

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 Introduction

This chapter describes the two alternatives analyzed in this EA: the No action Alternative and the Preferred Action Alternative. An analysis of all alternatives considered but dismissed from further consideration is presented below and describes how the Preferred Action was chosen for Sanctuary development.

2.2 Alternatives Considered but Eliminated from Further Study

Initially, several alternatives for the RGSM Sanctuary were discussed and analyzed for feasibility, reasonable cost and benefit to the species (Reclamation 2004). During the alternative screening process, five different alternatives were considered and each evaluated to determine which best met the objective of the project's Purpose and Need. Alternatives considered included the following:

- **Drain Diversion**: Development of a rearing channel utilizing diverted ditch/canal water. This alternative would include a constructed channel and pools supplied with water from a Middle Rio Grande Project irrigation canal. Water would be returned into the drainage system, or to the river.
- **Closed Loop**: Development of a closed loop similar in concept to the BioPark Refugium, but larger and more "naturalized". It would include a closed loop channel with integrated pools.
- **Side Channel**: Development of a Sanctuary side channel utilizing river water as the main source of water to the system. The Sanctuary would include a side channel off the river with integrated pools. Water would be diverted from the river through a gated control structure and returned to the river downstream. A weir or dam would be needed in the river to allow gravity diversion to the Sanctuary during low flow; alternatively water could be pumped in. Optional fish screens could be installed to exclude non-target fish and aquatic predators, but these would also prevent movement of RGSM into and out of the Sanctuary.
- **Existing Drain**: Development of a Sanctuary within and adjacent to existing irrigation drain. The Sanctuary would be based on an existing drain. Pools and backwaters would be built into and adjacent to the drain. The drain would be connected with the river at the downstream end through an existing or constructed outlet. Fish screens could be incorporated to exclude non-target fish and aquatic predators, but this would keep RGSM from moving into and out of the Sanctuary.
- **In Channel**: Development of a Sanctuary within and adjacent to the Rio Grande. This alternative would require work in the river and associated riparian areas, and considerable maintenance to maintain flows through the Sanctuary. Predation control difficulties may also be associated with this alternative.

Reclamation conducted a project team meeting to determine the preferred alternative by comparing a number of factors for each alternative. Each of the team members provided input as related to their field of expertise. Construction and operational cost, siting flexibility, control of

environmental factors, and connection to the Rio Grande were established as the criteria for evaluating the alternatives listed above.

Table 2-1. Parameters Considered for Selecting the Preferred Alternative.

Parameter Considered
Source of water
Cost
Siting flexibility
Control of environmental factors
River connection

Based on parameters considered and other factors including permitting requirements, excavation quantities and engineering challenges, construction of the Sanctuary utilizing the Drain Diversion alternative was determined to be the Preferred Alternative. In this alternative, facility siting is relatively flexible as several suitable sites are present throughout the MRG that meet the project objectives. Siting will require a sufficiently sized parcel near the existing irrigation canals and drains with adequate reserve capacity to serve the Sanctuary. Additionally, siting will require a suitable location to return flow back to the Drain and to the Rio Grande. The Preferred Alternative also presents a high degree of control over conditions (flow of water, potential for predation exclusion, etc.). Finally, with an established river connection, this alternative could be used to acclimate hatchery fish to a river-like environment while allowing fish to be released into their native habitat, the Rio Grande.

Each of the alternatives had varying requirements of environmental compliance and potential future maintenance. The Preferred Alternative was considered one of the best alternatives with regard to impacts to the river’s aquatic environment because, although some work below bankfull will be required to construct a fish and water return channel to the Rio Grande, no in-river diversion or rearing structures will be constructed.

In summary, the Drain Diversion alternative was chosen as the Preferred Alternative for several reasons. Initial construction will comprise the greatest costs of this alternative and long-term maintenance will be relatively low. Construction will require site clearing and grading, channel and pool excavation and the addition of miscellaneous habitat structures (woody debris, etc.), installation of a water intake structure at an existing canal diversion, installation of fish screens and water/fish return conveyances. Following initial construction, the costs of operation and maintenance activities, including periodic cleaning and sediment removal, operation and maintenance of the water control structure, and monitoring and feeding of the RGSM, will be relatively low.

2.3 Alternatives Considered in EA

2.3.1 Alternative A: No Action

Under this alternative, the proposed Sanctuary would not be constructed. Fulfillment of the RGSM refugium requirements (RPA AA) of the USFWS 2003 BO would not occur through the

development of a Sanctuary. There would be a continuing shortage of grow-out and acclimation facilities for the RGSM. Additionally, habitat enhancement within the vicinity of the Sanctuary would not occur in association with Element S of the RPA.

2.3.2 Alternative B: Preferred Alternative (Proposed Action)

Description and Production Scenario

The proposed Sanctuary will provide diverse habitats such as channels, backwaters, and pools for all RGSM life stages to assist in increasing the population of this endangered fish. It is proposed that this facility will be operated on a year round basis. For the initial phase of this project the emphasis will be on growing out and acclimating larvae and juvenile fish. It is anticipated that advanced larvae obtained from the existing Refugium will be introduced into the facility in the early summer months. As the Sanctuary is considered a pilot project, the number of fish initially reared in the facility will be conservative until the performance of the system can be determined. Using the low end of the “high” density RGSM populations (>150 RGSM/100m²) (Reclamation and USACE 2003) this equates to approximately 10,000 to 15,000 fish for an initial stocking event. Production numbers will be adjusted following operational reviews and evaluations.

Juveniles may be released in October with a percentage of the population being held over winter to be released as sub-adults in early spring. Prior to fish release, it is desired that the facility have the ability to enumerate, mark, and take data (lengths, weights, etc.) to assist in evaluating the success not only of the Sanctuary but of its contribution to the overall RGSM restoration program. A collection “kettle” will be located at the south end of the Sanctuary. Fish could either be sorted in this kettle or physically moved to an outside portable tank for processing prior to release.

Although the USFWS prefers that all RGSM exiting the Sanctuary be marked to facilitate future monitoring, marking of eggs and larvae will present extreme operational difficulties that may be counterproductive to the intent of the project. Because the Sanctuary’s egg/larvae carrying capacity is currently unknown, there is a desire to allow offspring to volitionally exit to the Rio Grande to prevent potential loss through density constraints on habitat and space (if spawns are productive enough to overwhelm the facility). Eggs and larvae that volitionally exit the Sanctuary will not be marked. The USFWS has agreed that eggs and larvae may be released into the river without marking due to potential take issues associated with the unknown carrying capacity of the facility (J. Parody, USFWS, pers. comm.). Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct. As the Sanctuary is an experimental facility, amendments and improvements to release protocols are planned to be a component of monitoring and evaluation. In accordance with USFWS policies, handling of any fish, regardless of lifestage, will be kept to a minimum. All juveniles or adults that reach sufficient size (30 mm standard length [SL]) will be marked; released fish will be monitored according to USFWS protocols.

Design Concepts

Key components of the project include a pump station and outlet facilities. Figure 2-1 illustrates the project site.

Water Supply

Source and Flow

Sanctuary water will be provided from the Albuquerque Riverside Drain. During the irrigation season (March – October), the source of this water is diversions from the Rio Grande, groundwater seepage inflow, and occasional stormwater flows. During the non-irrigation season (November – February) source water for the Drain is groundwater and stormwater return flow. Based upon the water supply available during the non-irrigation season 15 cubic feet per second (cfs) is considered to be the maximum design flow for the Sanctuary. All screening and conveyance facilities will be designed to accommodate 15 cfs.

The Drain is operated by the MRGCD, which is a cooperating partner in this project. The MRGCD has prepared a letter of commitment (Appendix A) to Reclamation regarding use of Drain water. The initial operators of the Sanctuary will be Reclamation or another operator, working under contract or agreement with Reclamation. The Sanctuary operator will be permitted by the USFWS who will also provide oversight in the operations of the Sanctuary. The capabilities of the Sanctuary will be modified and adjusted as indicated by operations over time. The Sanctuary operators will work closely with the City of Albuquerque BioPark and others performing research and restoration efforts. At this time, no additional water supply is planned. However, a water recirculation pump will be provided as an emergency back up to recirculate existing water throughout the facility when necessary.

Pump Station

A new pump station will be required to divert water from the Drain. The pump station will be located approximately 150 feet east of the Sanctuary alongside the Drain. The pump station will be set into the Drain bank and equipped with a self-cleaning vertical screen; a trash rack will be located just upstream of the screen and pumps. Three-phase power will be required to run the screen's trolley brush cleaning system and pumps. The trash rack and screen will remove medium to large sized debris and fish before entering the pump station.



All in-water work will be completed during low flow periods from October 1 through February 28. Because the Drain generally contains 6-12 inches of water during the winter (S. Grogan, MRGCD, pers. comm., 6/1/05), installation of the intake diversion will require the use of a small cofferdam and dewatering well system. This cofferdam and well system will be used to temporarily dewater an area anticipated to occupy 1/3 of the channel width, leaving 2/3 of the channel width for fish bypass during construction. Water removed from the cofferdam area will be discharged back into the Drain downstream of the construction area. Fish stranded by dewatering will be salvaged by qualified biologists and relocated away from construction activities.

The concrete foundation for the intake structure will be poured within the dewatered area contained within the cofferdam. Installation of the structure will result in the removal of approximately 100 square feet (ft²) of the riverbank and associated riparian vegetation, which consists primarily of weedy herbaceous vegetation that provides minimal bank stabilization or instream shading. No trees will be removed at this location. A small amount of riprap or other erosion protection may be required for stabilization of the intake. For all locations requiring bank stabilization (intake and fish release/water return conveyance outlets), riprap will be hauled in from one of several existing Reclamation stockpiles in the local vicinity. Approximately 5 truck loads of riprap will be transported to the site using a route that takes I-25, Avenida Cesar Chavez, and Second Street to the project area. The riprap hauling will require approximately 5 days, spread out over the estimated eight month construction period.

Conveyance from Sanctuary

Water discharging from the Sanctuary will be returned via gravity flow to either the Rio Grande or to the Drain, depending upon operations, river hydraulics, and fish release scenarios. Mr. Sterling Grogan, MRGCD biologist, indicated that Drain flow is eventually returned to the Rio Grande about 10 miles downstream of the Sanctuary site (pers. comm. 2005).

Water exiting the Sanctuary will flow through a 500 ft² covered outlet structure, which will be equipped with a trash rack to remove any large debris that may have entered the Sanctuary channel. From the trash rack, water will flow through two drum screens, which will act to maintain juvenile and adult RGSM within the Sanctuary through small mesh openings and a low approach velocity (0.2 ft/sec). Water flowing past the drum screens will be routed to the Rio Grande release channel (described below), or water could be directed to the Drain discharge pipeline. A sloped debris screen will be located behind the drum screens. When so desired, a gate beneath that screen will be opened to allow flow (maximum of 5 cfs) to enter a recirculation pump where it will be oxygenated and returned to the facility.

During most of the year, including periods of fish release, discharge water from the Sanctuary will be directed into a 500 foot long open channel that will convey flow into the Rio Grande. The river bank at the channel mouth will be armored with riprap to provide protection during high flow events and to prevent bank sloughing. Although installation of the outlet structure will occur during low flow periods in the winter, a small cofferdam, extending approximately 5 feet from the bank into the river, might be required. Water removed from the cofferdam area will be discharged into a small settling basin prior to discharge back into the river downstream of the construction area. Because the river is approximately 500 feet wide at this location,

cofferdamming will result in a negligible impact to instream resources as best management practices (BMPs) to prevent erosion and sedimentation will be implemented. Installation of the fish release channel and associated bank protection will remove 100 cy of bank material. Two to four mature cottonwoods may be removed from this location.

During periods of peak river flow, when the hydraulic profile precludes gravity flow of return water to the river, facility water will be routed to the Drain. Discharge from the Sanctuary will be routed 150 feet to the Drain via a 36-42 inch diameter pipeline that will penetrate the levee prior to entering the Drain. Vegetation within the pipeline corridor consists of weedy herbaceous species that provide limited habitat value. As a precautionary erosion-prevention measure, a small amount of rock or riprap will be placed in-water on the drainbed under the pipeline discharge to minimize scour. Installation of the discharge pipeline will be conducted during low flow periods and is not anticipated to require a dewatering cofferdam. Approximately 25 ft² of Drain-bank, consisting primarily of weedy herbaceous vegetation will be removed at this site. No trees will be removed from this location.

Water Supply Screening

The Drain has been documented to contain as many as fifteen species of fish. It is critical to keep these various species from entering the Sanctuary to: 1) prevent predacious fish from impacting the RGSM; and, 2) minimize biomass of other species (i.e. fathead minnows and red shiners) that could overload the system and out-compete the RGSM for available food and space. Screening of water supply structures will be required at three locations: 1) at the intake to preclude debris from entering the structure; 2) at the fish screen building to prevent predator fish from entering the Sanctuary and to return RGSM eggs and larvae to the Drain; and 3) at the water discharge outlet to contain RGSM juveniles and adults within the Sanctuary and prevent fish from coming into the Sanctuary from the river. All screens will be designed to accommodate the maximum facility flow of 15 cfs.

Intake Debris Screen

A self-cleaning vertical screen will be located at the diversion structure to preclude the entrance of debris into the water conveyance system. The openings in the wedgewire screen will be approximately 1.75 millimeter (mm; 0.07 inch) in size which will prevent the entrance of fish, woody debris, algal and plant masses, and refuse. However, the openings are too large to prevent entrance of RGSM eggs and larvae that may naturally be present in the Drain. Therefore, an additional screen (described below) will be required to prevent the entrance of RGSM eggs and larvae (as well as other small fish) into the Sanctuary in order to return them to the Drain.

Sanctuary Fish Screen

Small matter, including RGSM fish eggs, larva, and fish, will be prevented from entering the Sanctuary through the use of a drum screen, to be housed within a building near the northern end of the Sanctuary. The Sanctuary drum screen will be equipped with 300 micron mesh and spray bars that continually backwash the screen. The bars will be modified to discharge low velocity spray to prevent damage to eggs/larva/fish. A continuous flow of water will be provided to safely return eggs/larva/fish back to the Drain via a small (4 inch) fish return pipe that will penetrate the levee and discharge into the Drain. Power will be required for operation of the drum screens. Construction of the screen building will require the removal of approximately 250 ft² of

floodplain bosque habitat, currently occupied by weedy herbaceous species dominated by invasive mustard. No trees will be removed from this location. The building design incorporates materials, elements, and features to make it as unobtrusive as possible.

Outlet Screens

A third screening system will be provided at the Sanctuary water discharge outlet structure. Two 5 feet diameter by 10 feet long drum screens (screen size opening = 2.2 mm) will be housed side by side at the main outlet. Following spawning, the screens will be monitored via use of a stationary egg collector. Once eggs are observed, the gate to the volitional release channel can be opened to allow eggs and larvae to exit the facility and enter the Rio Grande. A stationary screen system can be placed in front of the drum screens to capture any eggs, if desired. A percentage of eggs will be captured in the overbank areas where they will hatch and larvae will reside.

Fish that may enter the Rio Grande release channel from the river will be prohibited from entering the facility by the drum screen structure during normal operations. When volitional release is occurring, it is likely that the velocity and turbulence created in the channel will prevent predatory fish from entering the structure. However, if there is a need in the future to prevent entry of unwanted fish, a downstream facing finger weir or a screen/grate could be installed in the release channel. The slope and velocity of the Drain discharge pipeline will act as a barrier to entry of fish within the Drain.

Sanctuary Channel Features

The overall geometry of the Sanctuary will conform to the landform that is available in the bosque between Glass Gardens to the north and the construction debris landfill to the south. The actual Sanctuary will vary in width and direction to conform to the existing topography and to avoid removal of existing cottonwood trees to the greatest extent possible. The proposed facility, including overbank areas, will occupy a maximum area 1,500 feet long and 100 feet wide, with variable widths averaging 50 feet.

The Sanctuary and internal features, including bars, channels, pools, and backwaters will be constructed with native soil (from excavated materials on site, if suitable) combined with hard materials (i.e. rock, sand bags, small gabions, large woody debris, etc.) to create forms with defined structure. Mature cottonwoods removed from the site will be recycled and used as large woody debris within the channel. Fine sand to small gravels will be used as substrate for the Sanctuary. All imported materials will come from locally approved, certified sources. A limited number of haul trips will be required along existing public roads to bring these materials to the site.

Construction of the rearing channel will permanently remove approximately 1.8 acres (78,000 ft²) of bosque habitat that is dominated by weedy invasive species and serves as low quality habitat for terrestrial species. Up to 18 mature cottonwoods and 60 immature cottonwoods will be removed from the Sanctuary and release channel footprint. A revegetation plan will be developed with the City of Albuquerque Open Space Division to mitigate for loss of any native trees. Approximately 5,800 cy of material will be excavated during Sanctuary construction. Excavated material will be stockpiled on site and used for creation of Sanctuary features and levee road fill. Excess material will be hauled off site and deposited at a Reclamation-approved location.

Upland vegetation and/or emergent vegetation could be used for bank stabilization around the perimeter of the Sanctuary. Existing cottonwood trees that border either side of the Sanctuary site will be maintained to contribute leaf litter and other organic debris associated with overhead canopy habitat. Existing and replanted trees also help to shade the Sanctuary.

Sanctuary Support Facilities

Storage and Maintenance Building

It is anticipated that a small storage/operations and maintenance building will be needed to support the Sanctuary. The building is anticipated to be a portable unit, approximately 20 feet wide and 40 feet long, located between the Drain and Barr Main Canal. The storage building will be outside the floodplain, east of the Drain, in an area that is devoid of vegetation.

Predation Protection

Allowing some predator exposure conditions fish to natural conditions when released into the Rio Grande. As there is a desire to maintain the Sanctuary in as natural a state as possible, the facility will not initially be equipped with predation protection. Upon operation, if predation is found to significantly reduce the number of RGSM in the Sanctuary, predator fencing may be installed to prevent predacious reptiles and amphibians from entering. Additionally, if deemed necessary, a predator prevention system will be installed to minimize bird predation.

Monitoring and Alarms

It is proposed that flows, dissolved oxygen, temperature, and water level be monitored on a continuous basis. The monitoring system will include a remote telemetry system to notify appropriate personnel of any problems. An intrusion alarm may also be considered to minimize vandalism.

Access

Security measures will be determined in the final design. Access to the project site will be provided via existing paved roadways and frontages with the main entrance off 2nd Street through the MRGCD gate. The existing levee road will be used for access to the Sanctuary site and fish/water conveyance channels. During construction, temporary gravel access roads may be required along the perimeter of the Sanctuary and along pipeline/channel routes to allow access to those locations from the levee road. All gravel roads not required for facility operation will be obliterated following construction, and the areas will be revegetated with native trees and shrubs.

Powerline Easement

Three-phase power will be required for facility operations at three locations: 1) the vertical screen at the intake diversion, 2) the fish screen building for drum screens, and 3) the drum screens and recirculation pump at the outlet structure. Power will be provided by Public Service Company New Mexico (PNM). Approximately 200 feet of overhead line and two poles will be required to bring power to the intake location from the nearest power source at the City of Albuquerque South Second Softball fields to the east. A separate overhead line, approximately 100 feet in length, will be required to power structures at the outlet. From the outlet, power will be buried along the western edge of the Sanctuary to the fish screen building.

Summary of Ground Disturbance under Preferred Alternative

As described above, construction of the Sanctuary and its associated infrastructure will necessitate ground disturbance within the bosque and removal of habitat primarily dominated by non-native herbaceous species. In addition, excavation will be required to develop several components of the facility. Fill, utilizing material excavated during site development where possible, will also be required for the construction of facility infrastructure. Tables 2-2 depicts those activities and provides preliminary estimates of disturbance, excavation and fill quantities.

Table 2-2. Estimated Areas of Disturbance and Cut and Fill Quantities.

Clearing/Excavation Location	Area cleared (square feet)	Area cleared (acres)	Excavation Quantity (cy)	Fill Quantity (cy)
Roadways				
Sanctuary perimeter road	18,000	0.41	NA	NA
Sanctuary				
Rearing channel and overbank	78,000	1.8	5,800	NA ^a
Buildings				
Storage and maintenance	800	0.02	--	--
Fish Screen building	250	0.005	--	--
Facility discharge structure	500	0.01	--	--
Water and Fish Conveyance				
Pump Station at Drain	320	0.007	380	135 ^b
Fish release/water return channel to Rio Grande	10,000	0.23	1,200	60 ^c
Water return pipeline to Drain	600	0.01	200	100 ^c
TOTALS	108,470	2.492	7,580	295

^a Quantities for Sanctuary construction features, including sand substrate, rock and large woody debris are unknown at this time; however, these materials would be placed within areas excavated for the Sanctuary channel and would not impact additional bosque habitat.

^b Indicates estimated quantity of riprap at intake, fish release/water discharge outlets on river and Drain

^c Fill quantities include backfill. Backfill would be comprised of recovered materials excavated for pipeline/channel installation.

2.4 Alternatives Considered but Eliminated from Consideration

As discussed in Section 2.2, five alternatives for the creation of additional RGSM habitat were considered during preliminary development of the project. Four alternatives were dismissed after thorough comparison of environmental constraints, permitting requirements, hydrologic requirements, siting flexibility, and long-term cost:

- **Closed Loop:** Development of a closed system would not truly mimic the natural environment. Based on these parameters, along with high construction and operational maintenance requirements and cost, Reclamation eliminated this alternative from further consideration.
- **Side Channel:** Development of a side channel utilizing river water would require a weir or dam in the river to provide flow to the created channel, specifically during periods of low flow. A side channel would also likely require a berm for flood protection. This alternative presents permitting and design challenges that would necessitate the consideration of naturally occurring elements in the river, including extreme hydrologic fluctuation,

predation, and human intrusion. Costs are also high under this alternative. Based on these considerations, this alternative was eliminated from further consideration.

- Existing Drain: Development of a rearing channel within and adjacent to an irrigation drain with a connection to the river would achieve the objectives of the purpose and need. However, irrigation drains are operated by the MRGCD, and development within a drain would involve extensive consultation to determine if this alternative were truly feasible considering irrigation users and flow requirements. Surrounding environmental factors and human intrusion potential would also present design challenges that eliminated this alternative from consideration.
- In Channel: Development of a rearing channel within and adjacent to the Rio Grande presents regulatory and design challenges similar to the side channel alternative. This alternative would require work in the river and associated riparian areas, and considerable maintenance to maintain flows through the channel. Controlling predators would be extremely difficult in an in-channel environment. These challenges eliminated this alternative from further consideration.