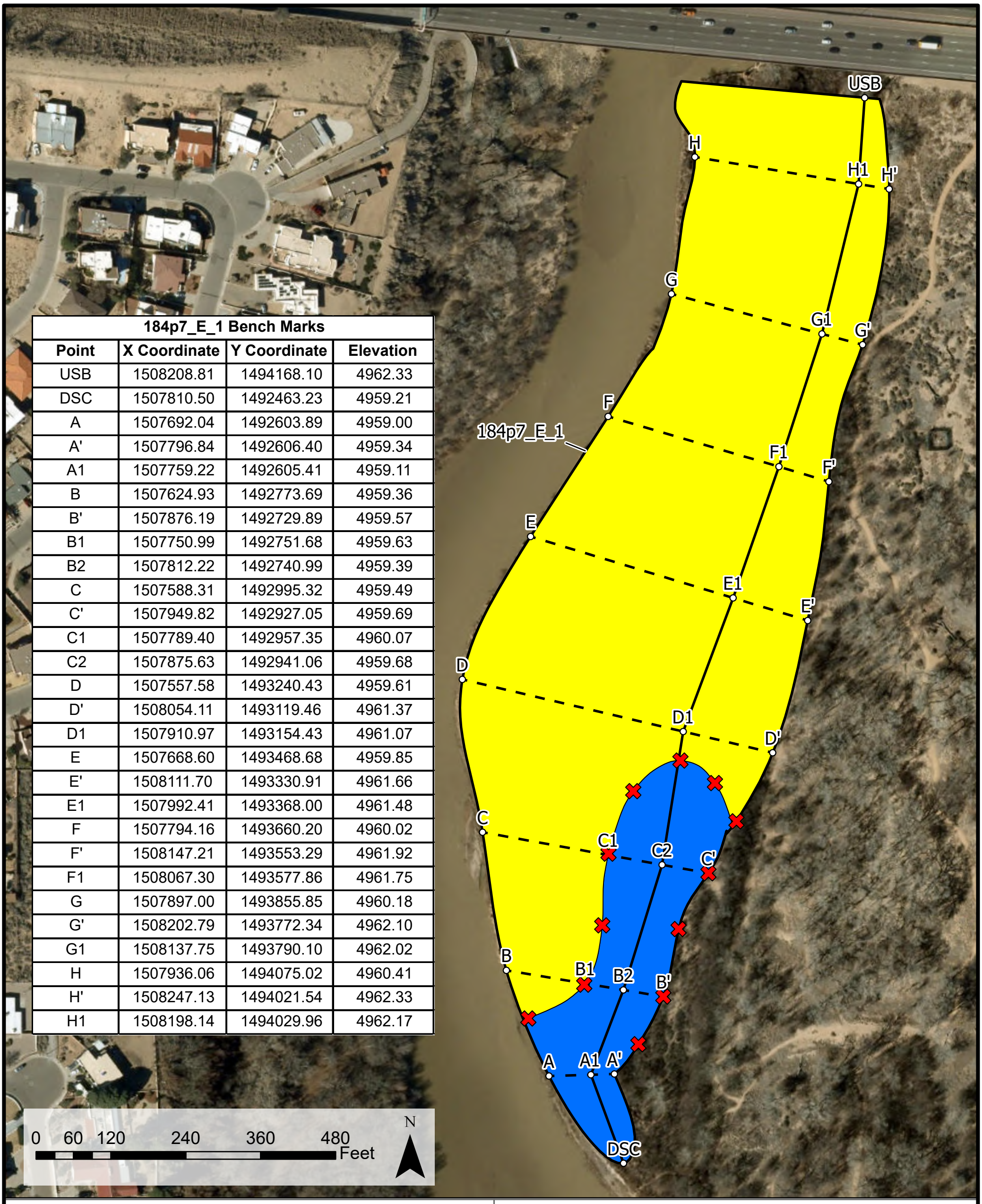
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

184p7_E_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1508208.81	1494168.10	4962.33
DSC	1507810.50	1492463.23	4959.21
A	1507692.04	1492603.89	4959.00
A'	1507796.84	1492606.40	4959.34
A1	1507759.22	1492605.41	4959.11
B	1507624.93	1492773.69	4959.36
B'	1507876.19	1492729.89	4959.57
B1	1507750.99	1492751.68	4959.63
B2	1507812.22	1492740.99	4959.39
C	1507588.31	1492995.32	4959.49
C'	1507949.82	1492927.05	4959.69
C1	1507789.40	1492957.35	4960.07
C2	1507875.63	1492941.06	4959.68
D	1507557.58	1493240.43	4959.61
D'	1508054.11	1493119.46	4961.37
D1	1507910.97	1493154.43	4961.07
E	1507668.60	1493468.68	4959.85
E'	1508111.70	1493330.91	4961.66
E1	1507992.41	1493368.00	4961.48
F	1507794.16	1493660.20	4960.02
F'	1508147.21	1493553.29	4961.92
F1	1508067.30	1493577.86	4961.75
G	1507897.00	1493855.85	4960.18
G'	1508202.79	1493772.34	4962.10
G1	1508137.75	1493790.10	4962.02
H	1507936.06	1494075.02	4960.41
H'	1508247.13	1494021.54	4962.33
H1	1508198.14	1494029.96	4962.17



Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Backwater
- Bankline Modification

Title
Site 184p7_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

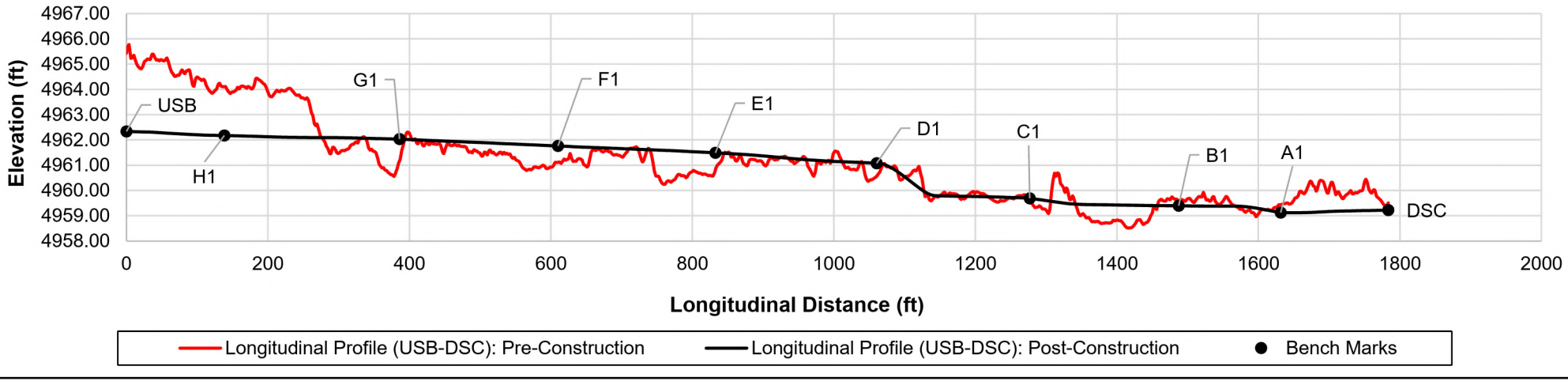
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

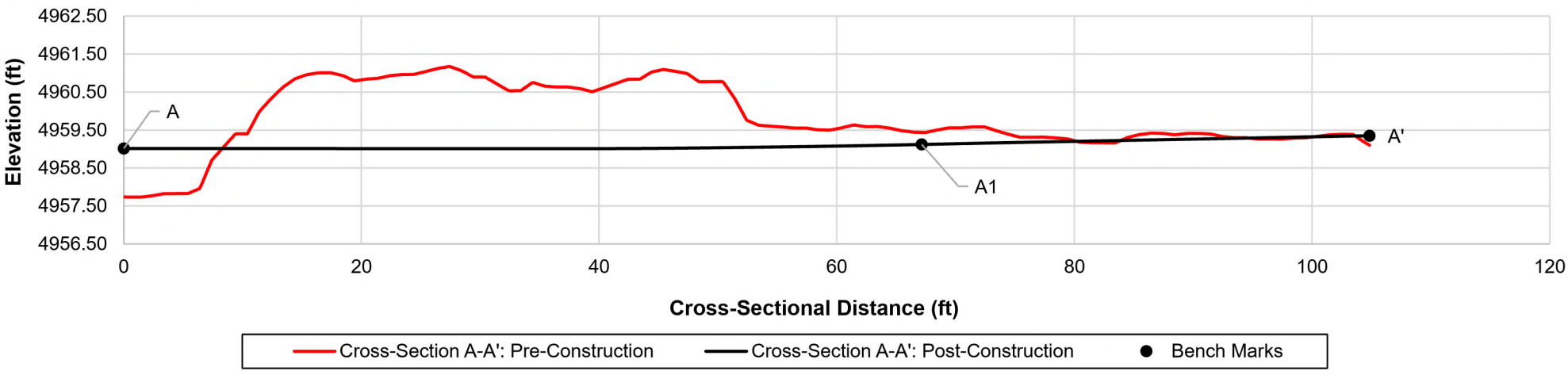
Revision: 0

GSA GeoSystems Analysis, Inc. *Innovative Solutions*

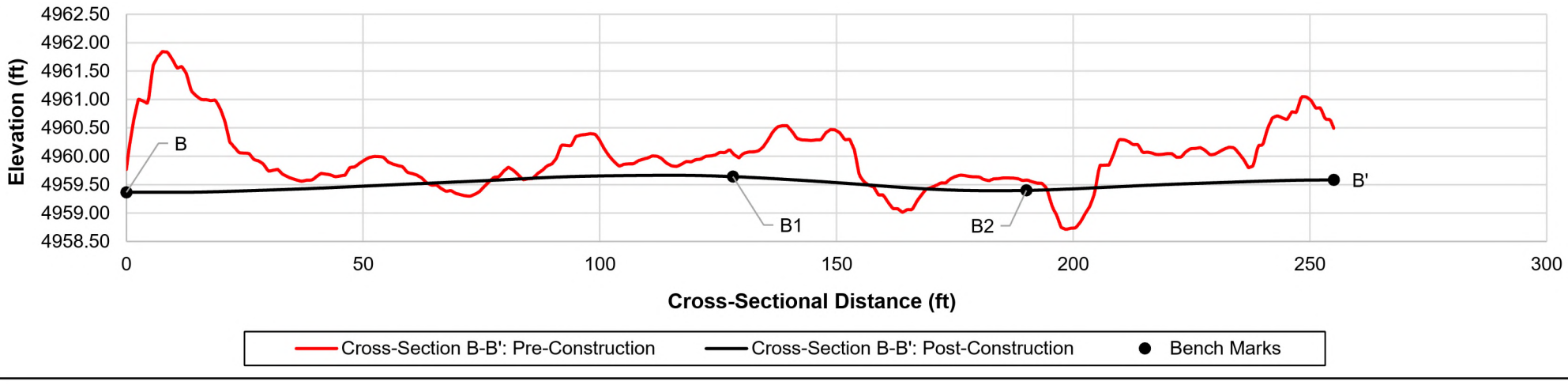
Longitudinal Profile (USB-DSC)



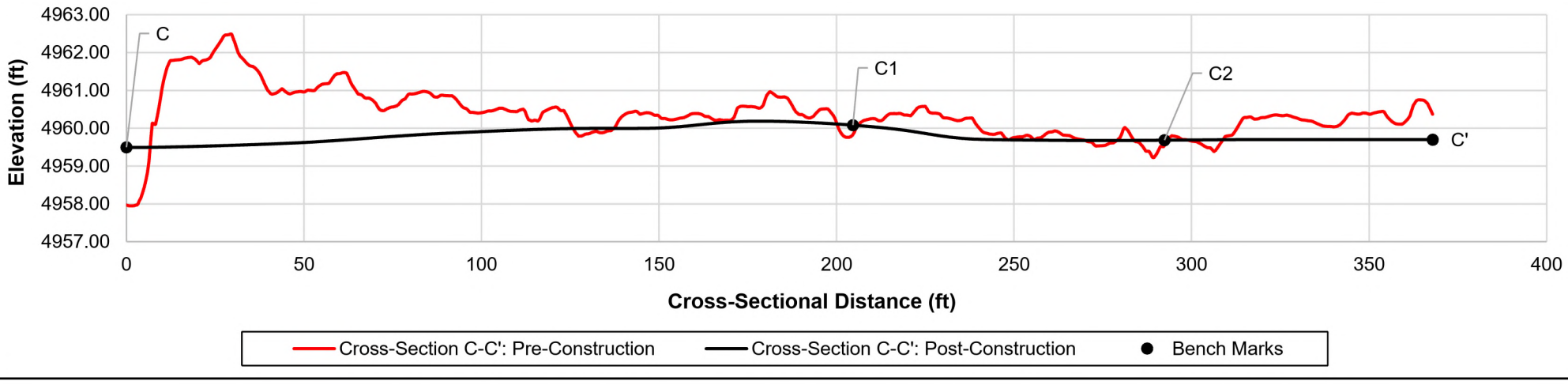
Cross-Section A-A'



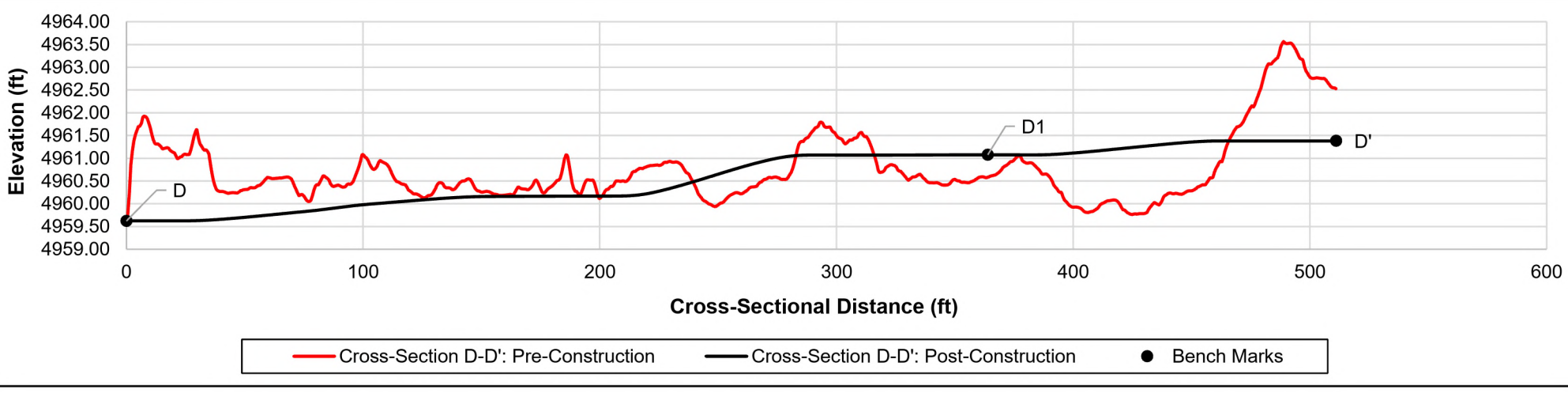
Cross-Section B-B'



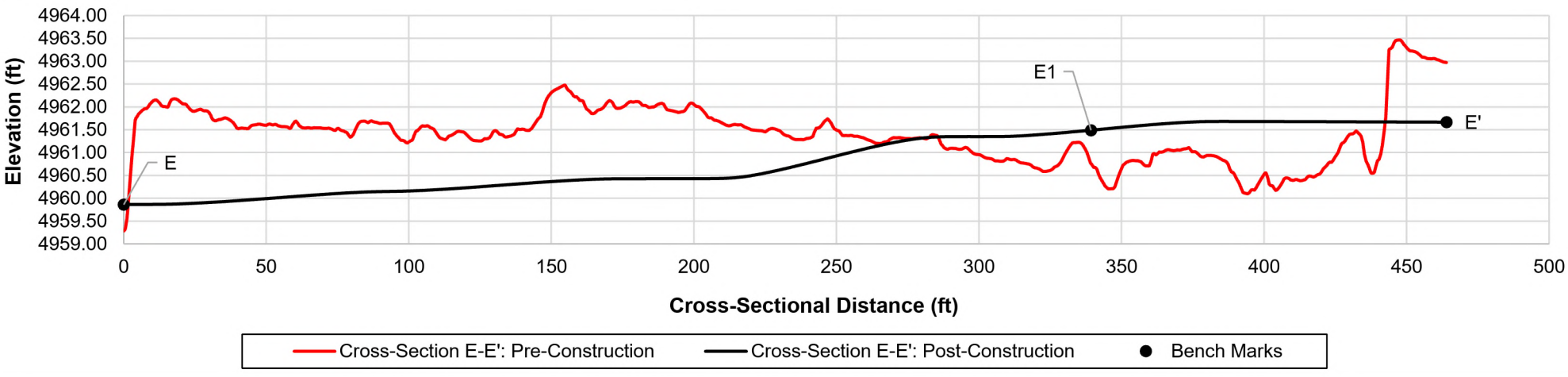
Cross-Section C-C'



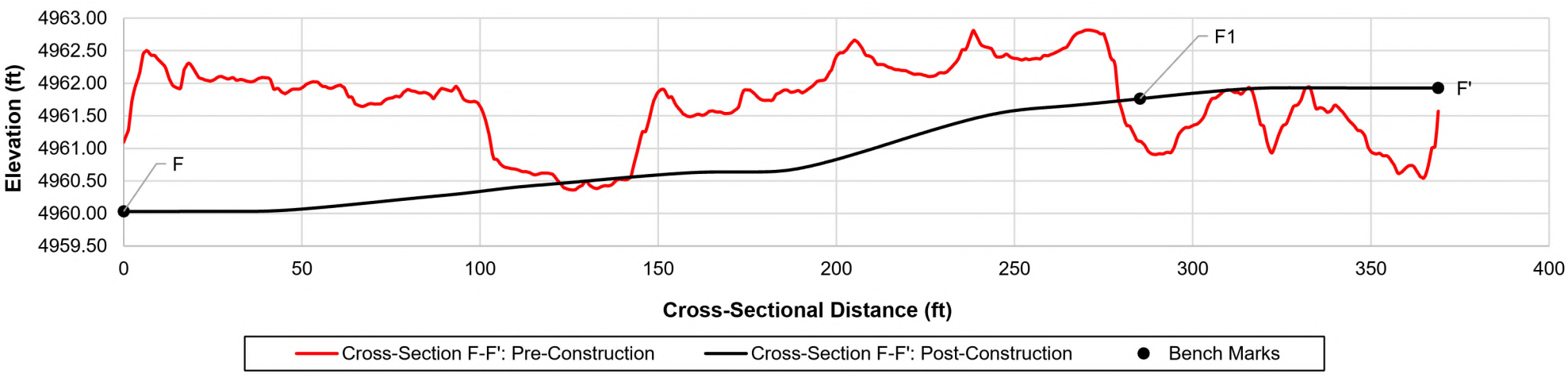
Cross-Section D-D'



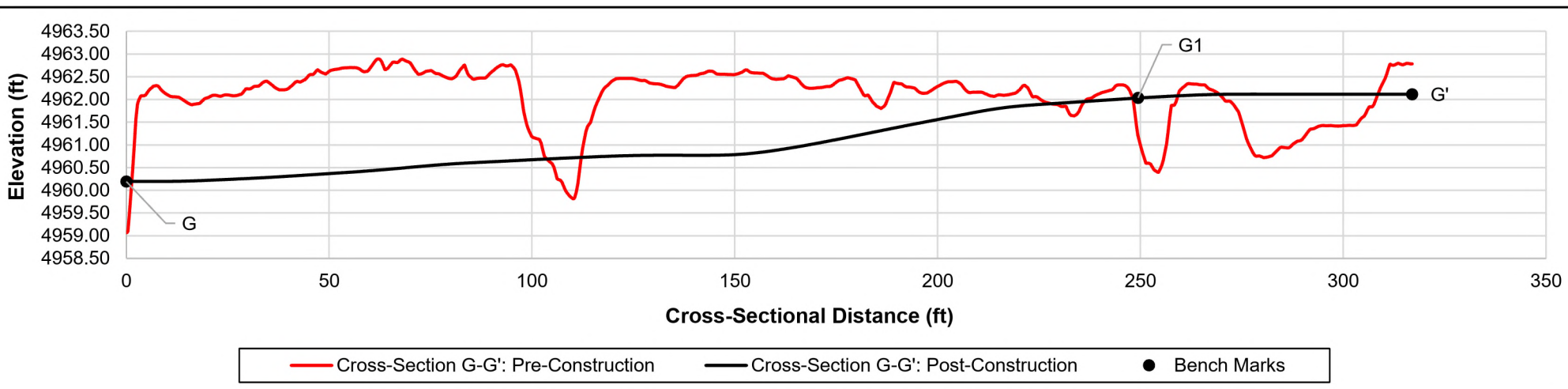
Cross-Section E-E'



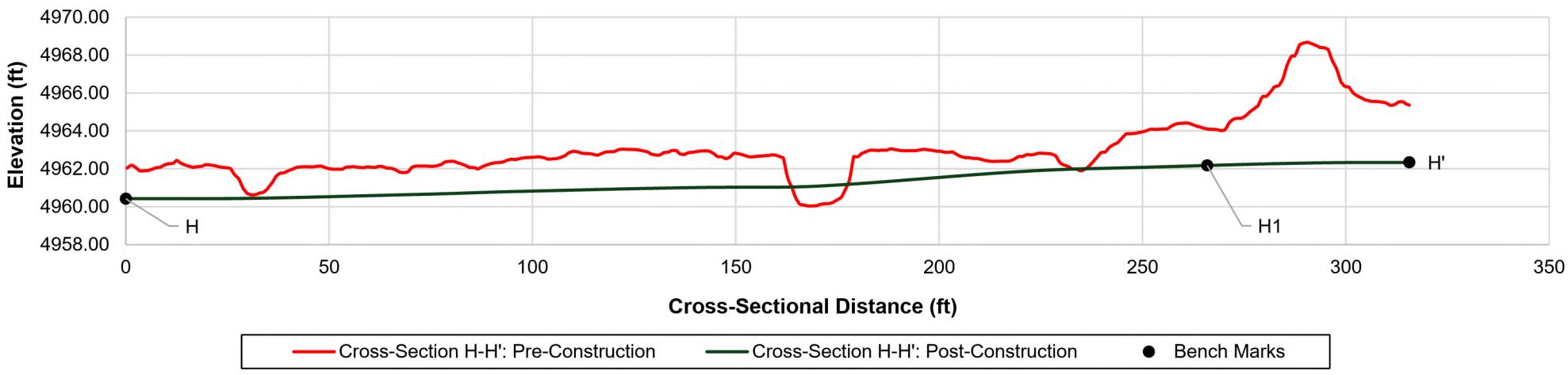
Cross-Section F-F'



Cross-Section G-G'



Cross-Section H-H'

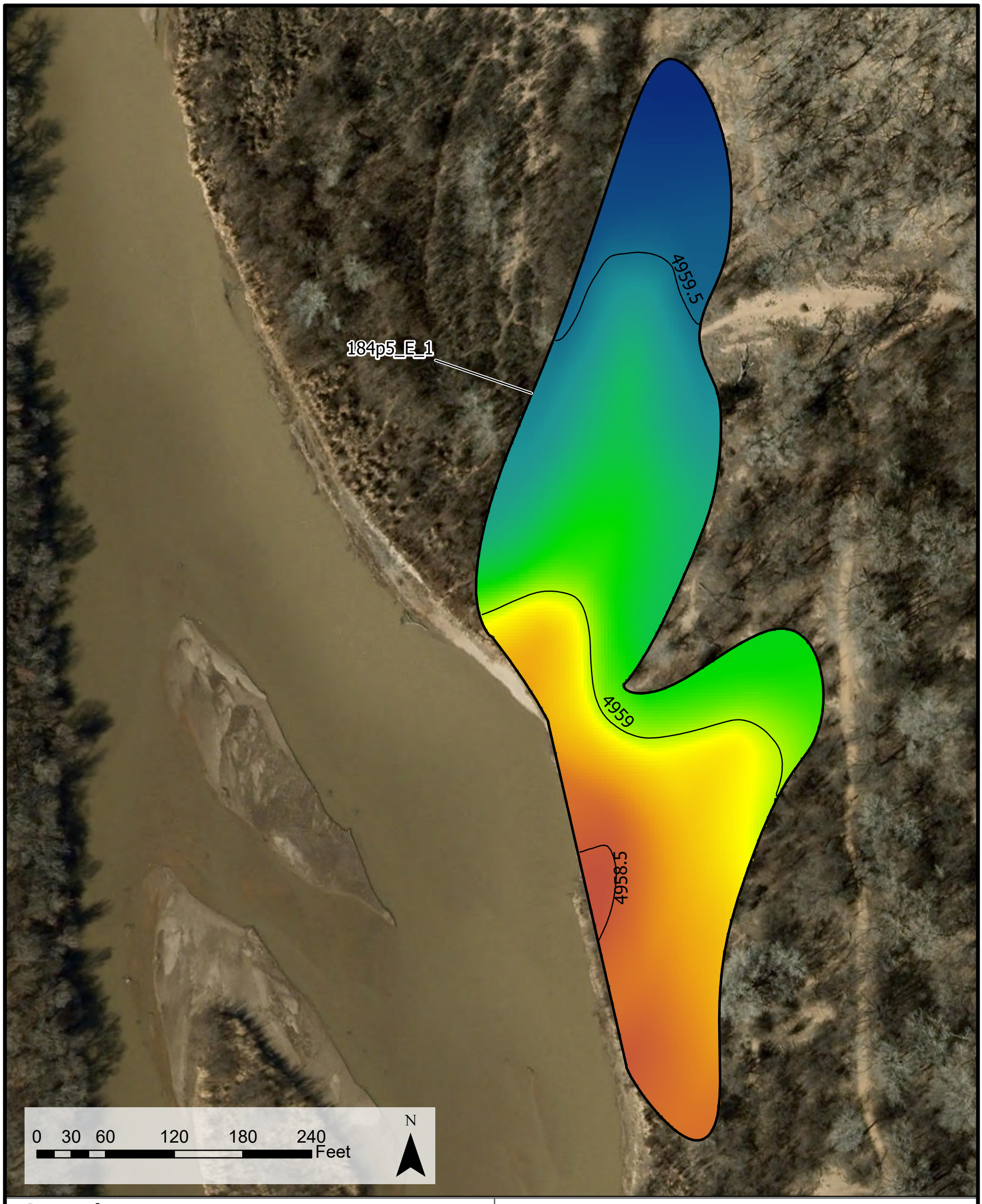


Notes:

USB = Upstream Boundary, DSC = Downstream Channel Connection Point, Letters A through H represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4959.65

4958.43

Title

Site 184p5_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

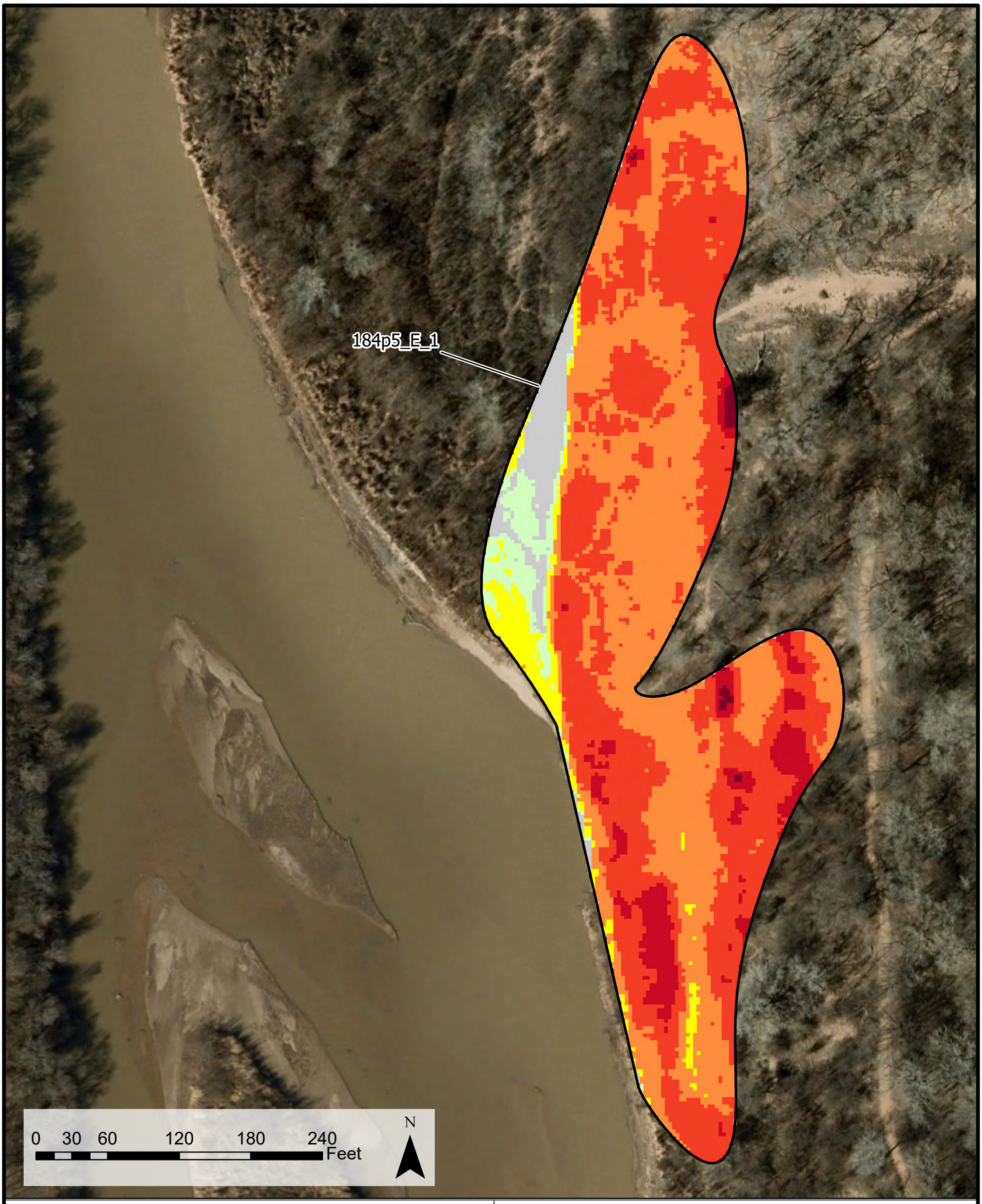
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.6

Title
Site 184p5_E_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

Spatial Reference

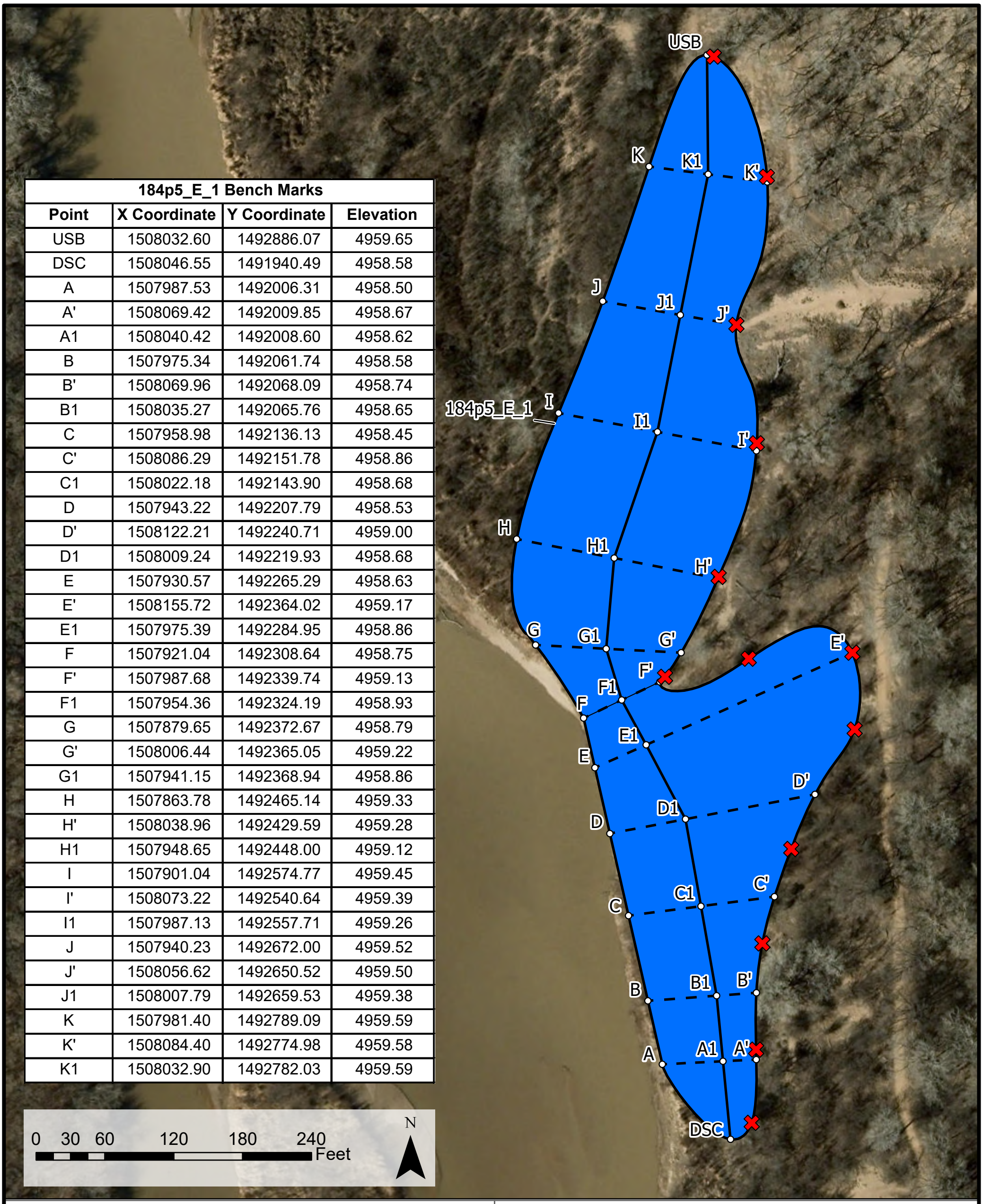
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

184p5_E_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1508032.60	1492886.07	4959.65
DSC	1508046.55	1491940.49	4958.58
A	1507987.53	1492006.31	4958.50
A'	1508069.42	1492009.85	4958.67
A1	1508040.42	1492008.60	4958.62
B	1507975.34	1492061.74	4958.58
B'	1508069.96	1492068.09	4958.74
B1	1508035.27	1492065.76	4958.65
C	1507958.98	1492136.13	4958.45
C'	1508086.29	1492151.78	4958.86
C1	1508022.18	1492143.90	4958.68
D	1507943.22	1492207.79	4958.53
D'	1508122.21	1492240.71	4959.00
D1	1508009.24	1492219.93	4958.68
E	1507930.57	1492265.29	4958.63
E'	1508155.72	1492364.02	4959.17
E1	1507975.39	1492284.95	4958.86
F	1507921.04	1492308.64	4958.75
F'	1507987.68	1492339.74	4959.13
F1	1507954.36	1492324.19	4958.93
G	1507879.65	1492372.67	4958.79
G'	1508006.44	1492365.05	4959.22
G1	1507941.15	1492368.94	4958.86
H	1507863.78	1492465.14	4959.33
H'	1508038.96	1492429.59	4959.28
H1	1507948.65	1492448.00	4959.12
I	1507901.04	1492574.77	4959.45
I'	1508073.22	1492540.64	4959.39
I1	1507987.13	1492557.71	4959.26
J	1507940.23	1492672.00	4959.52
J'	1508056.62	1492650.52	4959.50
J1	1508007.79	1492659.53	4959.38
K	1507981.40	1492789.09	4959.59
K'	1508084.40	1492774.98	4959.58
K1	1508032.90	1492782.03	4959.59



Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Backwater

Title

Site 184p5_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

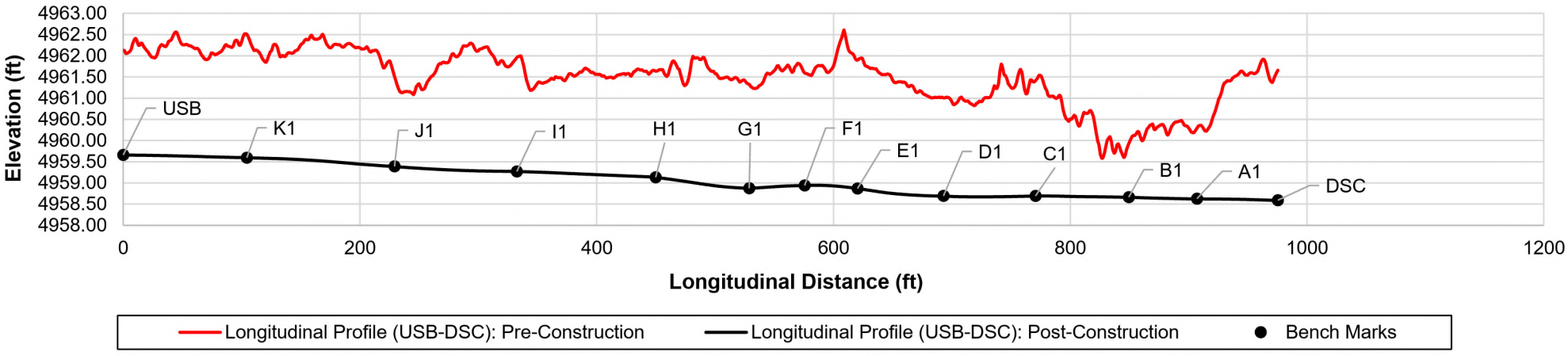
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

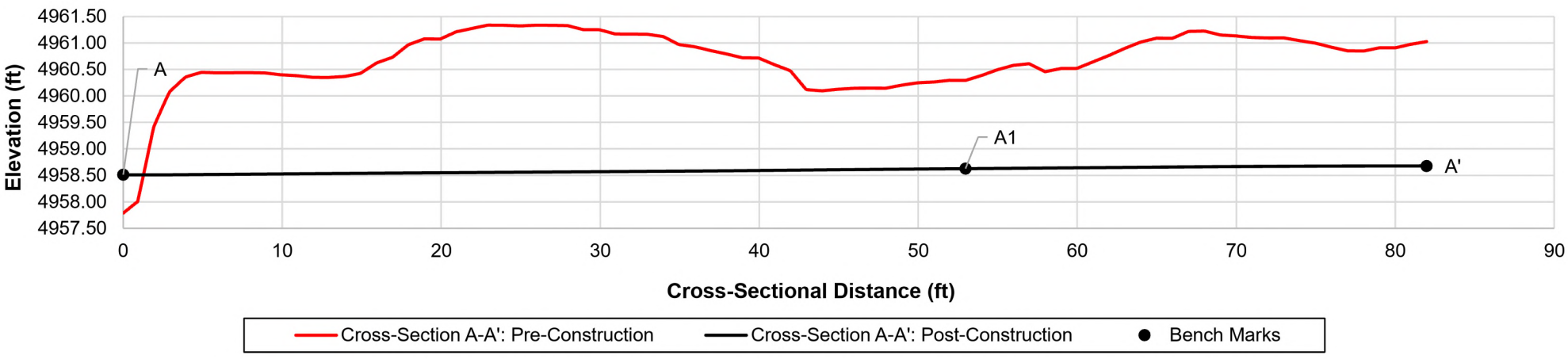
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

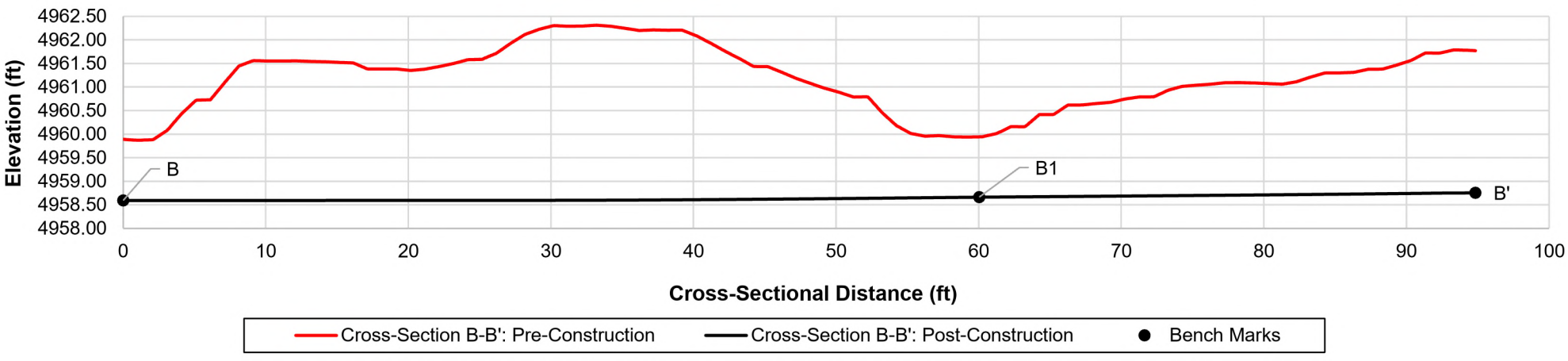
Longitudinal Profile (USB-DSC)



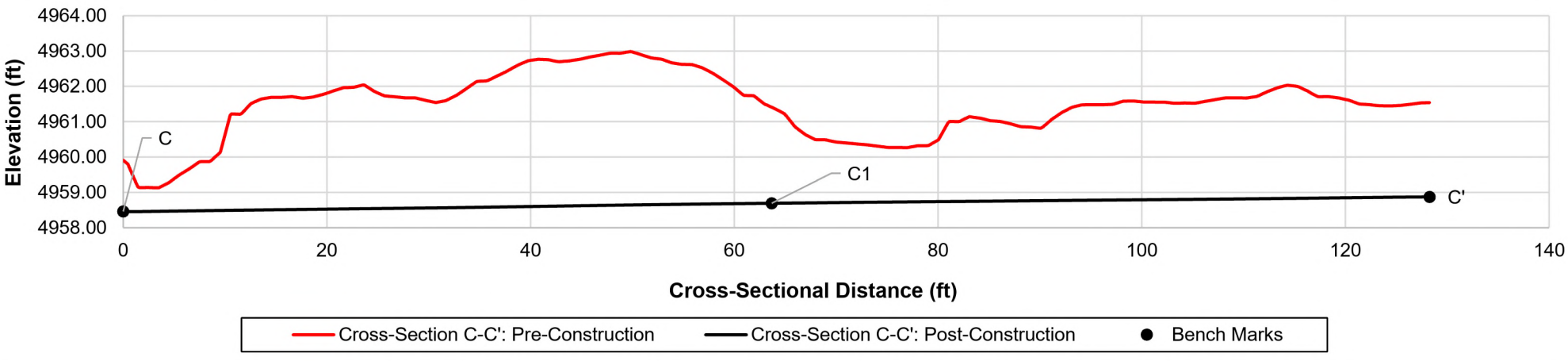
Cross-Section A-A'



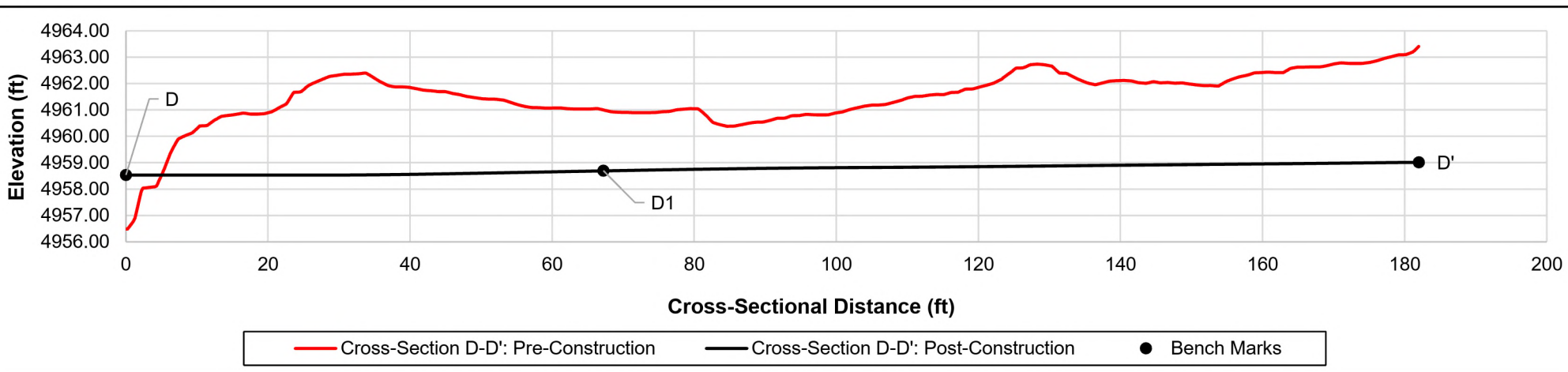
Cross-Section B-B'



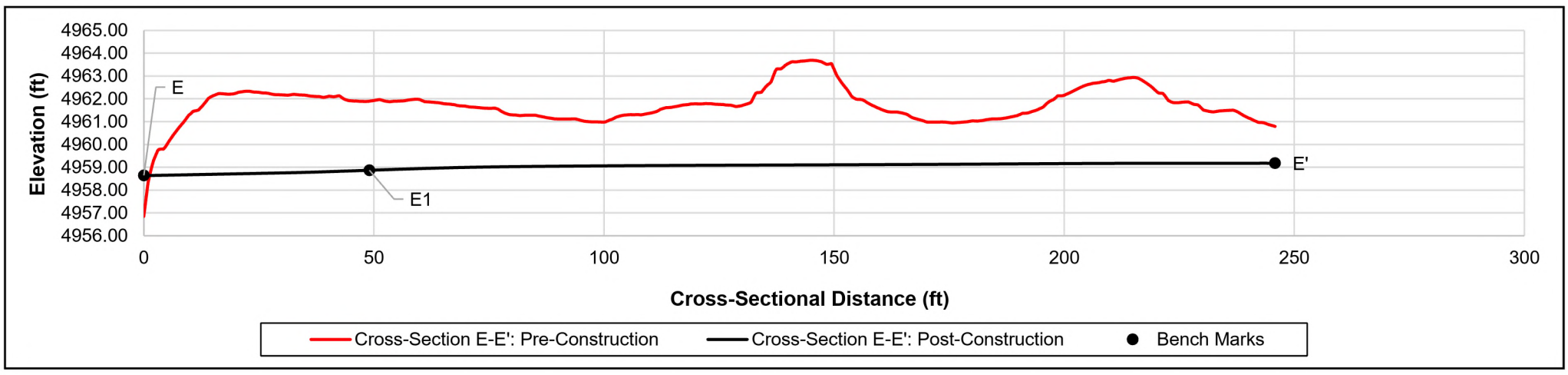
Cross-Section C-C'



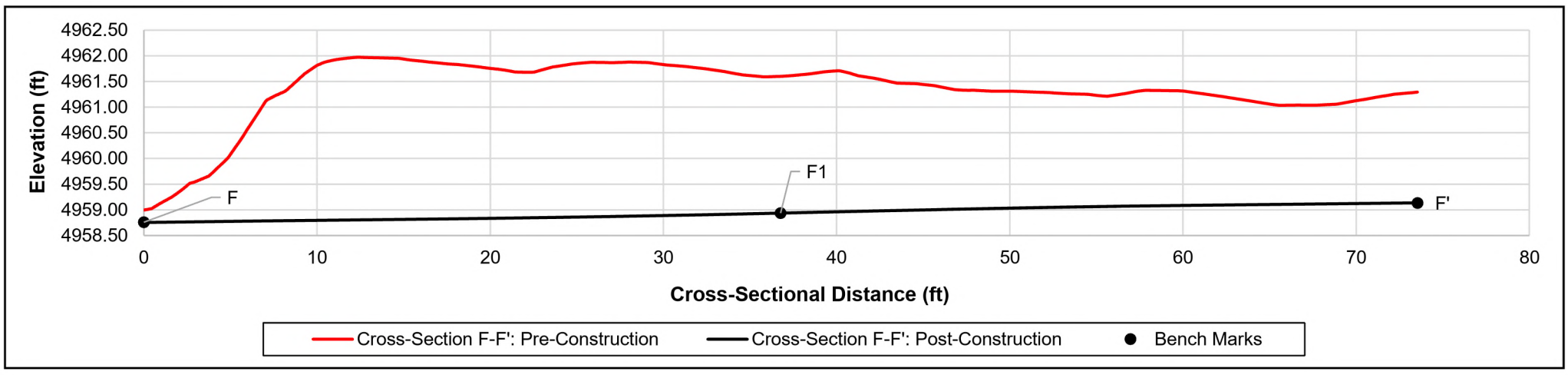
Cross-Section D-D'



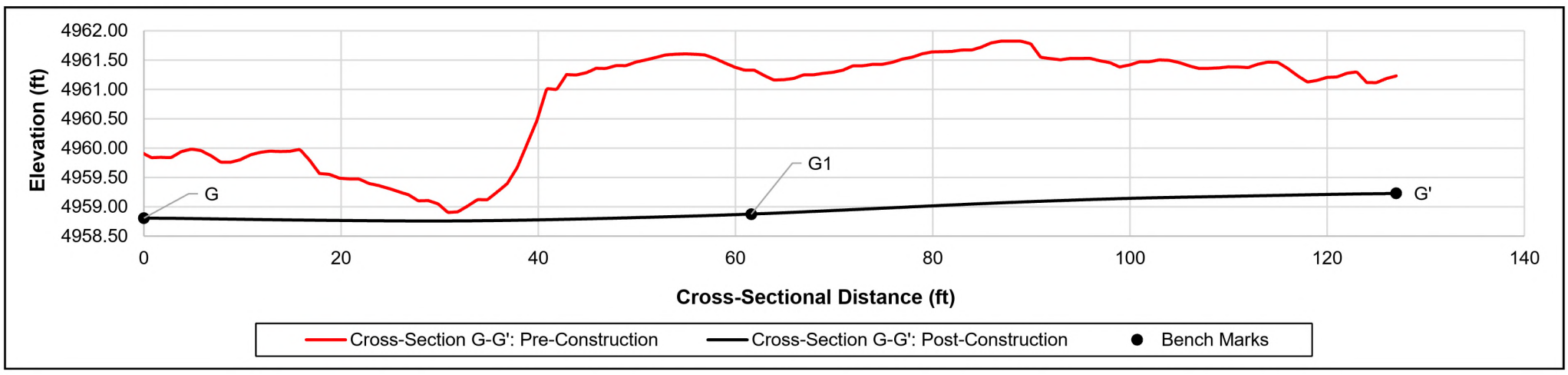
Cross-Section E-E'



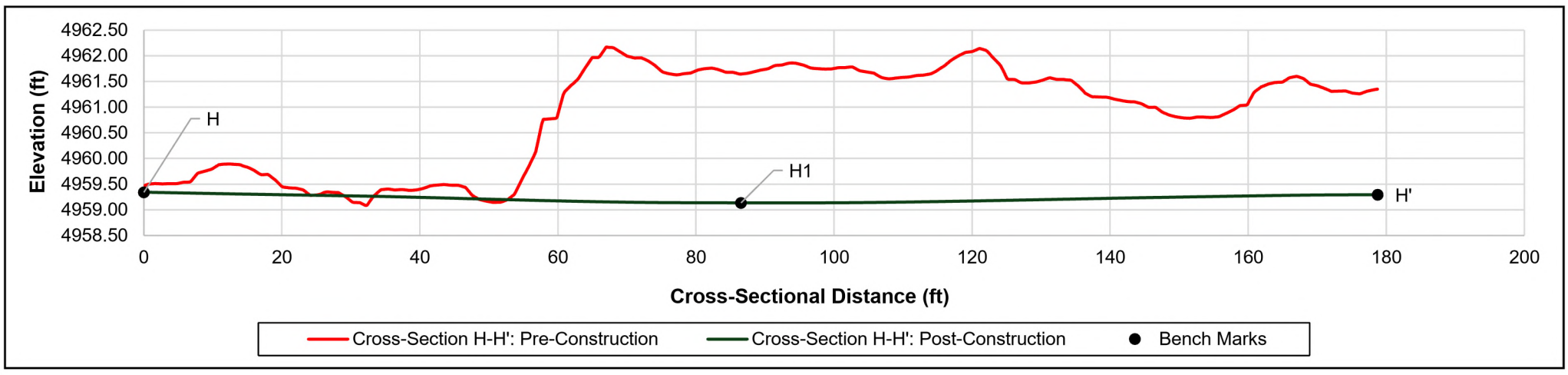
Cross-Section F-F'



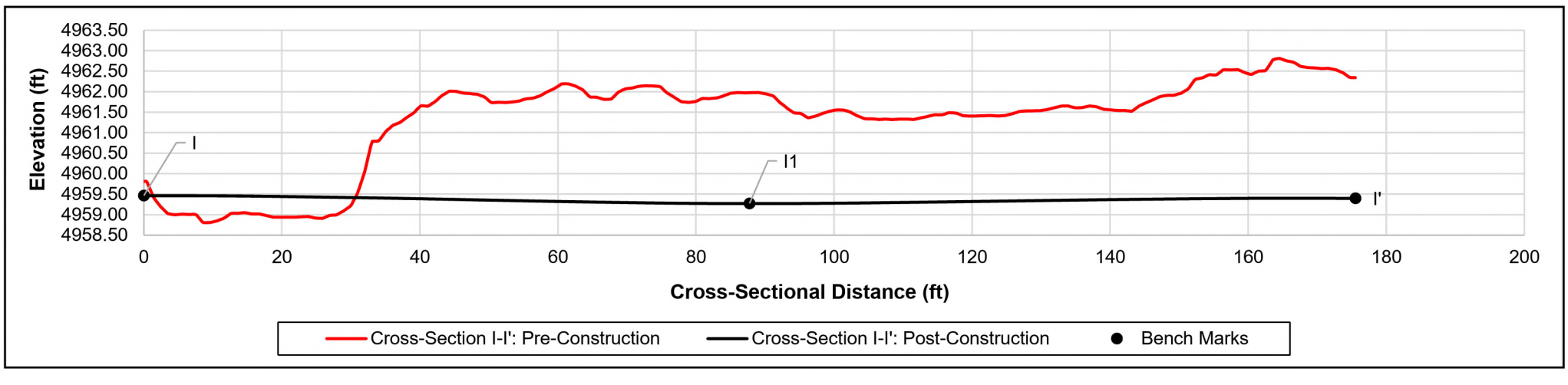
Cross-Section G-G'



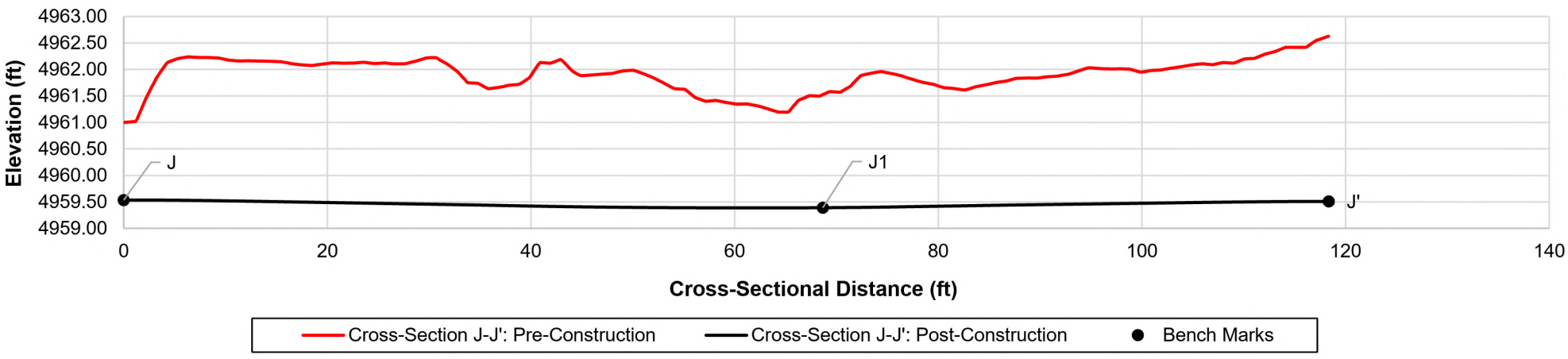
Cross-Section H-H'



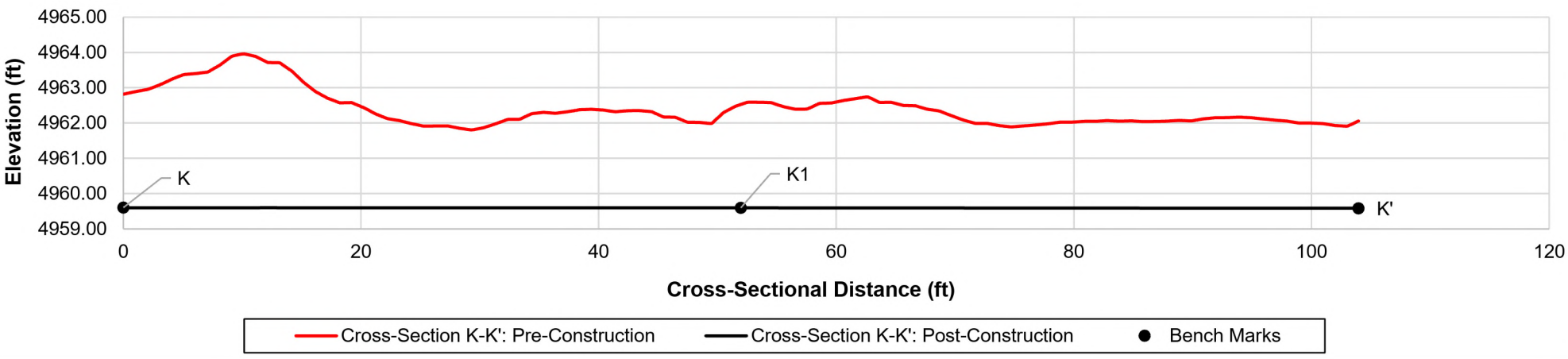
Cross-Section I-I'



Cross-Section J-J'



Cross-Section K-K'

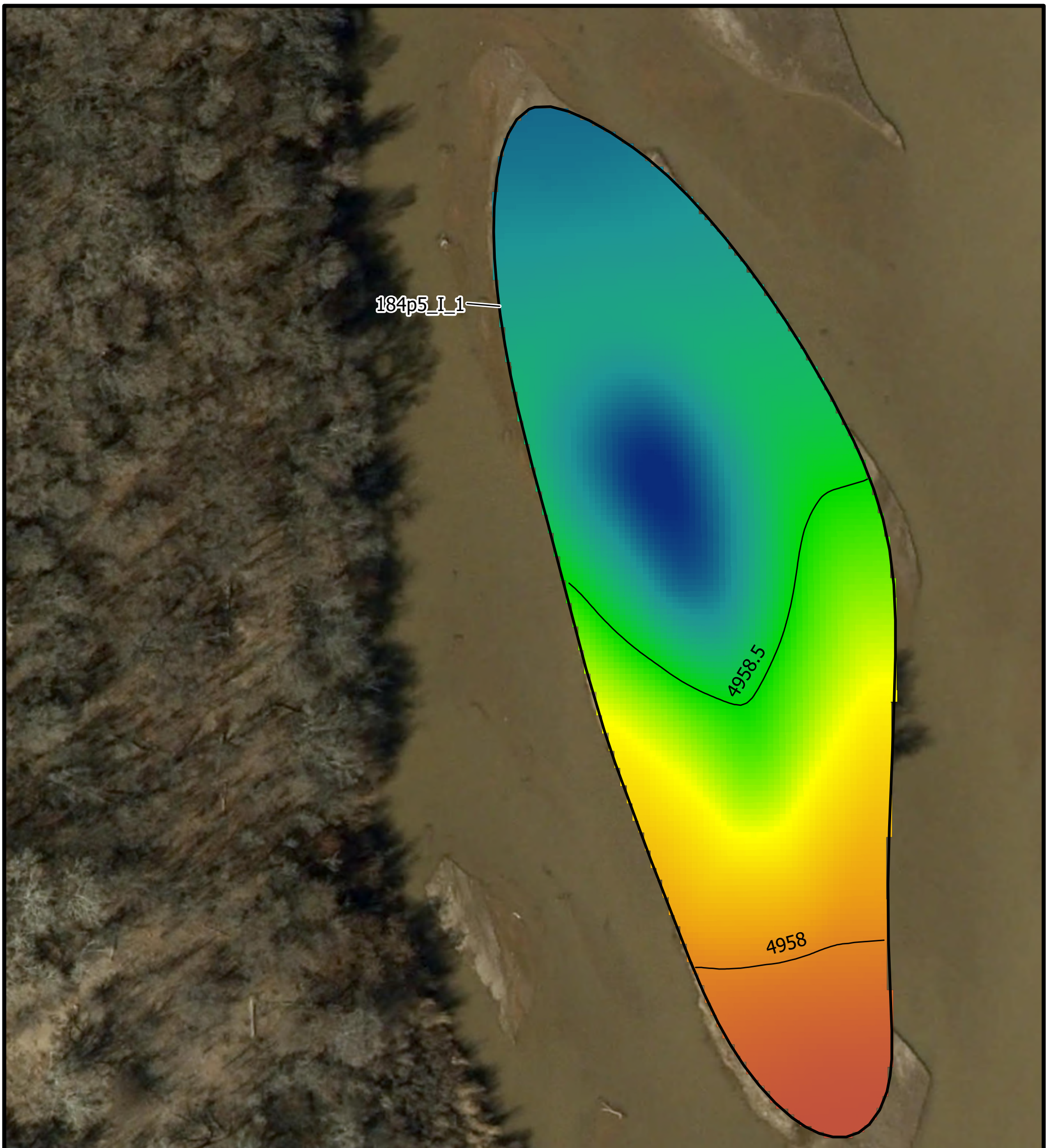


Notes:

USB = Upstream Boundary, DSC = Downstream Channel Connection Point, Letters A through K represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4958.96

4957.83

Title

Site 184p5_I_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

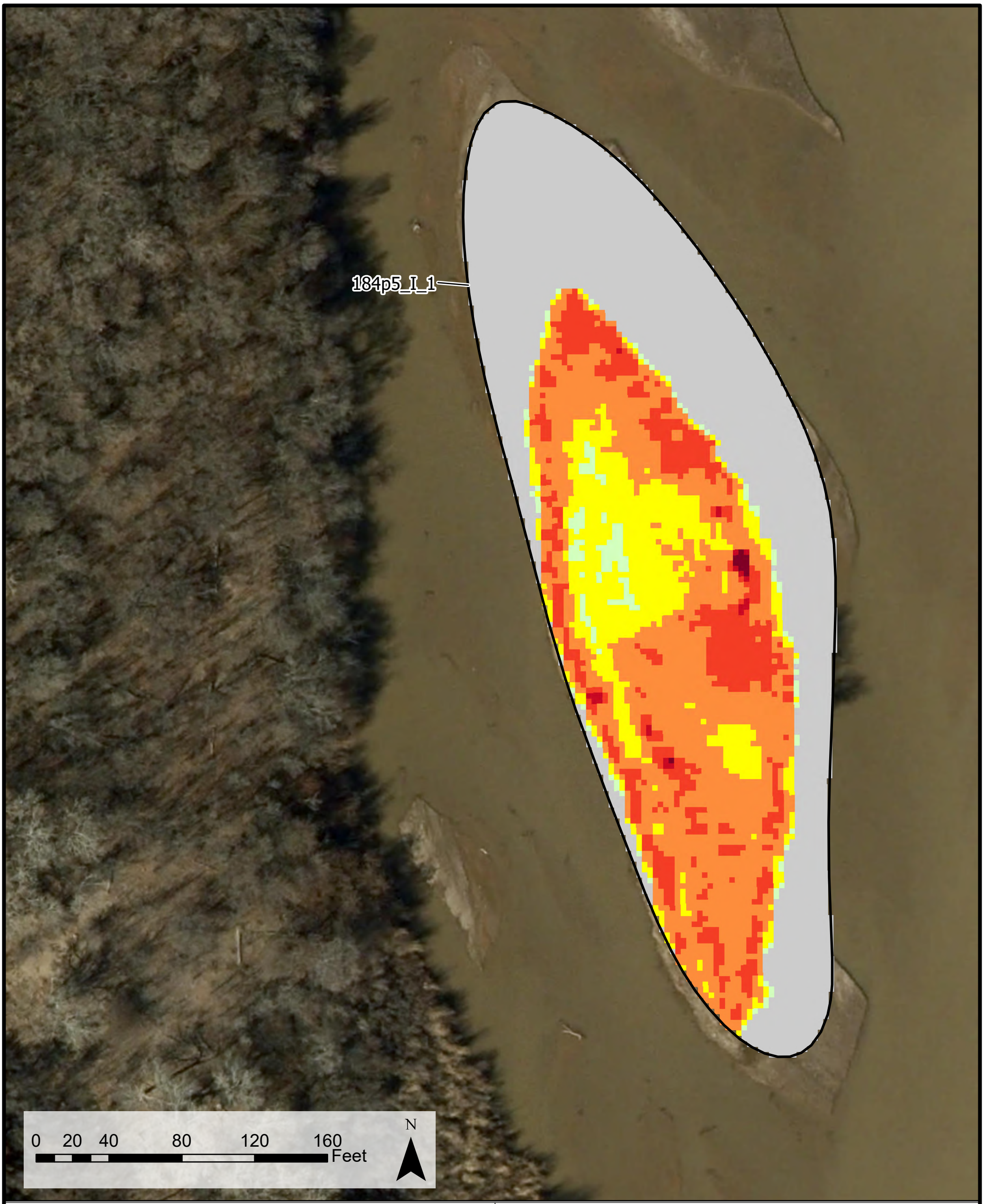
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.3

Title
Site 184p5_I_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

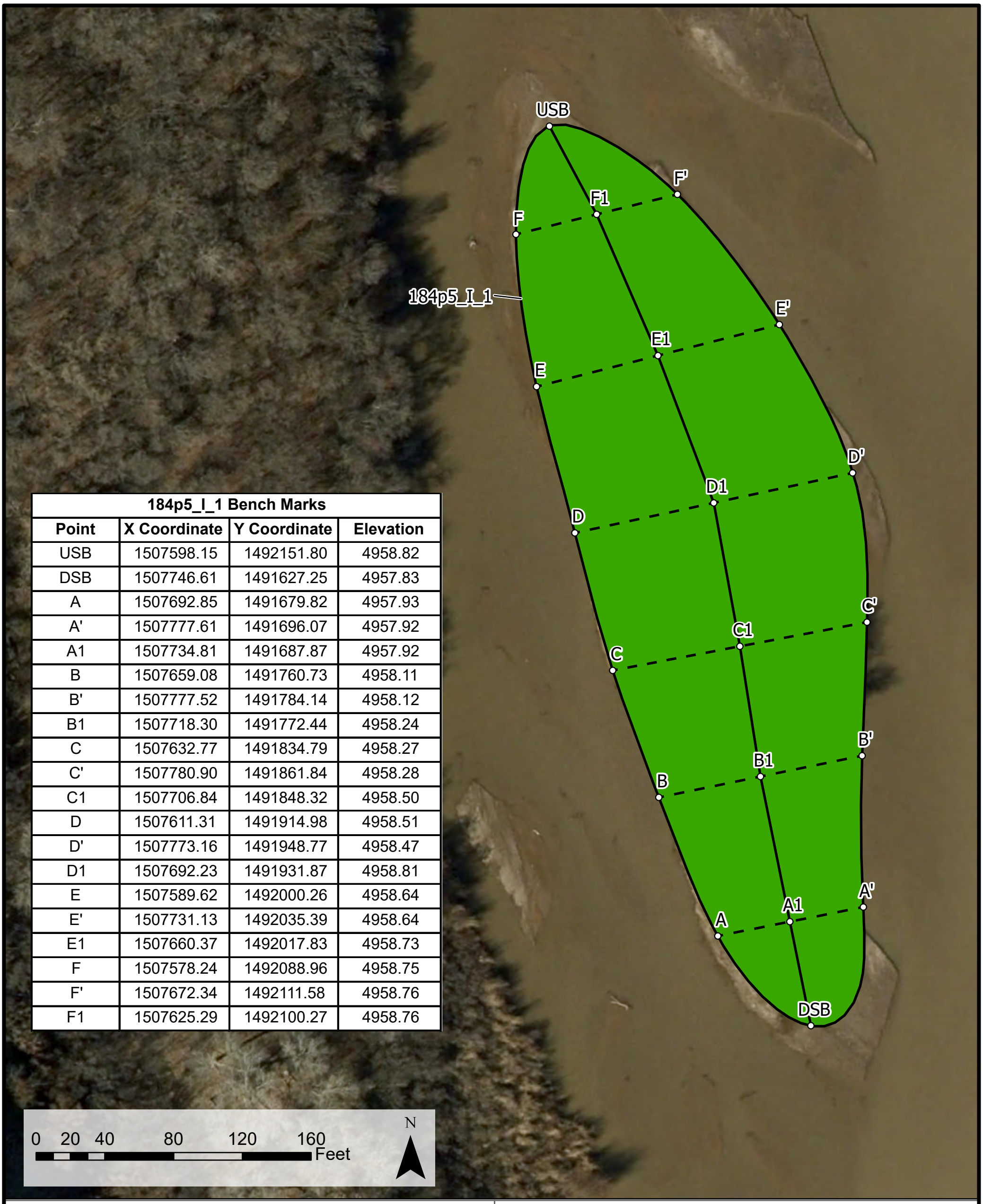
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



184p5_I_1 Bench Marks			
Point	X Coordinate	Y Coordinate	Elevation
USB	1507598.15	1492151.80	4958.82
DSB	1507746.61	1491627.25	4957.83
A	1507692.85	1491679.82	4957.93
A'	1507777.61	1491696.07	4957.92
A1	1507734.81	1491687.87	4957.92
B	1507659.08	1491760.73	4958.11
B'	1507777.52	1491784.14	4958.12
B1	1507718.30	1491772.44	4958.24
C	1507632.77	1491834.79	4958.27
C'	1507780.90	1491861.84	4958.28
C1	1507706.84	1491848.32	4958.50
D	1507611.31	1491914.98	4958.51
D'	1507773.16	1491948.77	4958.47
D1	1507692.23	1491931.87	4958.81
E	1507589.62	1492000.26	4958.64
E'	1507731.13	1492035.39	4958.64
E1	1507660.37	1492017.83	4958.73
F	1507578.24	1492088.96	4958.75
F'	1507672.34	1492111.58	4958.76
F1	1507625.29	1492100.27	4958.76

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Island Destabilization

Title

Site 184p5_I_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

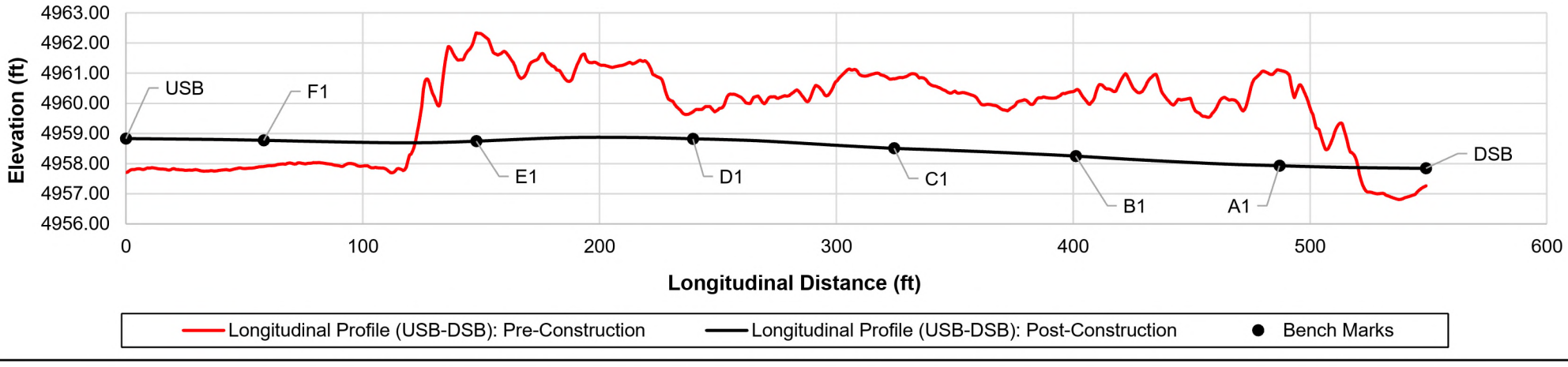
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

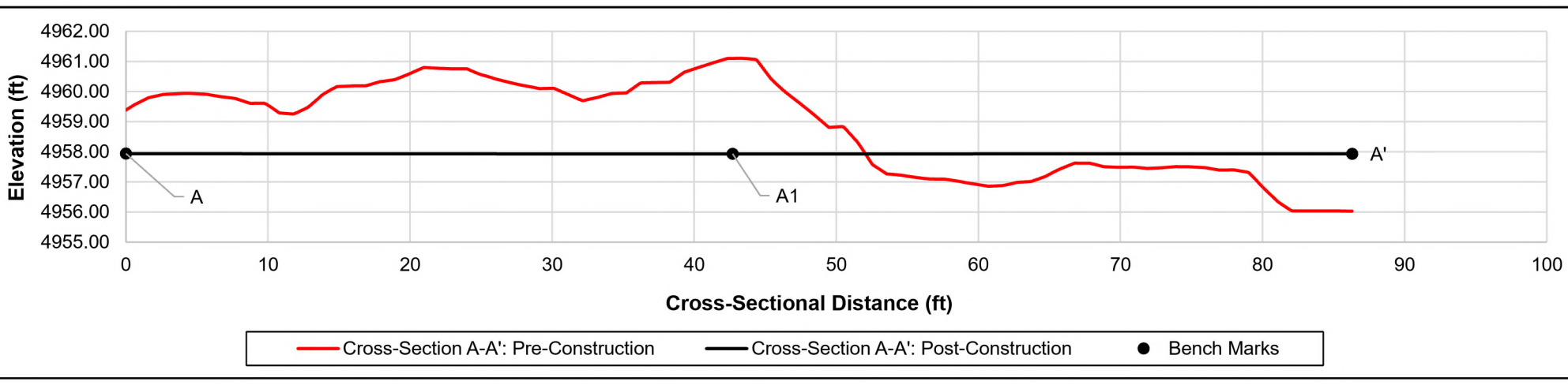
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

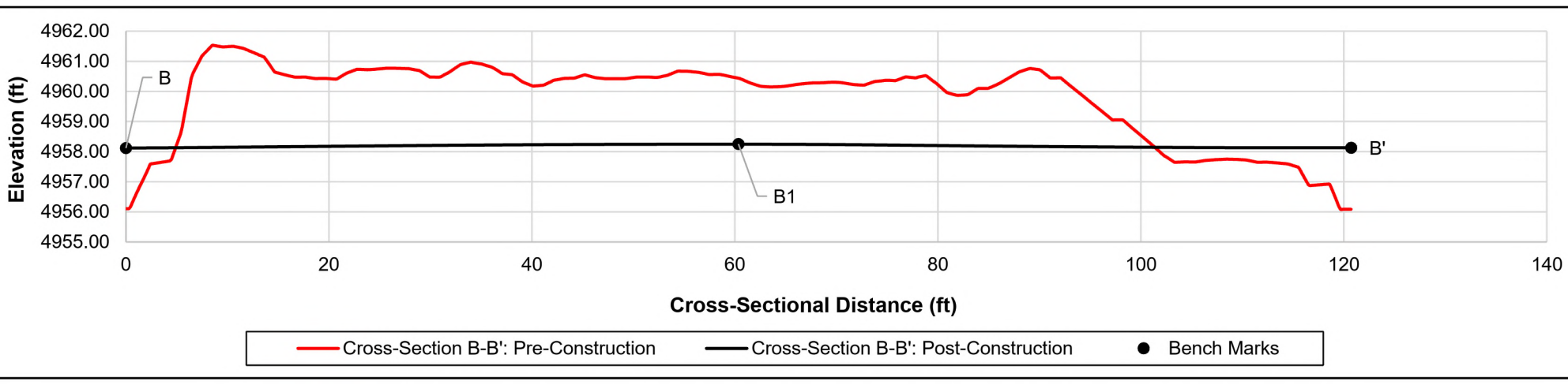
Longitudinal Profile (USB-DSB)



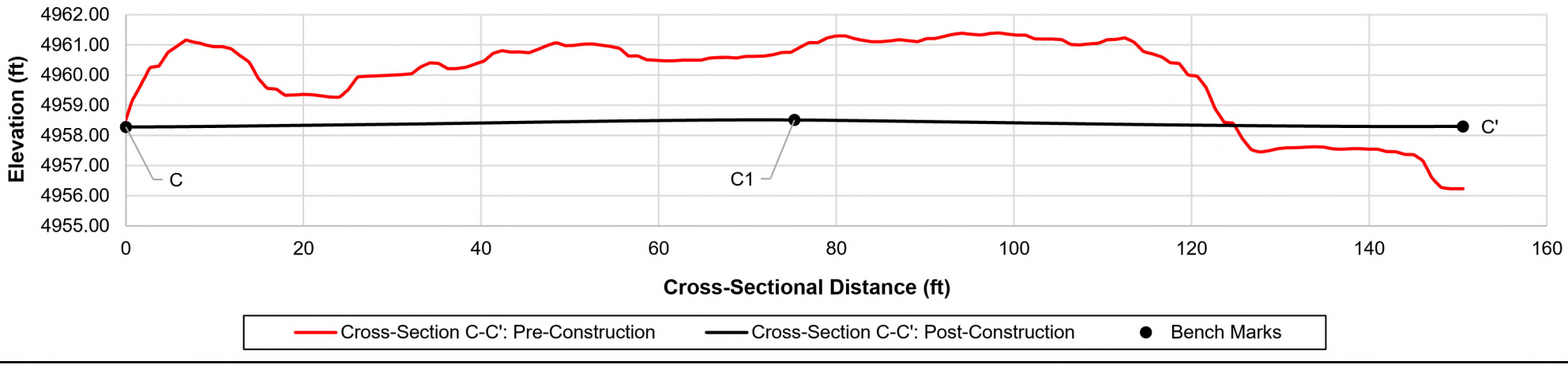
Cross-Section A-A'



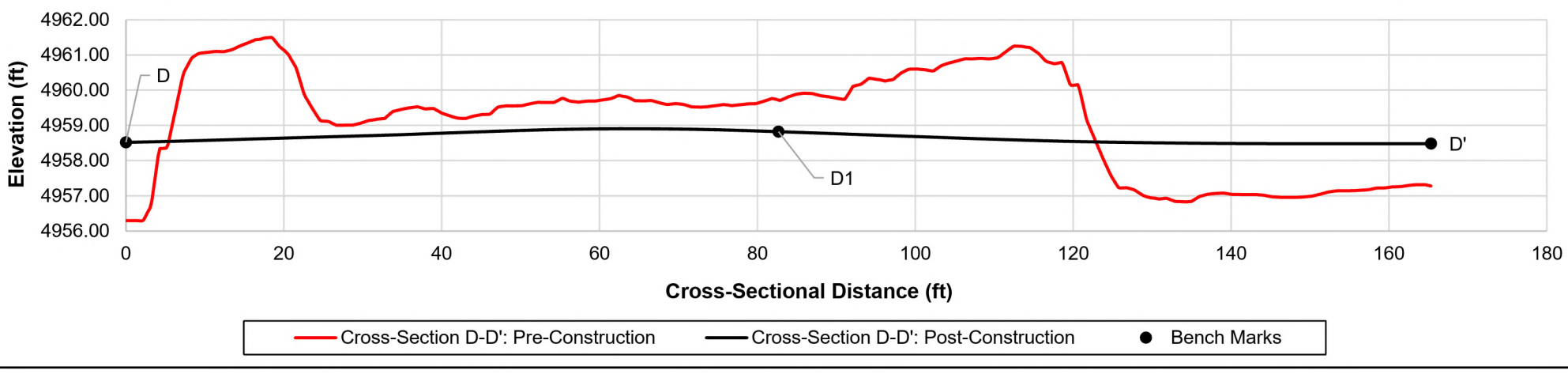
Cross-Section B-B'



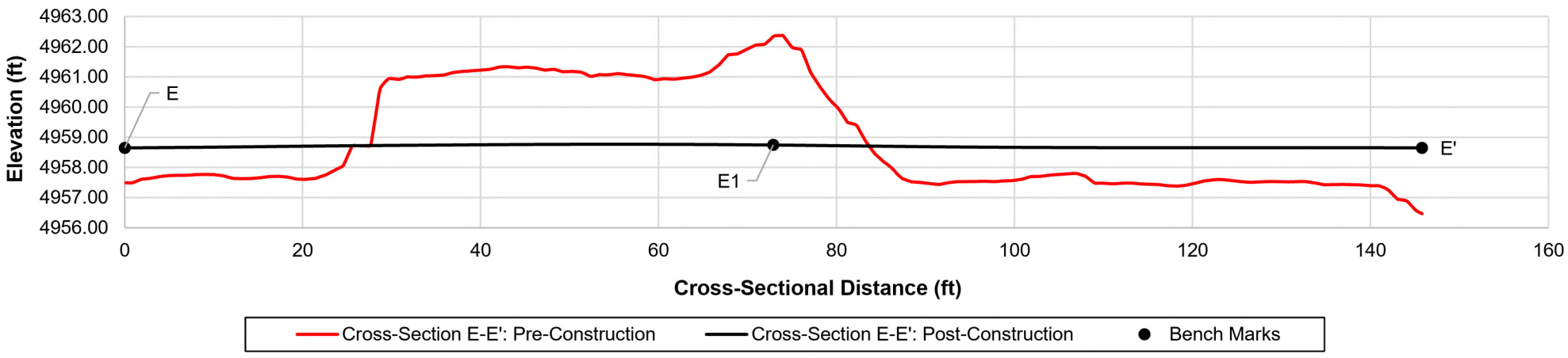
Cross-Section C-C'



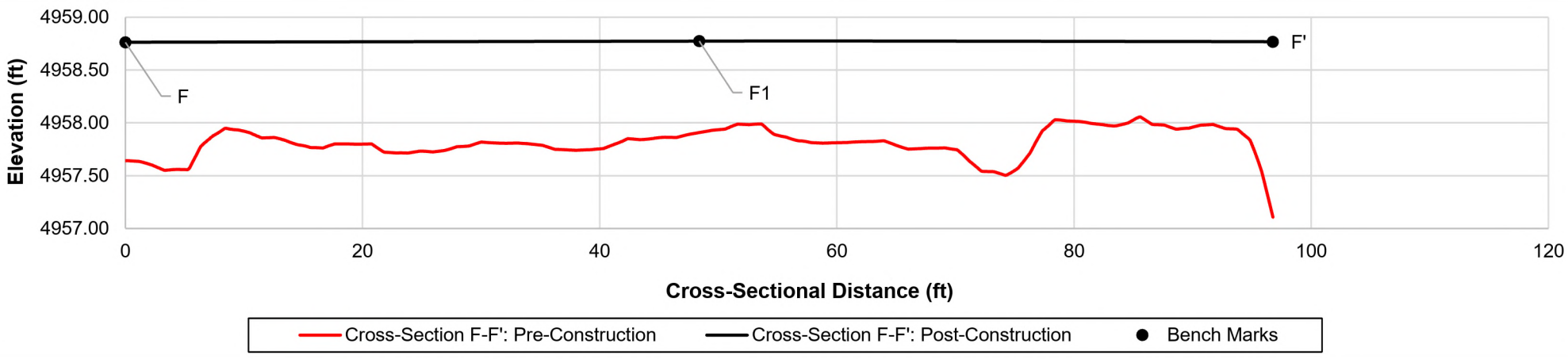
Cross-Section D-D'



Cross-Section E-E'



Cross-Section F-F'

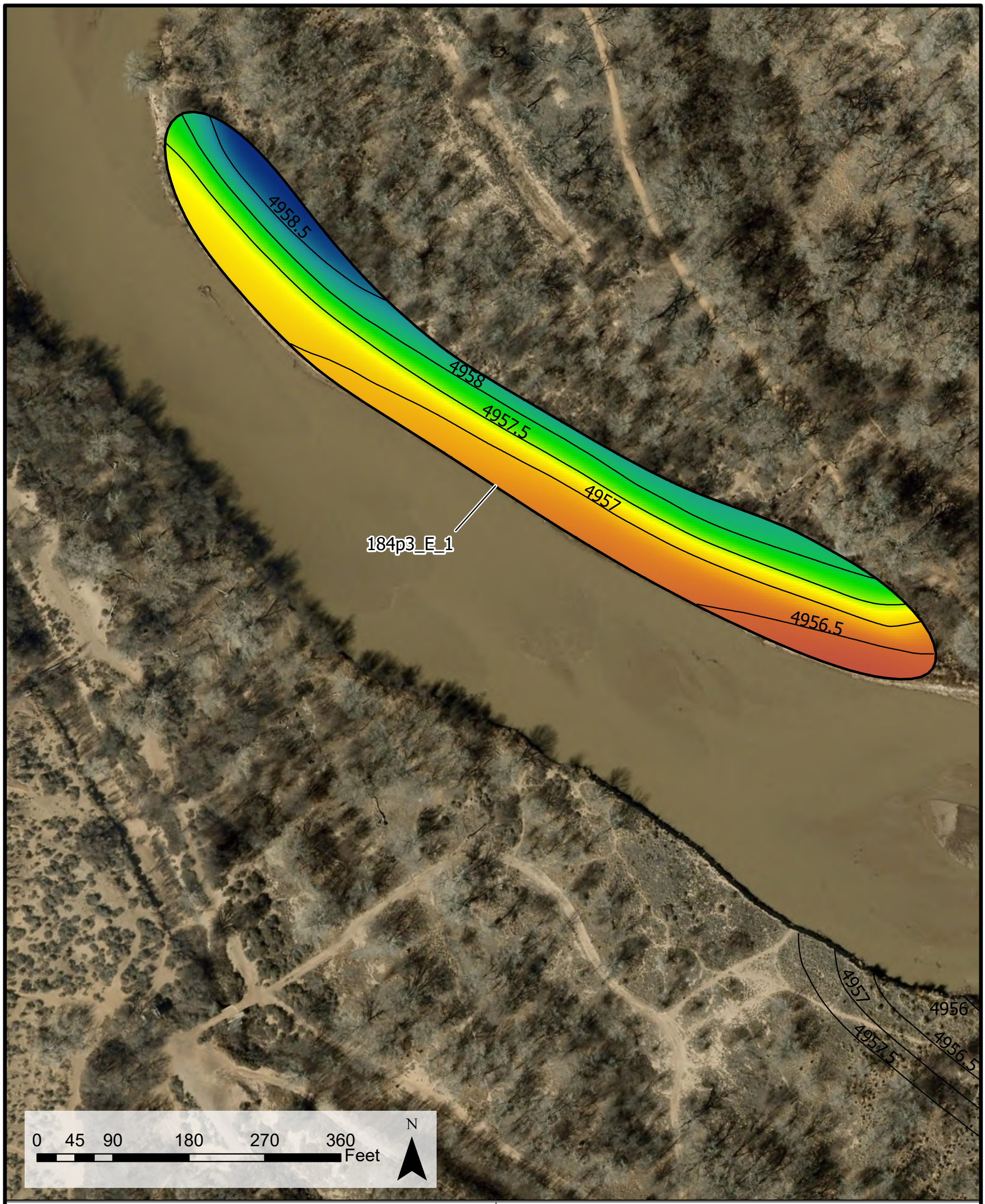


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through F represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4958.89

4956.29

Title

Site 184p3_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

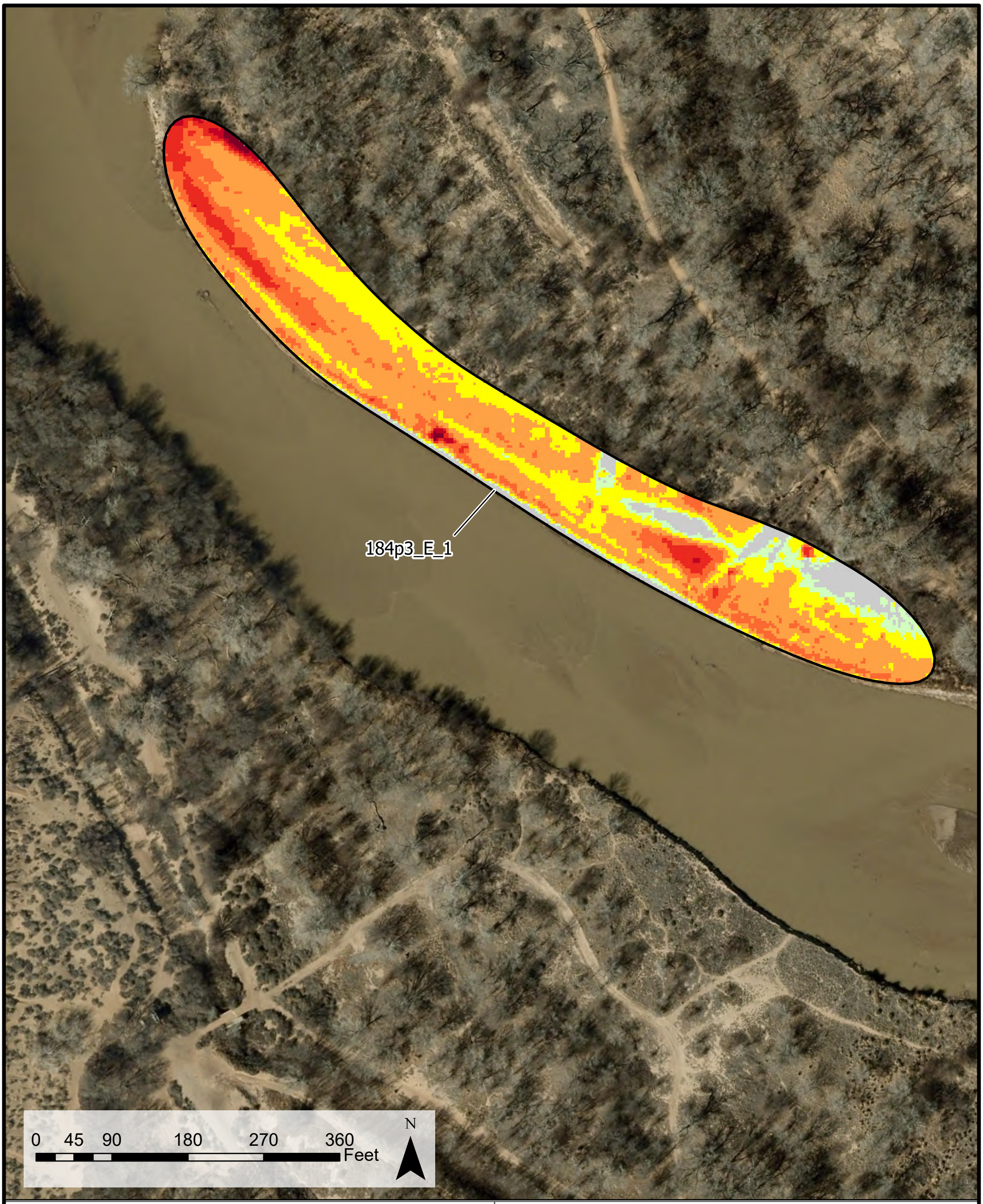
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.5
- 5.5-6.5

Title

Site 184p3_E_1 Excavation Depths

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

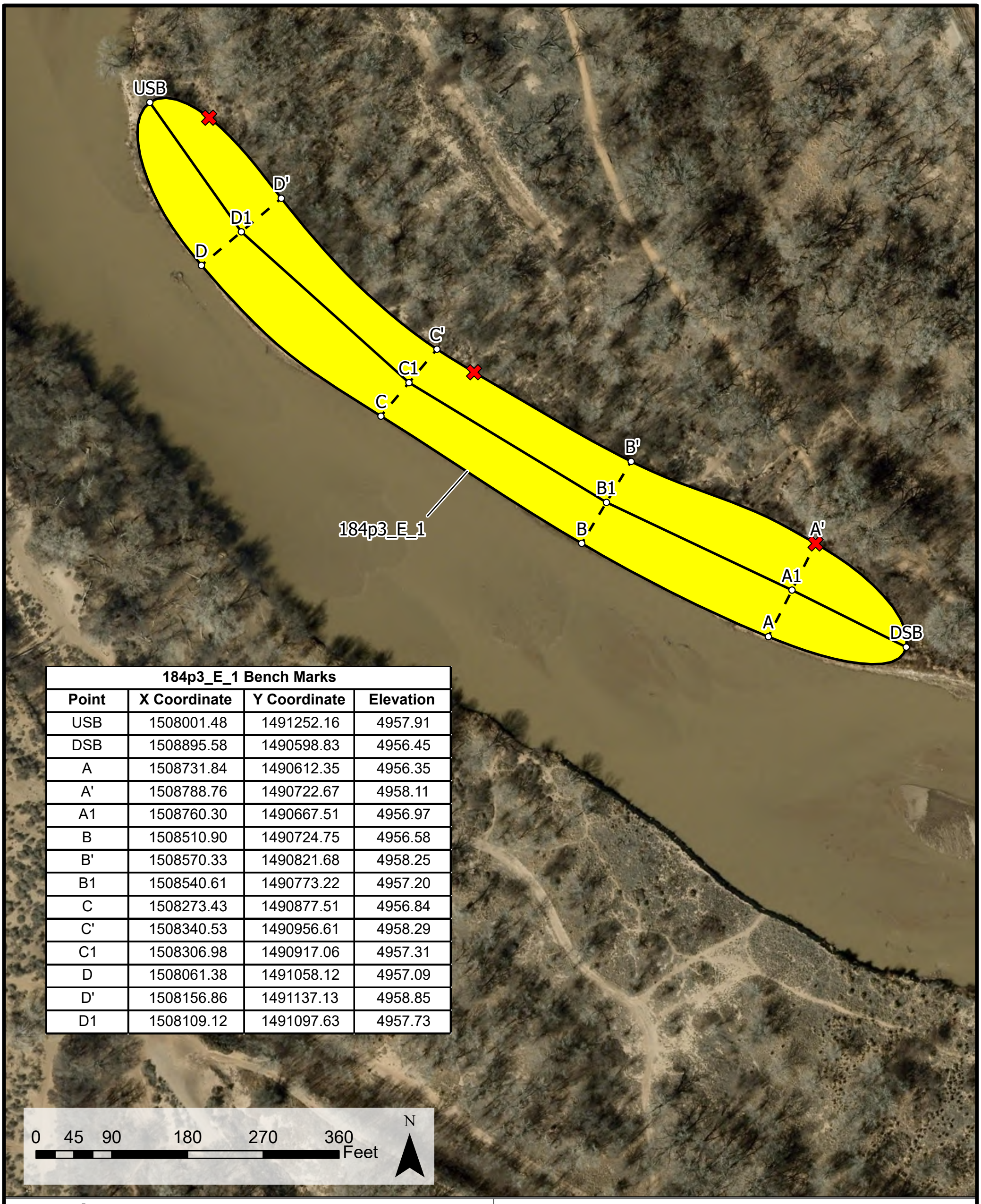
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



184p3_E_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1508001.48	1491252.16	4957.91
DSB	1508895.58	1490598.83	4956.45
A	1508731.84	1490612.35	4956.35
A'	1508788.76	1490722.67	4958.11
A1	1508760.30	1490667.51	4956.97
B	1508510.90	1490724.75	4956.58
B'	1508570.33	1490821.68	4958.25
B1	1508540.61	1490773.22	4957.20
C	1508273.43	1490877.51	4956.84
C'	1508340.53	1490956.61	4958.29
C1	1508306.98	1490917.06	4957.31
D	1508061.38	1491058.12	4957.09
D'	1508156.86	1491137.13	4958.85
D1	1508109.12	1491097.63	4957.73

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Bankline Modification

Title

Site 184p3_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

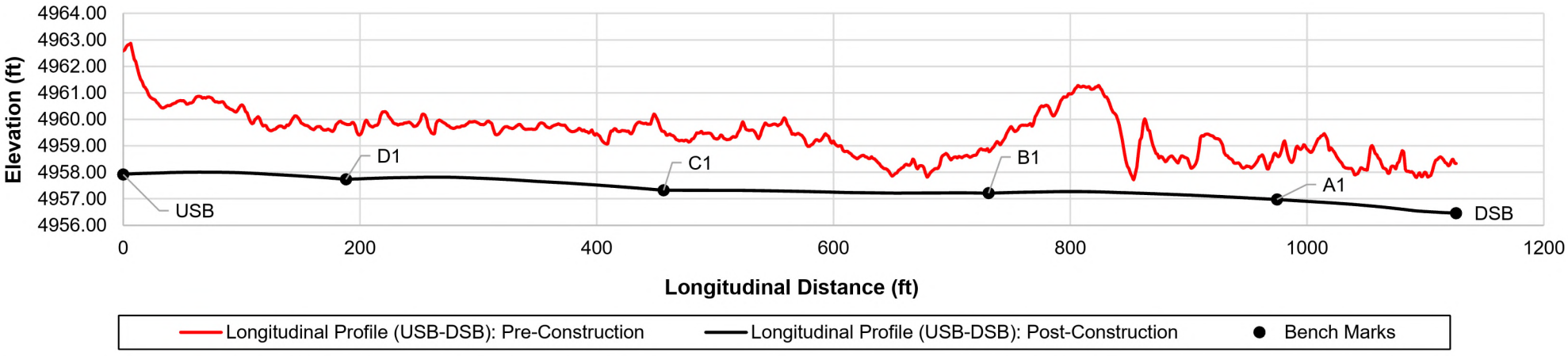
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

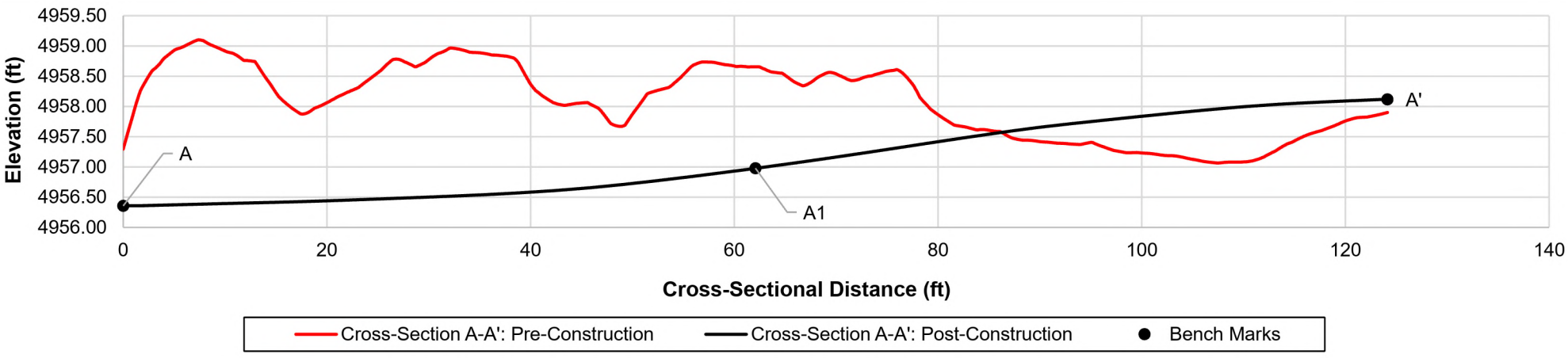
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

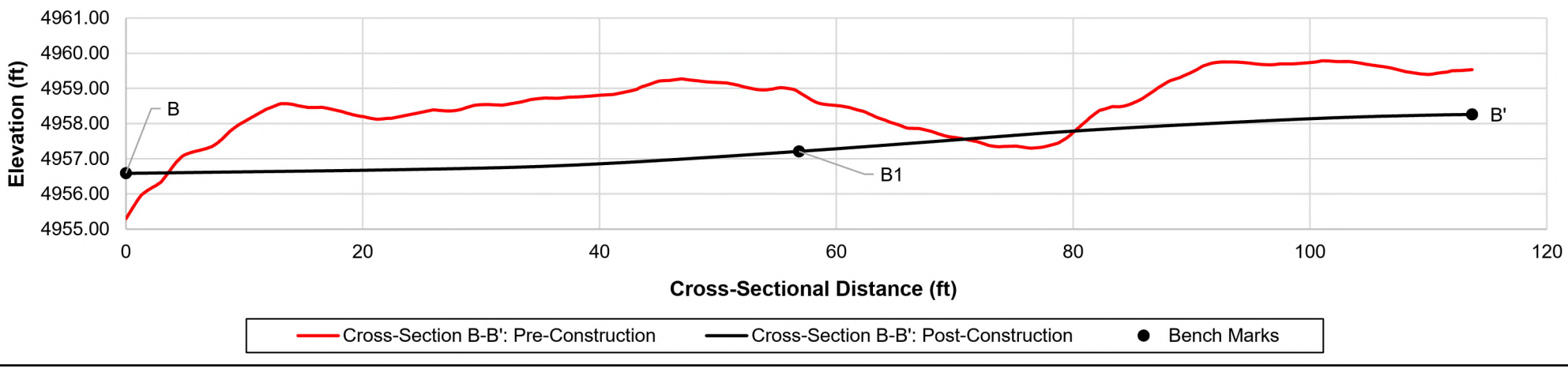
Longitudinal Profile (USB-DSB)



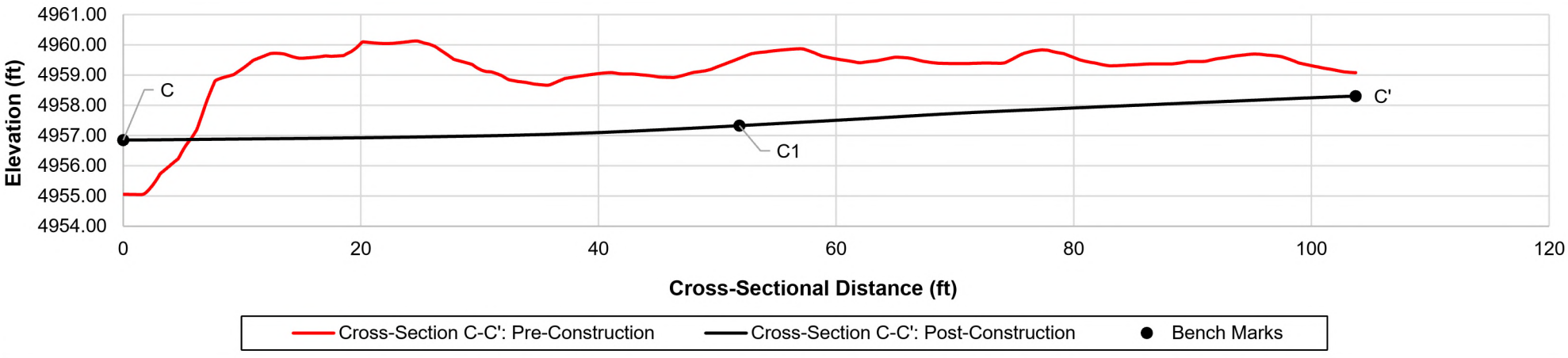
Cross-Section A-A'



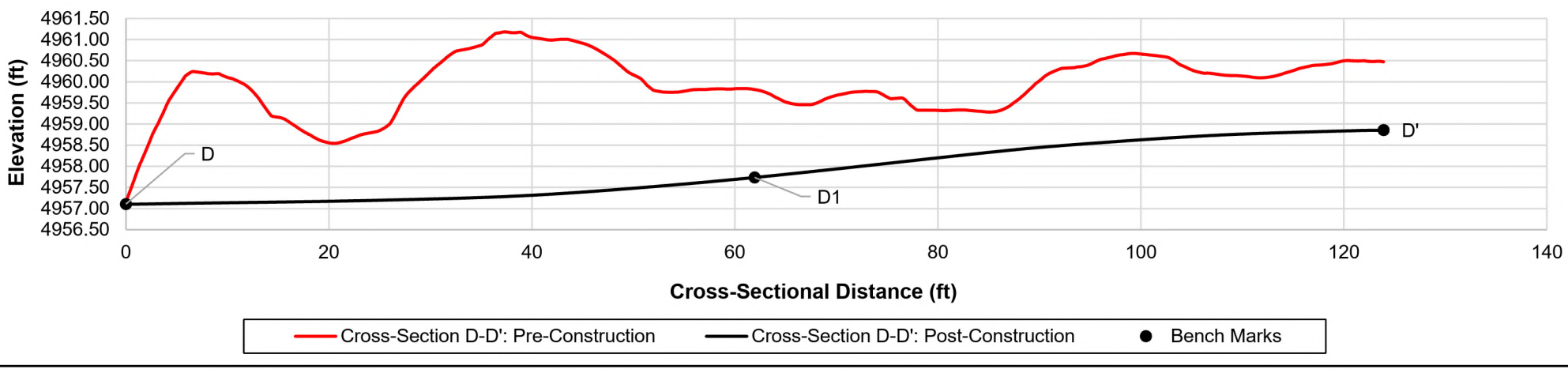
Cross-Section B-B'



Cross-Section C-C'



Cross-Section D-D'

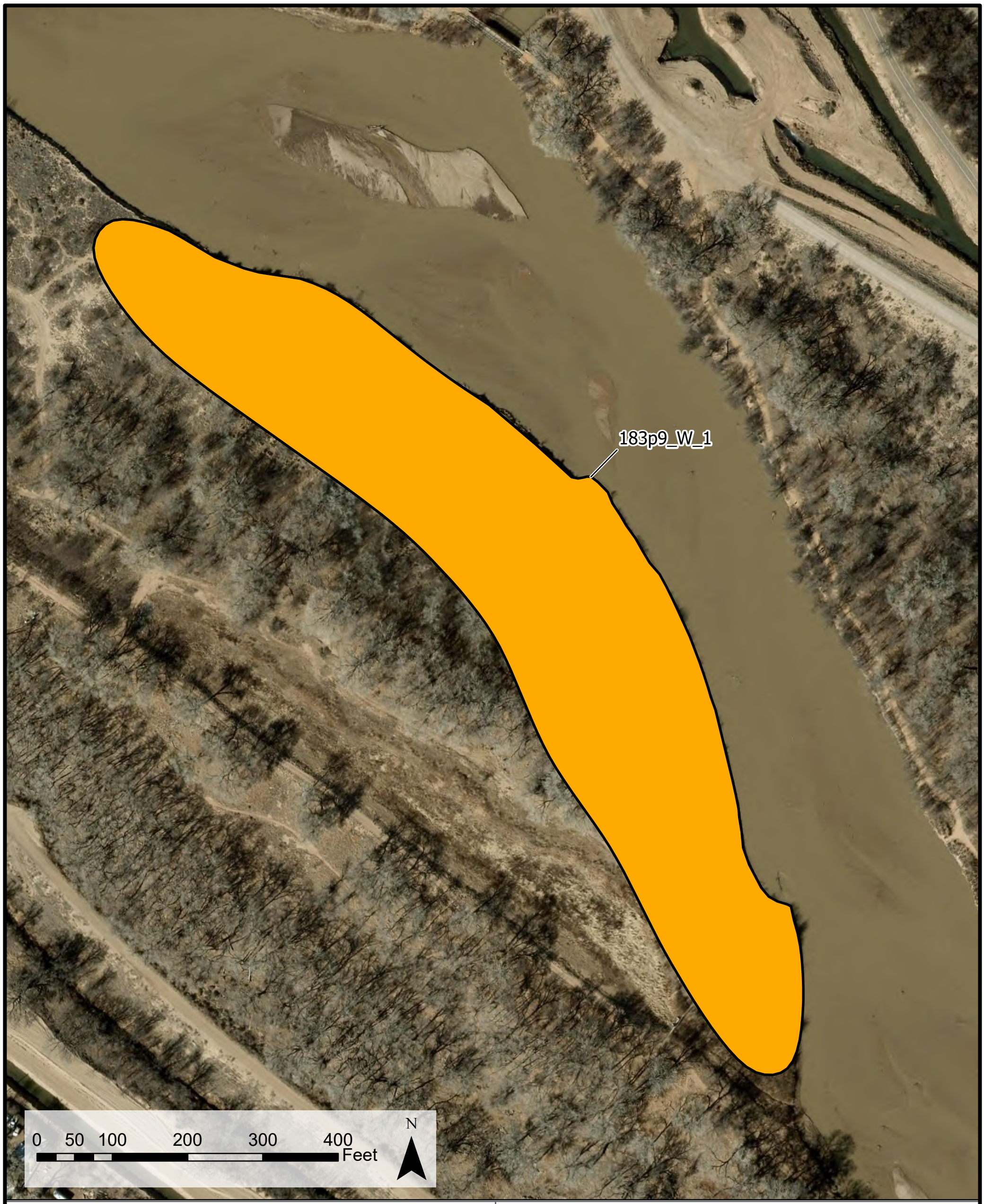


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through D represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

HR Features

Vegetation Removal

Title
Site 183p9_W_1: Vegetation Treatment Only

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

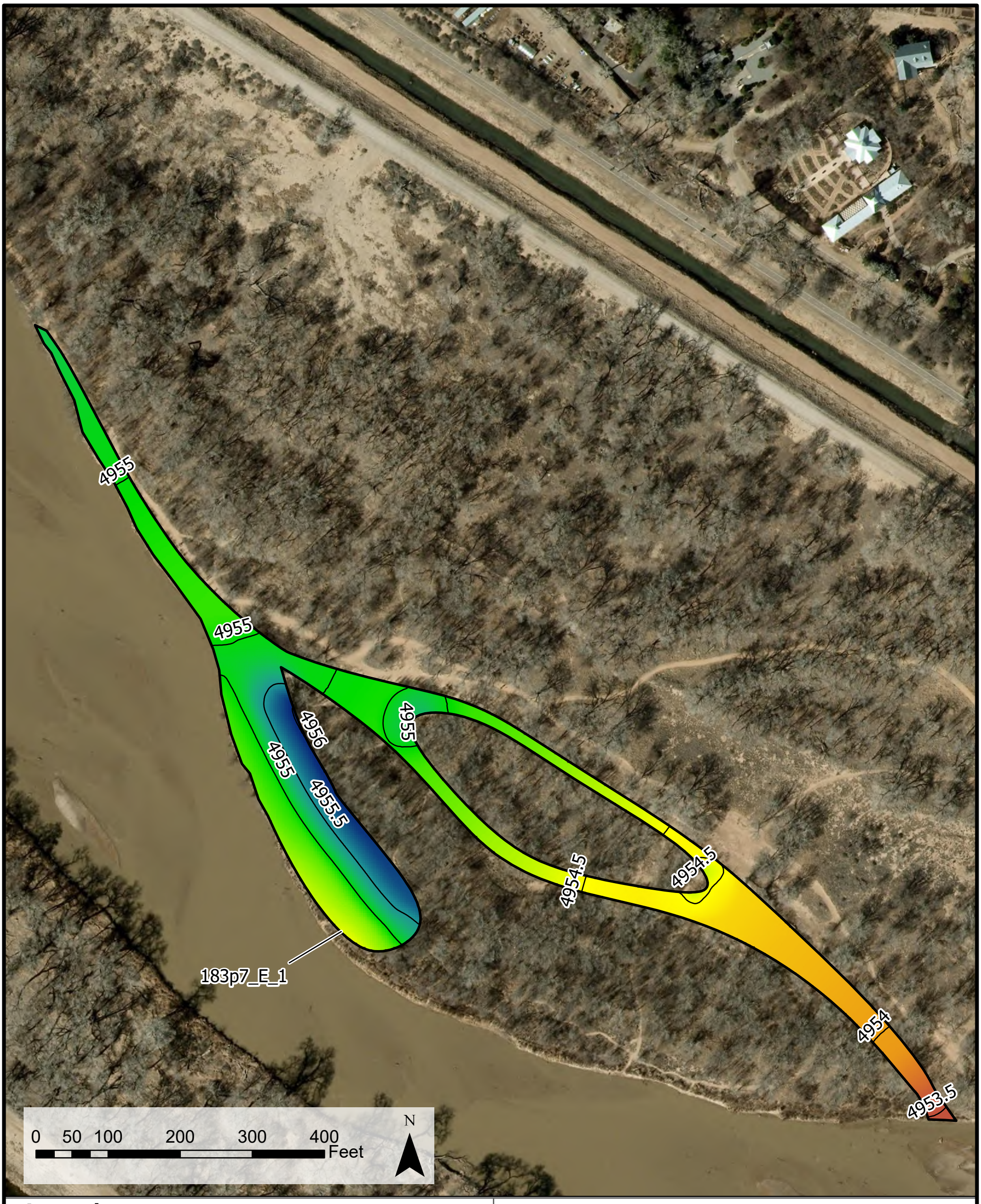
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4956.05

4953.42

Title

Site 183p7_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

183p7_E_1

0 50 100 200 300 400 Feet

N

Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.4

Title

Site 183p7_E_1 Excavation Depths

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

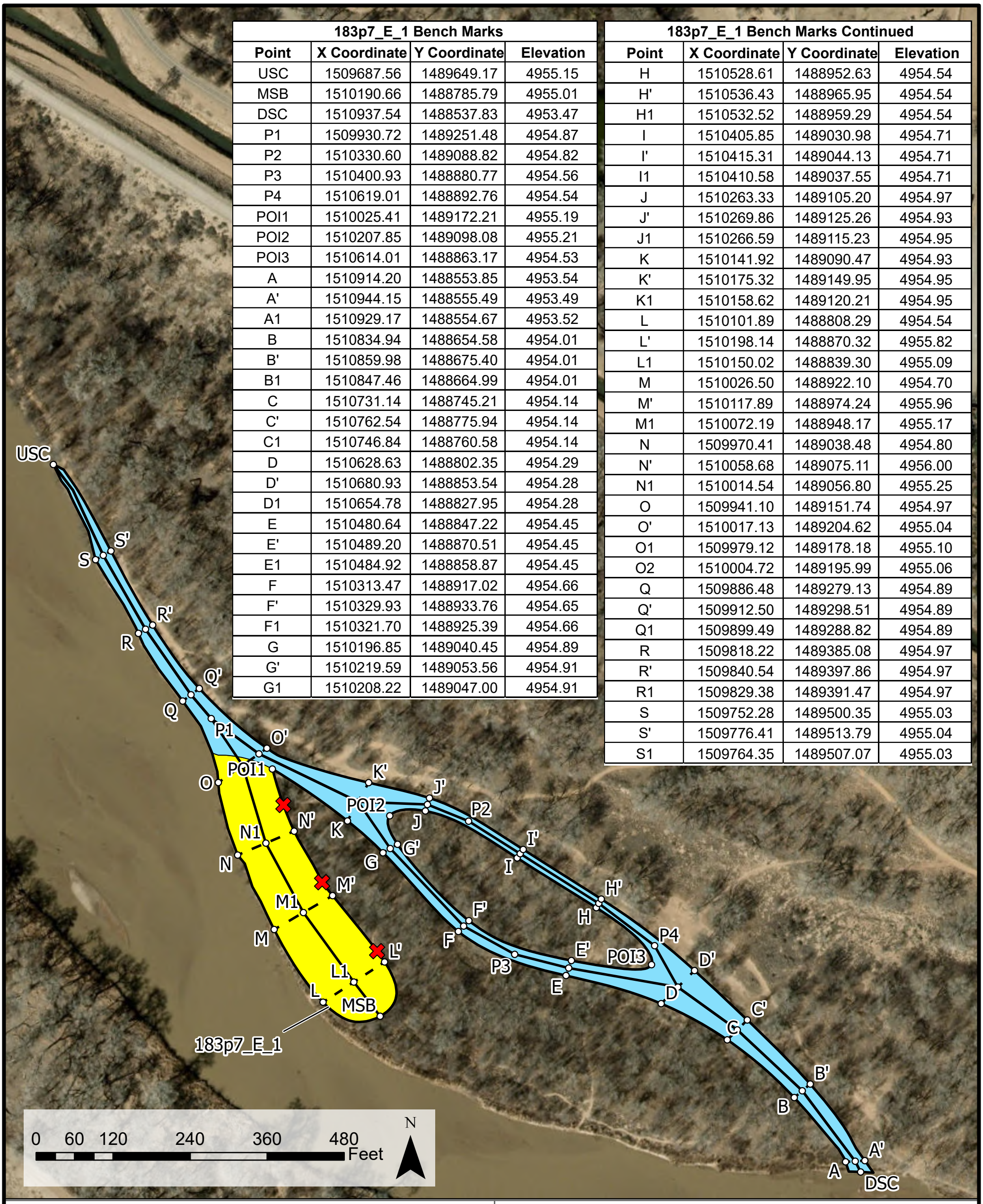
GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

183p7_E_1 Bench Marks			
Point	X Coordinate	Y Coordinate	Elevation
USC	1509687.56	1489649.17	4955.15
MSB	1510190.66	1488785.79	4955.01
DSC	1510937.54	1488537.83	4953.47
P1	1509930.72	1489251.48	4954.87
P2	1510330.60	1489088.82	4954.82
P3	1510400.93	1488880.77	4954.56
P4	1510619.01	1488892.76	4954.54
POI1	1510025.41	1489172.21	4955.19
POI2	1510207.85	1489098.08	4955.21
POI3	1510614.01	1488863.17	4954.53
A	1510914.20	1488553.85	4953.54
A'	1510944.15	1488555.49	4953.49
A1	1510929.17	1488554.67	4953.52
B	1510834.94	1488654.58	4954.01
B'	1510859.98	1488675.40	4954.01
B1	1510847.46	1488664.99	4954.01
C	1510731.14	1488745.21	4954.14
C'	1510762.54	1488775.94	4954.14
C1	1510746.84	1488760.58	4954.14
D	1510628.63	1488802.35	4954.29
D'	1510680.93	1488853.54	4954.28
D1	1510654.78	1488827.95	4954.28
E	1510480.64	1488847.22	4954.45
E'	1510489.20	1488870.51	4954.45
E1	1510484.92	1488858.87	4954.45
F	1510313.47	1488917.02	4954.66
F'	1510329.93	1488933.76	4954.65
F1	1510321.70	1488925.39	4954.66
G	1510196.85	1489040.45	4954.89
G'	1510219.59	1489053.56	4954.91
G1	1510208.22	1489047.00	4954.91

183p7_E_1 Bench Marks Continued			
Point	X Coordinate	Y Coordinate	Elevation
H	1510528.61	1488952.63	4954.54
H'	1510536.43	1488965.95	4954.54
H1	1510532.52	1488959.29	4954.54
I	1510405.85	1489030.98	4954.71
I'	1510415.31	1489044.13	4954.71
I1	1510410.58	1489037.55	4954.71
J	1510263.33	1489105.20	4954.97
J'	1510269.86	1489125.26	4954.93
J1	1510266.59	1489115.23	4954.95
K	1510141.92	1489090.47	4954.93
K'	1510175.32	1489149.95	4954.95
K1	1510158.62	1489120.21	4954.95
L	1510101.89	1488808.29	4954.54
L'	1510198.14	1488870.32	4955.82
L1	1510150.02	1488839.30	4955.09
M	1510026.50	1488922.10	4954.70
M'	1510117.89	1488974.24	4955.96
M1	1510072.19	1488948.17	4955.17
N	1509970.41	1489038.48	4954.80
N'	1510058.68	1489075.11	4956.00
N1	1510014.54	1489056.80	4955.25
O	1509941.10	1489151.74	4954.97
O'	1510017.13	1489204.62	4955.04
O1	1509979.12	1489178.18	4955.10
O2	1510004.72	1489195.99	4955.06
Q	1509886.48	1489279.13	4954.89
Q'	1509912.50	1489298.51	4954.89
Q1	1509899.49	1489288.82	4954.89
R	1509818.22	1489385.08	4954.97
R'	1509840.54	1489397.86	4954.97
R1	1509829.38	1489391.47	4954.97
S	1509752.28	1489500.35	4955.03
S'	1509776.41	1489513.79	4955.04
S1	1509764.35	1489507.07	4955.03



Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Bankline Modification
- Flowthrough Channel

Title
Site 183p7_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

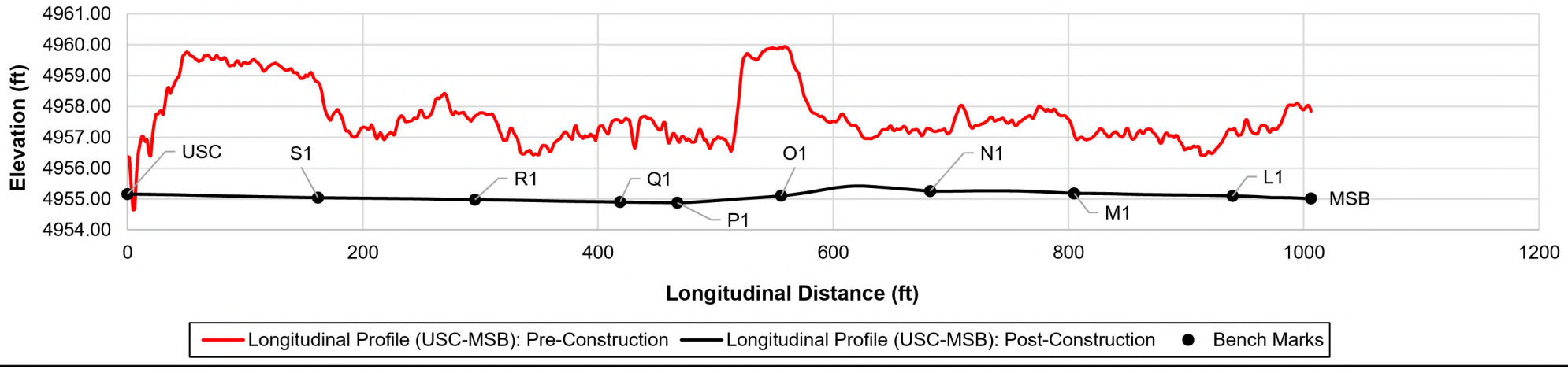
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

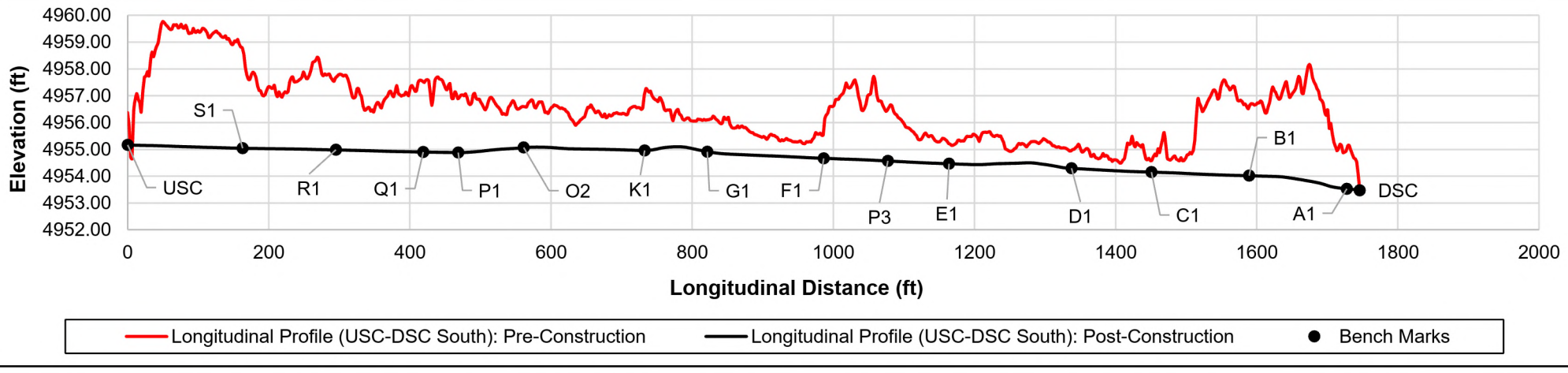
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

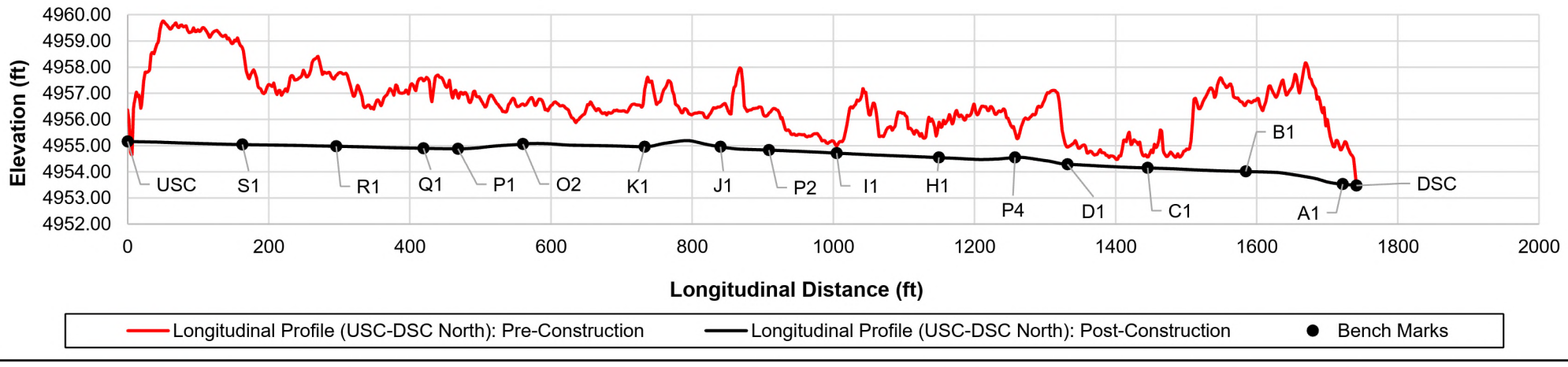
Longitudinal Profile (USC-MSB)



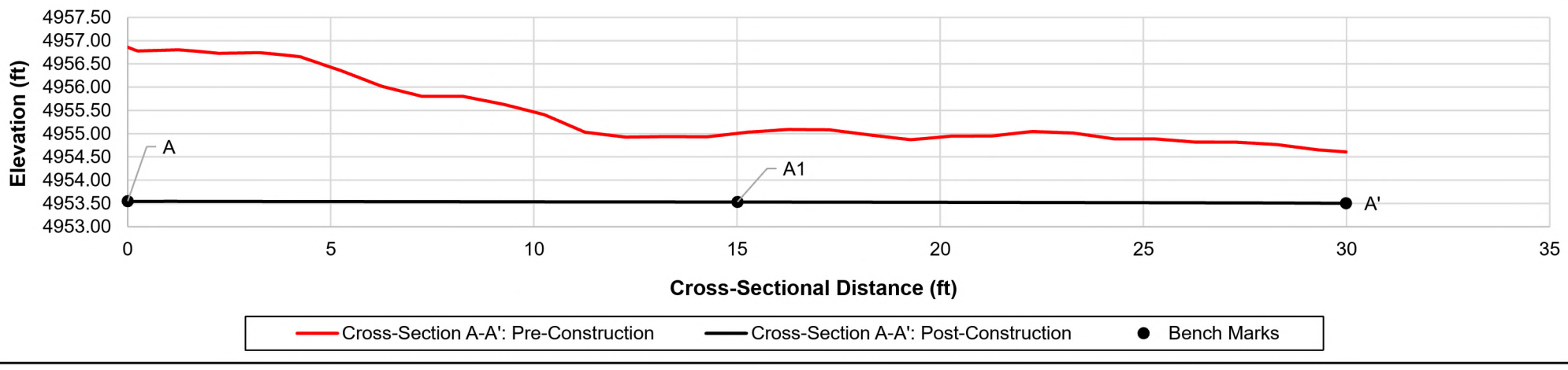
Longitudinal Profile (USC-DSC South)



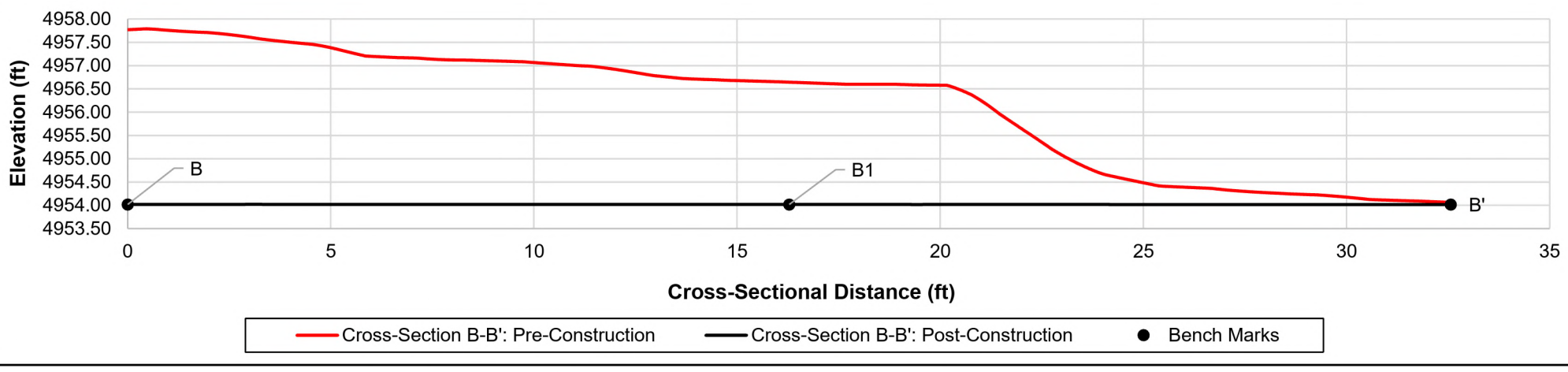
Longitudinal Profile (USC-DSC North)



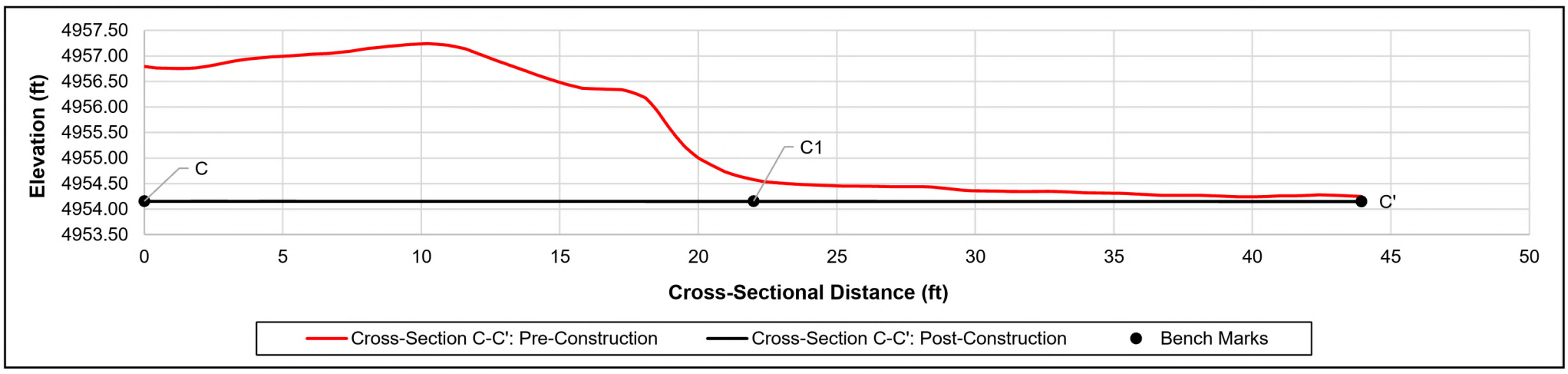
Cross-Section A-A'



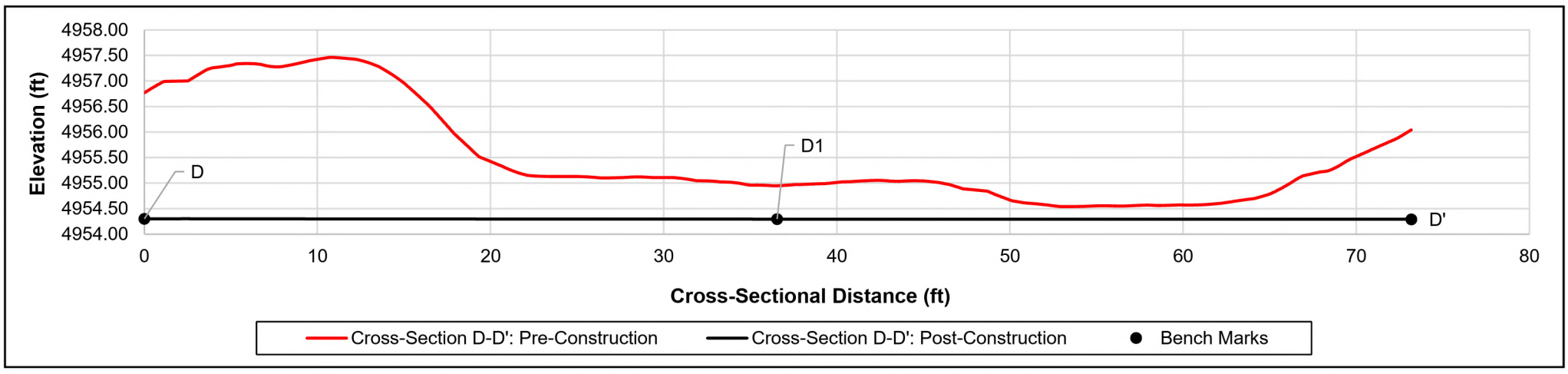
Cross-Section B-B'



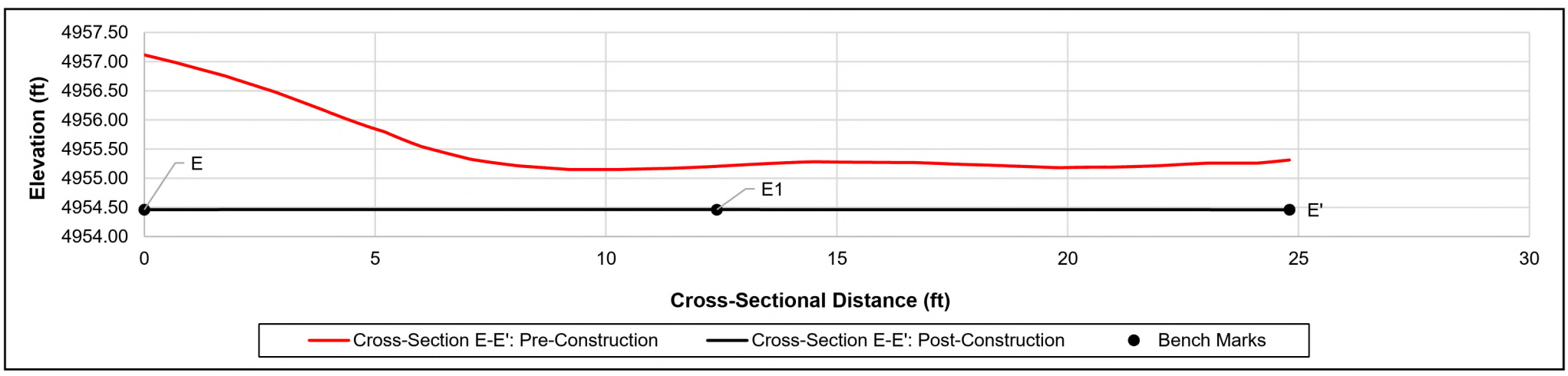
Cross-Section C-C'



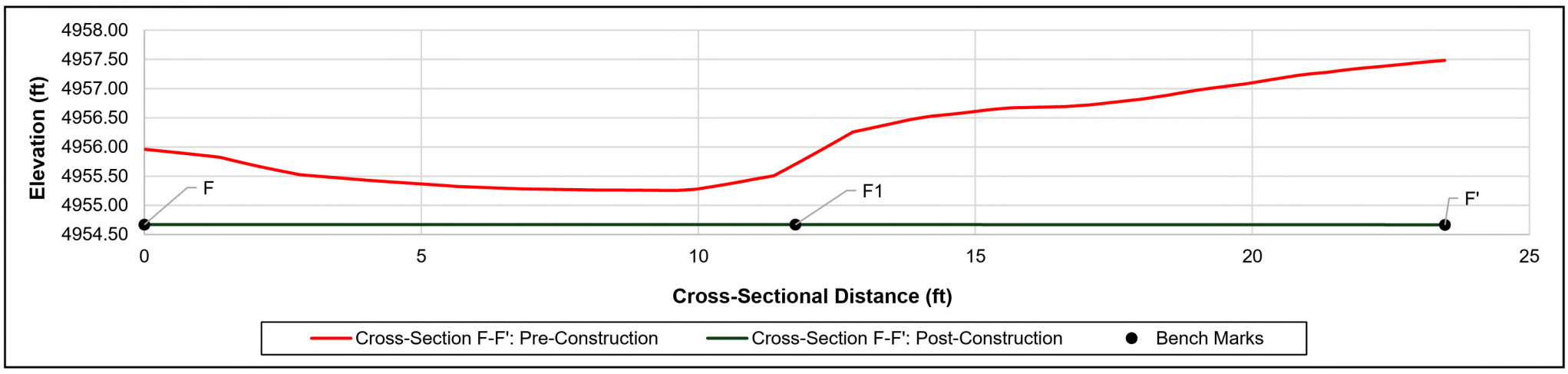
Cross-Section D-D'



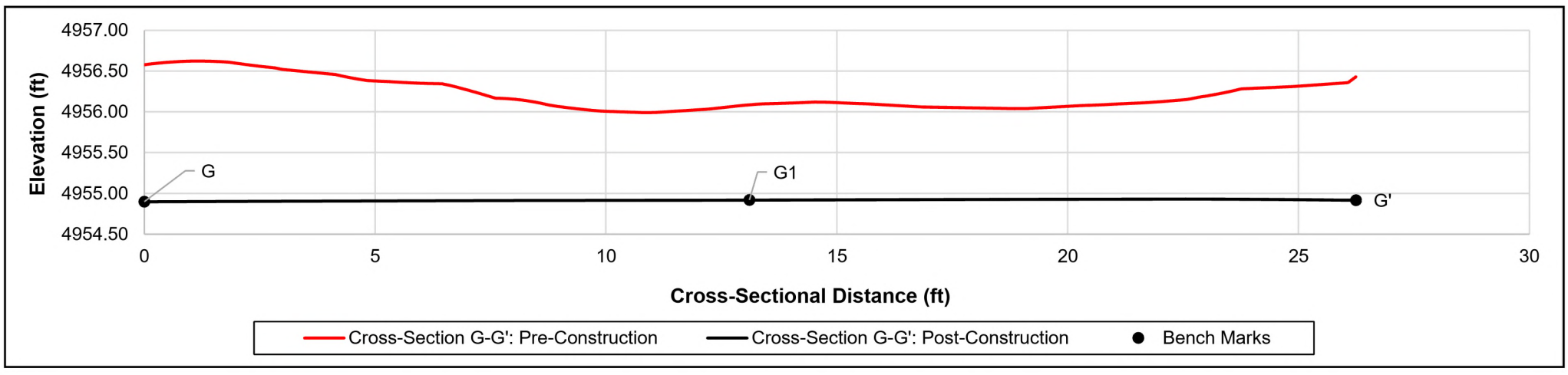
Cross-Section E-E'



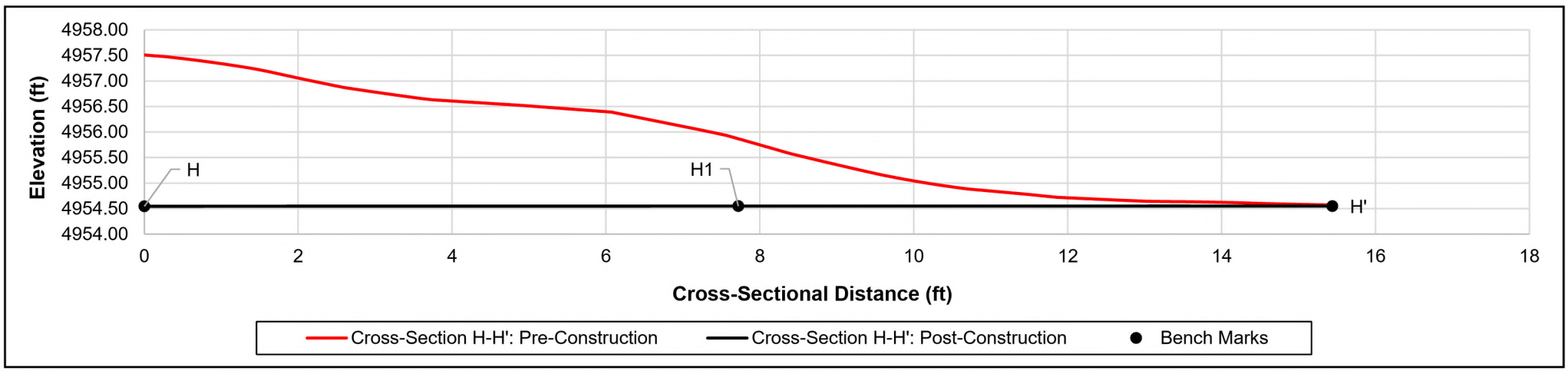
Cross-Section F-F'



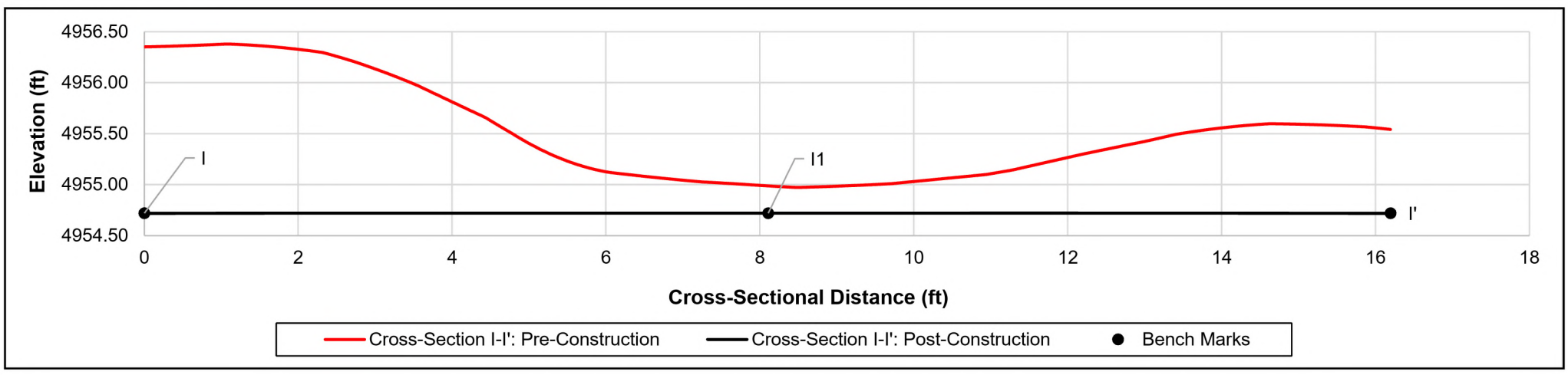
Cross-Section G-G'



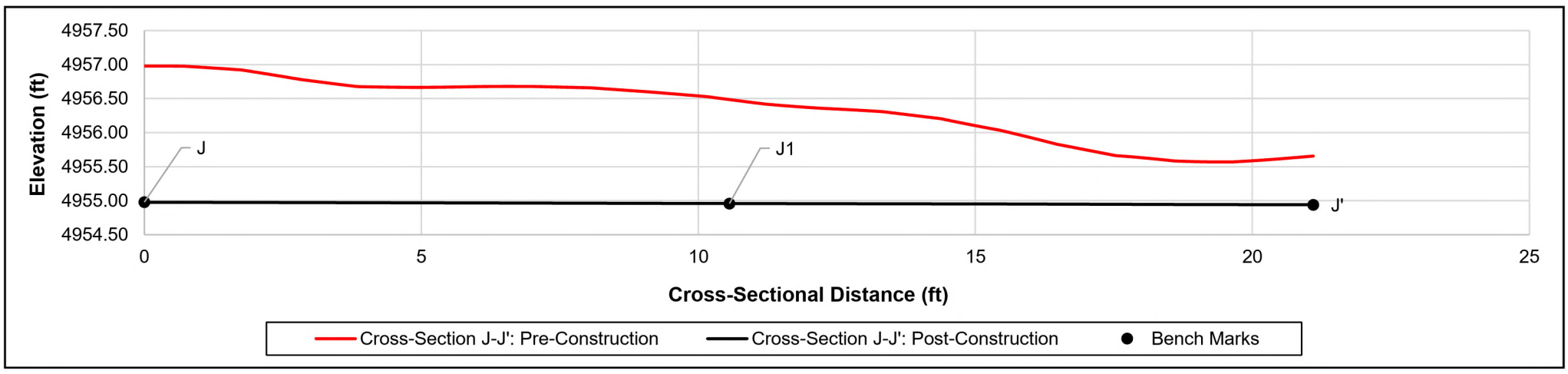
Cross-Section H-H'



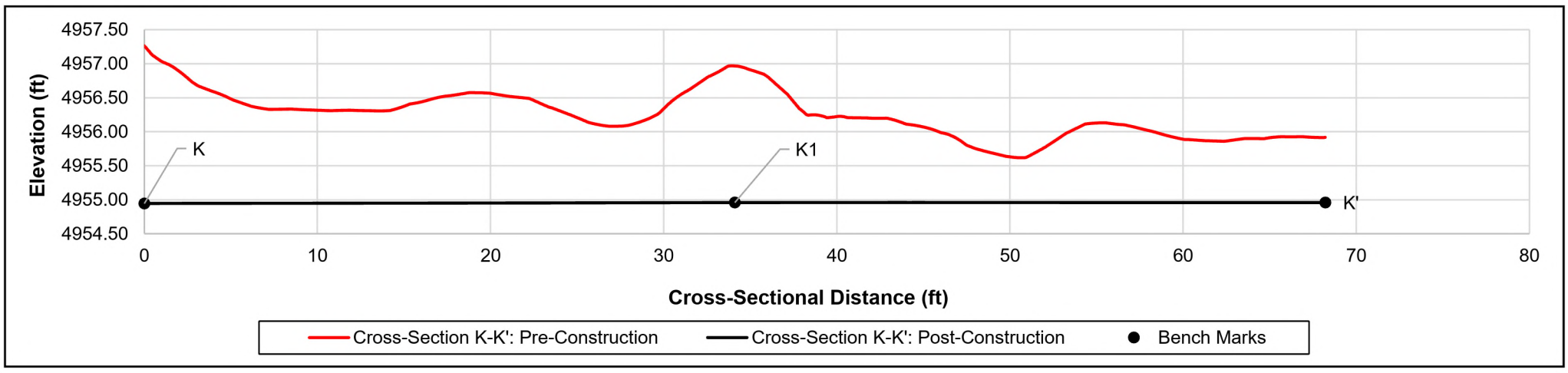
Cross-Section I-I'



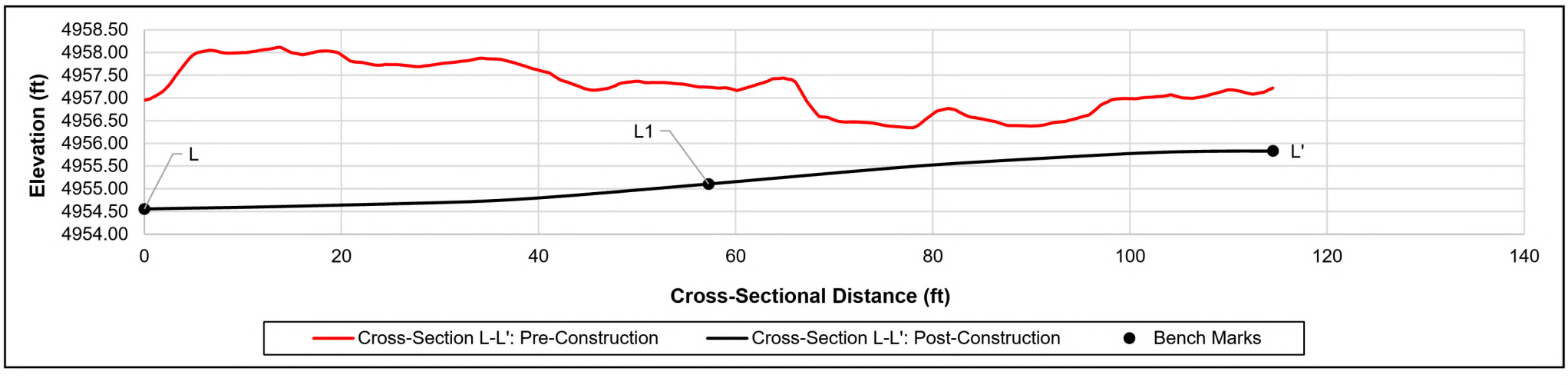
Cross-Section J-J'



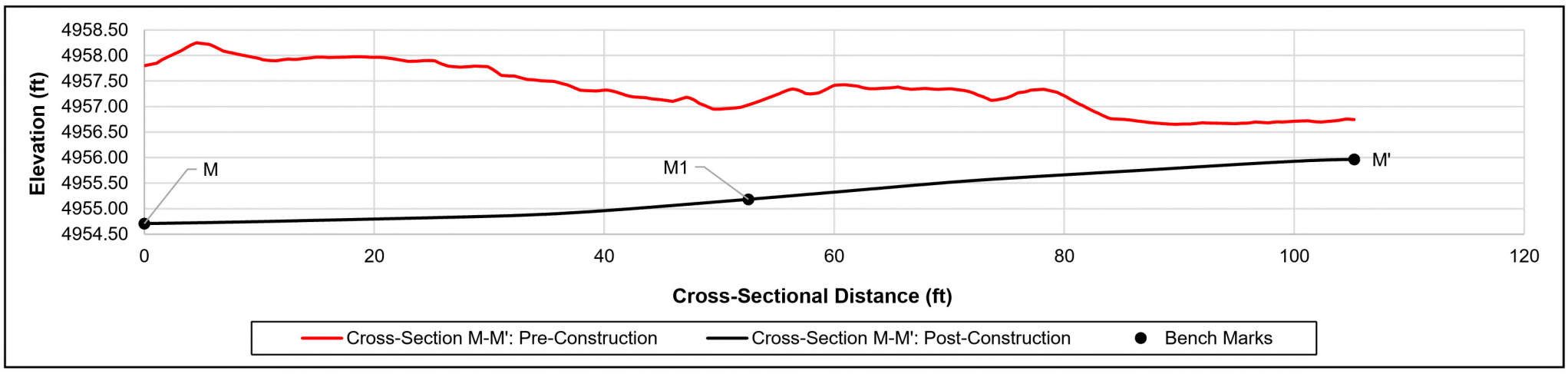
Cross-Section K-K'



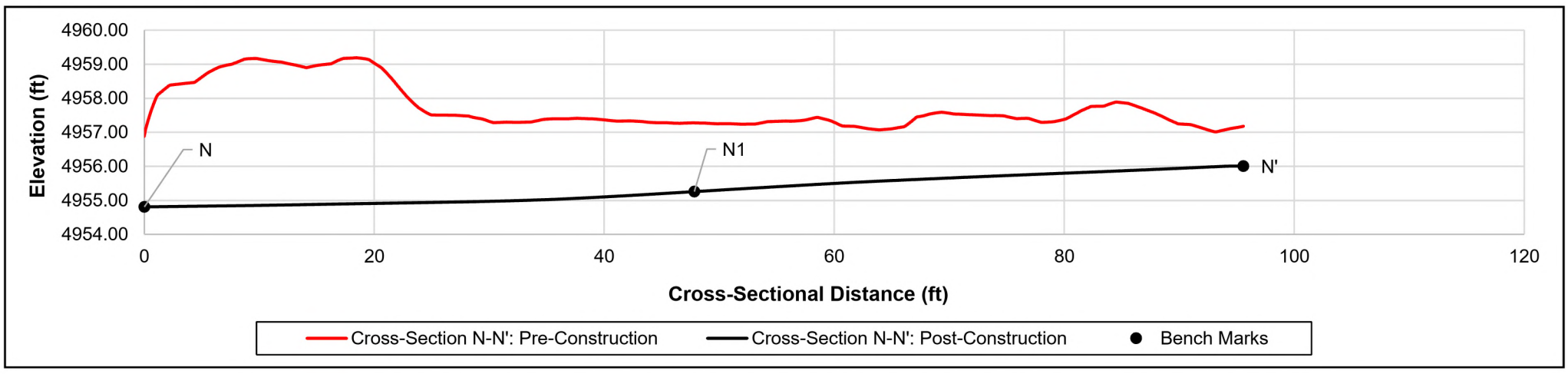
Cross-Section L-L'



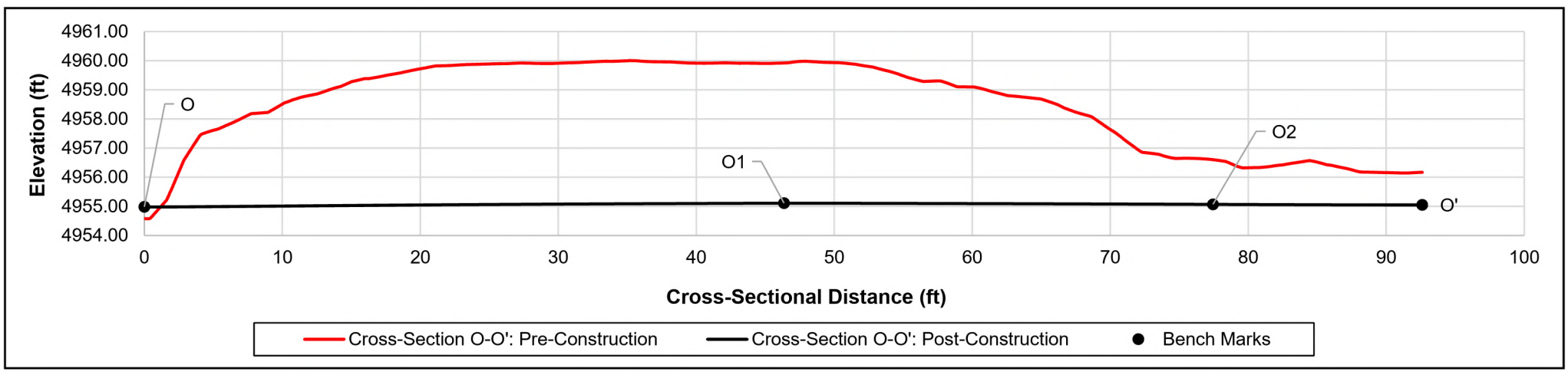
Cross-Section M-M'



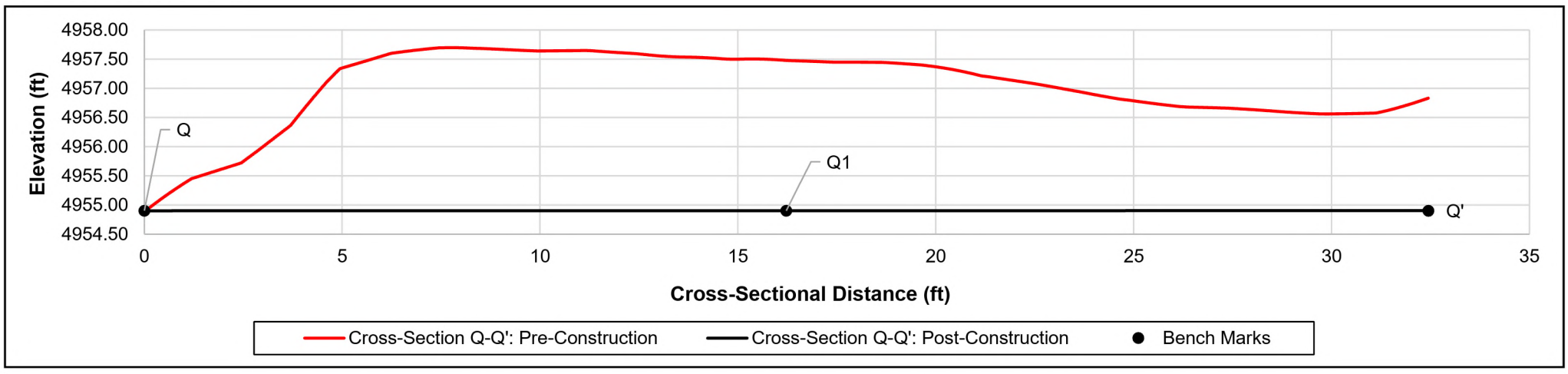
Cross-Section N-N'



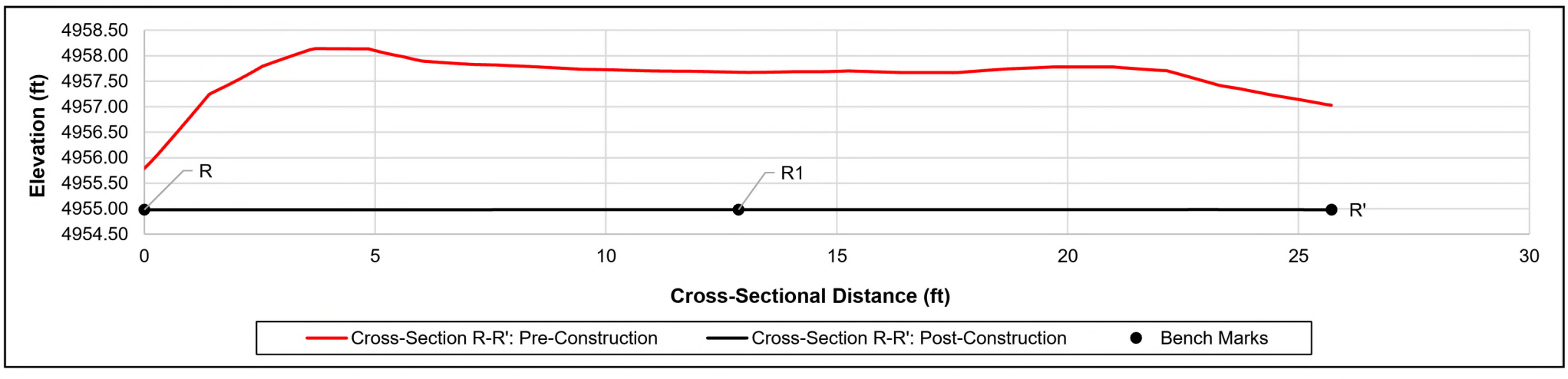
Cross-Section O-O'



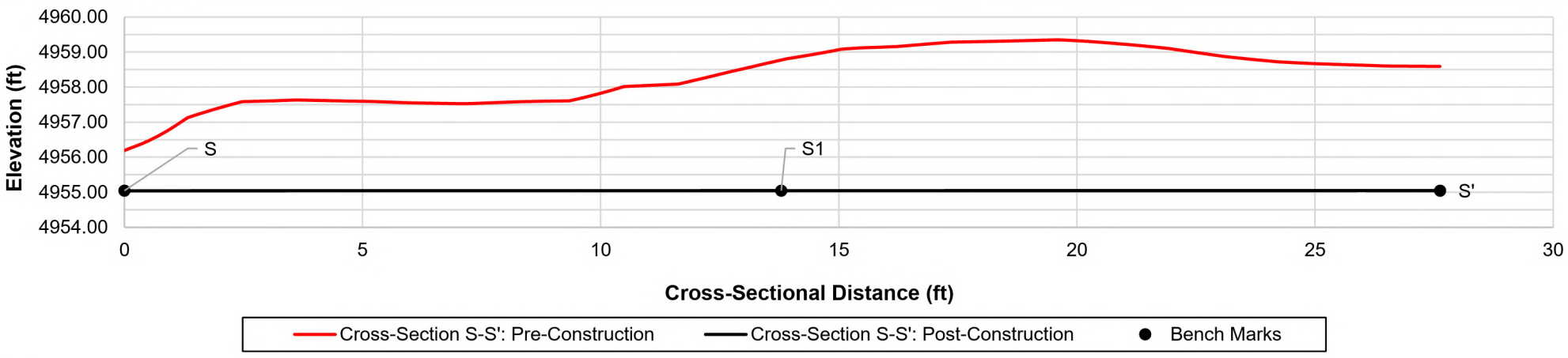
Cross-Section Q-Q'



Cross-Section R-R'



Cross-Section S-S'

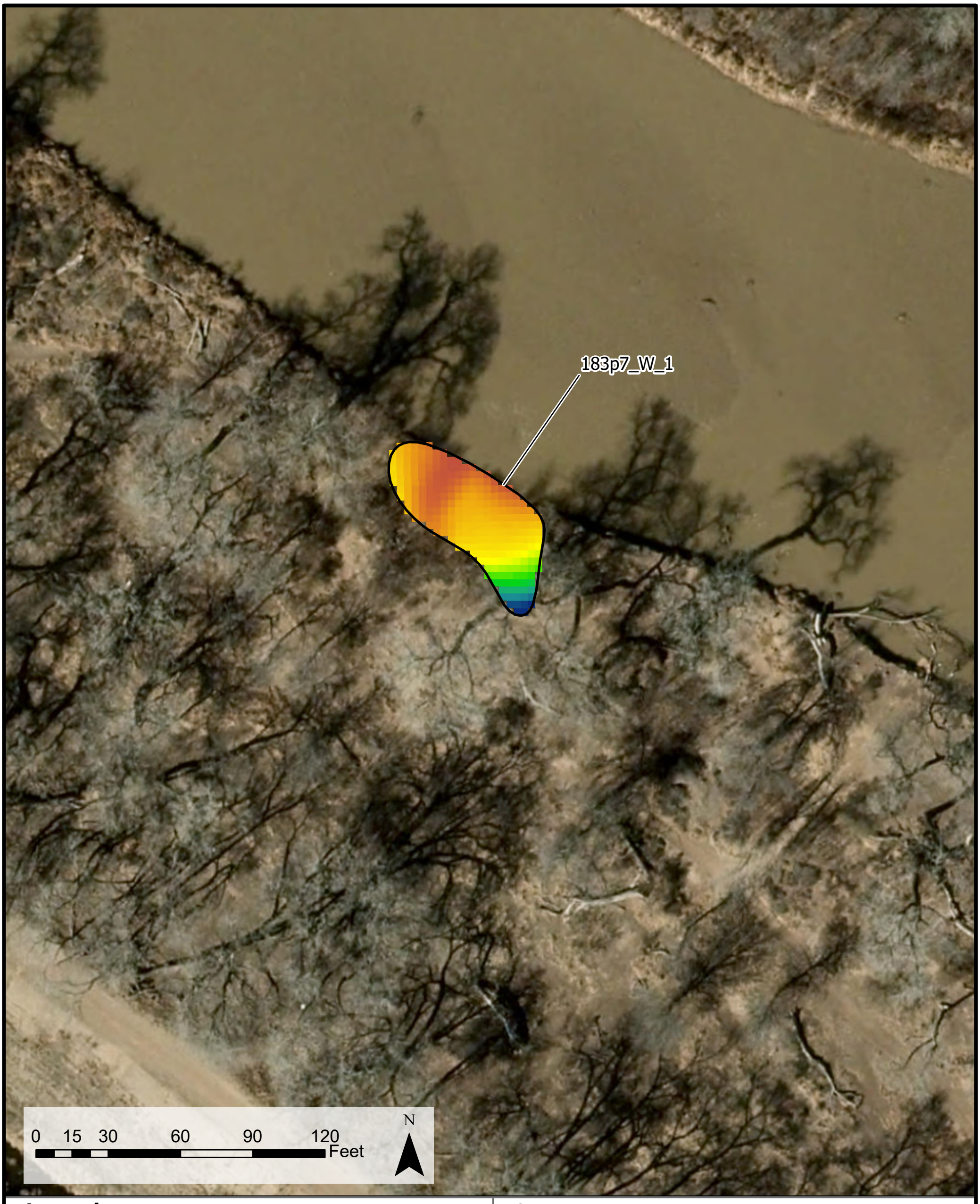


Notes:

USC = Upstream Channel Connection Point, MSB = Mid-Stream Boundary, DSC = Downstream Channel Connection Point, Letter P represents locations where the longitudinal profile pivots, POI = Points of Interest where there is curvature in the feature, Letters A through S represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4954.41

4954.32

Title

Site 183p7_W_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.7

Title
Site 183p7_W_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

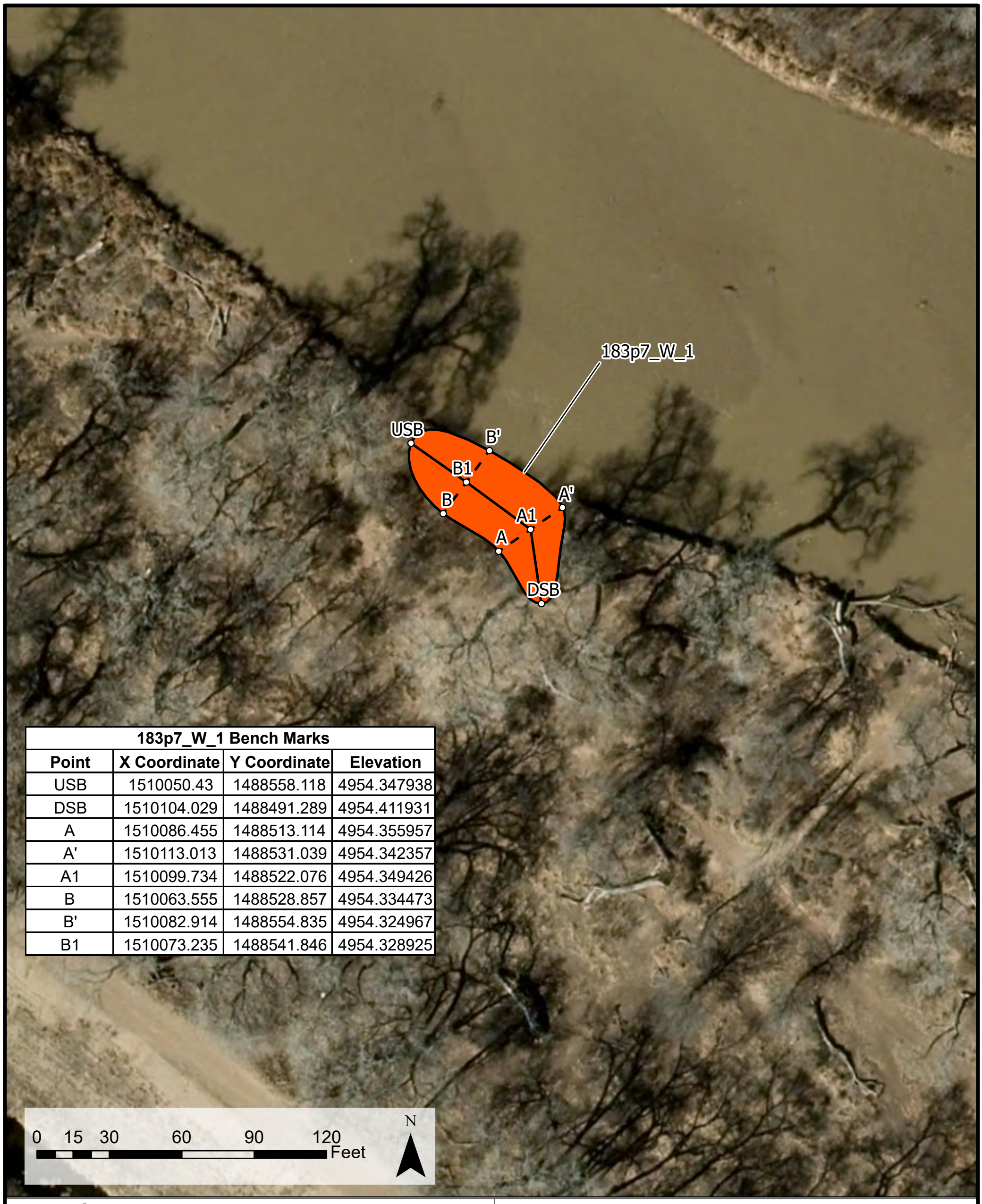
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



183p7_W_1 Bench Marks			
Point	X Coordinate	Y Coordinate	Elevation
USB	1510050.43	1488558.118	4954.347938
DSB	1510104.029	1488491.289	4954.411931
A	1510086.455	1488513.114	4954.355957
A'	1510113.013	1488531.039	4954.342357
A1	1510099.734	1488522.076	4954.349426
B	1510063.555	1488528.857	4954.334473
B'	1510082.914	1488554.835	4954.324967
B1	1510073.235	1488541.846	4954.328925

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Mouth Cleanout

Title
Site 183p7_W_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

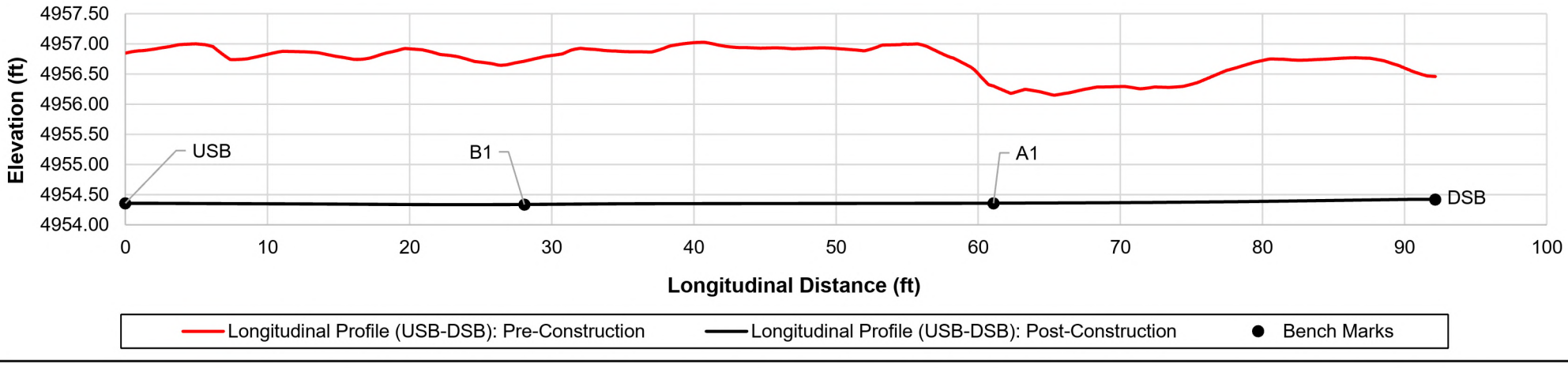
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

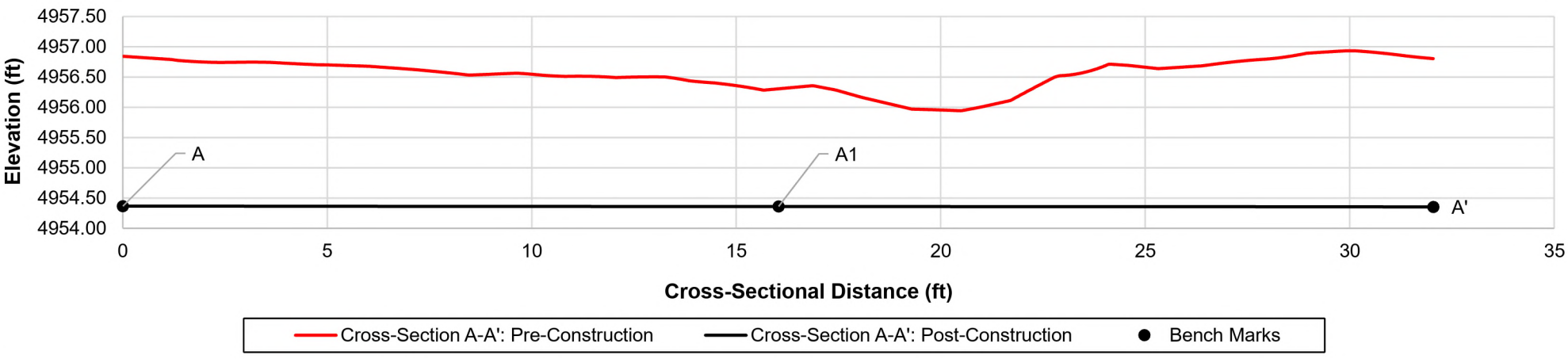
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

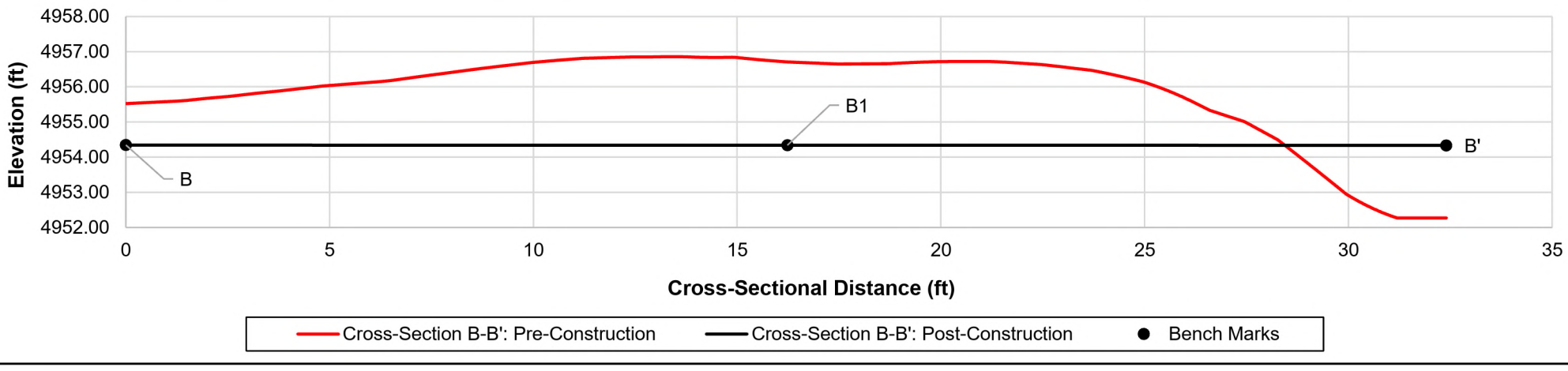
Longitudinal Profile (USB-DSB)



Cross-Section A-A'



Cross-Section B-B'

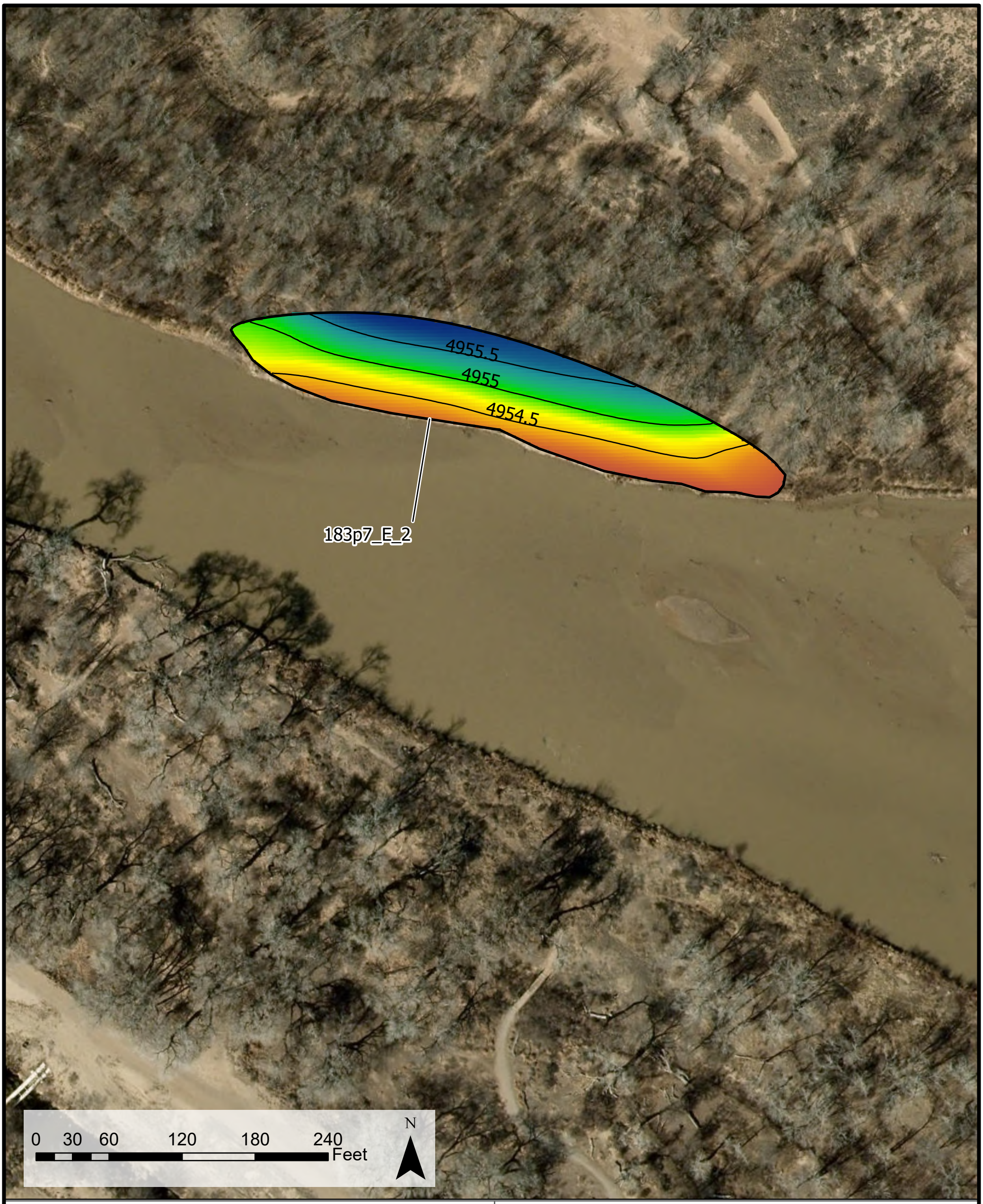


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through B represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4955.75

4954.03

Title

Site 183p7_E_2 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

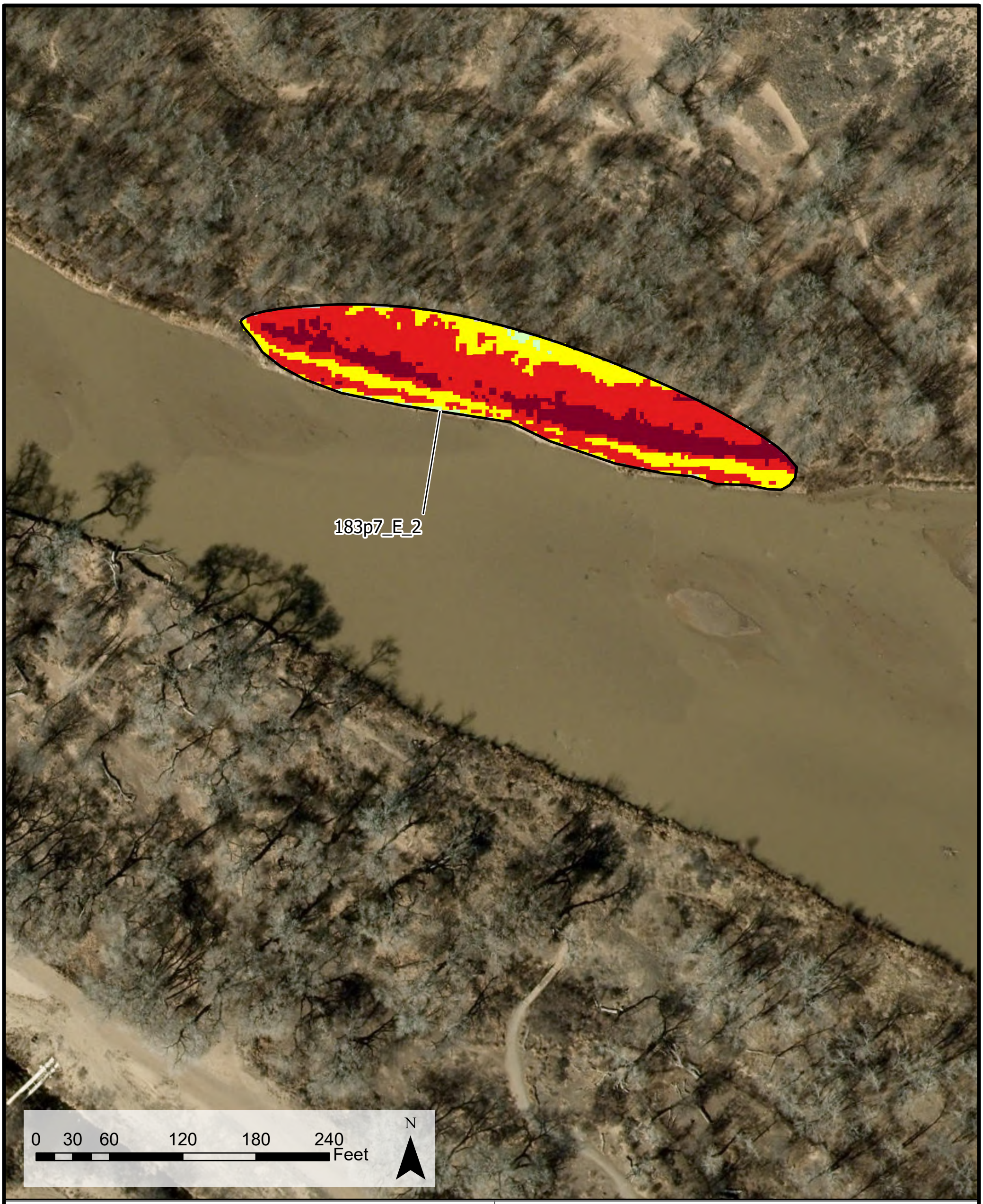
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.5

2.5-3.5

Title

Site 183p7_E_2 Excavation Depths

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

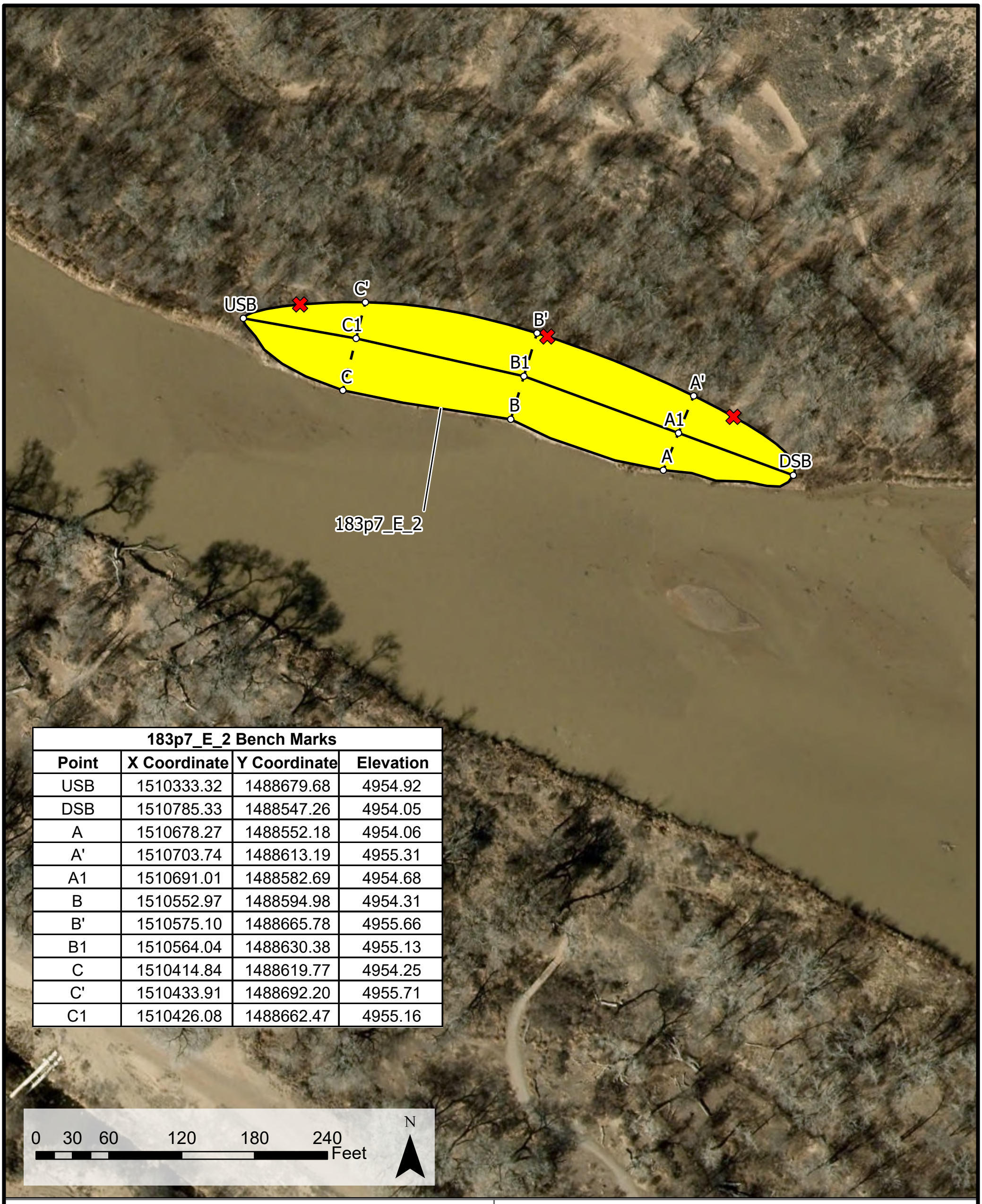
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



183p7_E_2 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1510333.32	1488679.68	4954.92
DSB	1510785.33	1488547.26	4954.05
A	1510678.27	1488552.18	4954.06
A'	1510703.74	1488613.19	4955.31
A1	1510691.01	1488582.69	4954.68
B	1510552.97	1488594.98	4954.31
B'	1510575.10	1488665.78	4955.66
B1	1510564.04	1488630.38	4955.13
C	1510414.84	1488619.77	4954.25
C'	1510433.91	1488692.20	4955.71
C1	1510426.08	1488662.47	4955.16

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Bankline Modification

Title

Site 183p7_E_2 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

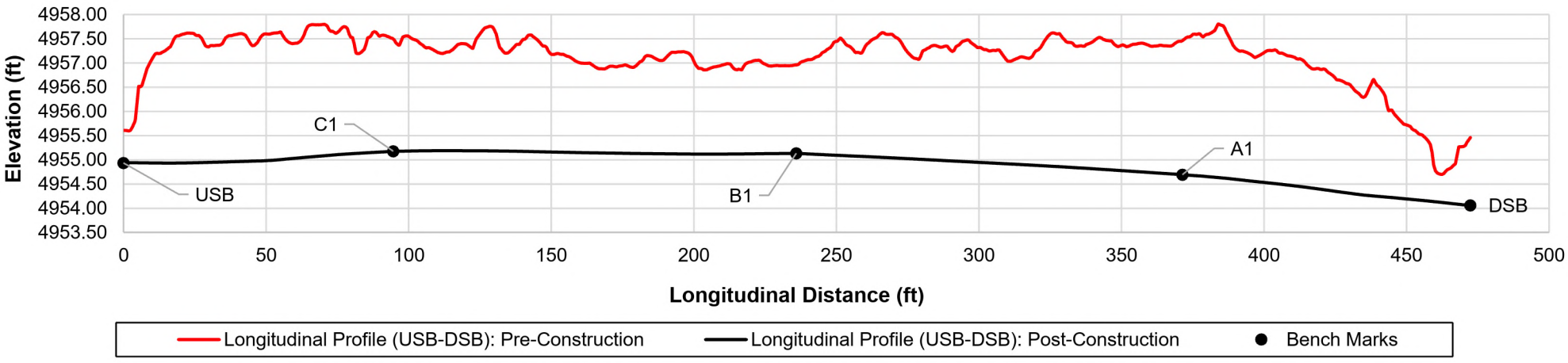
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

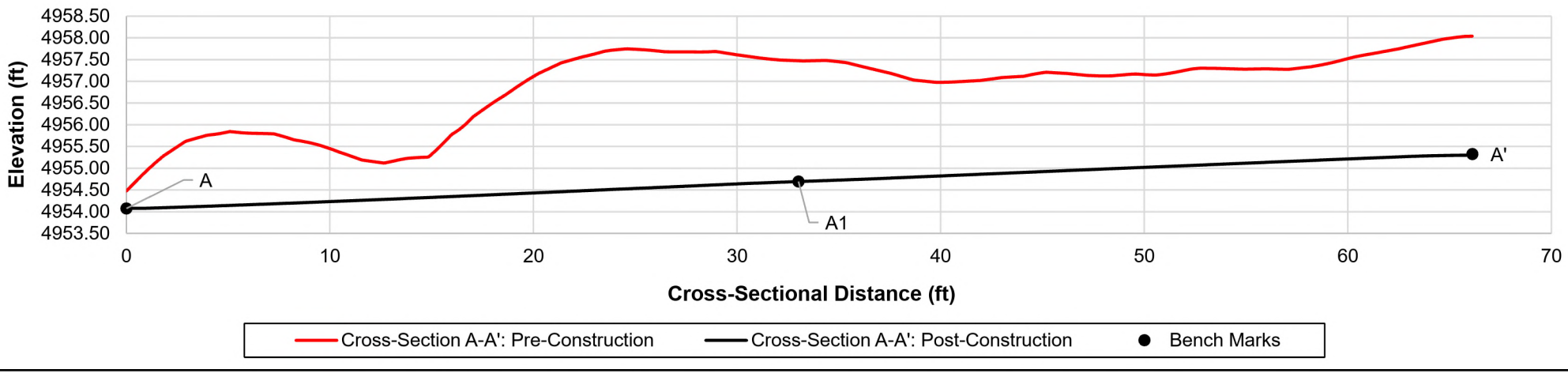
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

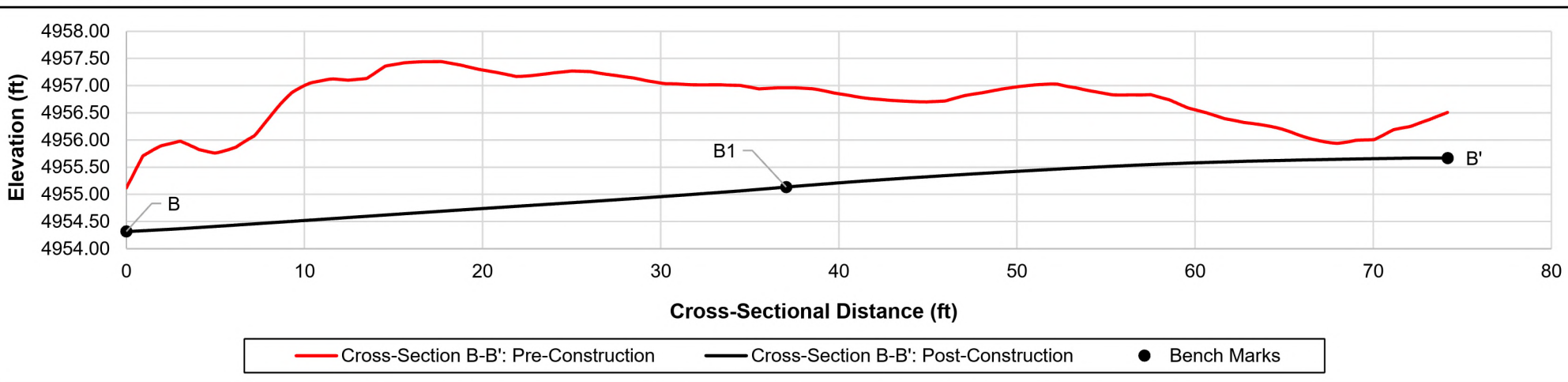
Longitudinal Profile (USB-DSB)



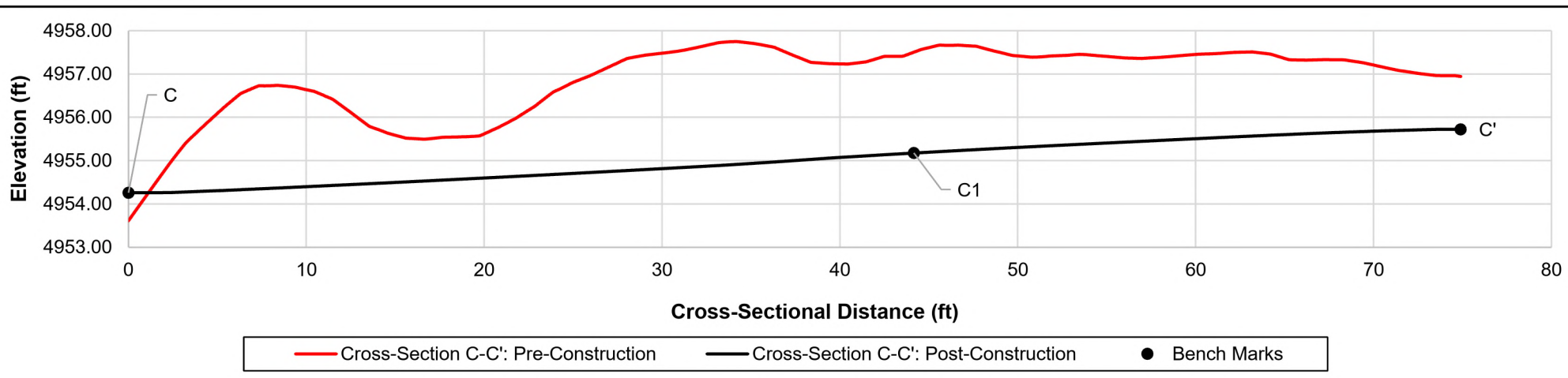
Cross-Section A-A'



Cross-Section B-B'



Cross-Section C-C'

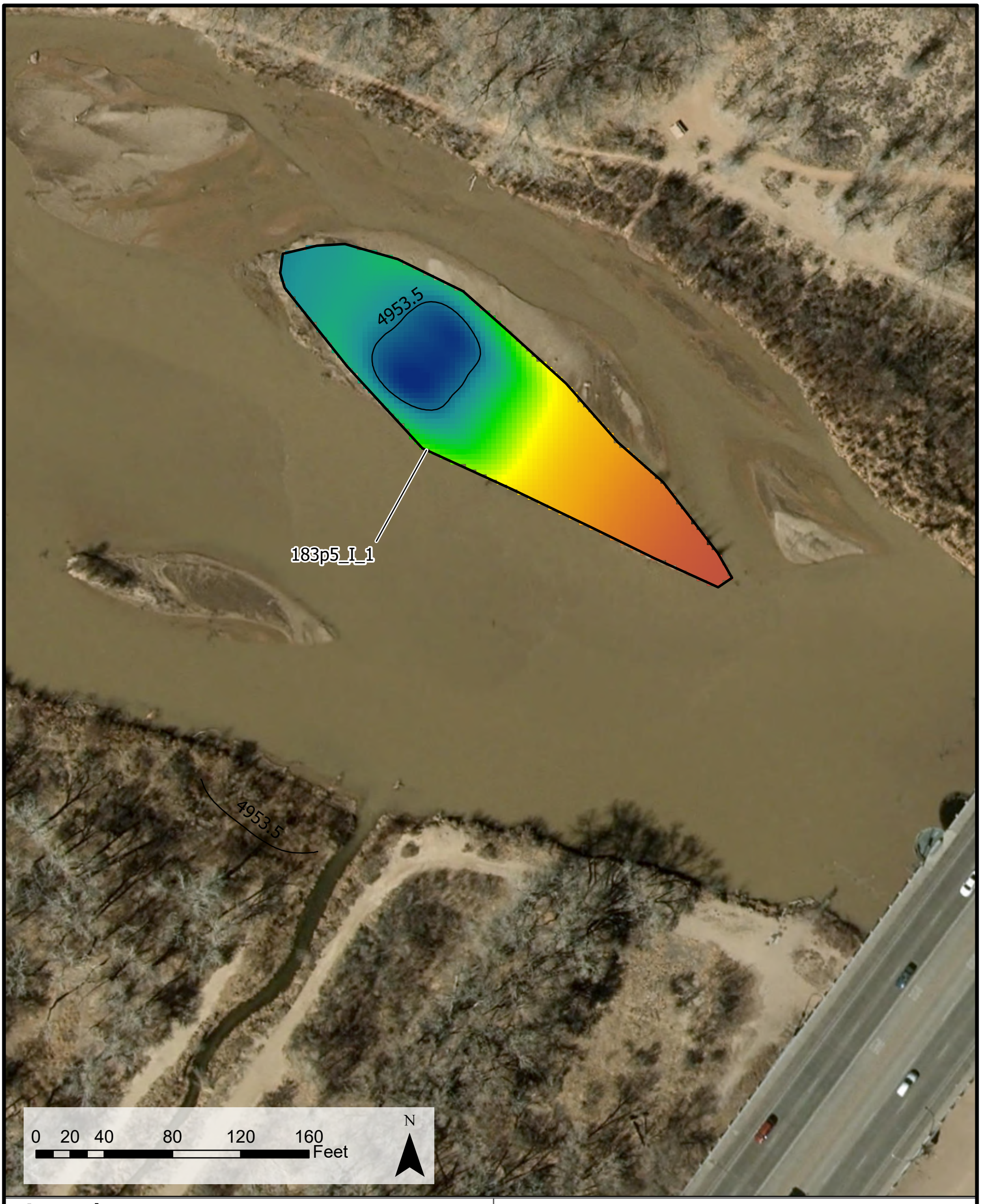


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through C represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4953.56

4953.11

Title

Site 183p5_I_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

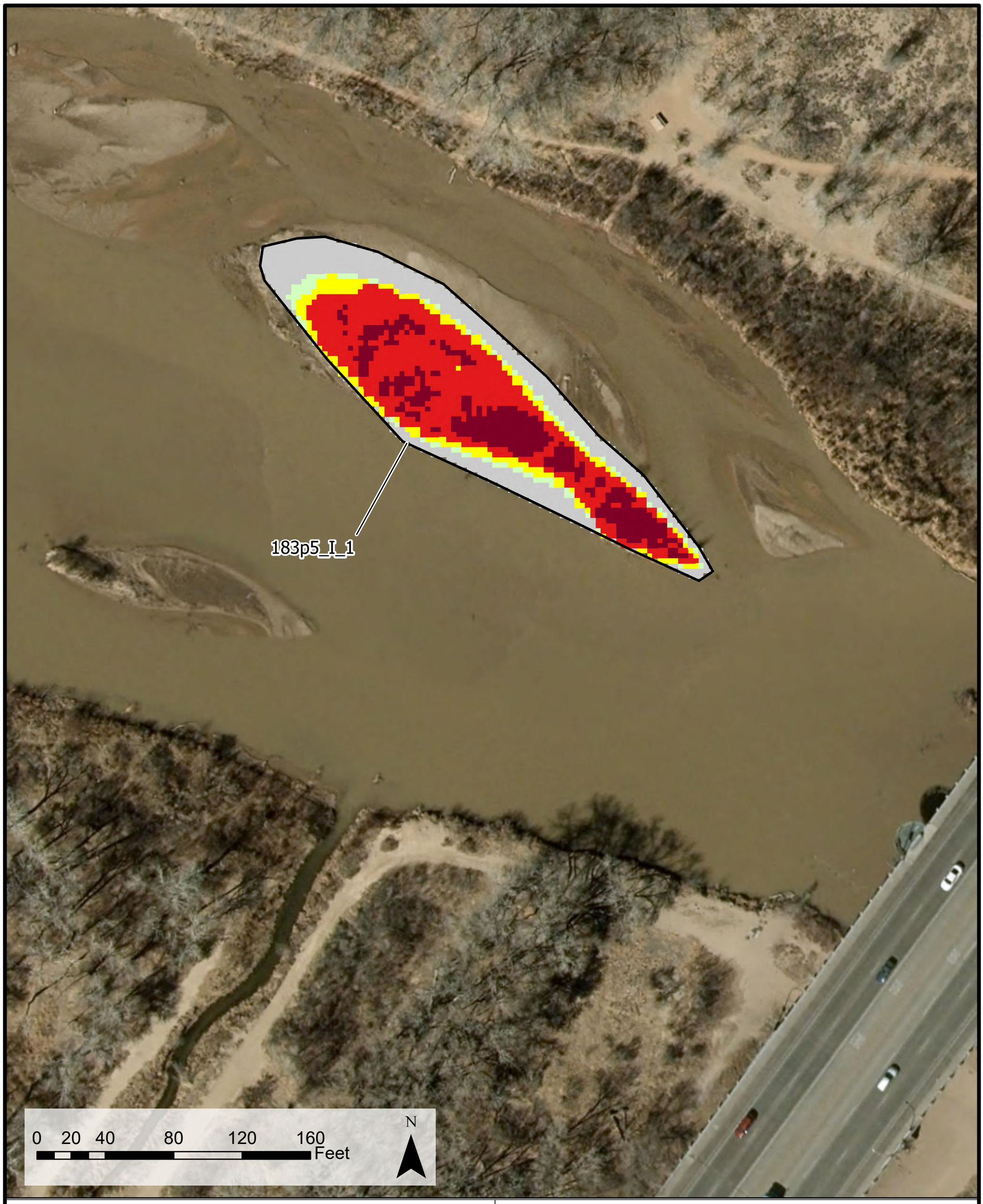
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.5

2.5-3.3

Title
Site 183p5_I_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

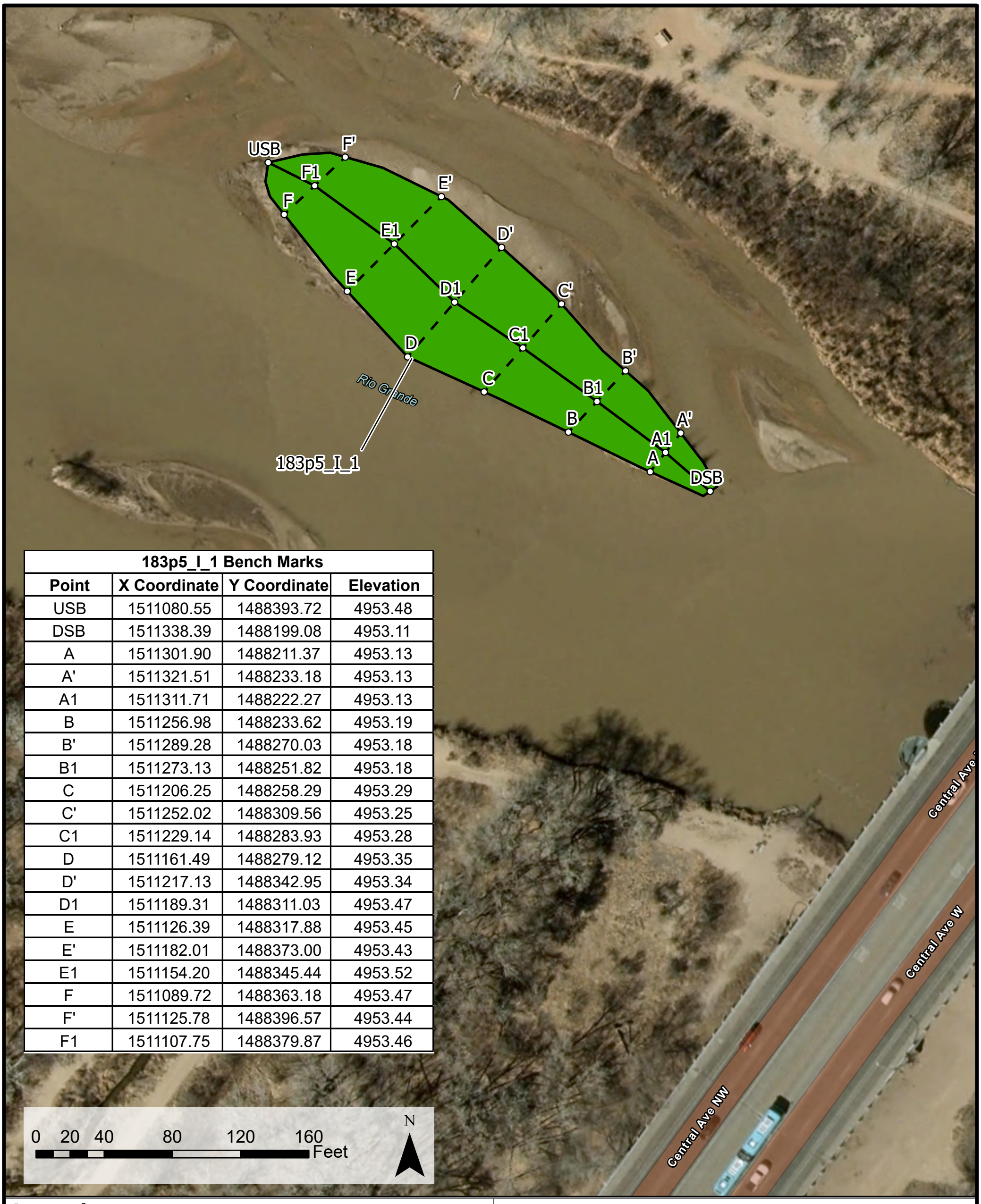
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



183p5_I_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1511080.55	1488393.72	4953.48
DSB	1511338.39	1488199.08	4953.11
A	1511301.90	1488211.37	4953.13
A'	1511321.51	1488233.18	4953.13
A1	1511311.71	1488222.27	4953.13
B	1511256.98	1488233.62	4953.19
B'	1511289.28	1488270.03	4953.18
B1	1511273.13	1488251.82	4953.18
C	1511206.25	1488258.29	4953.29
C'	1511252.02	1488309.56	4953.25
C1	1511229.14	1488283.93	4953.28
D	1511161.49	1488279.12	4953.35
D'	1511217.13	1488342.95	4953.34
D1	1511189.31	1488311.03	4953.47
E	1511126.39	1488317.88	4953.45
E'	1511182.01	1488373.00	4953.43
E1	1511154.20	1488345.44	4953.52
F	1511089.72	1488363.18	4953.47
F'	1511125.78	1488396.57	4953.44
F1	1511107.75	1488379.87	4953.46

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Island Destabilization

Title

Site 183p5_I_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

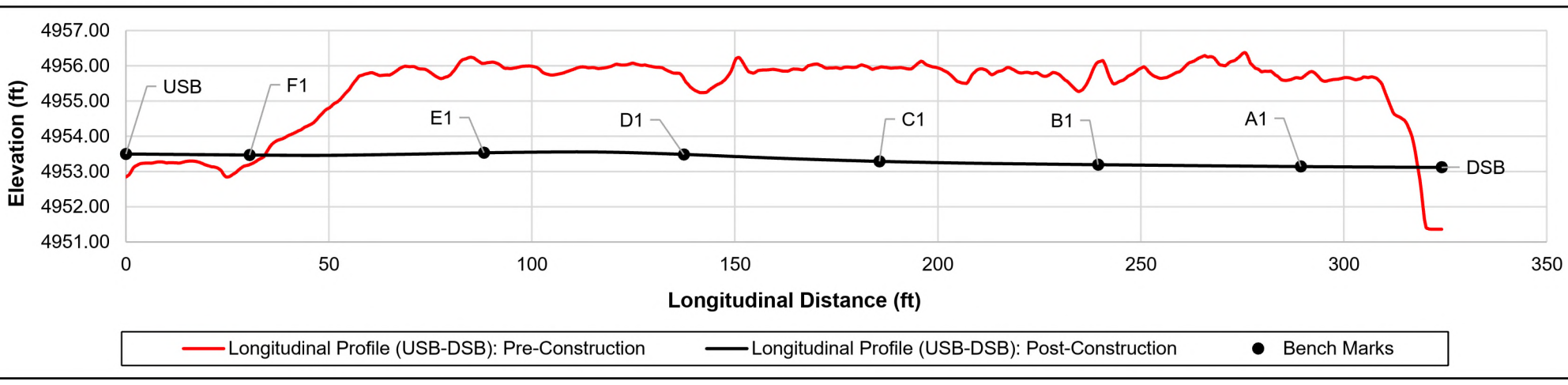
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

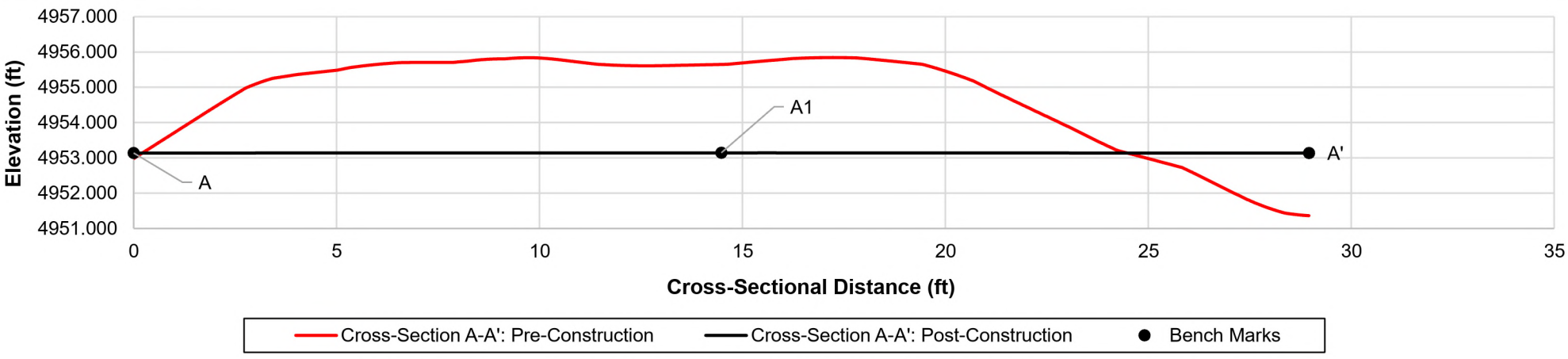
Revision: 0

GSA GeoSystems Analysis, Inc. *Innovative Solutions*

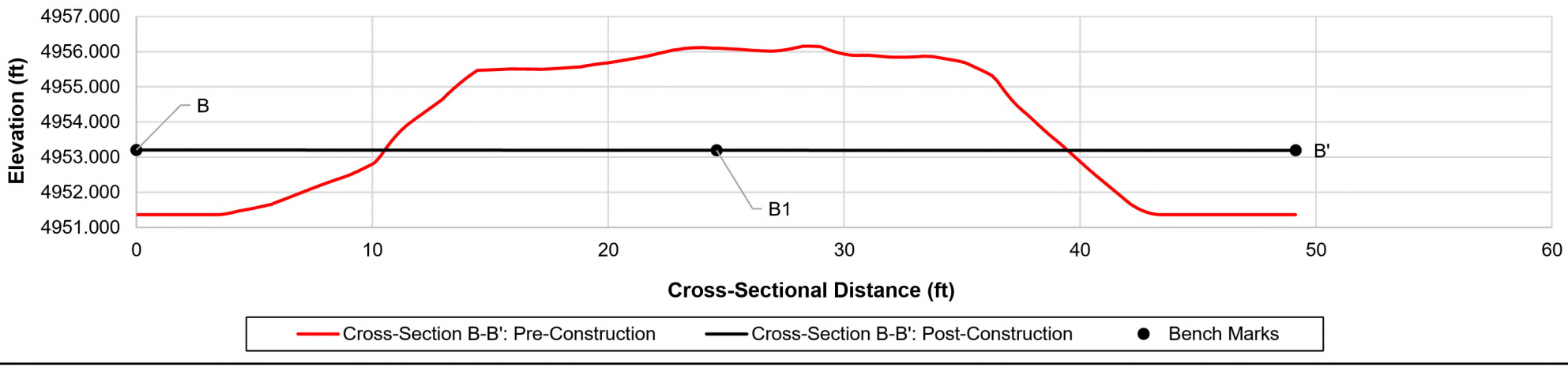
Longitudinal Profile (USB-DSB)



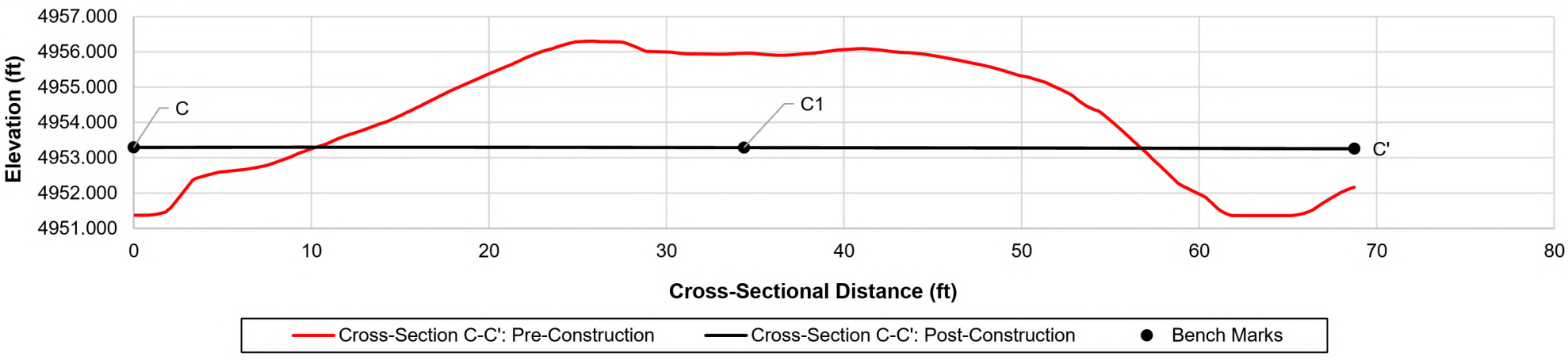
Cross-Section A-A'



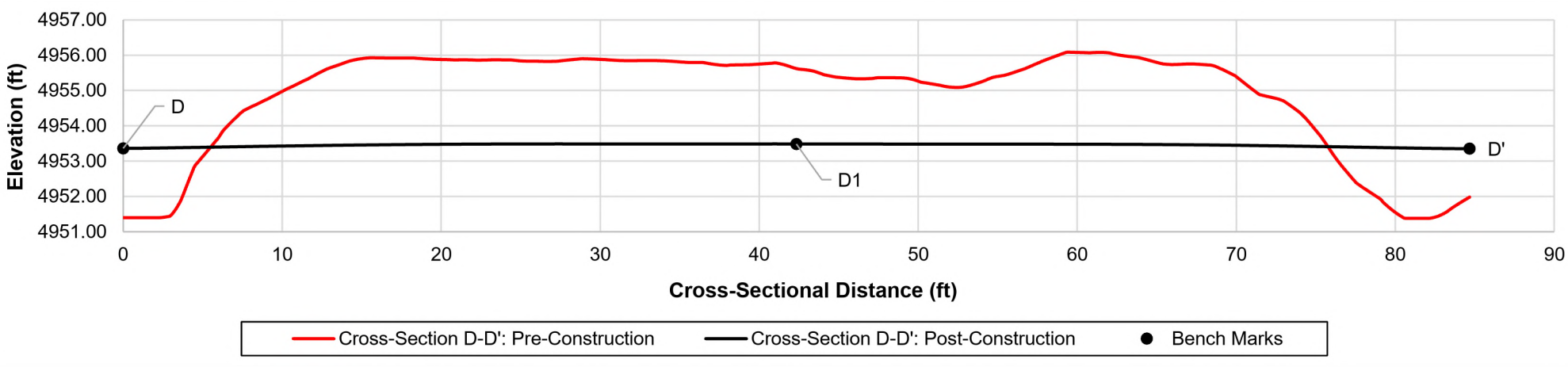
Cross-Section B-B'



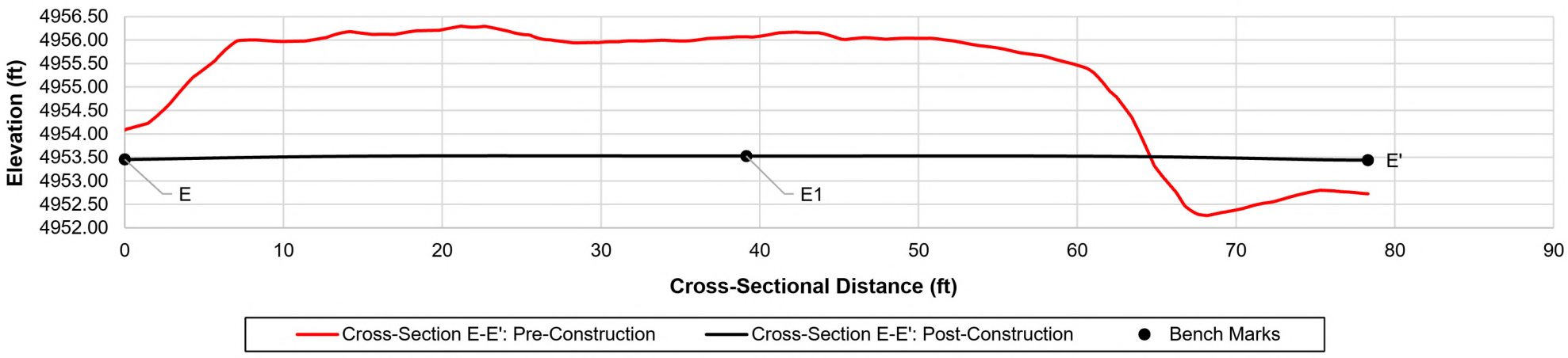
Cross-Section C-C'



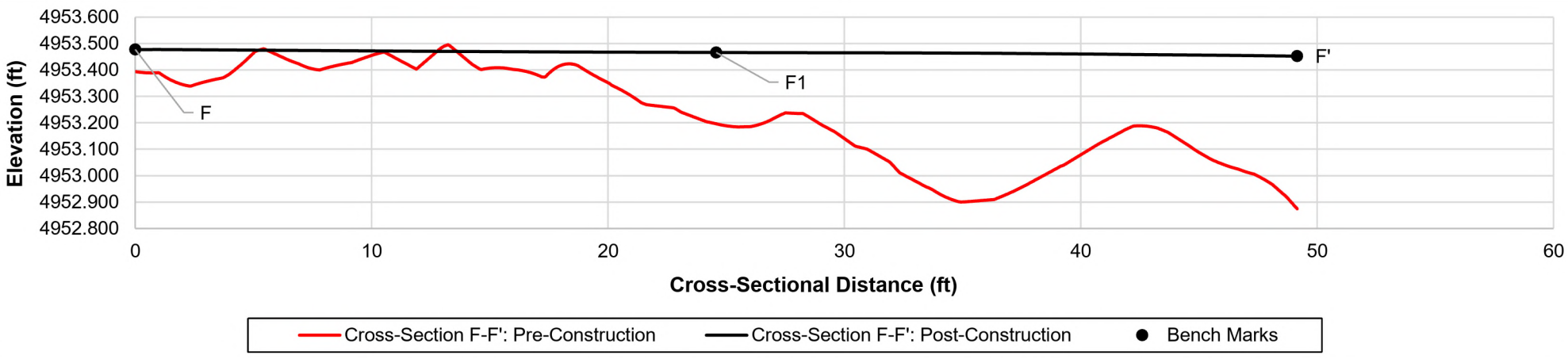
Cross-Section D-D'



Cross-Section E-E'



Cross-Section F-F'

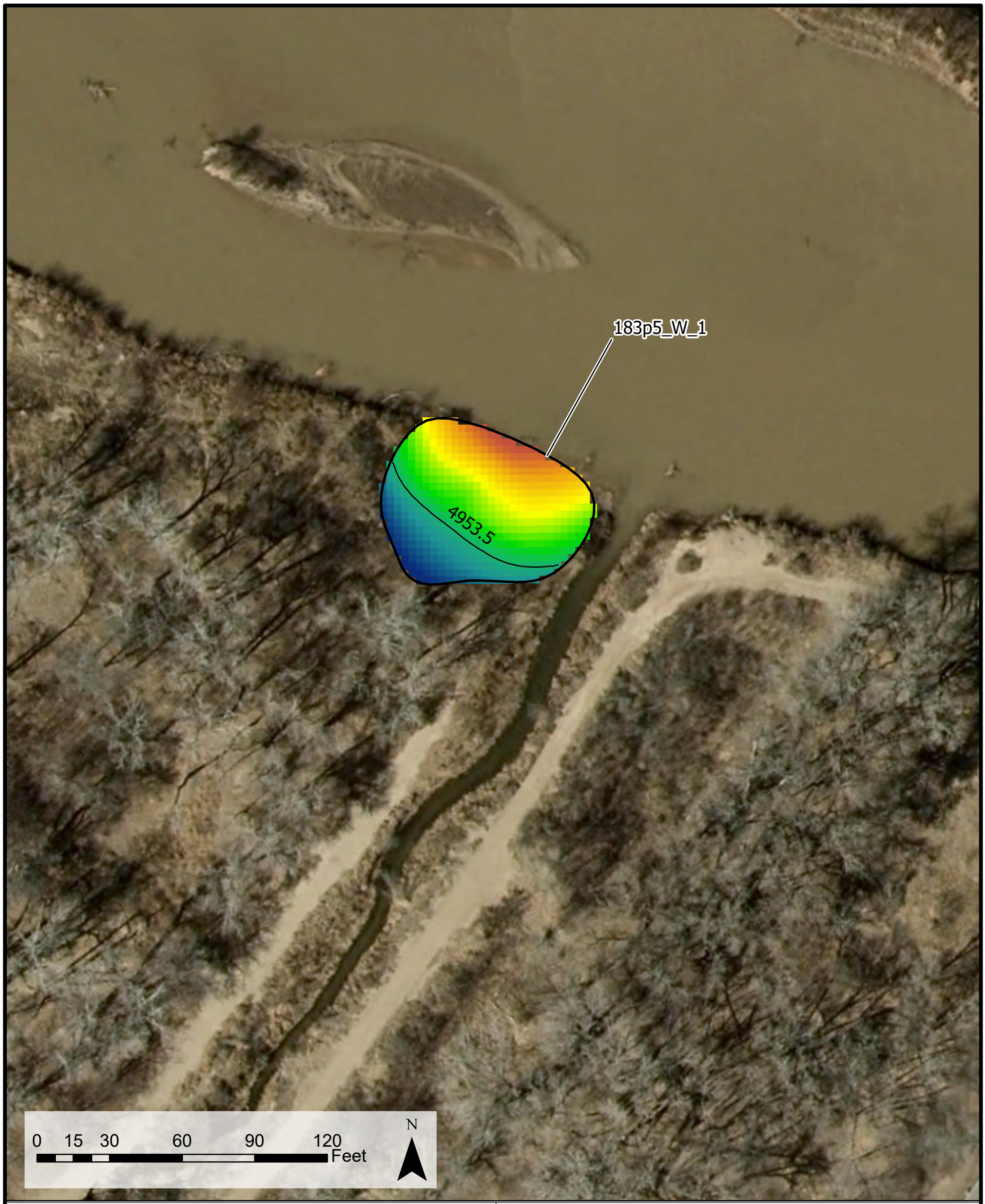


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through F represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4953.58

4953.3

Title

Site 183p5_W_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

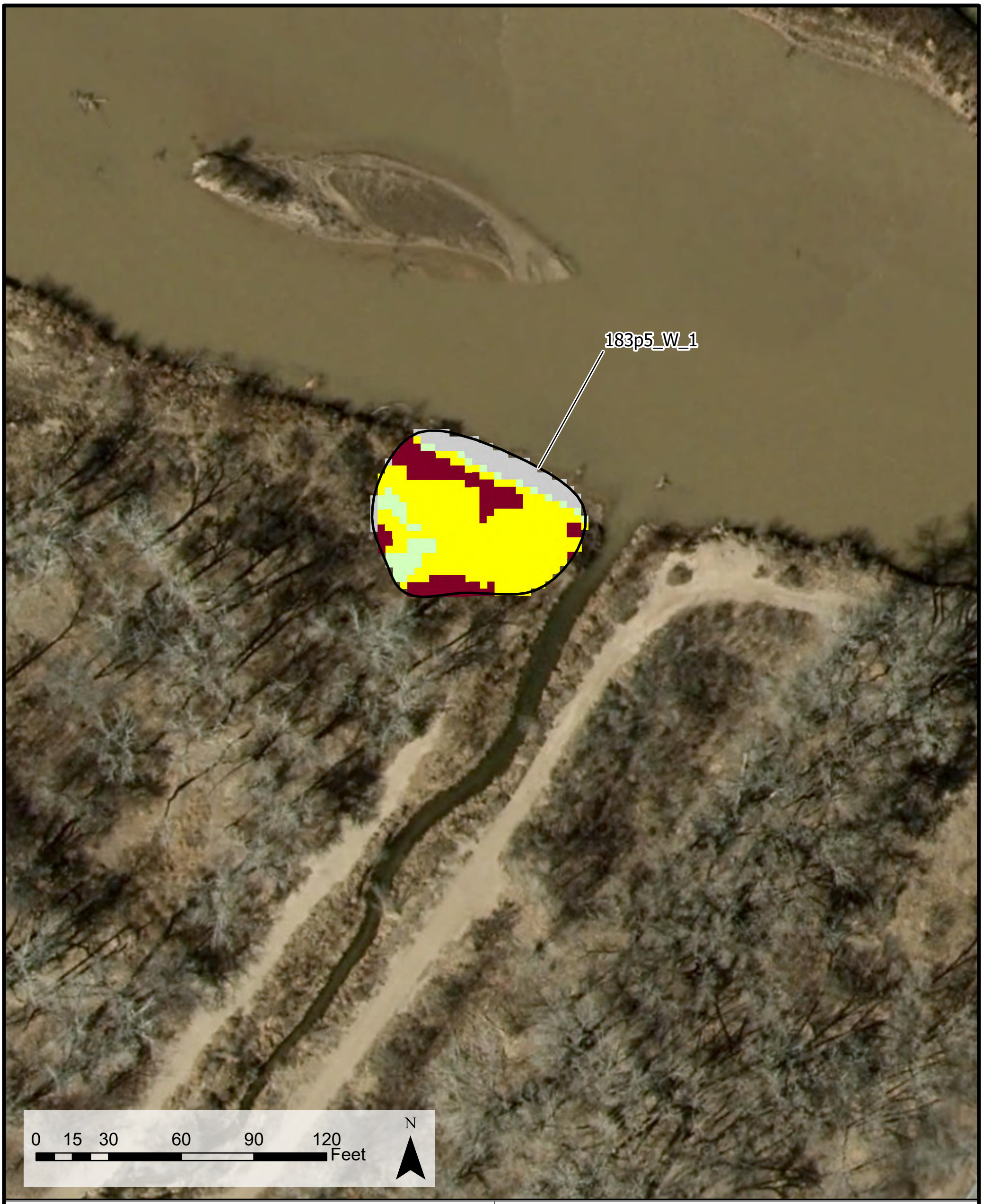
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.8

Title

Site 183p5_W_1 Excavation Depths

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

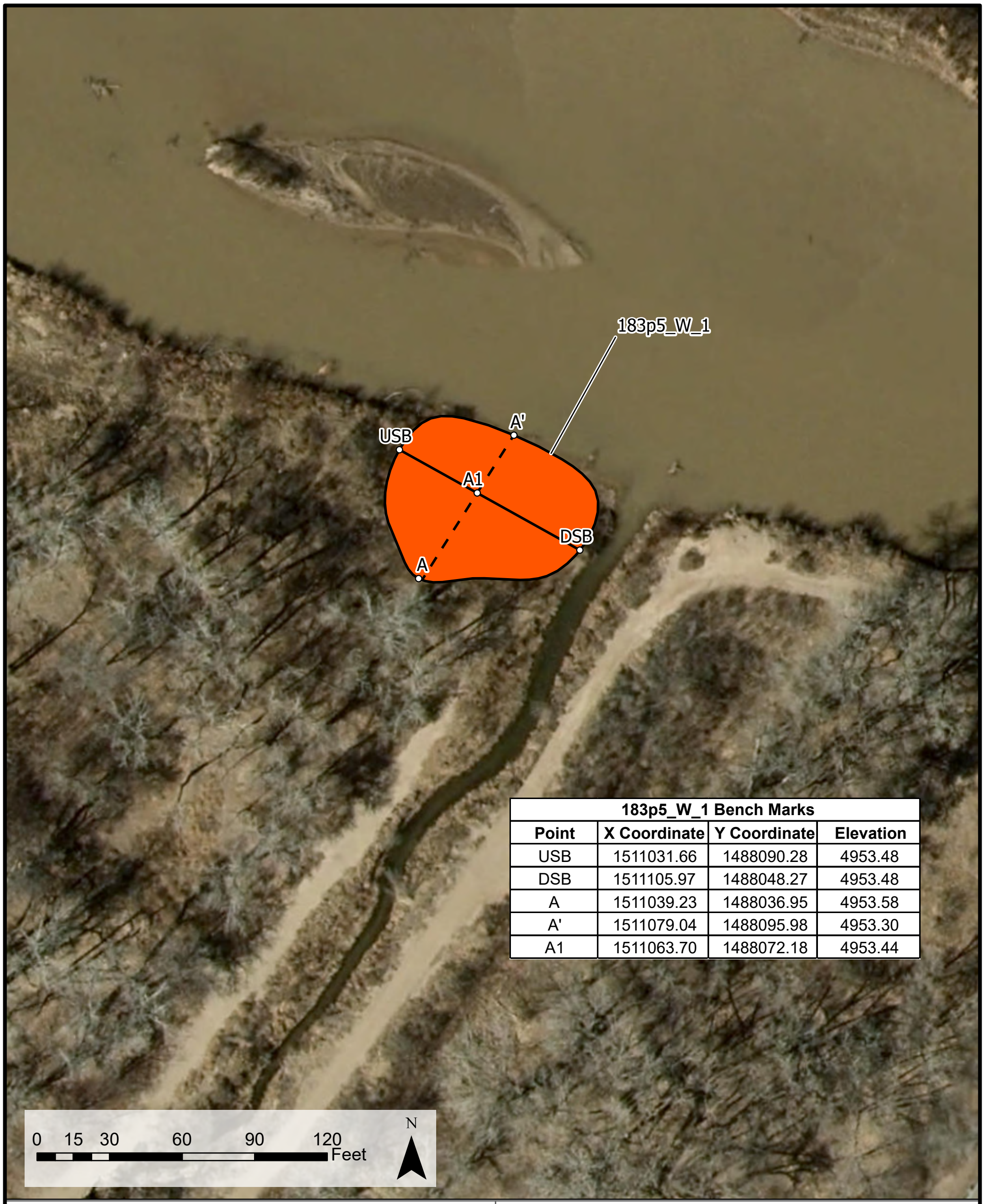
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



183p5_W_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1511031.66	1488090.28	4953.48
DSB	1511105.97	1488048.27	4953.48
A	1511039.23	1488036.95	4953.58
A'	1511079.04	1488095.98	4953.30
A1	1511063.70	1488072.18	4953.44

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Mouth Cleanout

Title
Site 183p5_W_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

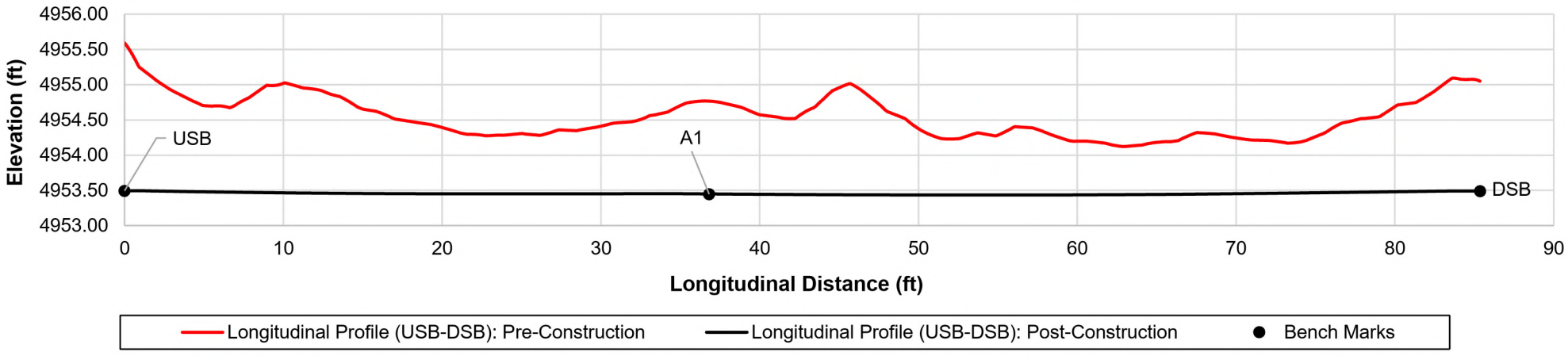
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

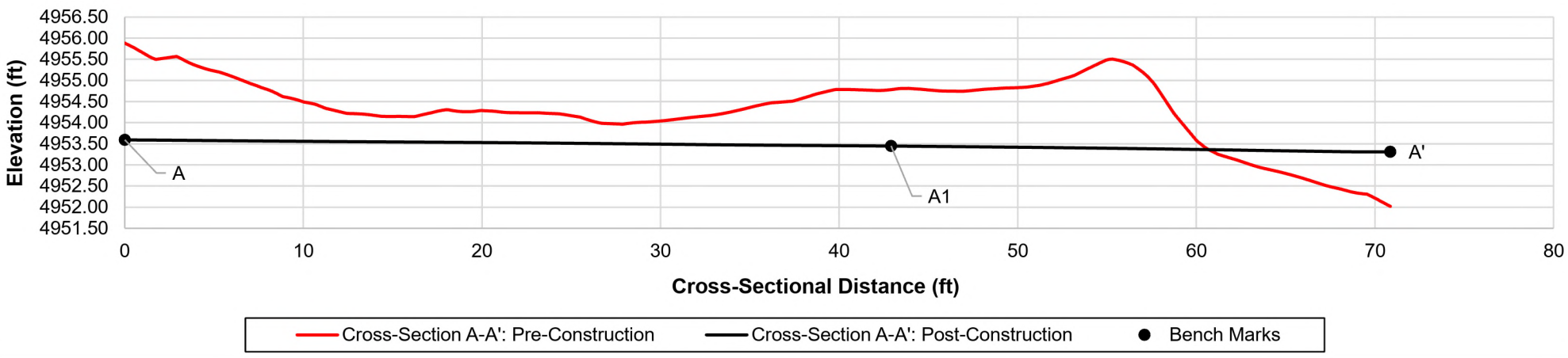
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

Longitudinal Profile (USB-DSB)



Cross-Section A-A'

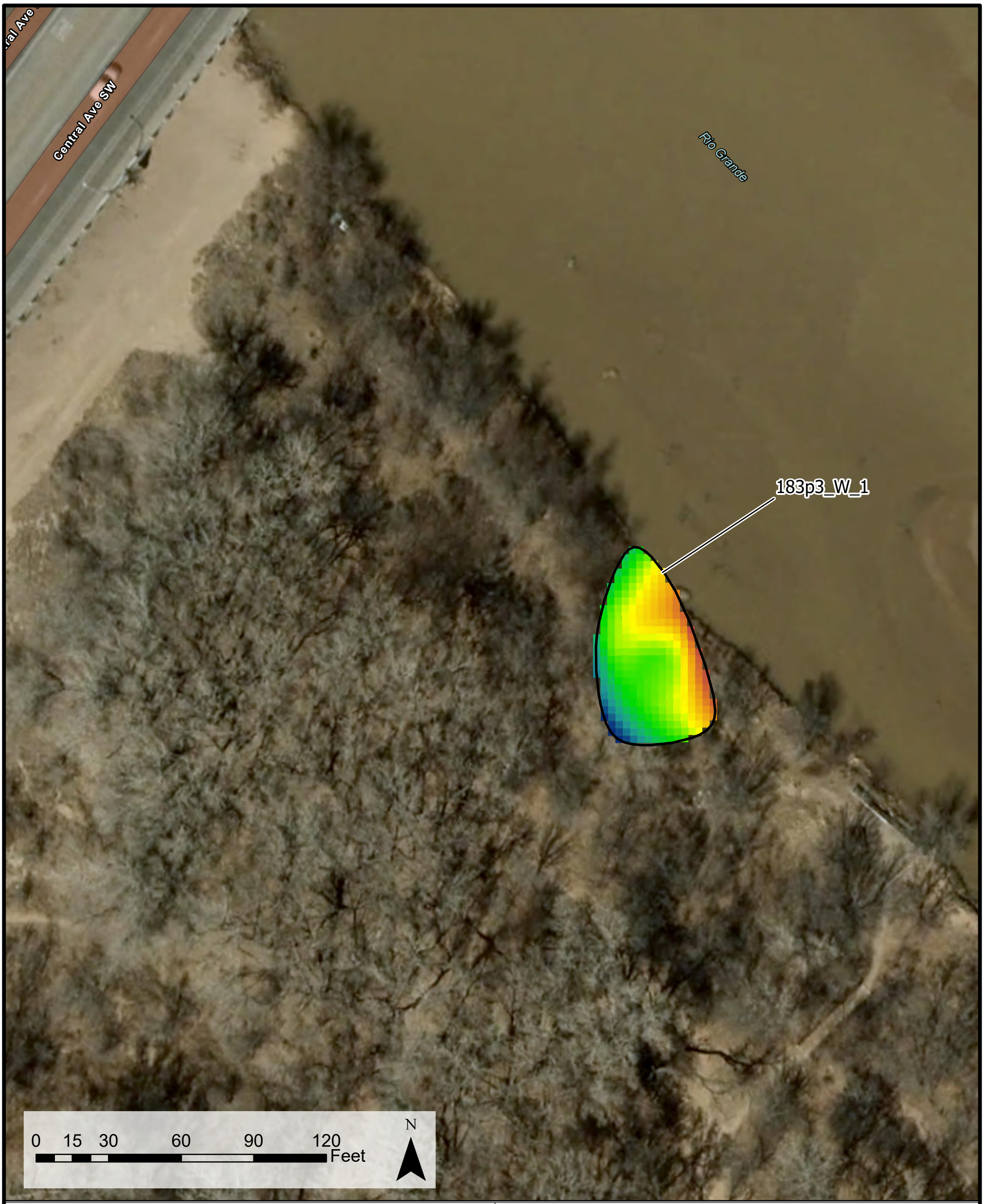


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through A' represent the cross-section from west to east.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4952.85

4952.77

Title

Site 183p3_W_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.5

2.5-3.4

Title

Site 183p3_W_1 Excavation Depths

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

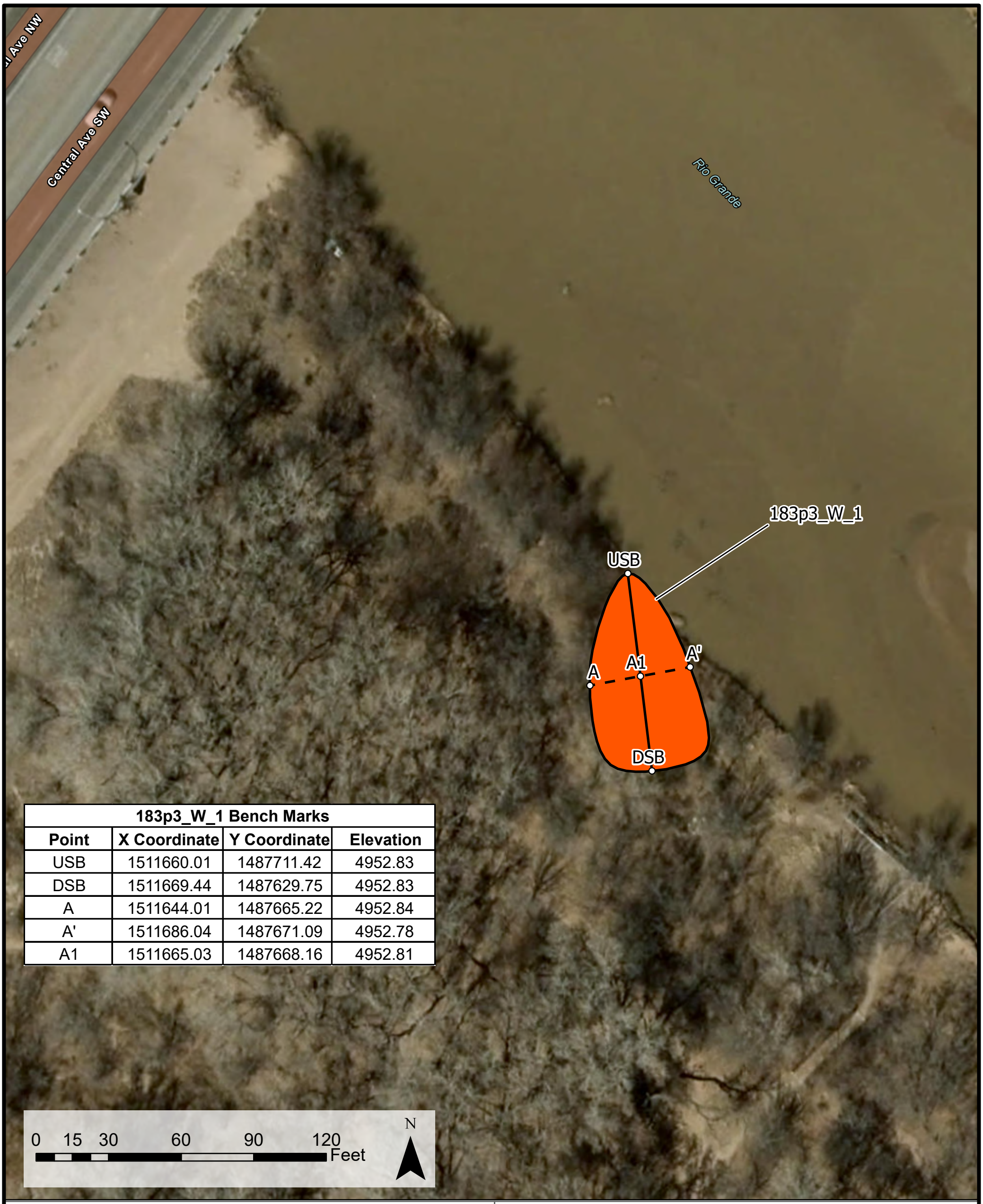
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



183p3_W_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1511660.01	1487711.42	4952.83
DSB	1511669.44	1487629.75	4952.83
A	1511644.01	1487665.22	4952.84
A'	1511686.04	1487671.09	4952.78
A1	1511665.03	1487668.16	4952.81

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Mouth Cleanout

Title
Site 183p3_W_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

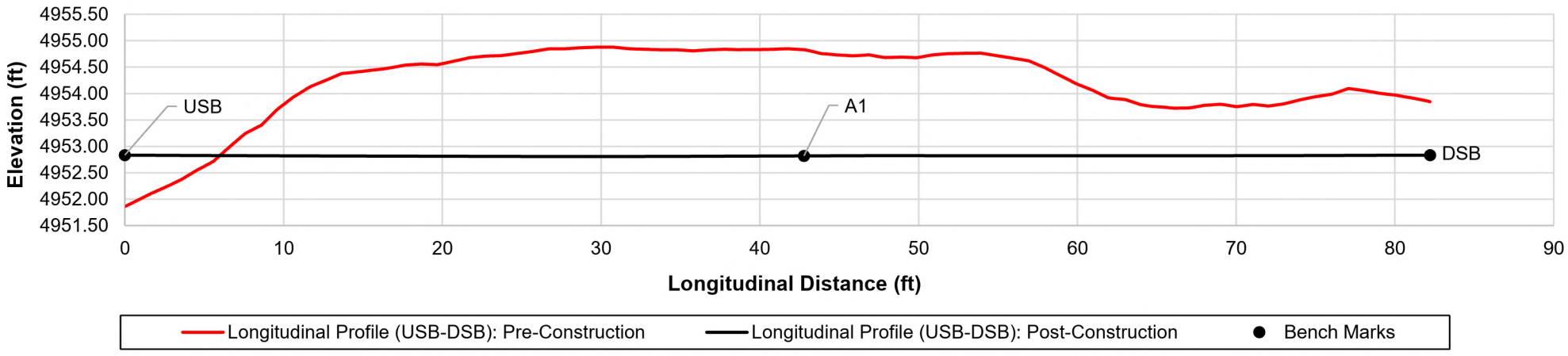
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

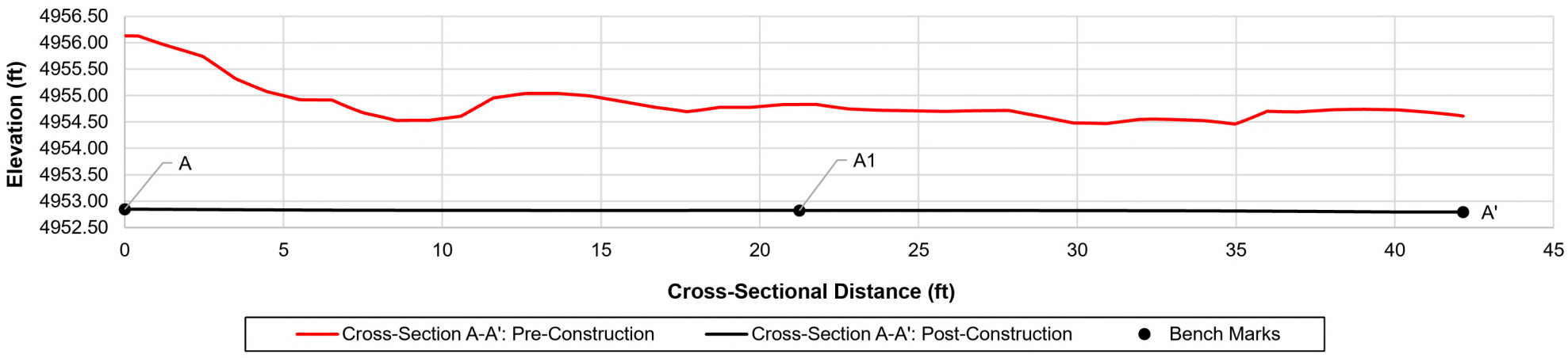
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

Longitudinal Profile (USB-DSB)



Cross-Section A-A'

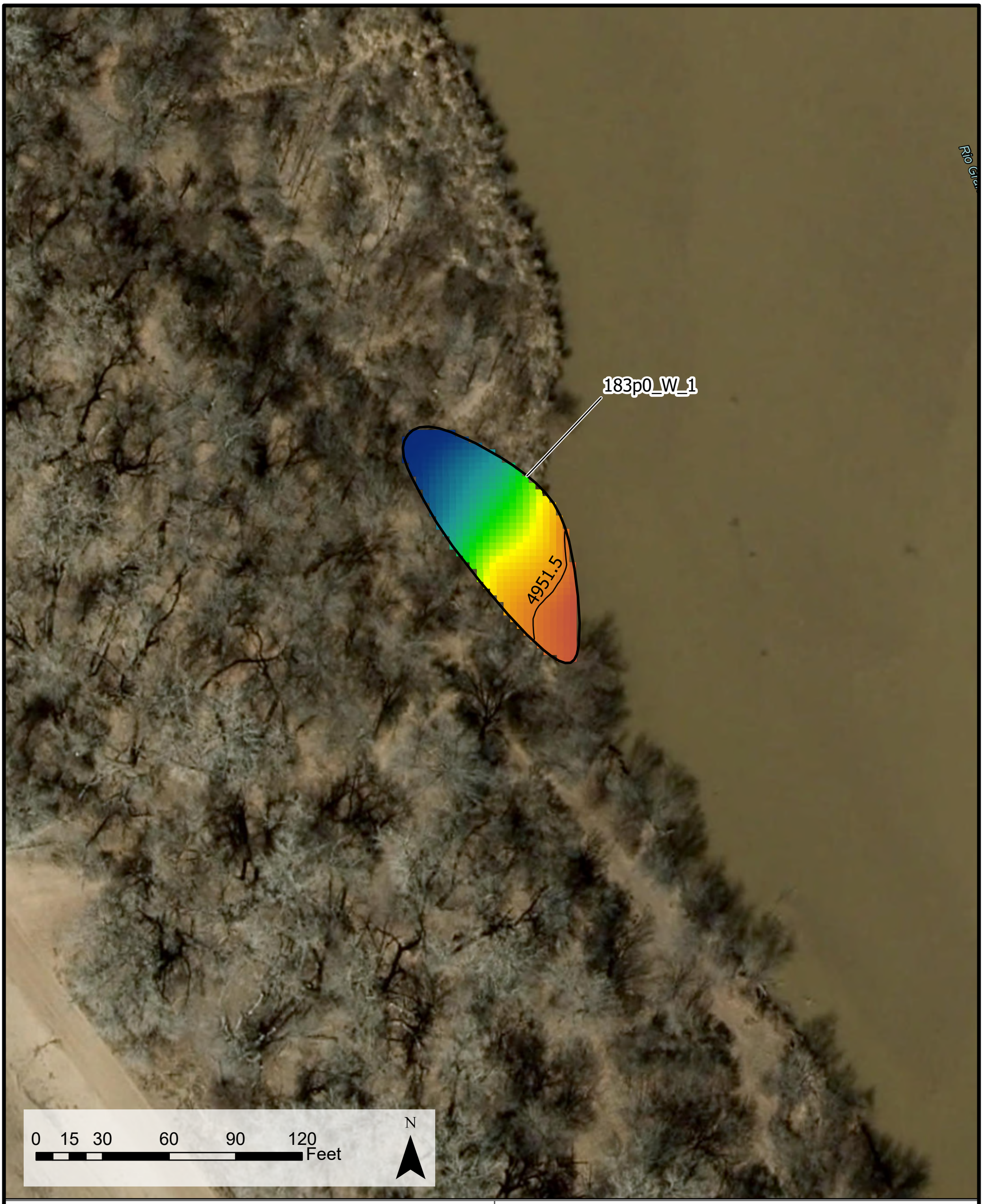


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through A' represent the cross-section from west to east.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4951.87

4951.45

Title

Site 183p0_W_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

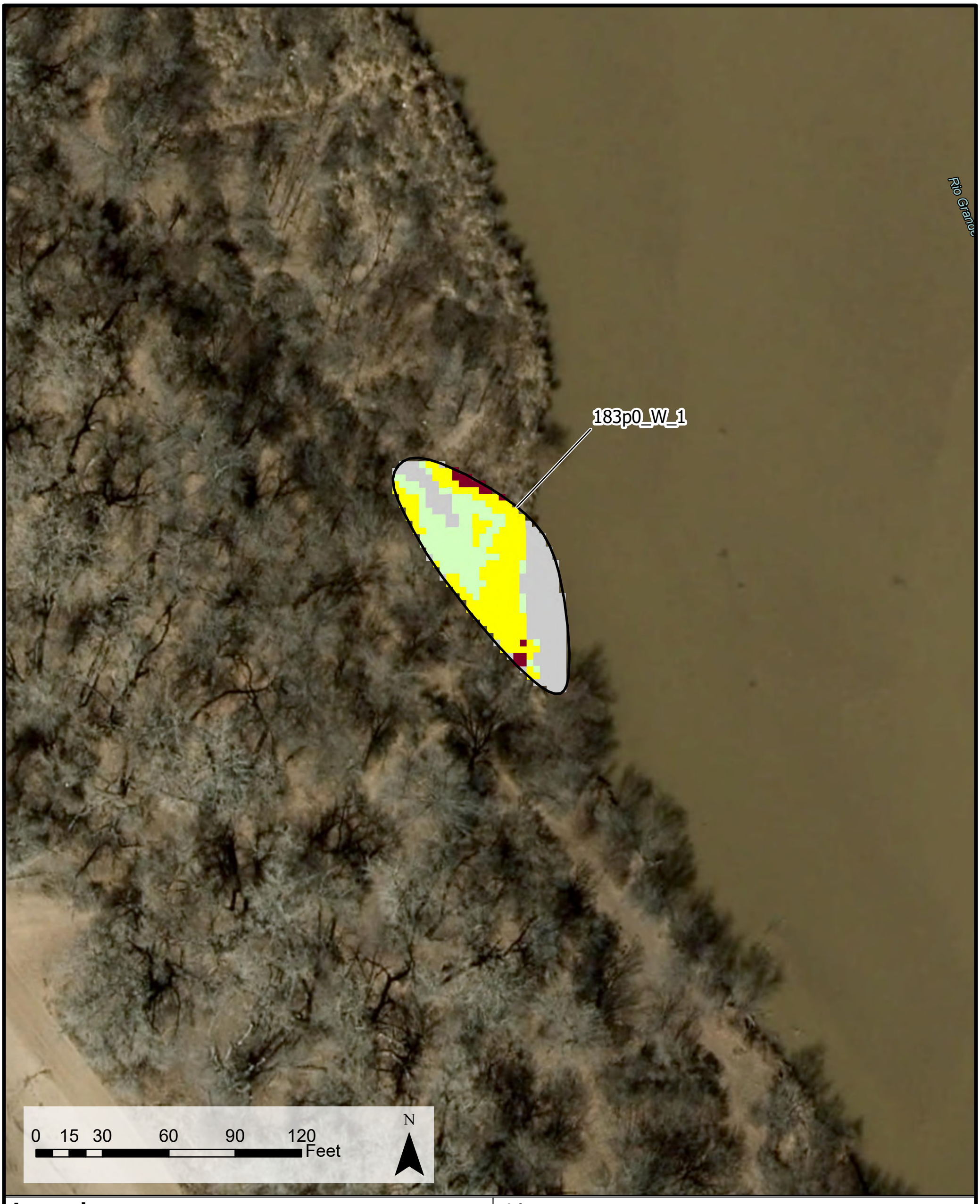
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.3

Title
Site 183p0_W_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

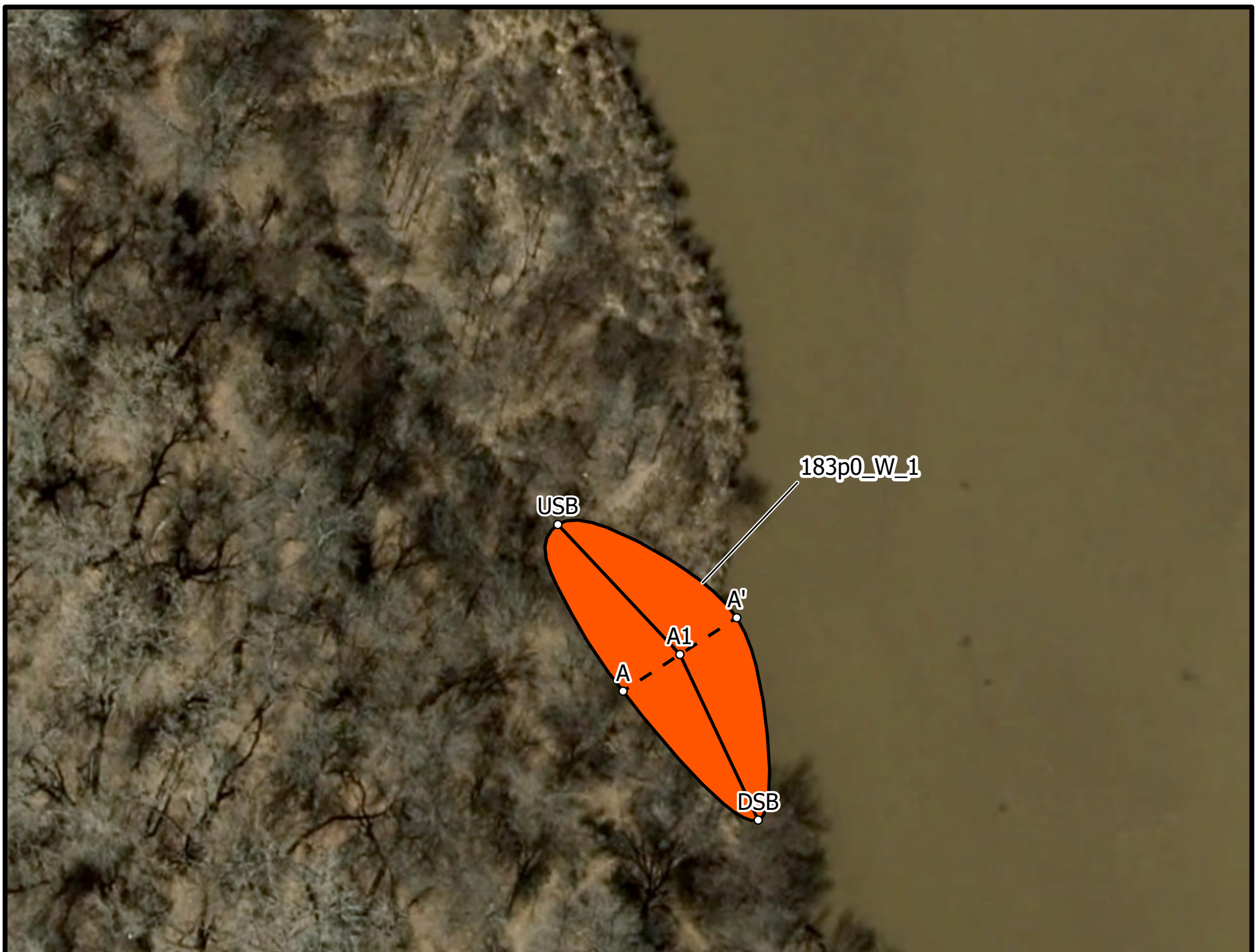
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



183p0_W_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1512334.82	1486580.46	4951.87
DSB	1512405.20	1486475.04	4951.46
A	1512358.35	1486520.11	4951.71
A'	1512396.22	1486549.38	4951.60
A1	1512377.28	1486534.75	4951.66

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Mouth Cleanout

Title

Site 183p0_W_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

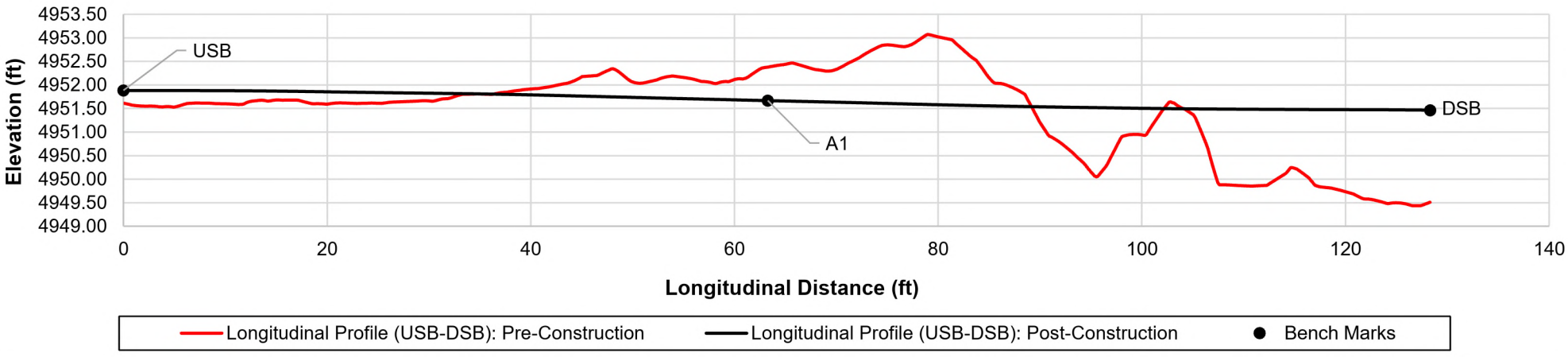
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

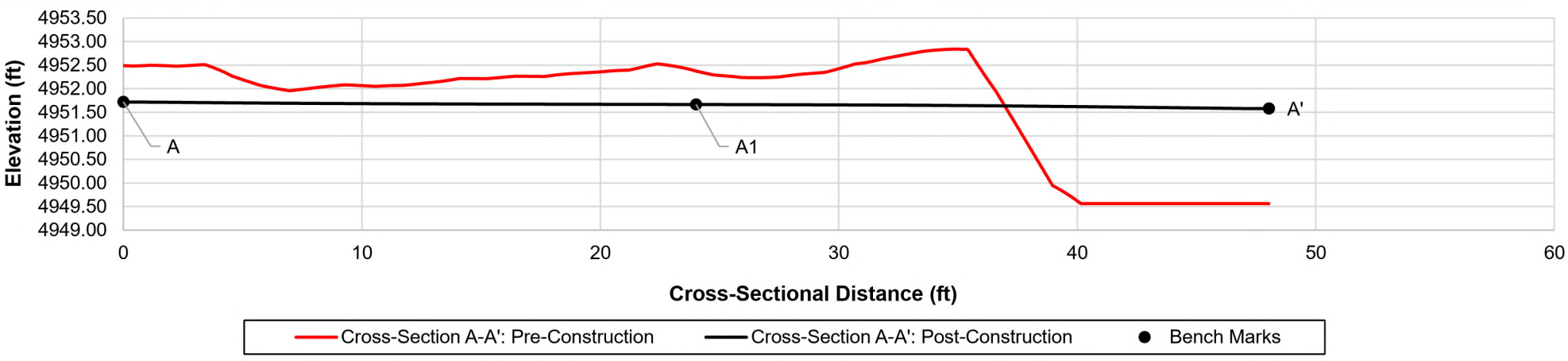
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

Longitudinal Profile (USB-DSB)



Cross-Section A-A'

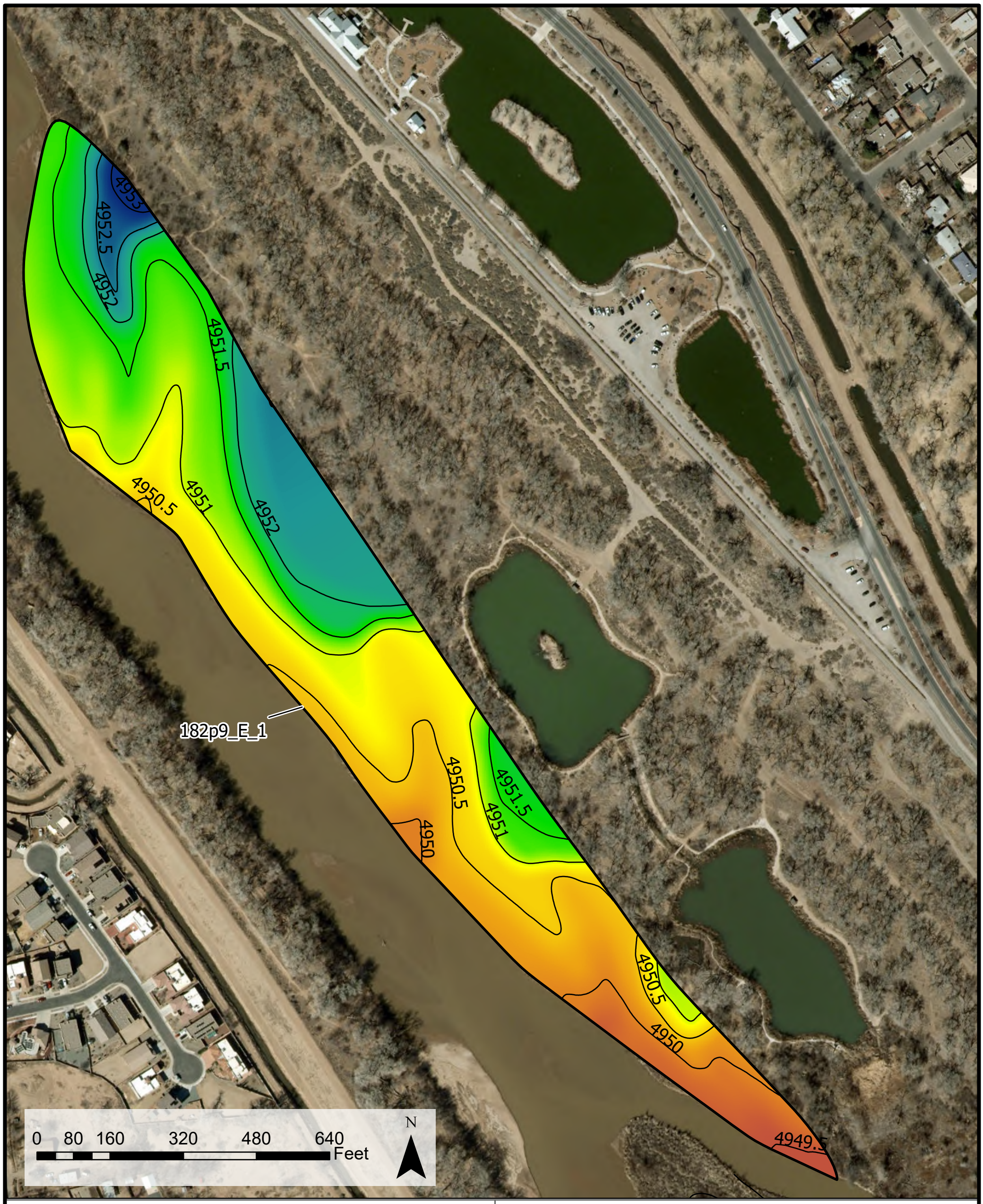


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through A' represent the cross-section from west to east.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4953.15

4949.26

Title

Site 182p9_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

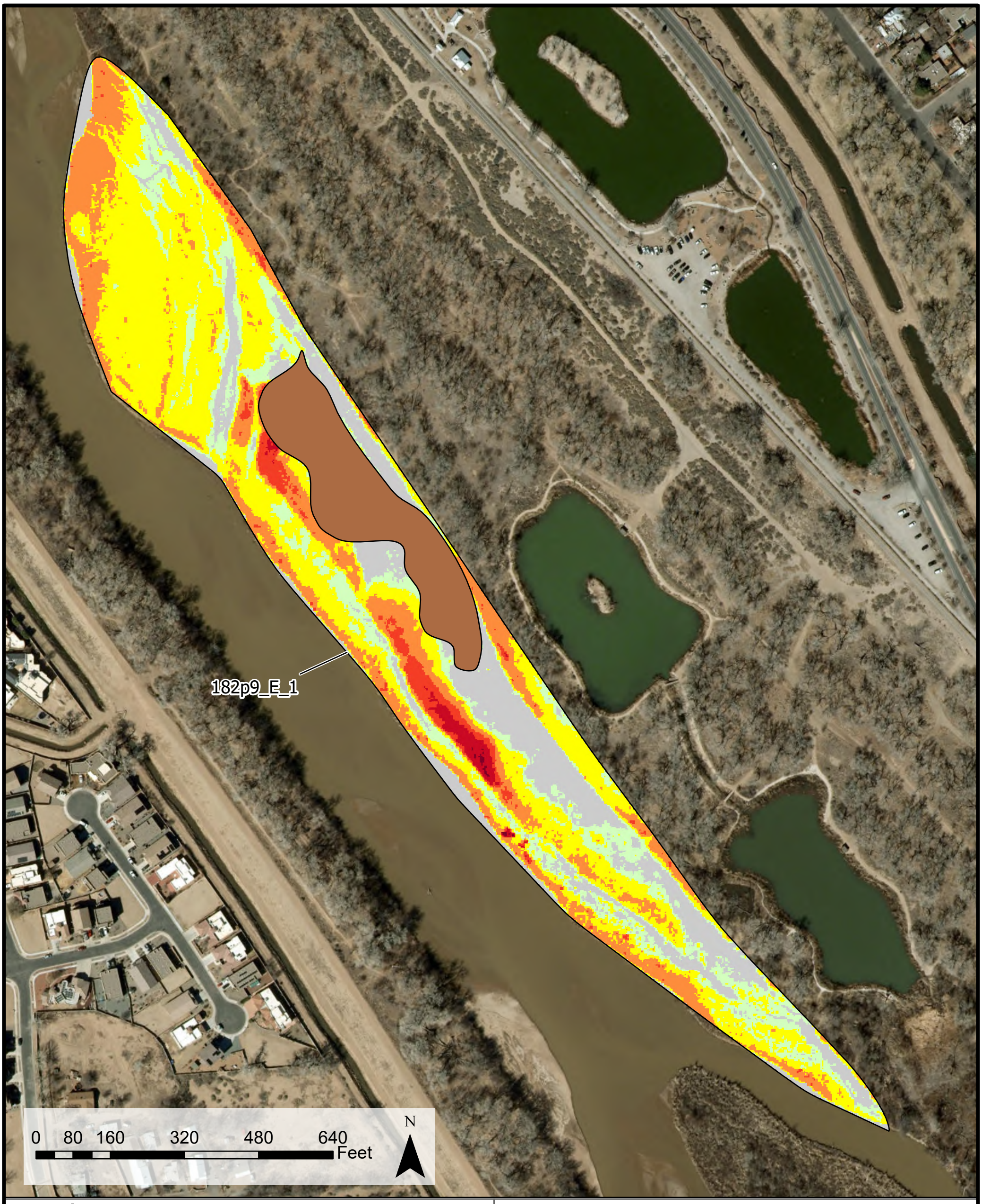
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

- HR Sites
- Cottonwood Preservation

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.5
- 3.5-4.5
- 4.5-5.5

Title
Site 182p9_E_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

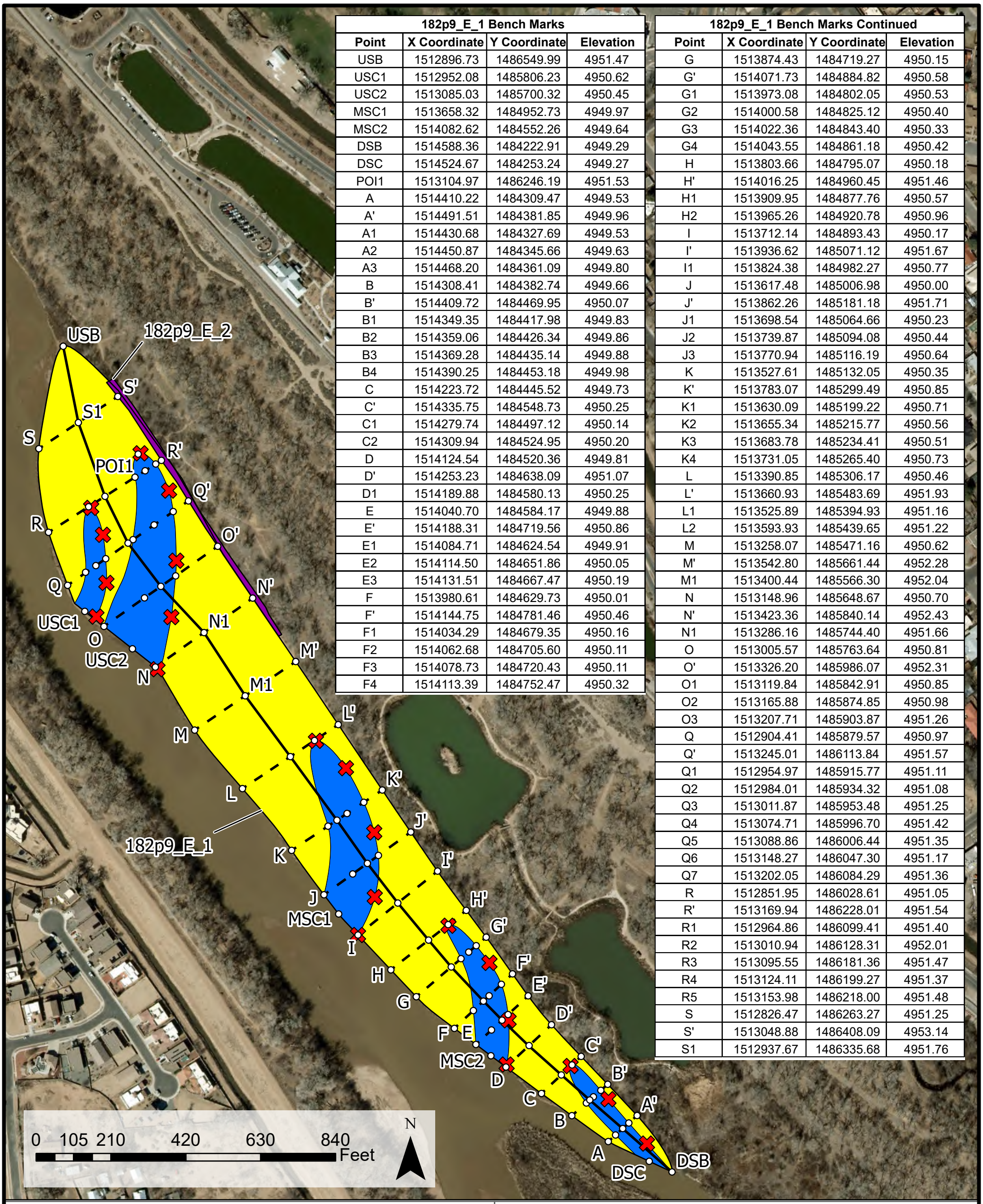
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



182p9_E_1 Bench Marks			
Point	X Coordinate	Y Coordinate	Elevation
USB	1512896.73	1486549.99	4951.47
USC1	1512952.08	1485806.23	4950.62
USC2	1513085.03	1485700.32	4950.45
MSC1	1513658.32	1484952.73	4949.97
MSC2	1514082.62	1484552.26	4949.64
DSB	1514588.36	1484222.91	4949.29
DSC	1514524.67	1484253.24	4949.27
POI1	1513104.97	1486246.19	4951.53
A	1514410.22	1484309.47	4949.53
A'	1514491.51	1484381.85	4949.96
A1	1514430.68	1484327.69	4949.53
A2	1514450.87	1484345.66	4949.63
A3	1514468.20	1484361.09	4949.80
B	1514308.41	1484382.74	4949.66
B'	1514409.72	1484469.95	4950.07
B1	1514349.35	1484417.98	4949.83
B2	1514359.06	1484426.34	4949.86
B3	1514369.28	1484435.14	4949.88
B4	1514390.25	1484453.18	4949.98
C	1514223.72	1484445.52	4949.73
C'	1514335.75	1484548.73	4950.25
C1	1514279.74	1484497.12	4950.14
C2	1514309.94	1484524.95	4950.20
D	1514124.54	1484520.36	4949.81
D'	1514253.23	1484638.09	4951.07
D1	1514189.88	1484580.13	4950.25
E	1514040.70	1484584.17	4949.88
E'	1514188.31	1484719.56	4950.86
E1	1514084.71	1484624.54	4949.91
E2	1514114.50	1484651.86	4950.05
E3	1514131.51	1484667.47	4950.19
F	1513980.61	1484629.73	4950.01
F'	1514144.75	1484781.46	4950.46
F1	1514034.29	1484679.35	4950.16
F2	1514062.68	1484705.60	4950.11
F3	1514078.73	1484720.43	4950.11
F4	1514113.39	1484752.47	4950.32

182p9_E_1 Bench Marks Continued			
Point	X Coordinate	Y Coordinate	Elevation
G	1513874.43	1484719.27	4950.15
G'	1514071.73	1484884.82	4950.58
G1	1513973.08	1484802.05	4950.53
G2	1514000.58	1484825.12	4950.40
G3	1514022.36	1484843.40	4950.33
G4	1514043.55	1484861.18	4950.42
H	1513803.66	1484795.07	4950.18
H'	1514016.25	1484960.45	4951.46
H1	1513909.95	1484877.76	4950.57
H2	1513965.26	1484920.78	4950.96
I	1513712.14	1484893.43	4950.17
I'	1513936.62	1485071.12	4951.67
I1	1513824.38	1484982.27	4950.77
J	1513617.48	1485006.98	4950.00
J'	1513862.26	1485181.18	4951.71
J1	1513698.54	1485064.66	4950.23
J2	1513739.87	1485094.08	4950.44
J3	1513770.94	1485116.19	4950.64
K	1513527.61	1485132.05	4950.35
K'	1513783.07	1485299.49	4950.85
K1	1513630.09	1485199.22	4950.71
K2	1513655.34	1485215.77	4950.56
K3	1513683.78	1485234.41	4950.51
K4	1513731.05	1485265.40	4950.73
L	1513390.85	1485306.17	4950.46
L'	1513660.93	1485483.69	4951.93
L1	1513525.89	1485394.93	4951.16
L2	1513593.93	1485439.65	4951.22
M	1513258.07	1485471.16	4950.62
M'	1513542.80	1485661.44	4952.28
M1	1513400.44	1485566.30	4952.04
N	1513148.96	1485648.67	4950.70
N'	1513423.36	1485840.14	4952.43
N1	1513286.16	1485744.40	4951.66
O	1513005.57	1485763.64	4950.81
O'	1513326.20	1485986.07	4952.31
O1	1513119.84	1485842.91	4950.85
O2	1513165.88	1485874.85	4950.98
O3	1513207.71	1485903.87	4951.26
Q	1512904.41	1485879.57	4950.97
Q'	1513245.01	1486113.84	4951.57
Q1	1512954.97	1485915.77	4951.11
Q2	1512984.01	1485934.32	4951.08
Q3	1513011.87	1485953.48	4951.25
Q4	1513074.71	1485996.70	4951.42
Q5	1513088.86	1486006.44	4951.35
Q6	1513148.27	1486047.30	4951.17
Q7	1513202.05	1486084.29	4951.36
R	1512851.95	1486028.61	4951.05
R'	1513169.94	1486228.01	4951.54
R1	1512964.86	1486099.41	4951.40
R2	1513010.94	1486128.31	4952.01
R3	1513095.55	1486181.36	4951.47
R4	1513124.11	1486199.27	4951.37
R5	1513153.98	1486218.00	4951.48
S	1512826.47	1486263.27	4951.25
S'	1513048.88	1486408.09	4953.14
S1	1512937.67	1486335.68	4951.76

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Backwater
- Bankline Modification
- Jetty Jack Removal

Title

Site 182p9_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

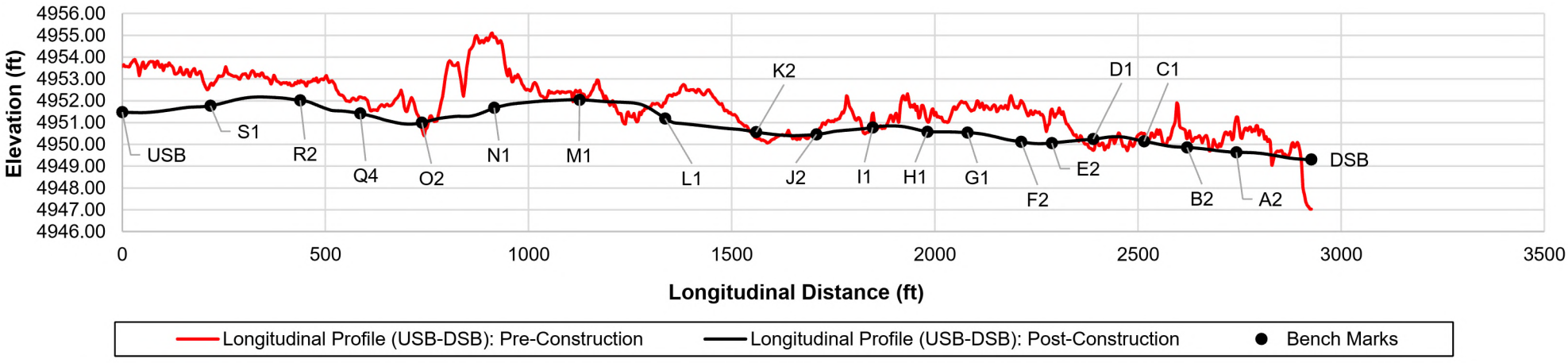
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

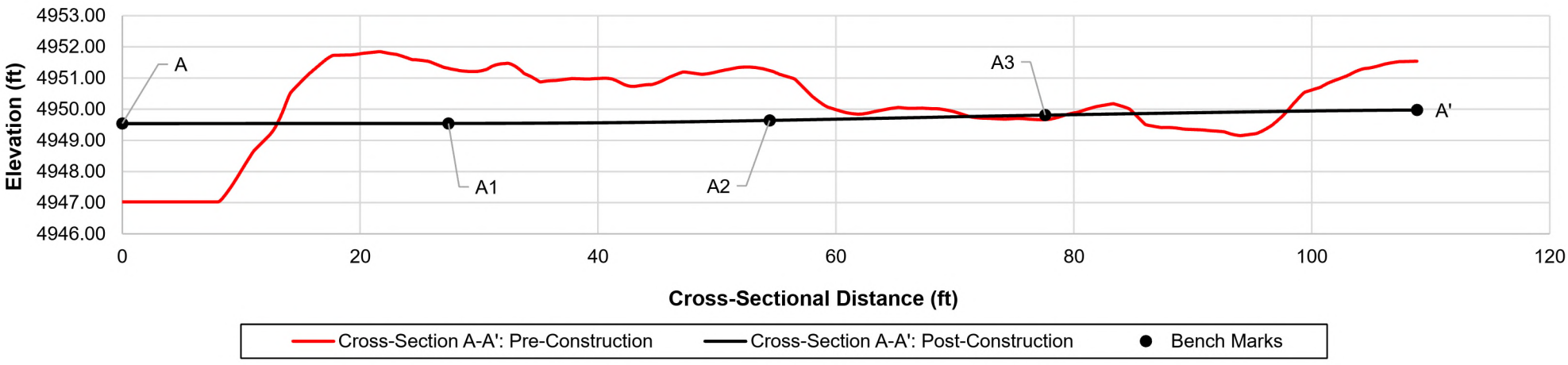
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

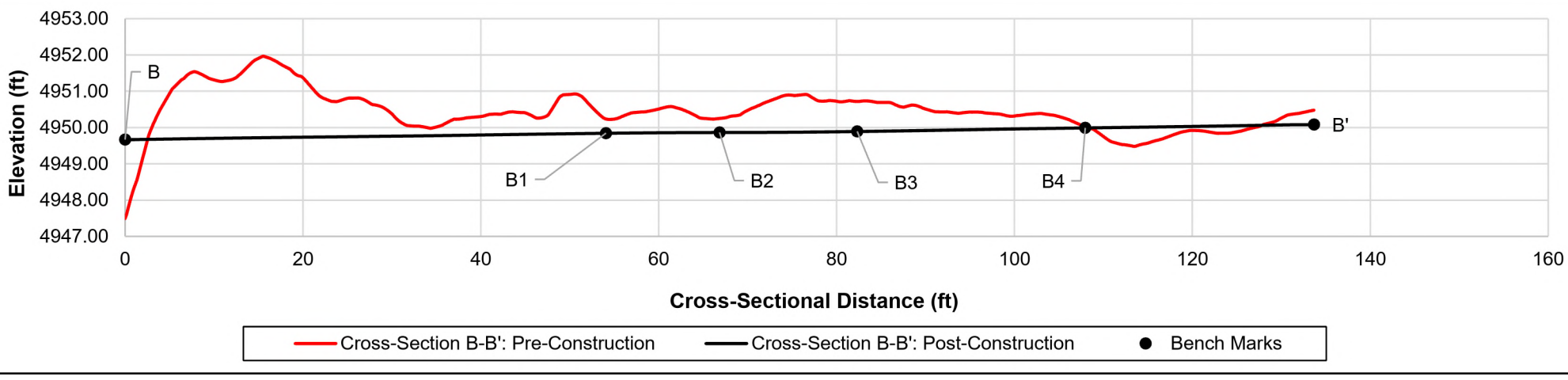
Longitudinal Profile (USB-DSB)



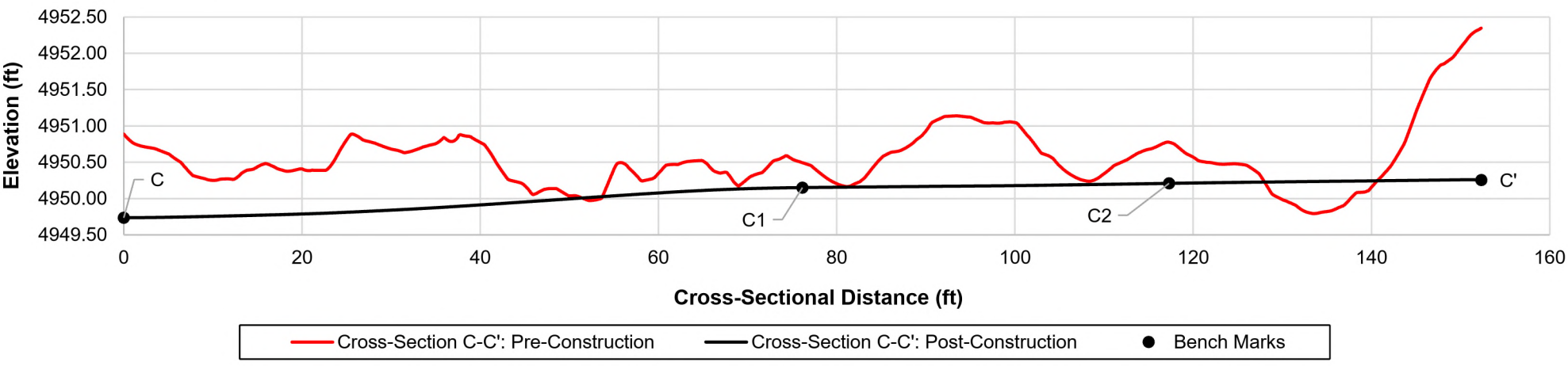
Cross-Section A-A'



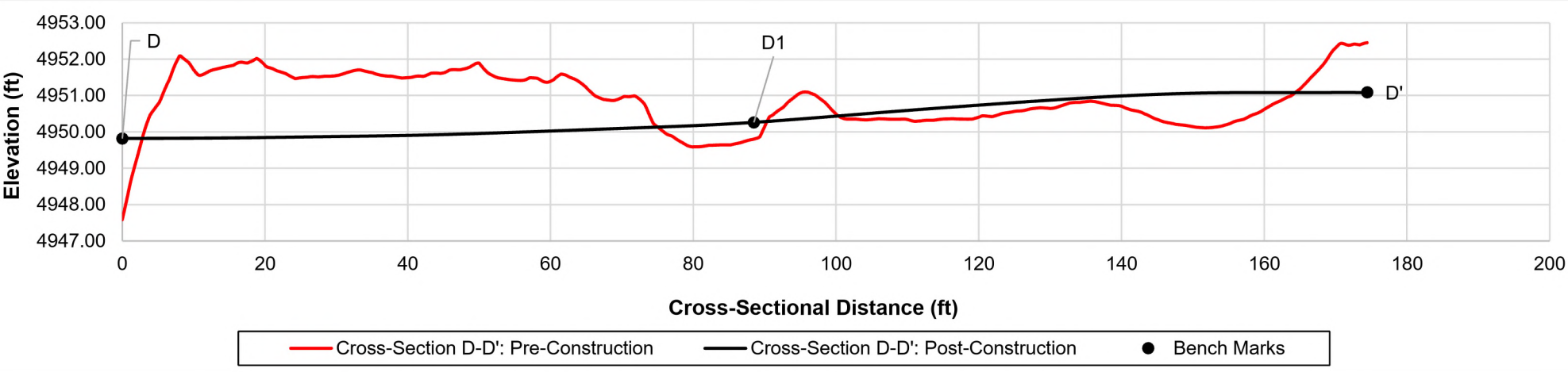
Cross-Section B-B'



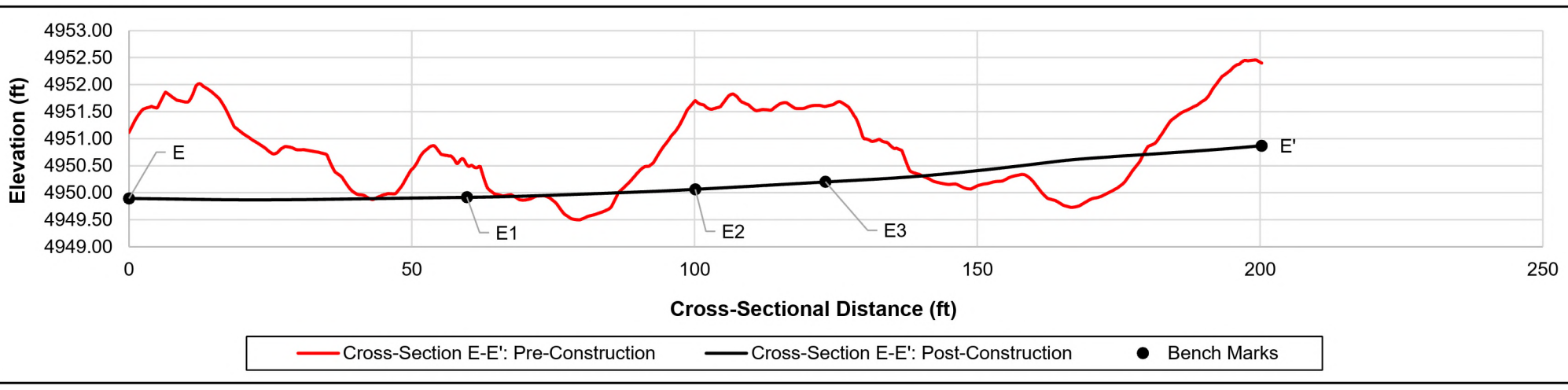
Cross-Section C-C'



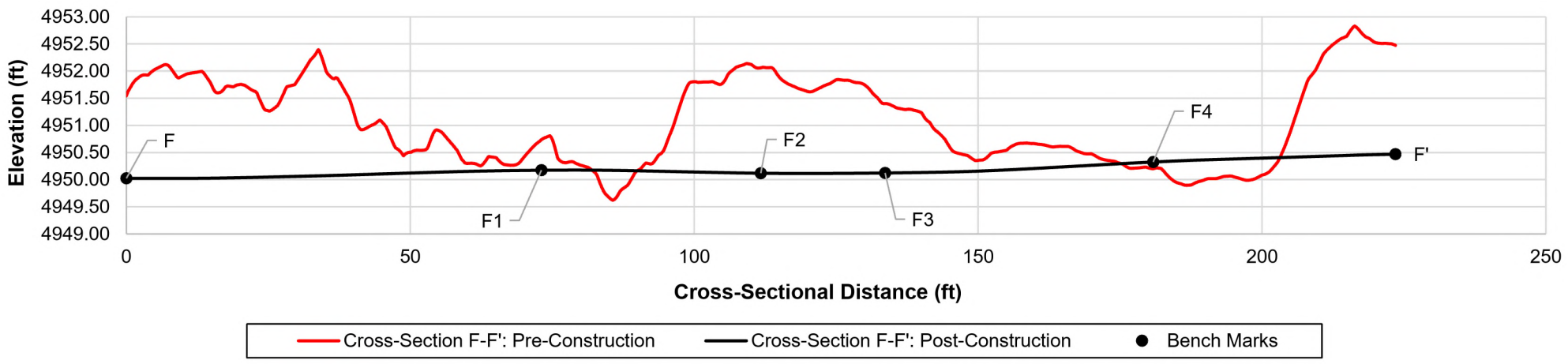
Cross-Section D-D'



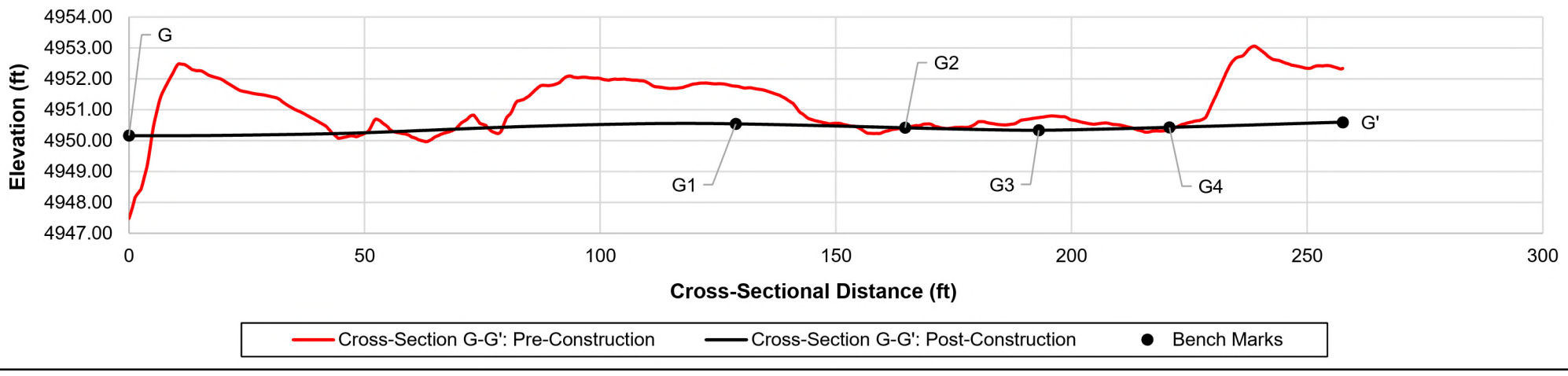
Cross-Section E-E'



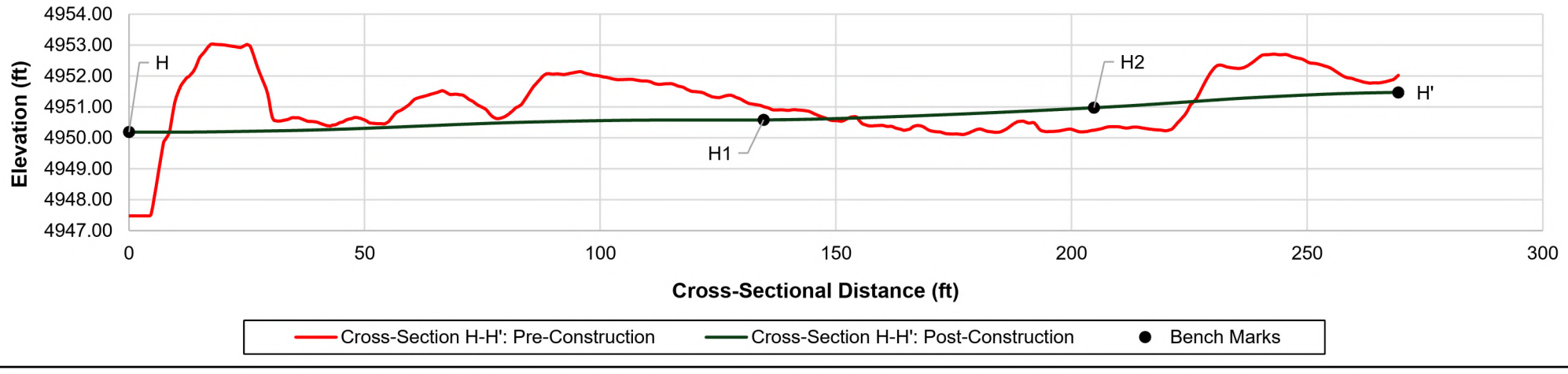
Cross-Section F-F'



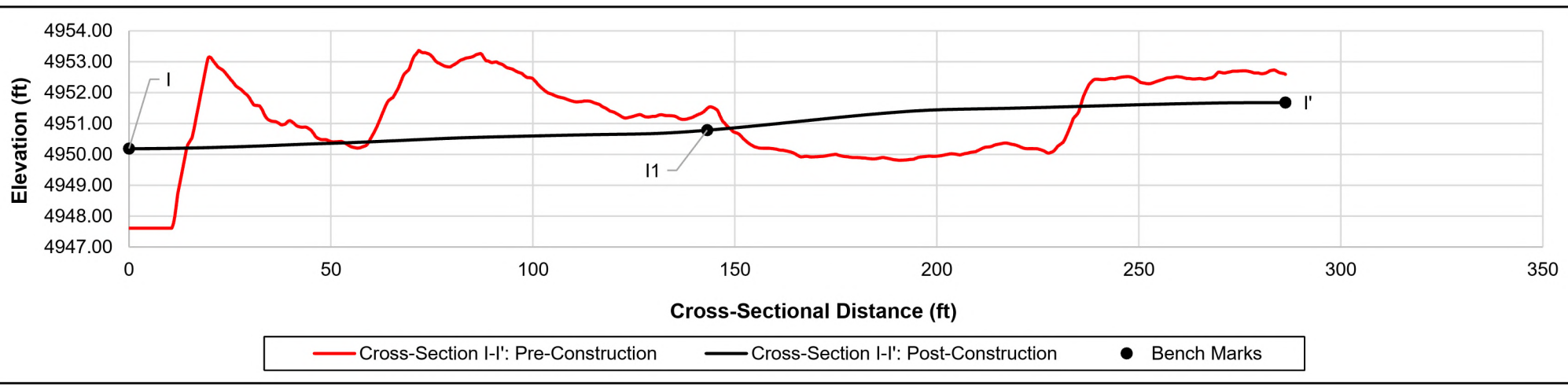
Cross-Section G-G'



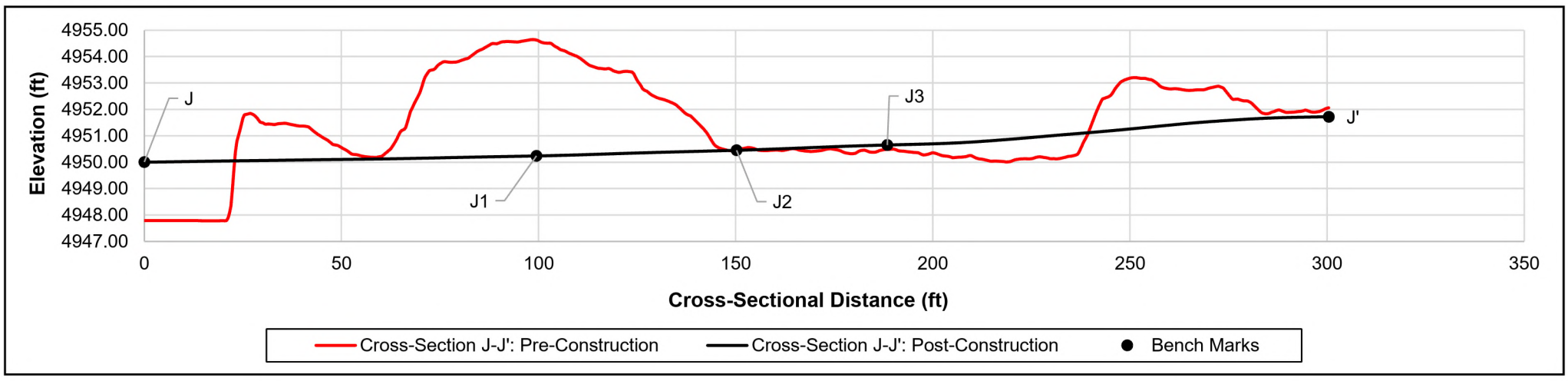
Cross-Section H-H'



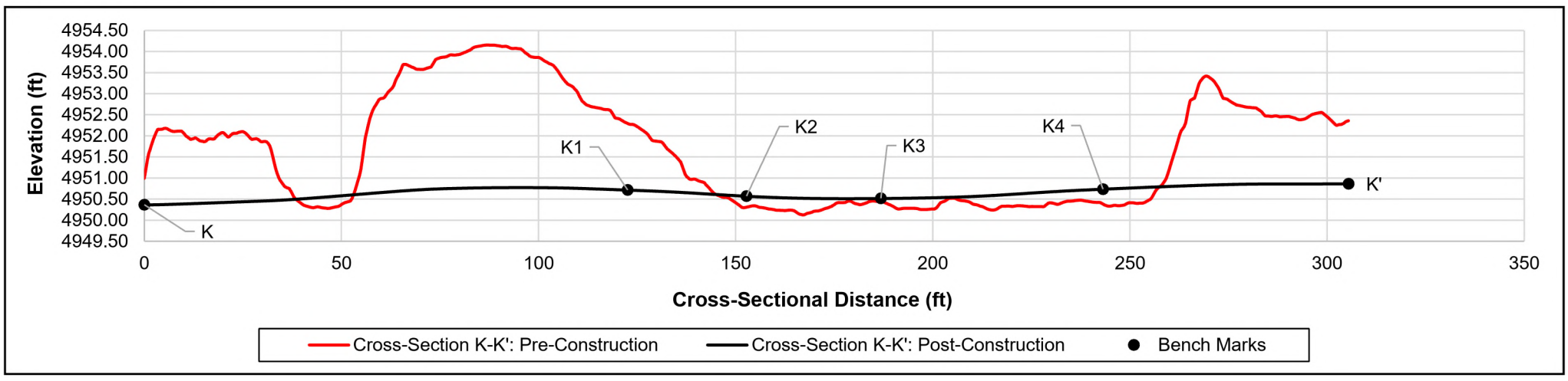
Cross-Section I-I'



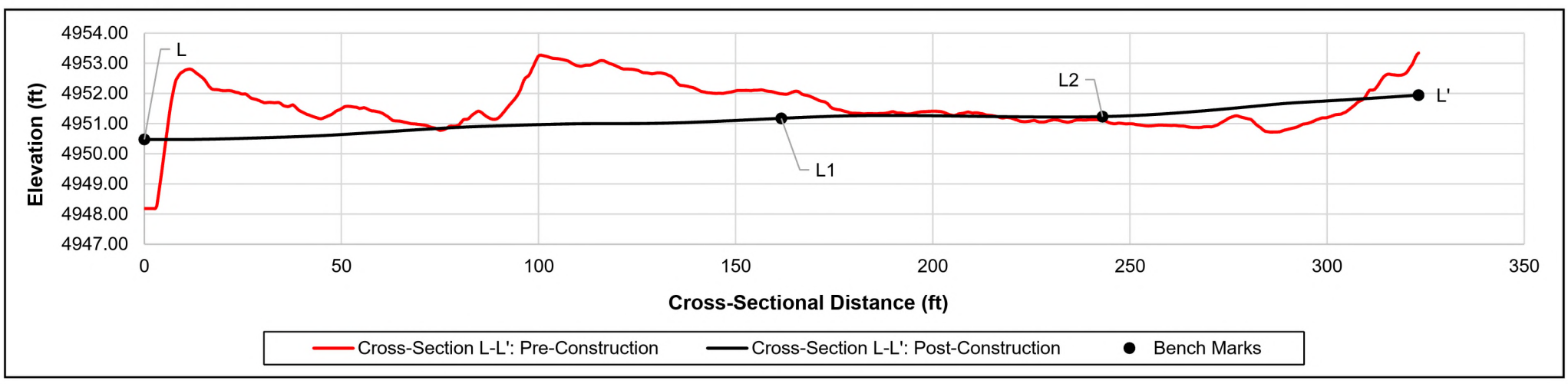
Cross-Section J-J'



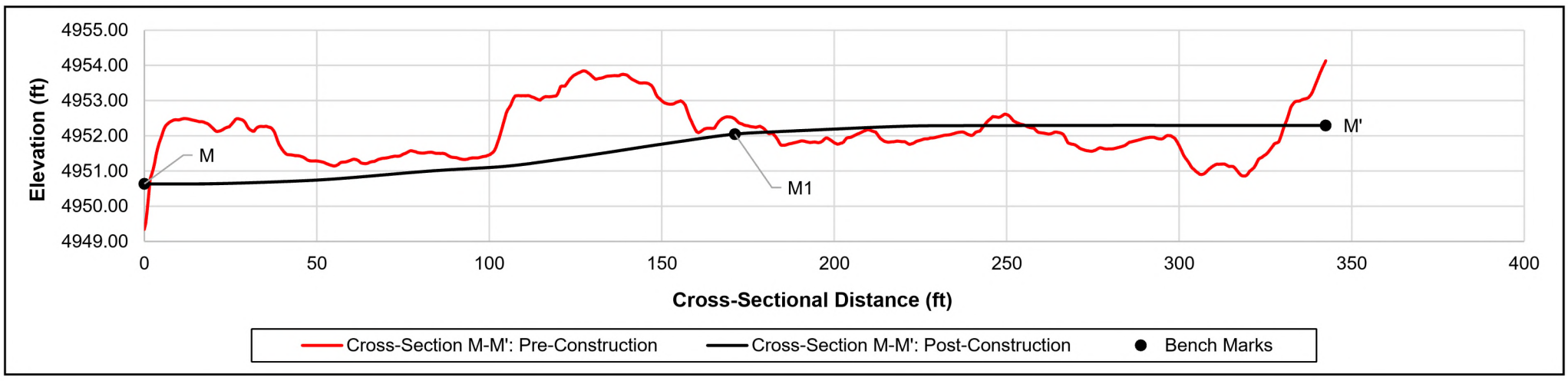
Cross-Section K-K'



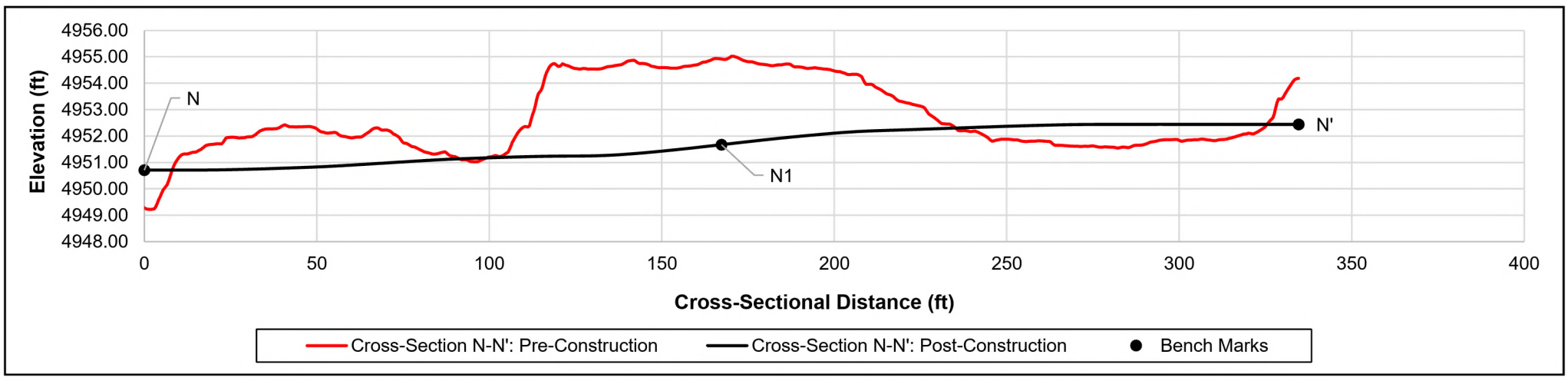
Cross-Section L-L'



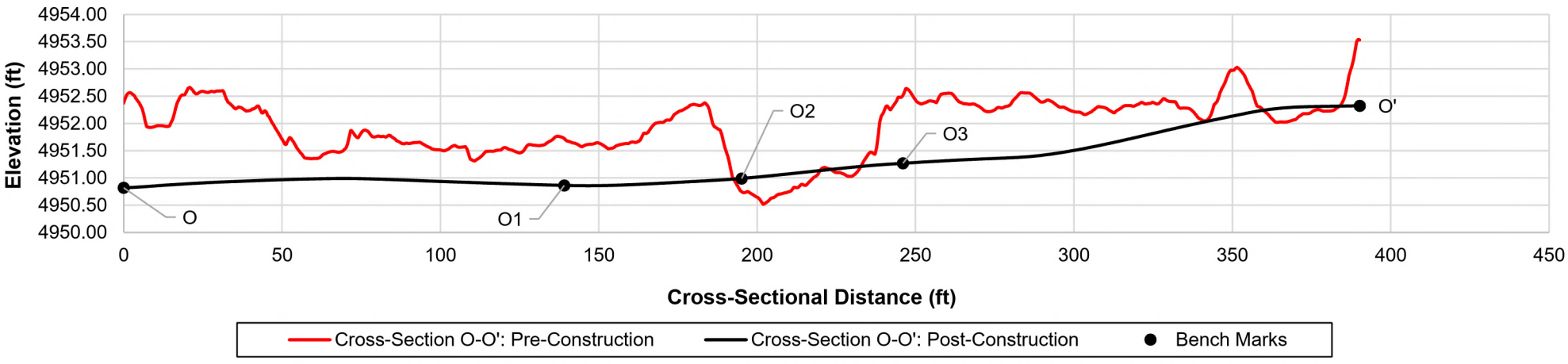
Cross-Section M-M'



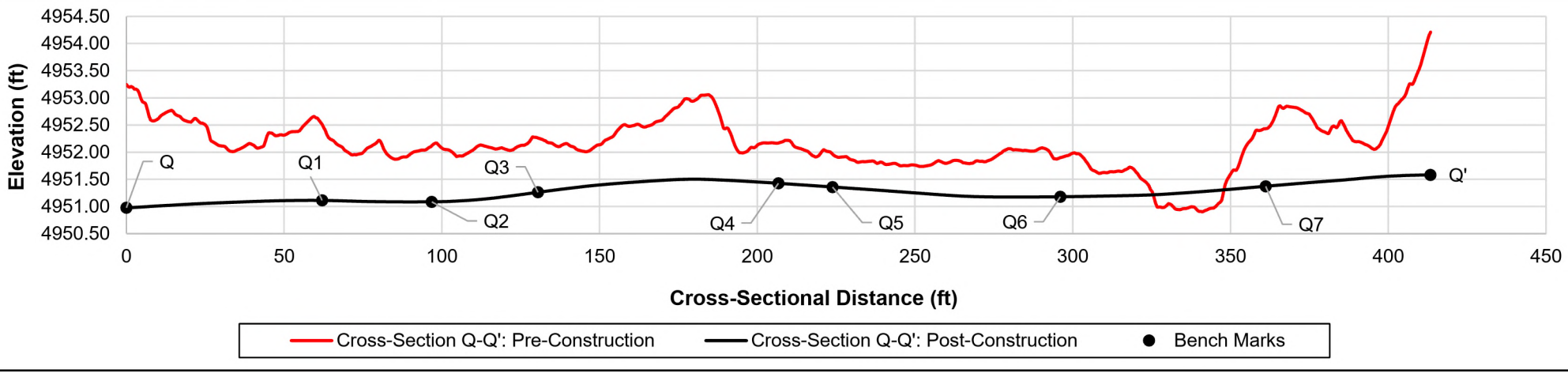
Cross-Section N-N'



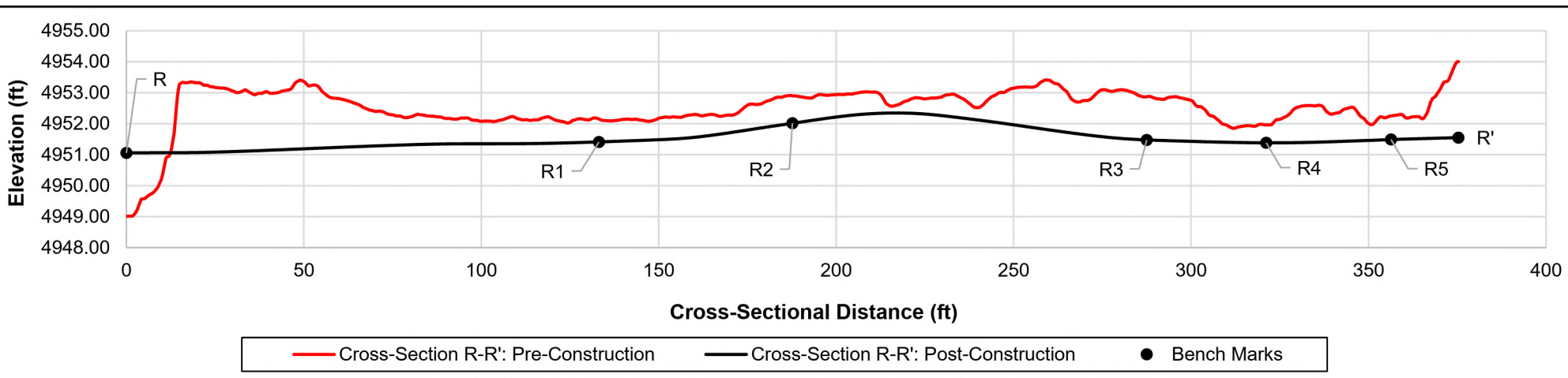
Cross-Section O-O'



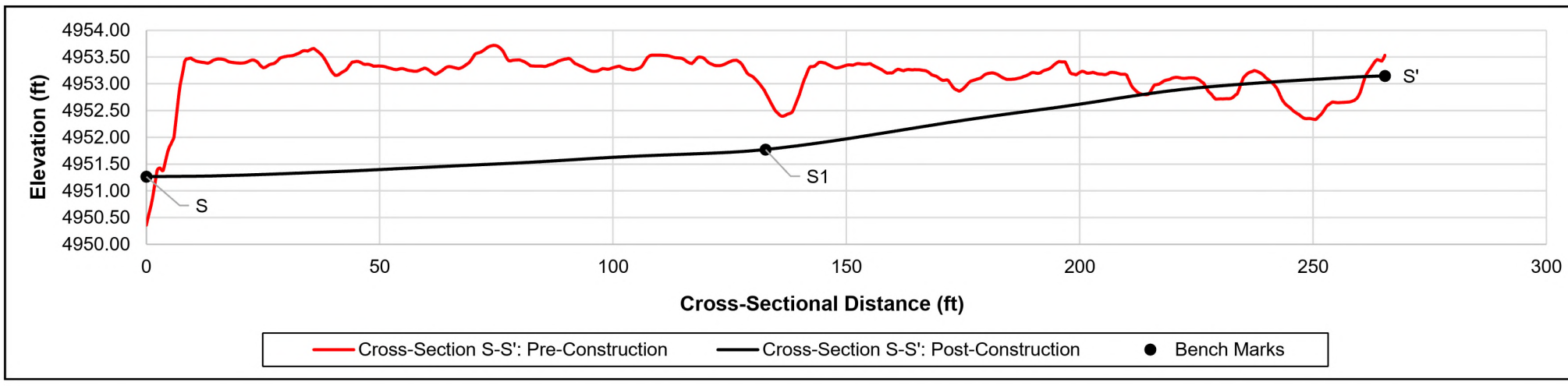
Cross-Section Q-Q'



Cross-Section R-R'



Cross-Section S-S'

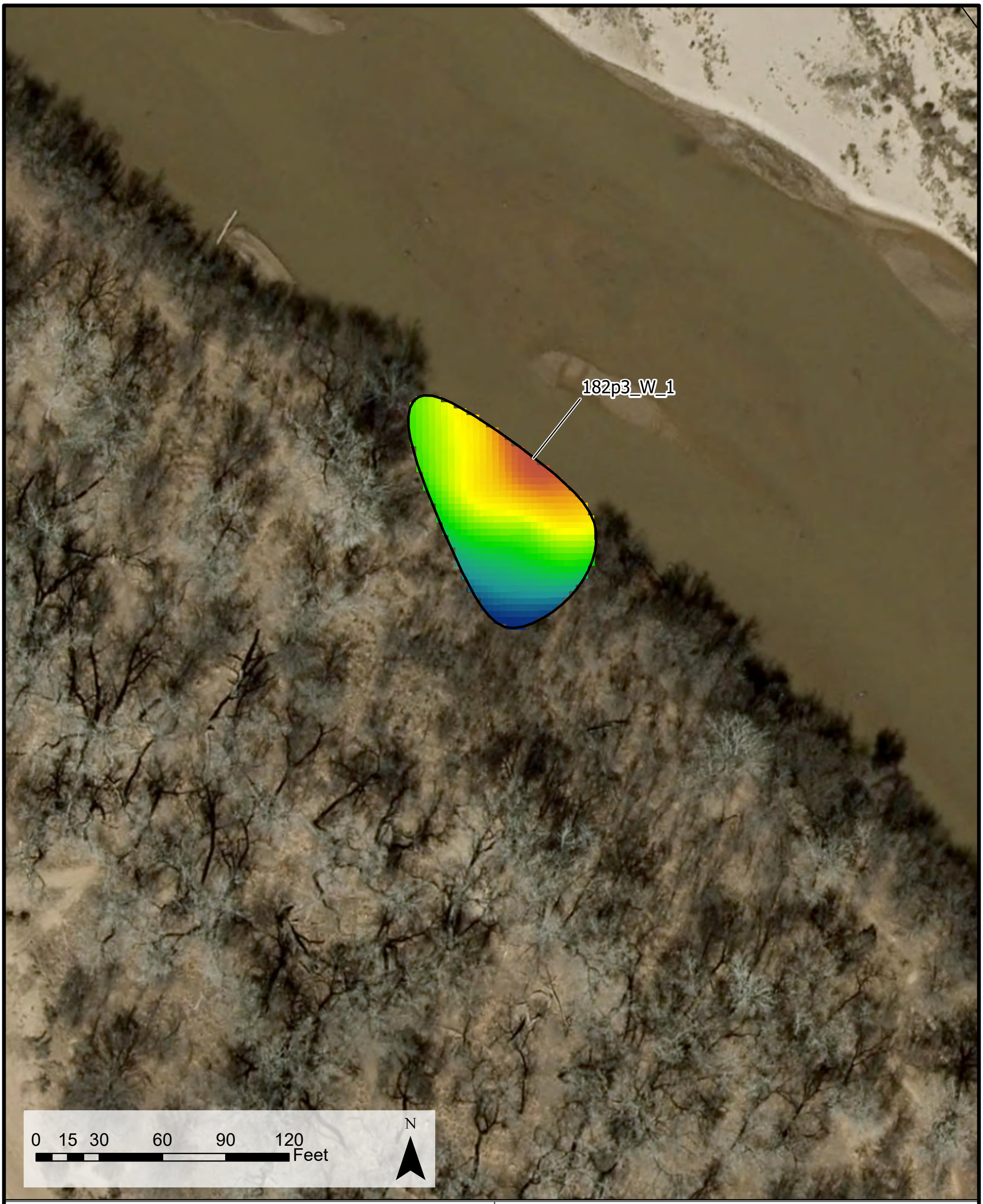


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through S represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4948.87

4948.63

Title

Site 182p3_W_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.2

Title
Site 182p3_W_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

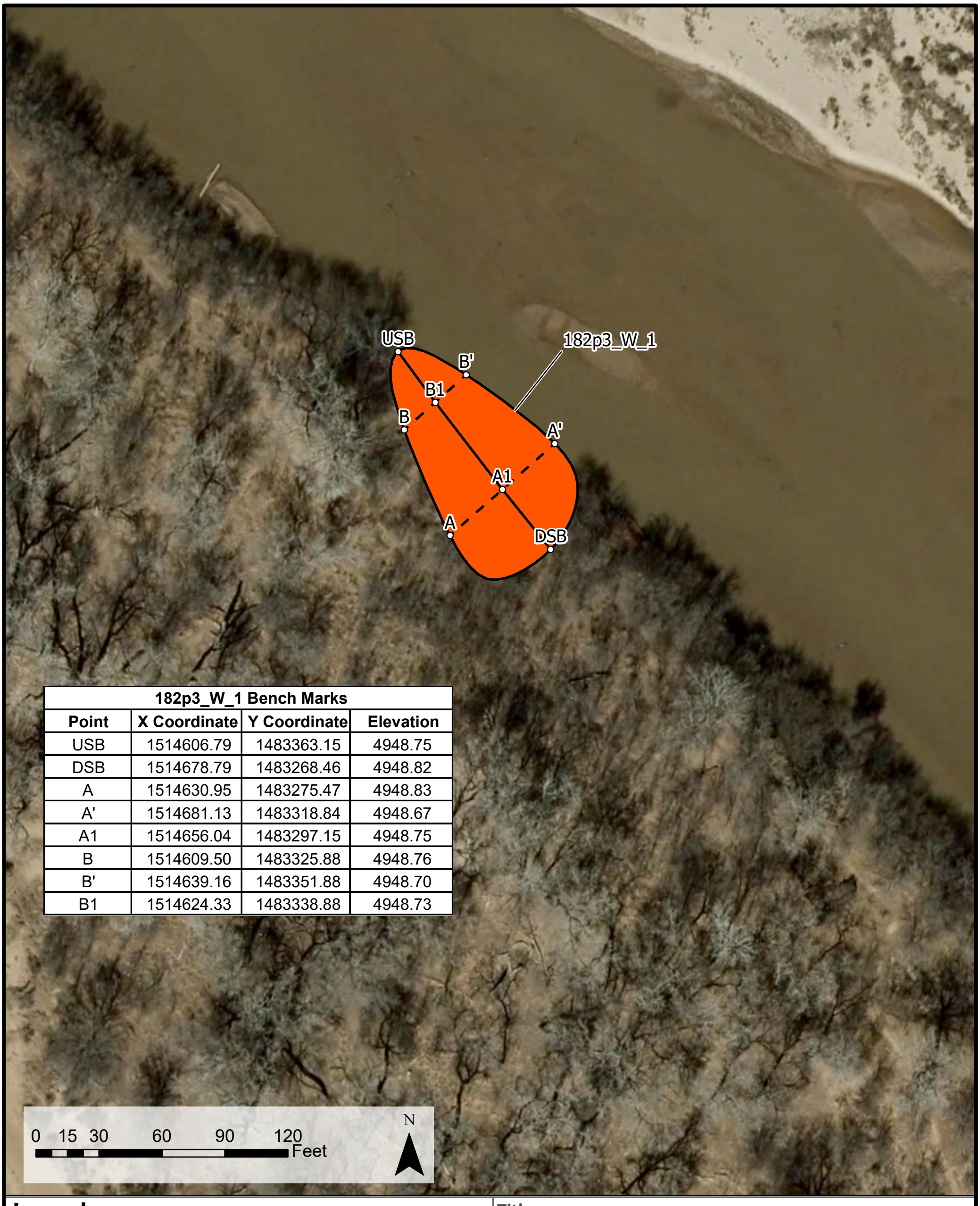
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



182p3_W_1 Bench Marks			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1514606.79	1483363.15	4948.75
DSB	1514678.79	1483268.46	4948.82
A	1514630.95	1483275.47	4948.83
A'	1514681.13	1483318.84	4948.67
A1	1514656.04	1483297.15	4948.75
B	1514609.50	1483325.88	4948.76
B'	1514639.16	1483351.88	4948.70
B1	1514624.33	1483338.88	4948.73

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features

- Mouth Cleanout

Title

Site 182p3_W_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

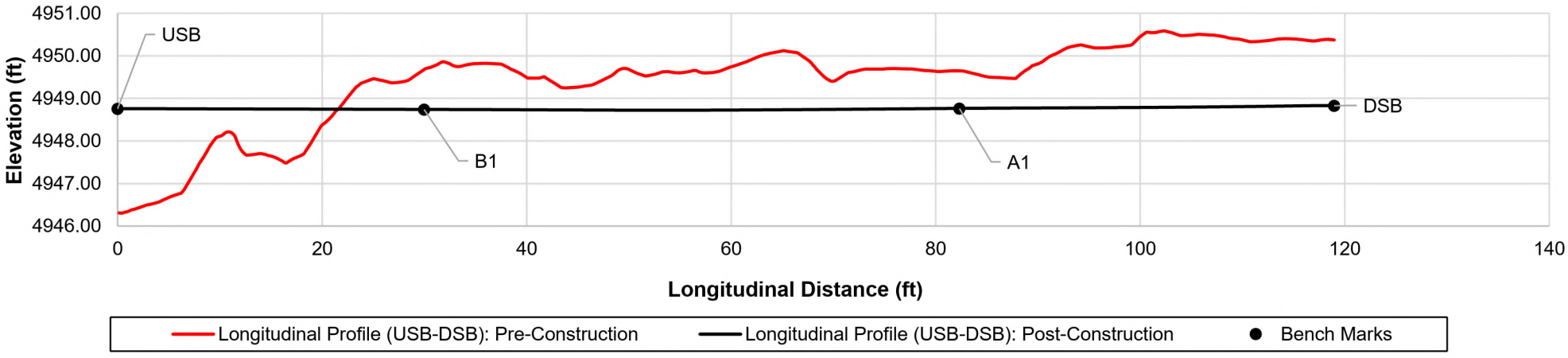
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

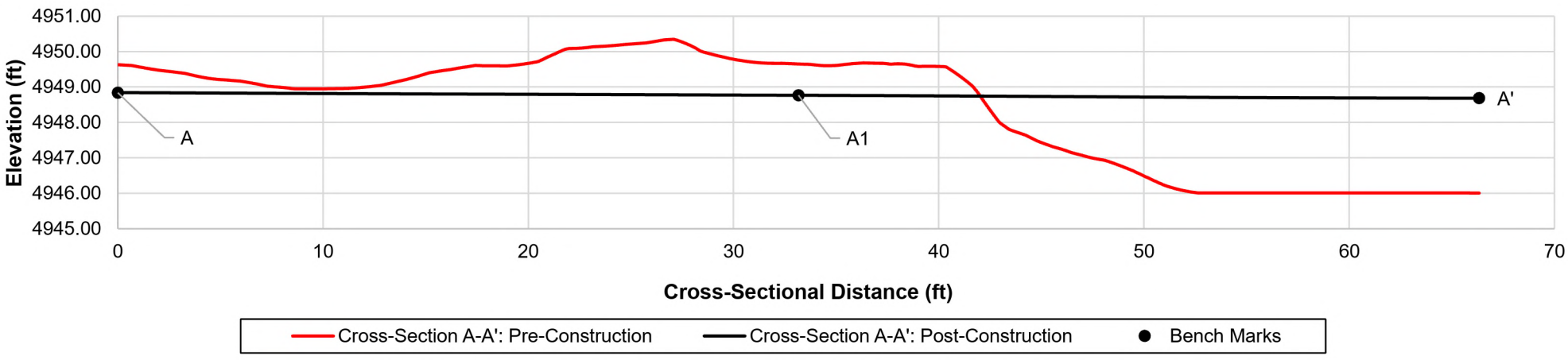
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

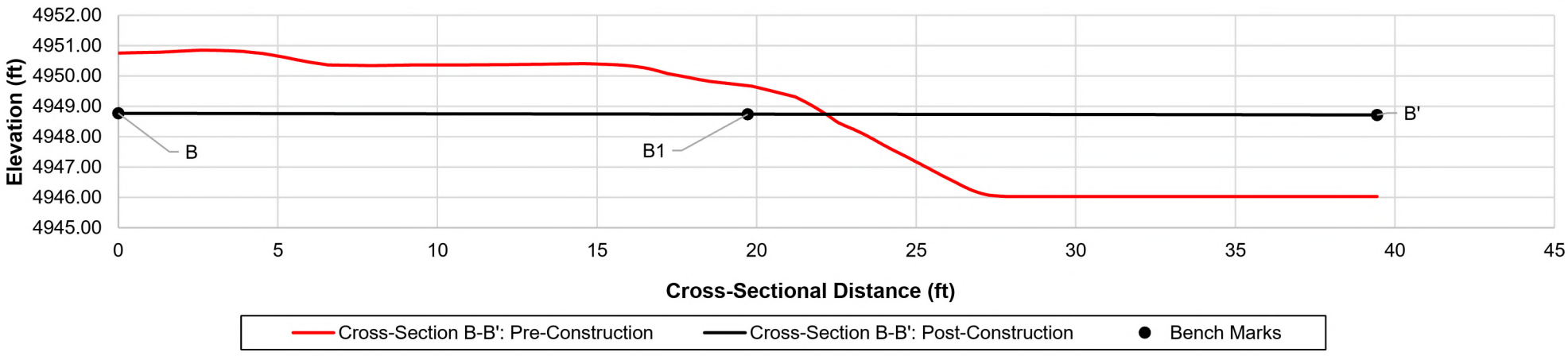
Longitudinal Profile (USB-DSB)



Cross-Section A-A'



Cross-Section B-B'

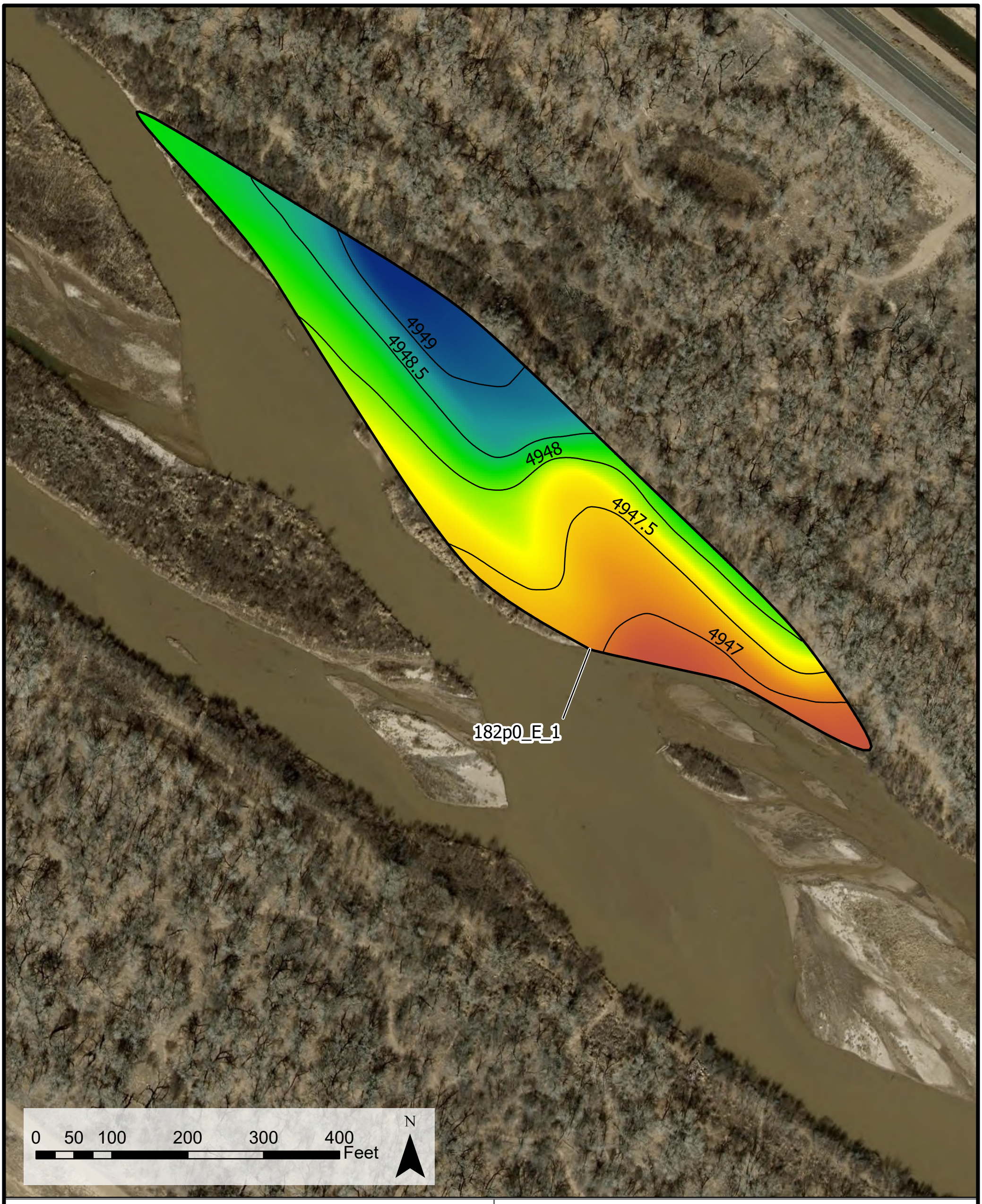


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through B represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4949.28

4946.69

Title

Site 182p0_E_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

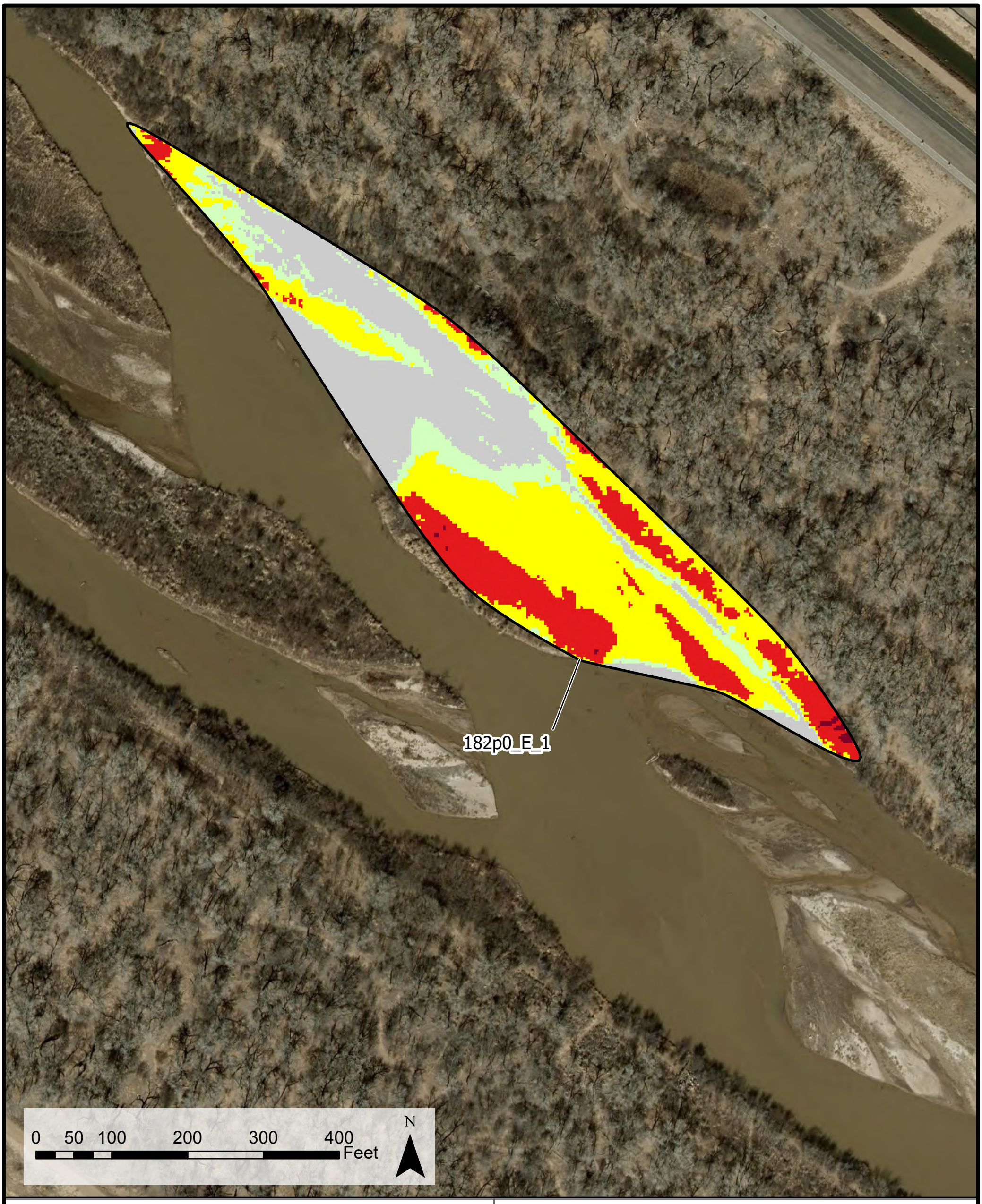
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

- No Excavation
- 0-0.5
- 0.5-1.5
- 1.5-2.5
- 2.5-3.4

Title
Site 182p0_E_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

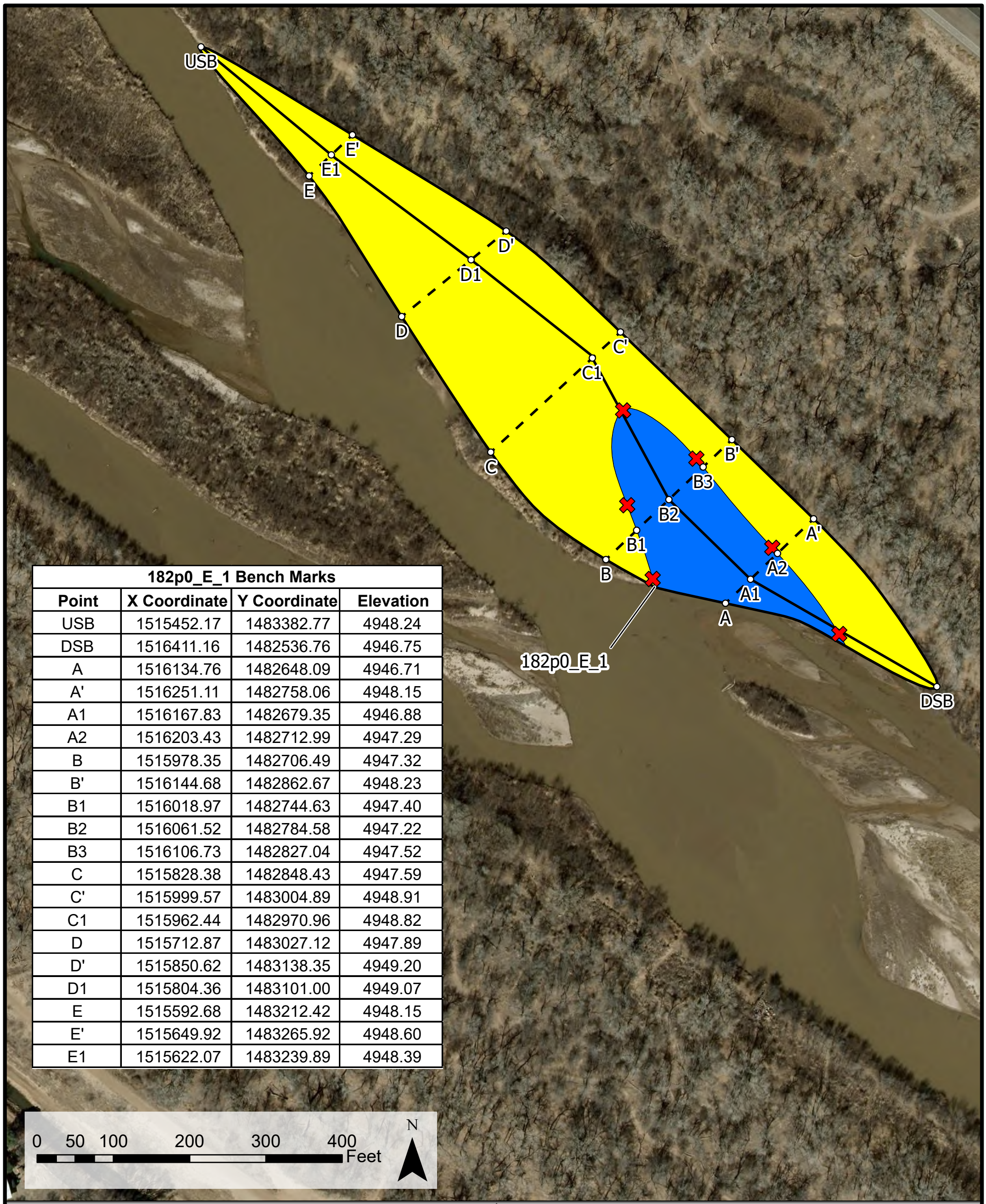
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



182p0_E_1 Bench Marks

Point	X Coordinate	Y Coordinate	Elevation
USB	1515452.17	1483382.77	4948.24
DSB	1516411.16	1482536.76	4946.75
A	1516134.76	1482648.09	4946.71
A'	1516251.11	1482758.06	4948.15
A1	1516167.83	1482679.35	4946.88
A2	1516203.43	1482712.99	4947.29
B	1515978.35	1482706.49	4947.32
B'	1516144.68	1482862.67	4948.23
B1	1516018.97	1482744.63	4947.40
B2	1516061.52	1482784.58	4947.22
B3	1516106.73	1482827.04	4947.52
C	1515828.38	1482848.43	4947.59
C'	1515999.57	1483004.89	4948.91
C1	1515962.44	1482970.96	4948.82
D	1515712.87	1483027.12	4947.89
D'	1515850.62	1483138.35	4949.20
D1	1515804.36	1483101.00	4949.07
E	1515592.68	1483212.42	4948.15
E'	1515649.92	1483265.92	4948.60
E1	1515622.07	1483239.89	4948.39

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- Woody Debris
- HR Sites

HR Features

- Backwater
- Bankline Modification

Title
Site 182p0_E_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

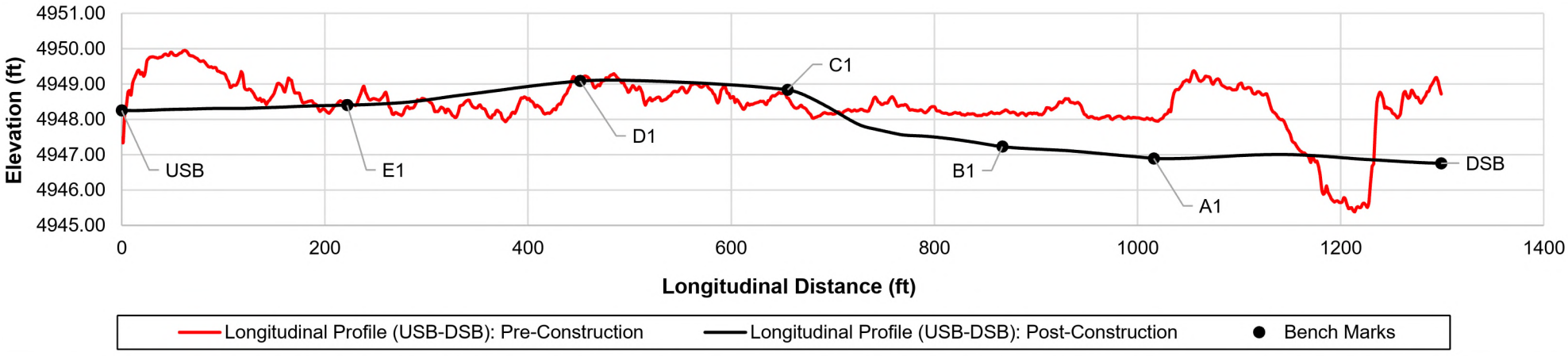
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

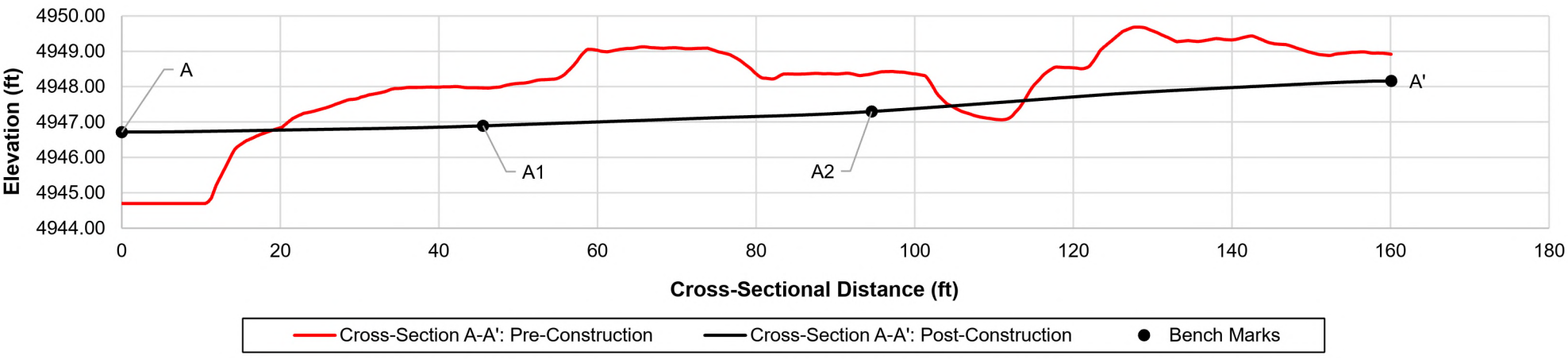
Revision: 0

GSA GeoSystems Analysis, Inc. *Innovative Solutions*

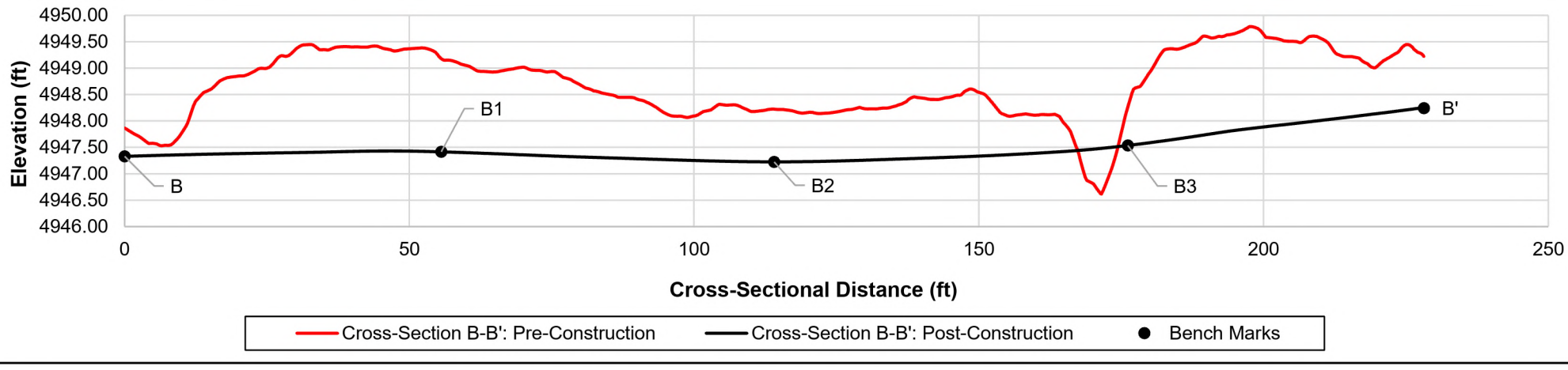
Longitudinal Profile (USB-DSB)



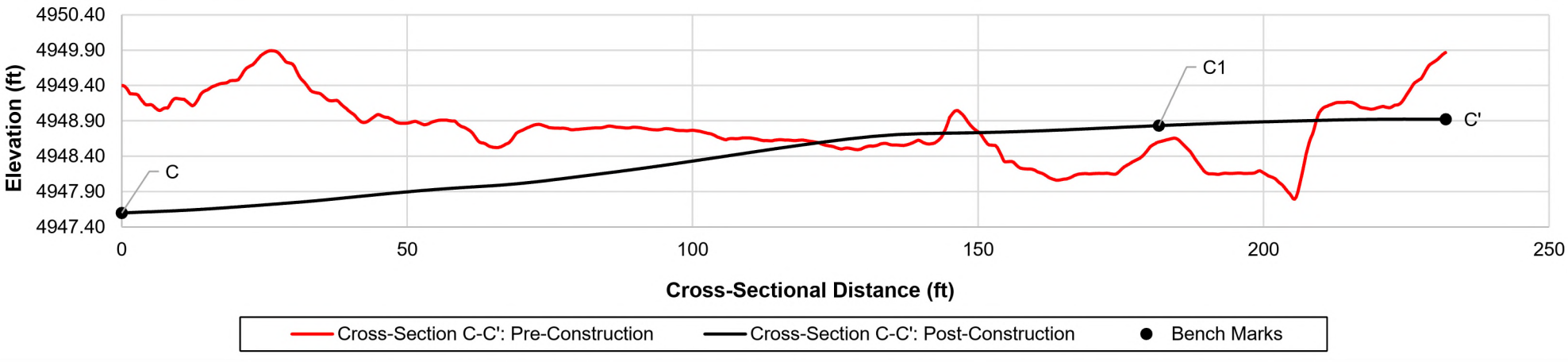
Cross-Section A-A'



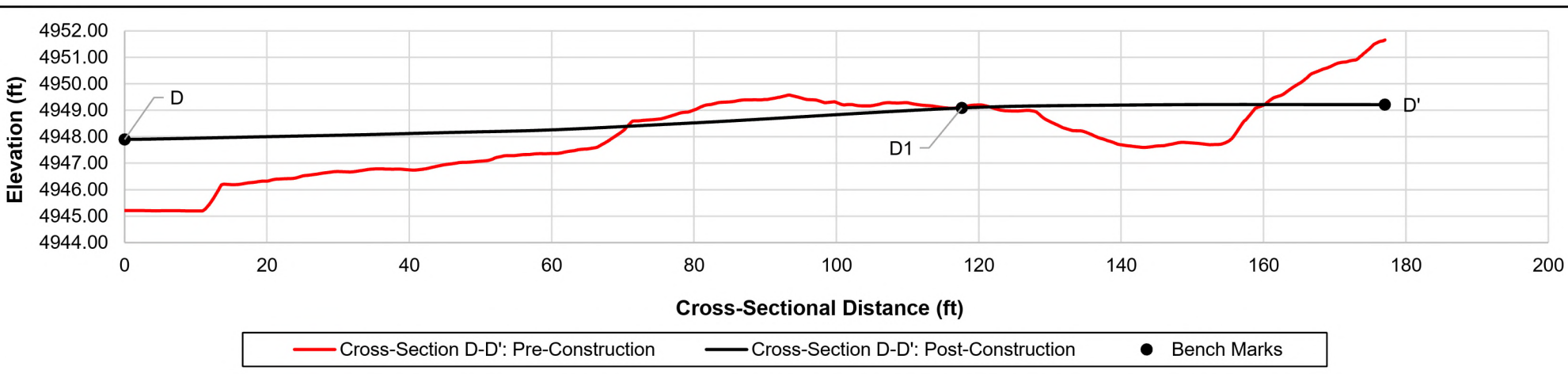
Cross-Section B-B'



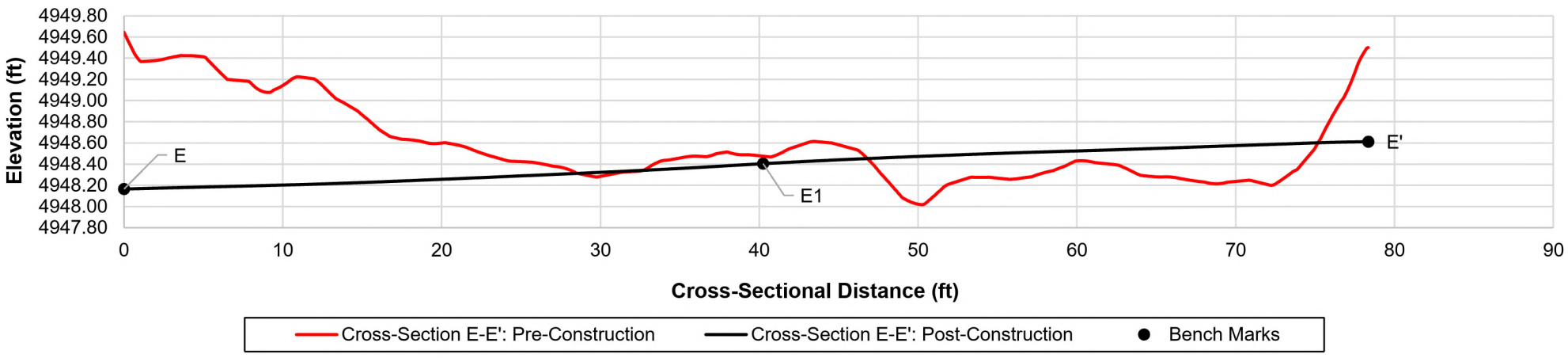
Cross-Section C-C'



Cross-Section D-D'



Cross-Section E-E'

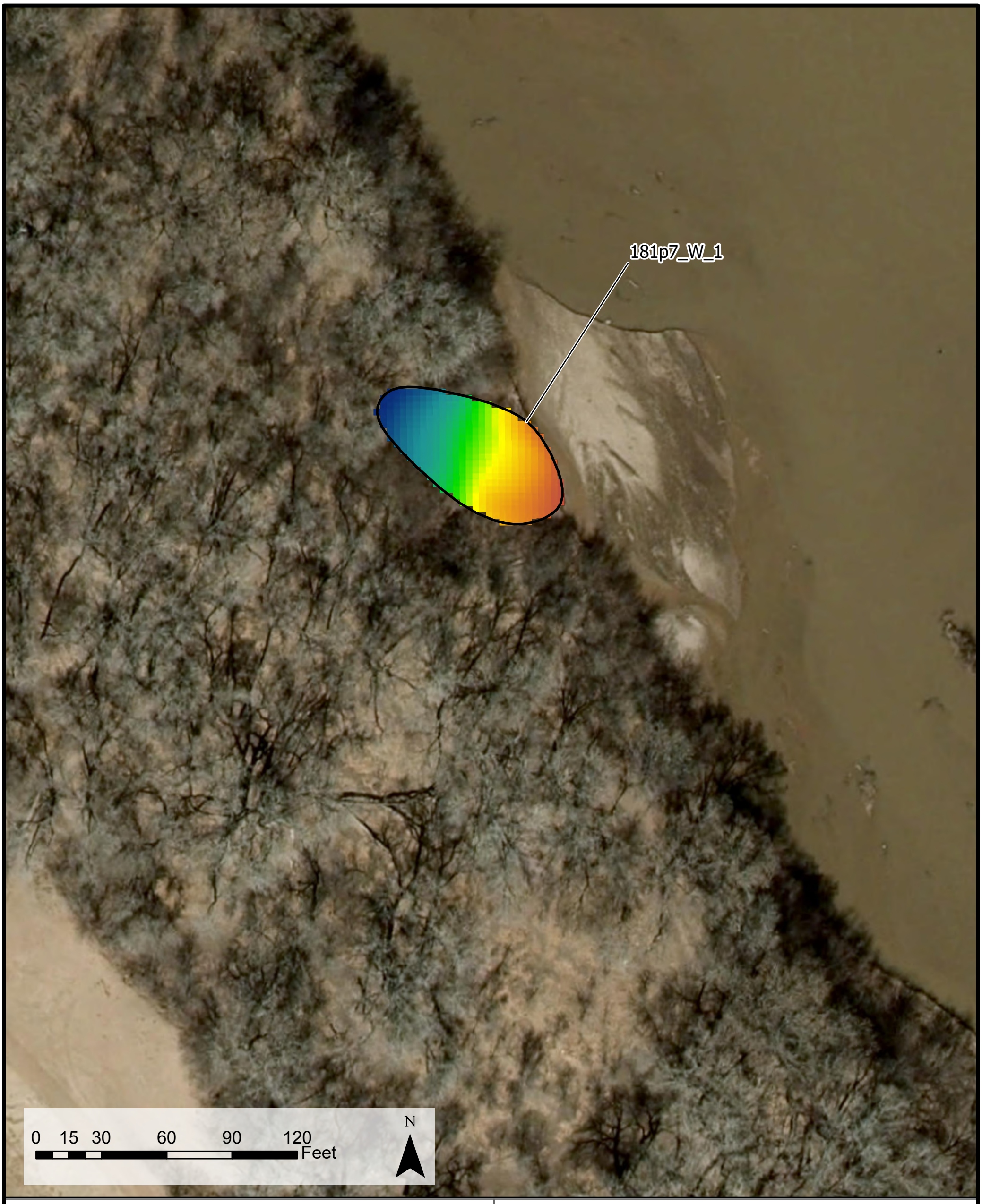


Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through E represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.



Legend

HR Sites

1/2ft Contours

Elevation (ft)

4945.97

4945.62

Title

Site 181p7_W_1 Post-Construction Contours and Elevation Grid

Project Name

NMISC ABQ Habitat Restoration

Client Name

New Mexico Interstate Stream Commission

Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



Legend

HR Sites

Excavation Depth (ft)

No Excavation

0-0.5

0.5-1.5

1.5-2.6

Title
Site 181p7_W_1 Excavation Depths

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

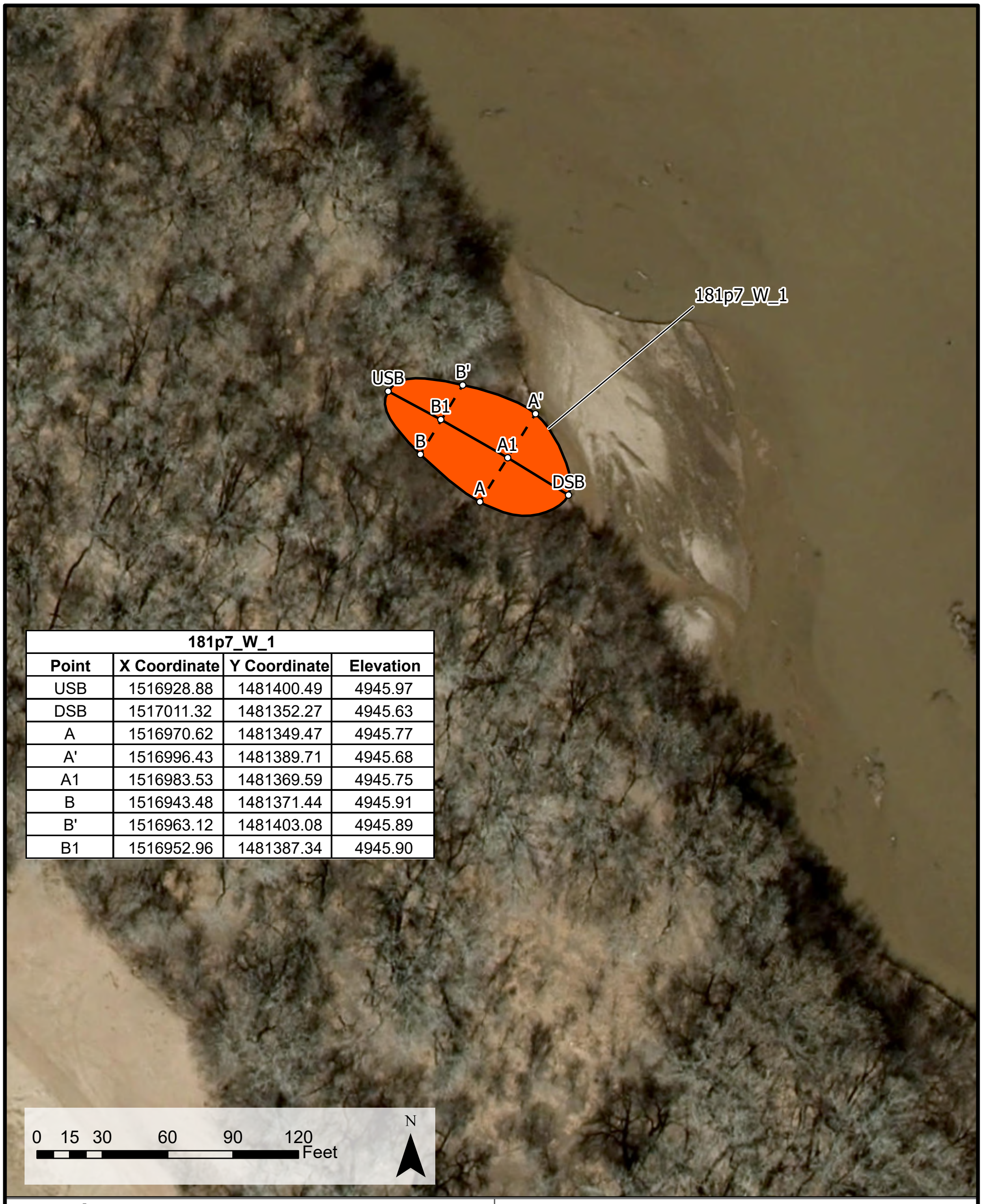
Spatial Reference

Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions



181p7_W_1			
Point	**X Coordinate**	**Y Coordinate**	**Elevation**
USB	1516928.88	1481400.49	4945.97
DSB	1517011.32	1481352.27	4945.63
A	1516970.62	1481349.47	4945.77
A'	1516996.43	1481389.71	4945.68
A1	1516983.53	1481369.59	4945.75
B	1516943.48	1481371.44	4945.91
B'	1516963.12	1481403.08	4945.89
B1	1516952.96	1481387.34	4945.90

Legend

- HR Benchmarks
- Longitudinal Profiles
- Cross Sections
- HR Sites

HR Features
- Mouth Cleanout

Title
Site 181p7_W_1 Post-Construction Longitudinal Profile, Cross-Sections, Benchmarks, and Woody Debris

Project Name
NMISC ABQ Habitat Restoration

Client Name
New Mexico Interstate Stream Commission

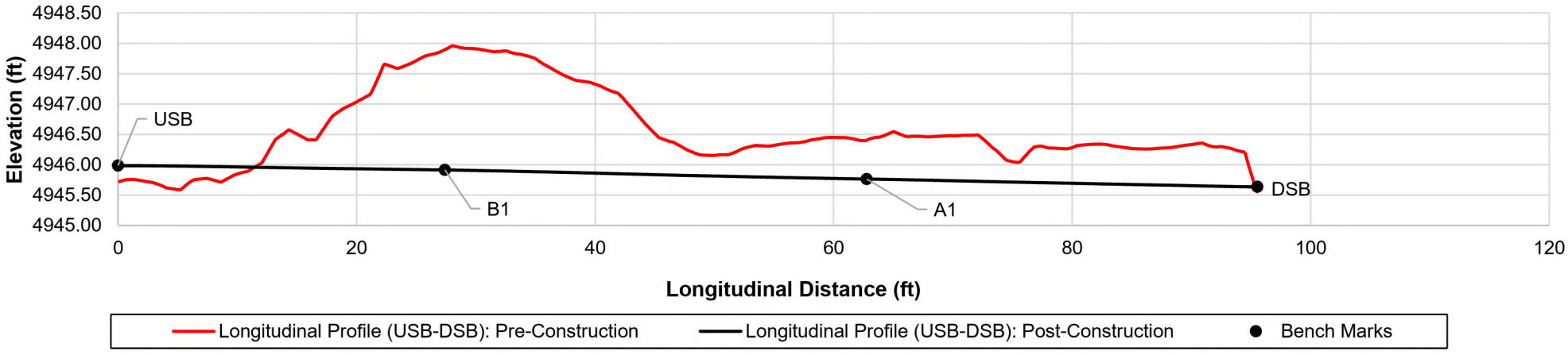
Spatial Reference
Name: NAD 1983 StatePlane New Mexico Central FIPS 3002 Feet
Datum: North American 1983

GSA Project #: 2402

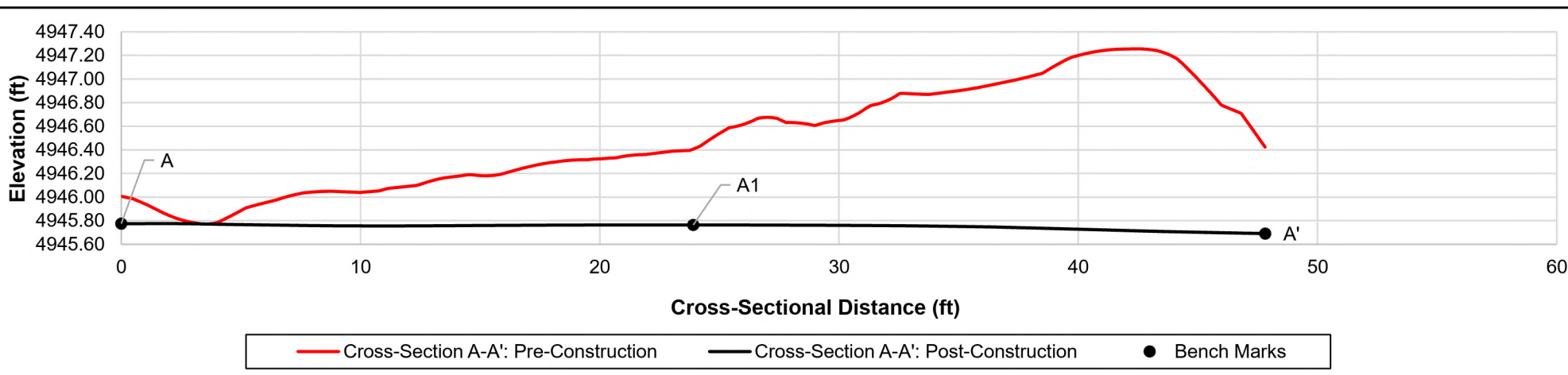
Revision: 0

GSA GeoSystems Analysis, Inc.
Innovative Solutions

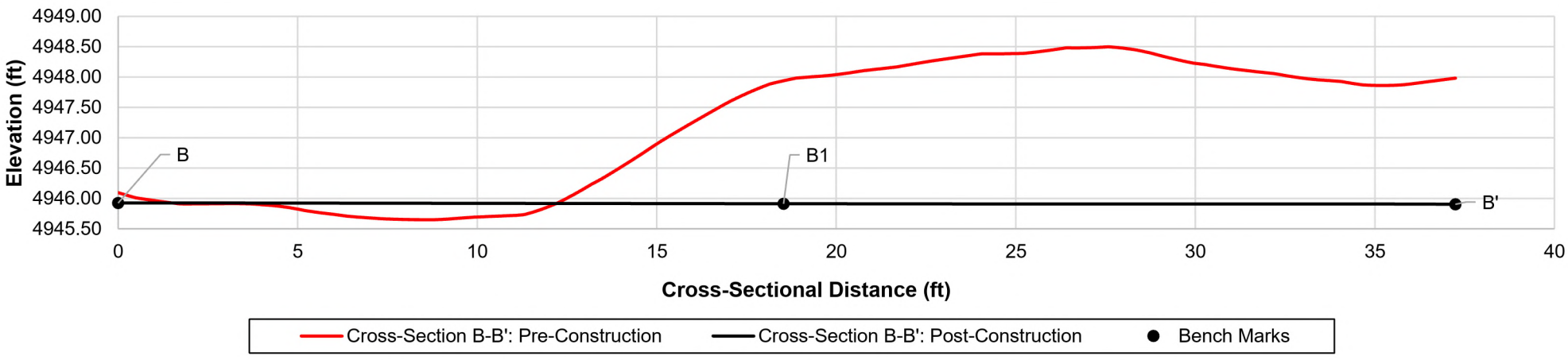
Longitudinal Profile (USB-DSB)



Cross-Section A-A'



Cross-Section B-B'



Notes:

USB = Upstream Boundary, DSB = Downstream Boundary, Letters A through B represent cross-sections from downstream to upstream.

Construction Specifications:

- Only use designated access roads for ingress and egress in the feature, as specified on design drawings. All access roads will be seeded following excavation. More detailed seeding specifications are provided in the specification document.
- Do not disturb vegetation or soils outside of the designated work area (feature perimeter, haul roads, spoil areas).
- Remove all existing vegetation and debris from the feature unless plants are marked with flagging for keeping. Vegetation can be bulldozed, masticated, or mechanically removed with other equipment at the contractor's discretion.
- Root rake feature and haul organic material and surface soils (to approximately one inch deep) offsite. This material should not be placed in spoil areas.
- Excavate soil to within 0.1 foot of the design elevation unless otherwise agreed on with the funding agency.
- Unless otherwise specified, restrict spoil placement to designated areas indicated on design drawings. Spoil placed on roadways, levees, or along ditch banks will be compacted according to the specification document. Spoils placed between the levee and the river (unless on the levee slope), along foot trails, or within abandoned floodplain terraces should not be compacted.
- In some cases, vegetation removal may also be required within designated access roads and spoil areas.
- Place large woody debris approximately where indicated on the design drawings. Additional specifications for desired materials, stabilizing and anchoring techniques for large woody debris are provided in the construction specification document.