404(b)(1) Alternatives Analysis, NMISC's Angostura/Albuquerque Reach, Priority I Habitat Restoration Project in Bernalillo County, New Mexico

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PREPARED BY

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404(B)(1) ALTERNATIVES ANALYSIS, NMISC'S ANGOSTURA/ALBUQUERQUE REACH, PRIORITY I HABITAT RESTORATION PROJECT IN BERNALILLO COUNTY, NEW MEXICO

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1 INTRODUCTION

This document presents a Section 404(b)(1) alternatives analysis for the New Mexico Interstate Stream Commission's (NMISC's) Priority I Habitat Restoration Project in Bernalillo County, New Mexico, within the Interstate 40 (I-40) subreach of the Middle Rio Grande (MRG), defined as north of I-40 at river mile 186.6 to downstream of the Avenida Dolores Huerta bridge at river mile 181.0 in Bernalillo County, New Mexico (I-40 subreach). The analysis has been prepared to support a Department of the Army Individual Permit application to the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act.

The Section 404(b)(1) Guidelines require that proposed discharges of dredged or fill material into waters of the United States (WOTUS) demonstrate compliance with the alternatives analysis requirements established by the U.S. Environmental Protection Agency (EPA) and USACE (EPA and USACE 1991). Under these guidelines, a permit cannot be issued if a practicable alternative exists that would have less adverse impact to the aquatic ecosystem, provided that the alternative does not have other significant environmental consequences.

The purpose of this analysis is to evaluate practicable alternatives for the Priority I project and compare their impacts to WOTUS to identify the Least Environmentally Damaging Practicable Alternative (LEDPA) capable of achieving the project purpose in accordance with the Section 404(b)(1) Guidelines.

2 PROJECT PURPOSE AND NEED

2.1.1 *Basic Project Purpose*

The basic project purpose is to restore and enhance degraded aquatic, riparian, wetland, and floodplain habitats within the Middle Rio Grande.

2.1.2 *Overall Project Purpose*

The overall purpose of the Priority I project is habitat restoration within the Interstate 40 (I-40) subreach of the Middle Rio Grande, defined from north of I-40 at river mile 186.6 to the Avenida Dolores Huerta bridge at river mile 181.0 in Bernalillo County, New Mexico. The project is water-dependent because restoration of aquatic, wetland, and floodplain habitats that support the Rio Grande silvery minnow (*Hybognathus amarus*) (RGSM) requires modification of geomorphic and hydrologic conditions within the active river channel and adjacent floodplain wetlands, where enhancing existing degraded wetlands is more practicable and likely to be successful than creating new wetlands. The project is intended to improve the quality of floodplain and low-velocity aquatic habitats that support RGSM, including through the restoration and enhancement of existing degraded wetlands, and to enhance the ecological function and habitat quality of riparian, wetland, and floodplain environments that support other federally listed species within this reach.

2.1.3 *Project Need*

Within the I-40 subreach, the active river channel has become increasingly disconnected from adjacent floodplains and wetlands due to localized incision, channel narrowing, and sediment deposition. In many areas, steep riverbanks limit the frequency and extent of overbank inundation during spring runoff,

reducing hydrologic connectivity and contributing to degradation of existing wetlands and floodplain habitats.

Additionally, many islands and bank-attached bars within the channel have become increasingly stabilized by dense vegetation that is often dominated by nonnative species. These stabilized features narrow and deepen the active channel and limit the availability of low-velocity aquatic habitats. The resulting conditions reduce the quality of floodplain and aquatic habitats that support RGSM and other riparian species.

Restoration is needed to improve hydrologic connectivity between the river channel and adjacent floodplain areas, improve the condition of existing wetlands, and address channel and floodplain conditions that currently limit the ecological function of floodplain and aquatic habitats within the I-40 subreach.

3 WATER DEPENDENCY DETERMINATION

The project is water-dependent because restoration of aquatic, wetland, and floodplain habitats requires modification of geomorphic and hydrologic conditions within the active river channel and adjacent floodplains. The primary goal of the project is to enhance degraded wetlands along the active channel and floodplain that are used throughout the entire life cycle of RGSM, providing important ecological functions and habitat conditions that support the species. Enhancing existing wetlands within the floodplain is more practicable and more likely to be successful than attempting to create new wetlands, given the hydrologic and geomorphic complexity required to establish functioning wetland systems. Activities intended to restore floodplain connectivity and create low-velocity aquatic habitats must occur within the river corridor where these processes occur. Therefore, the project requires siting within wetlands that are considered Special Aquatic Sites, as defined under the Section 404(b)(1) Guidelines (EPA and USACE 1991). Except for limited upland areas adjacent to the riparian corridor that provide opportunities for restoration, practicable alternatives that would avoid Special Aquatic Sites are not available.

4 ALTERNATIVES ANALYSIS

The Final Programmatic Environmental Assessment for the Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project (Bureau of Reclamation 2025) analyzes the impacts resulting from the No Action Alternative and the Proposed Priority I Project of possible future implementation of the Middle Rio Grande Angostura/Albuquerque Reach Habitat Restoration Project. The Priority I restoration sites are included under the 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 (U.S. Fish and Wildlife Service 2016).

The primary purpose of the Section 404(b)(1) alternatives analysis is to ensure that the USACE permits the LEDPA. Pursuant to 40 CFR 230.10(a), a permit shall not be issued if a practicable alternative exists with less adverse impact to the aquatic ecosystem. This mandate requires a rigorous screening of alternatives, beyond a No Action/Proposed Action comparison, to demonstrate that impacts have been avoided and minimized to the maximum extent practicable.

The following alternatives were identified based on restoration planning conducted for the Priority I project sites and information presented in the programmatic environmental assessment, and took into

consideration various approaches and methodologies for implementing restoration within the I-40 subreach.

4.1.1 *Alternative A: No Action Alternative*

Under the No Action Alternative (Alternative A), the USACE would not approve the Proposed Priority I Project (Alternative B) or joint license agreements, and no restoration activities would be implemented. The existing geomorphic and ecological conditions within the I-40 subreach would remain unaltered, which would likely result in the river channel continuing to disconnect from adjacent floodplains due to continued channel incision, bank steepening, and sediment deposition patterns that limit the frequency and extent of overbank flooding.

Existing wetland, riparian and floodplain habitats would likely continue to degrade as hydrologic connectivity with the active channel remains limited and nonnative invasive plant infestations continue to outcompete native vegetation. In addition, islands and bank-attached bars within the channel would likely remain stabilized by dense vegetation. These conditions would continue to narrow and deepen the active channel and limit the availability of shallow, low-velocity aquatic habitats that support RGSM and other riparian species.

Overall, Alternative A would not address the channel and floodplain conditions currently limiting hydrologic connectivity, floodplain function, and aquatic habitat availability within the I-40 subreach. As a result, the project purpose of restoring floodplain connectivity and enhancing degraded wetlands and associated low-velocity aquatic habitats that support RGSM within the I-40 subreach would not be achieved.

4.1.2 *Alternative B: Proposed Priority I Project*

Detailed information regarding the proposed activities for the Priority I project alternative (Alternative B) is provided in the *Restoration Plan for Priority I – Interstate-40 Subreach Sites, NMISC's Angostura/Albuquerque Reach Habitat Restoration Project in Bernalillo County, New Mexico* (SWCA Environmental Consultants [SWCA] 2026), which is included in Appendix C of the project's permit application to the USACE.

Alternative B consists of implementing aquatic, riparian, wetland, and floodplain habitat restoration activities within the I-40 subreach using a site-informed restoration design to optimize ecological improvements across restoration sites. Restoration activities are intended to improve ecological function within the river corridor, enhance habitat conditions for RGSM and other federally listed riparian species, and improve hydrologic connectivity between the river channel and adjacent floodplain areas, including wetlands.

Proposed restoration activities include constructing bankline modifications and backwater and flow-through channel features, destabilizing islands, removing jetty jacks, and placing large woody debris within the river corridor. The bankline modifications, backwater and flow-through channel features, island destabilization, and, to some extent, placement of large woody debris would require geomorphic modifications from excavation, are all intended to increase the availability and quality of floodplain and low-velocity aquatic habitats and improve ecological conditions within the I-40 subreach.

Construction of these 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 plant infestations, and removing 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 bulldozed during excavation or would be mechanically removed, including rootwads, with an excavator fitted with an extraction bucket. 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. The project's restoration plan (SWCA 2026) outlines vegetation monitoring and maintenance activities intended to ensure successful establishment of a healthy riparian vegetation community post-construction.

4.1.2.1 ALTERNATIVE B: POST-CONSTRUCTION MAINTENANCE ACTIVITIES

To maintain the function of restoration features post-construction, the restoration design anticipates the need for maintenance within designated channel maintenance zones (CMZs) within constructed restoration features where sediment deposition is anticipated to restrict the ability of features to inundate as designed. CMZ maintenance would consist of limited sediment removal and is anticipated to occur once during the permit's lifespan. CMZ maintenance would be implemented based on monitoring triggers and procedures identified in the project's restoration plan (SWCA 2026), and equipment access and excavation would be limited to the designated CMZ footprints to avoid disturbance to adjacent areas where wetlands and floodplain habitats would be reestablishing.

Vegetation management maintenance activities would also occur post-construction and would focus on removing nonnative invasive woody and herbaceous plants. Treatment methods could include mechanical or chemical control techniques, or both. Large-diameter nonnative trees and shrubs would be removed mechanically and chemically treated with cut stump techniques, while herbaceous vegetation would be removed using several methods such as chemical removal herbicide treatments, mowing, or other mechanical methods. Removed vegetation would be hauled off-site to reduce fuel loads and prevent reestablishment of invasive species.

4.1.2.2 ALTERNATIVE B: AQUATIC RESOURCE IMPACTS

SWCA conducted a desktop review and on-site aquatic resources delineation survey of the Priority I project sites to identify WOTUS potentially affected by the proposed restoration activities. The field survey was conducted on September 18 and 19 and October 23 through 27, 2023. The findings of this delineation are documented in the project's Aquatic Resources Inventory Report (SWCA 2025), included in Appendix B of the project's permit application to the USACE.

The proposed restoration activities involve excavation and construction of restoration features within portions of aquatic resources that are jurisdictional WOTUS, including Special Aquatic Sites defined under the Section 404(b)(1) Guidelines. In total, 38.94 acres of temporary disturbance is associated with restoration activities proposed within delineated WOTUS (see Section 6)

Alternative B would result in 53.67 acres of excavated restoration area within and outside WOTUS. These activities are expected to increase the extent of aquatic resources by 14.77 acres from excavation of adjacent upland areas to floodplain elevations suitable for establishment of wetlands and floodplains.

Estimates of impacts associated with Alternative B are provided in Tables 2 and 3 and are included in the *Section 404 Department of the Army Permit Application Narrative* submitted to the USACE.

4.1.3 *Alternative C: Previous Restoration Designs*

Alternative B design specifications include many of the restoration features that were constructed from 2005 to 2009 within the I-40 subreach. Under Alternative C, the restoration areas from previously constructed projects that overlap with Alternative B would be reconstructed or re-restored. Construction of the Alternative C design specifications would remain within the original restoration features; thus, Alternative C include fewer locations, reduced area, and less vegetation removal and excavation than does Alternative B. This would result in a reduction of dredge and fill activities within WOTUS and Special Aquatic Sites.

Since the construction of past restoration projects occurred, geomorphic and hydraulic conditions at the restoration sites have evolved, including the growth and formation of islands and bank-attached bars and localized sediment accumulation, which have altered hydraulic connectivity between some restoration features and the active channel. As a result, some of the locations and configurations of earlier restoration features reflect the conditions present at the time of their design and construction and do not incorporate the current, site-specific geomorphic and hydraulic conditions that influence floodplain connectivity within the I-40 subreach.

While the Alternative C approach would reduce temporary construction disturbance and the associated impacts to WOTUS compared to Alternative B, the reduced scale and effort would provide a lower level of improvement in aquatic and floodplain habitat conditions. Alternative C would restore approximately 39.41 acres of floodplain through excavation and associated geomorphic and hydrologic improvements, compared to 53.67 acres under Alternative B (approximately 27% less restoration area). As a result, this alternative would only partially meet the project purpose of restoring floodplain connectivity and enhancing degraded wetlands and low-velocity aquatic habitats that support RGSM within the I-40 subreach. The relative benefits and impacts of this alternative will be evaluated in the comparative impact analysis to determine the LEDPA in Section 6.

4.1.4 *Alternative D: Nonnative Invasive Plant Removal Only*

Under Alternative D, restoration activities would be limited to management and removal of nonnative invasive vegetation within the riparian corridor to improve riparian vegetation composition and quality of riparian habitats as described under Alternative B, above. This alternative would not include excavation, grading, channel modification, floodplain lowering, or placement of large woody debris. Alternative D would not involve dredge or fill activities within WOTUS or Special Aquatic Sites.

This approach would likely reduce the extent of nonnative invasive vegetation and may support the establishment and persistence of native riparian vegetation in some project sites, while in other areas it may only support upland species under current geomorphic conditions. Because Alternative D excludes geomorphic modifications, it would not address the underlying geomorphic and hydrologic conditions that limit floodplain connectivity and the formation of low-velocity aquatic habitats. As a result, this alternative would provide limited improvements to floodplain function and aquatic habitat conditions for RGSM and other federally listed species compared to alternatives that include geomorphic restoration activities. Therefore, Alternative D would not achieve the project purpose of restoring floodplain connectivity and enhancing degraded wetlands that support the RGSM life cycle within the I-40 subreach, and was not carried forward for further analysis.

4.1.5 *Alternative E: Alternative Restoration Locations*

During restoration planning, potential restoration opportunities were reviewed throughout the I-40 subreach. The Priority I restoration sites included under Alternative B were identified as the locations

where restoration actions would be most effective and feasible for improving floodplain connectivity and aquatic habitat conditions.

Alternative E represents restoration at other locations within the I-40 subreach that were not incorporated into Alternative B. These locations generally do not coincide with previously restored areas and do not target locations where restoration potential has already been demonstrated through earlier projects. In addition, many of these locations lack the geomorphic and hydraulic conditions necessary to support meaningful improvements in floodplain connectivity or the formation of low-velocity aquatic habitats.

Because restoration actions implemented in these locations would be unlikely to result in sustained improvements to aquatic or floodplain habitat conditions or effectively build upon previous restoration investments within the reach, this alternative would not effectively achieve the project purpose of restoring floodplain connectivity and enhancing degraded wetlands that support RGSM and was not carried forward for further analysis.

4.1.6 *Alternative F: Reduced Restoration Footprint*

Under Alternative F, Alternative B restoration activities that are associated with the largest wetland areas would be removed from the project design. This alternative results in a reduced restoration footprint compared to Alternative B, with 18.90 acres of excavated restoration area compared to 53.67 acres under Alternative B (approximately 65% less restoration area).

The components removed from the design include substantial backwater and bankline modifications proposed at Tingley Beach and south of the I-40 bridge. Portions of these areas were previously restored through past restoration efforts, many of which are represented in Alternative C, but have not been maintained to support their functionality, contributing to their current degraded condition. These areas are among the most substantial wetlands and floodplain areas within the I-40 subreach and have historically been the focus of restoration activities because of ecological value and restoration potential. If excluded from the restoration design, these areas are anticipated to continue to degrade as hydrologic connectivity with the active channel remains limited and nonnative invasive vegetation continues to outcompete native riparian species.

Restoration activities under this alternative would still include excavation at the remaining sites proposed under Alternative B. This approach would reduce the extent of temporary disturbance to WOTUS and Special Aquatic Sites compared to Alternative B. However, removal of the largest restoration components would substantially limit the project's ability to restore floodplain connectivity and improve wetland and aquatic habitat conditions within the I-40 subreach. Because these locations represent areas where floodplain reconnection opportunities are most substantial and where previous restoration efforts have demonstrated restoration potential, excluding them from the project design would significantly reduce the scale and effectiveness of restoration actions within the reach. As a result, this alternative would provide reduced ecological benefits and would not fully achieve the project purpose of restoring floodplain connectivity and enhancing degraded wetlands and associated aquatic habitats that support the RGSM life cycle. Therefore, this alternative was not carried forward for further analysis.

5 PRACTICABILITY SCREENING

Practicability Screening Criteria

Under the Section 404(b)(1) Guidelines, an alternative is considered practicable if it is available and capable of being implemented after taking into consideration cost, existing technology, and logistics.

Each alternative that meets the project purpose is evaluated using a yes/no rating system for each practicability criteria. These ratings are applied comparatively across alternatives to identify those that are practicable and capable of meeting the overall project purpose. Alternatives that exhibit substantially higher costs, require unproven technology, or present significant logistical constraints may be determined to be impracticable and will not be carried forward for analysis.

The following criteria were used to evaluate the practicability of alternatives that meet the project purpose, to identify those that both satisfy the project purpose and are practicable to carry forward for further analysis.

Cost

Cost is evaluated comparatively among the alternatives to determine whether implementation of an alternative would result in substantially greater expenses compared to other practicable alternatives. This evaluation also considers whether the costs are reasonable and proportionate to the project's purpose and if an alternative's relative cost differences are proportionate compared to the environmental benefits gained. The evaluation does not consider the applicant's financial standing.

Existing Technology

Existing technology considers whether an alternative can be implemented using currently available and proven construction methods, materials, and engineering practices. An alternative is considered practicable if it can be implemented using standard, proven technologies without requiring speculative, experimental, or unproven approaches. The criterion evaluates constructability, design complexity, and the reliability of the methods necessary to implement each alternative.

Logistics

Logistics include practical considerations associated with implementing an alternative at a given location, including factors such as site size, site configuration, access for construction and operations, proximity to infrastructure and utilities, property ownership or acquisition requirements, and other site-specific physical or regulatory constraints. Logistical considerations are evaluated using measurable site conditions that determine whether a location can reasonably support the proposed development. An alternative would be considered impracticable if logistical constraints prevent the alternative from reasonably being carried out.

5.1 Practicability Screening Results

The alternatives identified above that met the project purpose were evaluated for practicability based on cost, logistics, and available technology in accordance with the Section 404(b)(1) Guidelines (EPA and USACE 1991). An alternative is considered practicable if it is capable of being implemented after considering these factors and if it can reasonably achieve the project purpose. The screening process evaluated whether each alternative could restore floodplain connectivity and improve riparian and aquatic habitat conditions within the I-40 subreach while being technically feasible and logistically achievable. Alternatives that do not adequately meet the project purpose or were determined impracticable were not carried forward for detailed comparison (Table 1).

Table 1. Practicability Screening of Alternatives

Note: N/A = not applicable

Alternatives	Meets Project Purpose	Cost	Logistics	Existing Technologies	Practicable	Carried Forward
Alternative A: No Action Alternative	No	N/A	N/A	N/A	No	No
Alternative B: Proposed Priority I Project	Yes	Yes	Yes	Yes	Yes	Yes
Alternative C: Previous Restoration Designs	Partial	Yes	Yes	Yes	Yes	Yes
Alternative D: Nonnative Invasive Plant Removal Only	No	N/A	N/A	N/A	N/A	No
Alternative E: Alternative Restoration Locations	No	N/A	N/A	N/A	N/A	No
Alternative F: Reduced Restoration Footprint	Partial	No	Yes	Yes	N/A	No

5.2 Summary of Alternatives Not Carried Forward for Analysis

Alternative A would not meet the project purpose because it does not include restoration activities and therefore would not address the geomorphic and hydrologic conditions currently limiting floodplain connectivity and aquatic habitat conditions within the I-40 subreach. Therefore, Alternative A does not meet the project purpose of restoring floodplain connectivity and enhancing degraded wetlands and associated aquatic habitats that support RGSM and was not carried forward for detailed analysis.

Alternative D could improve the composition of riparian vegetation communities through removal of nonnative invasive plant species. However, because this alternative would not include modifications of channel and floodplain elevations, it would not address the geomorphic and hydrologic conditions that currently limit floodplain connectivity or the formation of low-velocity aquatic habitats specifically needed for the life cycle of RGSM. Therefore, this alternative would not meet the project purpose of restoring floodplain connectivity and enhancing degraded wetlands that support the RGSM life cycle and was not carried forward for detailed analysis.

Alternative E presented geomorphic limitations and reduced habitat restoration potential, as conditions at the alternative locations would not support meaningful improvements in floodplain connectivity or aquatic habitat within the I-40 subreach. As a result, the alternative would not achieve the project purpose of restoring floodplain connectivity and enhancing degraded wetlands that support RGSM and was not carried forward for detailed analysis..

Alternative F would reduce the restoration footprint by removing two of the largest restoration sites included in Alternative B. Although this alternative could implement limited restoration activities, removing these components would reduce the project's ability to restore floodplain connectivity and improve aquatic habitat conditions within the I-40 subreach, resulting in approximately 18.9 acres of restoration compared to 53.67 acres under Alternative B (approximately 65% less restoration area). As a result, this alternative would only partially meet the project purpose of restoring floodplain connectivity

and enhancing degraded wetlands and associated aquatic habitats that support the RGSM life cycle. This alternative does not meet the cost practicability criterion because costs would remain substantial despite the scale and effectiveness of restoration outcomes being reduced, resulting in a cost-to-benefit relationship that would be disproportionate relative to the practicable alternatives. Therefore, Alternative F was determined not practicable and was not carried forward for detailed analysis.

6 COMPARATIVE IMPACT ANALYSIS

Alternative B (Proposed Priority I Project) and Alternative C (Previous Restoration Designs) were retained for the comparative impact analysis. For purposes of this analysis, impacts to WOTUS were evaluated based on the estimated extent of temporary disturbance associated with excavation and construction activities within wetlands and the ordinary high water mark (OHWM) of the Rio Grande. Consistent with the Section 404(b)(1) Guidelines, the analysis also considers the relative ability of each alternative to achieve the project purpose and improve aquatic ecosystem functions while avoiding and minimizing adverse impacts to WOTUS. The Alternative C approach was retained because it represents a practicable approach that could achieve aspects of the project purpose while reducing the extent of dredge and fill impacts within WOTUS.

The two alternatives represent practicable approaches capable of improving floodplain connectivity and aquatic habitat conditions within the I-40 subreach; however, they differ in scale and extent. Alternative B includes the entirety of the proposed restoration, while Alternative C reduces the scale of activities and constructed features. As a result, while Alternative C would reduce the overall area of temporary disturbance within WOTUS relative to Alternative B, it would result in a reduced level of floodplain reconnection and aquatic habitat improvement.

Because both alternatives are capable of achieving aspects of the project purpose and met the practicability criteria, they were carried forward for detailed comparison of their impacts to WOTUS and Special Aquatic Sites. Anticipated impacts are compared in Tables 2 and 3. A detailed comparison of the two alternatives is provided in Table 4.

Table 2. Alternatives' Impacts to Aquatic Resources

Project Components	Alternative Carried Forward for Analysis	Area Within Wetland (acres)	Area Within Rio Grande OHWM (acres)	Total Area Within WOTUS (acres)
Backwater channels	Alternative B	7.29	0.60	7.89
	Alternative C	7.30	0.00	7.30
Bankline modification	Alternative B	28.92	1.16	30.08
	Alternative C	2.76	1.01	3.77
Flowthrough channel	Alternative B	0.09	0.01	0.10
	Alternative C	2.02	0.18	2.20
Island destabilization	Alternative B	0.00	0.75	0.75
	Alternative C	1.97	0.10	2.07
Mouth cleanout	Alternative B	0.00	0.08	0.08
	Alternative C	0.00	0.00	0.00
Jetty jack removal	Alternative B	0.05	0.00	0.05
	Alternative C	0.00	0.00	0.00

Table 3. Alternatives' Total Areas of Impacts

Alternative Carried Forward for Analysis	Area Within Special Aquatic Sites (wetlands)	Area Within Rio Grande OHWM (acres)	Area Within WOTUS (acres)	Total Excavated Restoration Area (acres)	Total Area of Potential WOTUS Increase (acres)
Alternative B	36.36	2.59	38.94	53.67	14.77
Alternative C	14.45	1.30	15.74	39.41	23.66

Note: Totals may not sum exactly due to rounding.

Table 4. Comparative Aquatic Resources Impacts

Aquatic Resources Impact	Alternative B: Proposed Priority I Project	Alternative C: Previous Restoration Designs
Area of WOTUS disturbance	38.94 acres of temporary disturbance to WOTUS associated with excavation and construction of restoration features	15.74 acres of temporary disturbance to WOTUS associated with excavation and construction of restoration features
Wetland-specific impacts	36.36 acres of temporary disturbance to wetlands with long-term improvement to wetland hydrology and function	14.45 acres of temporary disturbance to wetlands with long-term improvement to wetland hydrology and function
Floodplain connectivity	Site-informed restoration design tailored to optimize floodplain connectivity improvements across restoration sites	Past restoration designs do not incorporate current geomorphic and hydraulic conditions, resulting in restoration features that may be less effective at improving floodplain connectivity.
Low-velocity aquatic habitats	Substantial increase in habitat quantity and quality associated with approximately 53.67 acres of floodplain excavation and backwater feature construction	Moderate increase in habitat quantity and quality associated with approximately 39.41 acres of floodplain excavation and restoration features (approximately 27% less restoration area than under Alternative B)
Long-term ecological health	Benefits to long-term ecological health of wetlands and aquatic habitats from improved floodplain connectivity and hydrologic conditions	More limited improvements to the long-term ecological health of wetlands and aquatic habitats from reduced floodplain connectivity compared to Alternative B
Long-term river function	Maintenance of the proposed CMZs will support the long-term function of restoration features.	Because CMZs are not incorporated under this alternative, sediment deposition and vegetation establishment may limit the long-term functionality of the restoration features.

6.1 Summary of Comparative Impacts

The comparative analysis indicates that both Alternative B and Alternative C are practicable approaches capable of achieving the overall project purpose. However, the two alternatives differ in the scale of restoration activities and the resulting beneficial outcomes within the I-40 subreach.

Compared to Alternative B, Alternative C would have a smaller overall extent of geomorphic modification and excavation within the I-40 subreach. Consequently, Alternative B would have a smaller footprint of temporary disturbance to WOTUS and Special Aquatic Sites during construction relative to Alternative B (see Table 3). However, the larger restoration footprint under Alternative B allows for more substantial improvements in floodplain connectivity and aquatic habitat conditions, resulting in a more wholistic ecosystem restoration approach within the I-40 subreach. Individual restoration features under

Alternative C would be smaller in size and implemented in fewer locations compared to Alternative B, likely resulting in shorter construction duration due to the reduced restoration extent.

The reduced scale of restoration features under Alternative C would limit the extent to which floodplain connectivity and aquatic habitat conditions could be improved within the I-40 subreach. Because Alternative C relies on restoration approaches derived from past projects and applies them at a reduced scale, the resulting restoration features would provide fewer opportunities to reconnect floodplain surfaces and create persistent low-velocity aquatic habitats within the reach. Many of the past restoration sites have become isolated from the river channel due to changes in channel alignment and floodplain elevations. As a result, many designs from previously constructed restoration features would toned to be updated to address current site conditions and improve their functional connectivity with the river.

The reduced footprint of Alternative C would therefore provide fewer opportunities to improve habitat conditions for RGSM and other riparian species within the I-40 subreach. Areas that would be restored under Alternative B but excluded under Alternative C would remain at their current elevations, making them less likely to be inundated during typical flow conditions. As a result, these areas would remain disconnected from the active channel and would continue to experience degraded hydrologic and habitat conditions. Overall, while Alternative C would reduce the scale of construction activities and temporary disturbance to WOTUS, it would provide more limited improvements to ecological and hydrologic conditions within the reach.

In contrast, while Alternative B would result in a greater extent of temporary disturbance to WOTUS and Special Aquatic Sites due to the larger scale of restoration features implemented within the river corridor, these impacts are expected to be temporary in nature as restored floodplain and aquatic habitats establish following construction. The disturbance associated with excavation is expected to transition to restored floodplain and aquatic habitat as restoration features stabilize and revegetate over time. Although the area of temporary disturbance is larger, activities are intended to address the geomorphic and hydrologic conditions that currently limit floodplain connectivity and aquatic habitat quality within the I-40 subreach.

By restoring floodplain connectivity, increasing the availability of low-velocity aquatic habitats, and improving riparian habitat conditions, Alternative B would provide greater long-term ecological improvement within the river corridor compared to Alternative C. These improvements are expected to enhance the ecological function of the floodplain and aquatic environments within the I-40 subreach and provide greater habitat benefits for RGSM and other riparian species.

Although Alternative B would result in a greater area of temporary disturbance during construction, the restoration design more effectively addresses the geomorphic and hydrologic conditions currently limiting floodplain connectivity and aquatic habitat quality within the I-40 subreach. As a result, Alternative B provides greater long-term improvements to aquatic ecosystem function within the I-40 subreach while incorporating measures to avoid and minimize impacts to WOTUS and Special Aquatic Sites. The relative impacts and benefits of these alternatives are further considered in the LEDPA determination below.

7 LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE DETERMINATION

Following practicability screening, Alternative B (Proposed Priority I Project) and Alternative C (Previous Restoration Designs) were carried forward for comparative impact analysis. These alternatives represent practicable approaches capable of achieving the project purpose of restoring floodplain connectivity and improving aquatic and riparian habitat conditions within the I-40 subreach.

The comparative impact analysis indicates that Alternative C would have a smaller extent of temporary disturbance to WOTUS and Special Aquatic Sites compared to Alternative B by implementing a restoration design from previously constructed projects. However, this reduction in construction disturbance would also result in less floodplain reconnection and habitat improvement across the I-40 subreach than under Alternative B, which implements a site-specific restoration design that incorporates current geomorphic and hydraulic conditions within the restoration sites.

Alternative B would involve a greater extent of temporary disturbance associated with geomorphic restoration activities including bankline modification, island destabilization, and backwater and flow-through channel features. However, these actions are specifically designed to address the geomorphic and hydrologic conditions currently limiting floodplain connectivity and aquatic habitat quality within the I-40 subreach. The larger scale and site-specific design of these restoration features allow for greater reconnection of the river channel to adjacent floodplain surfaces and a larger increase in low-velocity aquatic habitats compared to Alternative C.

Although Alternative B would result in greater short-term disturbance, the comparative impact analysis demonstrates that it provides greater long-term ecological benefits through improved floodplain connectivity and aquatic habitat conditions. Additionally, the project incorporates numerous avoidance and minimization measures to reduce impacts to WOTUS and Special Aquatic Sites to the maximum extent practicable. These measures are described in the *Restoration Plan for Priority I – Interstate 40 Subreach Sites, NMISC's Angostura/Albuquerque Reach Habitat Restoration Project in Bernalillo County, New Mexico* (SWCA 2026), provided in an appendix to the permit application to the USACE.

Consistent with the Section 404(b)(1) Guidelines, the alternatives were evaluated to determine whether any practicable alternative exists that would achieve the project purpose while resulting in less adverse impact to aquatic ecosystems. Based on comparative analysis, Alternative B is identified as the LEDPA that meets the project purpose in accordance with the Section 404(b)(1) Guidelines (EPA, USACE 1991).

8 LEAST ENVIRONMENTALLY DAMAGING PRACTICABLE ALTERNATIVE AVOIDANCE AND MINIMIZATION

The proposed restoration activities were designed to avoid and minimize impacts to WOTUS and Special Aquatic Sites when practicable while adequately achieving the project purpose.
Project design incorporates measures to minimize construction-related impacts to aquatic resources and sensitive species. These measures include limiting in-water work during sensitive life stages of RGSM, implementing erosion and sediment control practices, minimizing disturbance to native vegetation, and avoiding wetlands where practicable. Construction best management practices and monitoring procedures will be implemented to prevent sediment discharge, fuel spills, and other potential impacts to water quality. These measures are described in the *Restoration Plan for Priority I – Interstate 40 Subreach Sites, NMISC's Angostura/Albuquerque Reach Habitat Restoration Project in Bernalillo County, New Mexico* (SWCA 2026), which provides a comprehensive list of design features, project best management practices, mitigation measures, and environmental commitments made to reduce environmental and unavoidable impacts; the restoration plan is included in an appendix to the permit application to the USACE
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9 LITERATURE CITED

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