

Low-Effect Habitat Conservation Plan
for the
Four Corners Water Development Project,
Pueblo of Santa Clara,
Rio Arriba County, New Mexico

8 November 2019
Updated 20 April 2020

Prepared for the
U.S. Fish and Wildlife Service

Prepared by the
Pueblo of Santa Clara

SUMMARY

The Pueblo of Santa Clara has applied for a permit from the U.S. Fish and Wildlife Service pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), to incidentally take federally endangered Rio Grande silvery minnow (*Hybognathus amarus*). Incidental take may occur indirectly as a result of withdrawing up to one million gallons per day of shallow groundwater (which is under the direct influence of surface water) from four existing wells located along the Rio Grande on lands owned in federally-restricted fee status by the Pueblo of Santa Clara in Rio Arriba County, New Mexico.

This Low-Effect Habitat Conservation Plan (LEHCP) for the Four Corners Water Development Project includes measures to avoid and otherwise mitigate potential impacts to Rio Grande silvery minnow. A low-effect determination for the plan is supported by analysis indicating that effects of the proposed action (including associated minimization and mitigation measures) on Rio Grande silvery minnow would be minor. Mitigation measures in the plan include suspension of pumping from the alluvial aquifer during critical low-runoff periods.

This LEHCP has been prepared in consultation with the Service to fulfill the requirements of an Endangered Species Act section 10(a)(1)(B) incidental take permit application for the proposed project.

CONTENTS

1. INTRODUCTION.....	2
1.1 Purpose and Need of the Proposed Action.....	2
1.2 Regulatory Requirements.....	2
1.3 Permit Applicant and Holder.....	3
1.4 Permit Duration.....	3
1.5 Plan and Permit Area.....	4
1.6 Description of the Proposed Action.....	4
1.7 Activities to be Covered by Permit.....	4
1.8 Species to be Covered by Permit.....	5
2. COVERED SPECIES.....	7
2.1 Distribution of Rio Grande Silvery Minnow.....	7
2.2 Rio Grande Silvery Minnow Ecology and Life History.....	7
2.3 Rio Grande Silvery Minnow Critical Habitat.....	8
3. ASSESSMENT OF POTENTIAL IMPACTS AND INCIDENTAL TAKE.....	9
3.1 Direct, Indirect and Cumulative Effects.....	9
3.1.1 Effects on Rio Grande Silvery Minnow Density in the Middle Rio Grande.....	11
3.1.2 Effects on Critical Habitat Designated for Rio Grande Silvery Minnow.....	13
3.2 Anticipated Take of Covered Species.....	14
4. HABITAT CONSERVATION PLAN.....	17
4.1 Actions to Minimize Impacts.....	17
4.2 Monitoring and Reporting.....	20
4.3 Funding.....	21
5. CHANGED CIRCUMSTANCES.....	22
6. UNFORESEEN CIRCUMSTANCES.....	22
7. AMENDMENT PROCESS.....	23
7.1 Minor Amendments.....	23
7.2 Formal Amendments.....	23
8. PERMIT RENEWAL OR EXTENSION.....	24
9. SUSPENSION OR REVOCATION.....	24
10. OTHER MEASURES.....	24

11. ALTERNATIVES CONSIDERED.	25
12. DEFINITIONS.	26
13. LITERATURE CITED.....	26
APPENDIX A: EVALUATION OF CATEGORICAL EXCLUSION CRITERIA.....	29
A.1 Categorical Exclusion Screening Criteria.....	29
A.2 Literature Cited.....	33
APPENDIX B: SPECIES EVALUATION.....	34
B.1 Listed Species Potentially Occurring in the Permit Area.	34
B.2 Sequential Evaluation.	35
B.2.1 Step 1 - Presence in Area Affected by Proposed Action.....	35
B.2.2 Step 2 - Exposure to Stressors Associated with the Proposed Action.....	36
B.2.3 Step 3 - Species Response to Exposure.....	38
B.3 Literature Cited.....	39
APPENDIX C: SPECIES LIST.....	40

LIST OF TABLES

Table 1. Potential reduction in estimated Rio Grande silvery minnow October density.....	12
Table 2. Water-level decline associated with a 1.55 cfs reduction at low flow.....	13
Table 3. Potential incidental take of Rio Grande silvery minnow from the proposed action.....	15
Table B1. Listed or candidate species and designated or proposed critical habitat.....	34
Table B2. Sequential evaluation of listed species.....	36
Table B3. Water-level decline associated with a 1.55 cfs reduction at low flow.....	38

LIST OF FIGURES

Figure 1. Location of the existing well-field area on Santa Clara Pueblo.....	3
Figure 2. Location of the existing well-field area on Santa Clara Pueblo where pumping would occur..	5
Figure 3. Location of the plan and permit area.....	6
Figure 4. Polynomial model of Rio Grande silvery minnow October density.....	10
Figure 5. Effect of a 3.07 acre-ft/day reduction in daily May-June flow volume at Albuquerque.	11
Figure 6. Potential incidental take for May-June runoff ranging from 52,500-700,000 acre-ft.....	16
Figure 7. Linear regression of Albuquerque and Otowi spring runoff volumes.....	17
Figure 8. Relationship between NRCS April and May forecasts and actual May-June flow volume. . .	19

1. INTRODUCTION

1.1 Purpose and Need of the Proposed Action

The Pueblo of Santa Clara proposes to withdraw up to one million gallons per day (mgd) of water from the alluvial aquifer connected to the Rio Grande to provide a reliable water source to support economic development in the “four corners” area, composed of lands owned in federally-restricted fee status by the Pueblo of Santa Clara, located in south-central Rio Arriba County, New Mexico (Figure 1). Economic development in the “four corners” area may consist of commercial, residential, and health-care facilities. The proposed water withdrawal would occur at an existing well field on lands owned in federally-restricted fee status by the Pueblo of Santa Clara.

The proposed action may indirectly affect Rio Grande silvery minnow (*Hybognathus amarus*), which occurs in the middle Rio Grande downstream from the existing well-field area (Figure 1), and is listed as endangered under the federal Endangered Species Act (ESA). Although the proposed action would have only minor effects, the Pueblo of Santa Clara is seeking a permit to authorize incidental take of Rio Grande silvery minnow. This authorization is necessary because otherwise lawful activities associated with the proposed action may result in incidental take through potential effects on downstream flows in the middle Rio Grande.

1.2 Regulatory Requirements

This Habitat Conservation Plan (HCP) has been prepared in consultation with the U. S. Fish and Wildlife Service (Service) to fulfill the requirements of section 10(a)(2)(A) of the ESA. It is part of an application for a section 10(a)(1)(B) permit for the proposed action. Section 10(a)(1)(B) of the ESA allows the Secretary of the Interior to permit “take¹” of a listed species by a non-federal entity if that take is incidental to an otherwise lawful activity. However, section 10(a)(2)(A) of the ESA requires that an HCP be submitted before such a permit can be issued.

The Pueblo of Santa Clara proposes that this plan be evaluated as a low-effect HCP (LEHCP). In order for a project to qualify for an LEHCP, issuance of the associated incidental take permit must meet the criteria for a categorical exclusion to detailed analysis under the National Environmental Policy Act, as defined in 40 CFR 1508.4 and in the Service’s *Habitat Conservation Planning Handbook* (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: pages 13-10 and 13-11). As documented in Appendix A, criteria for a categorical exclusion are met by this proposed action. The analysis in sections 3 and 4 of this LEHCP demonstrate that effects on Rio Grande silvery minnow and its critical habitat would be minor. Consequently, an LEHCP and associated incidental take permit are appropriate for the proposed action.

¹ In the context of the ESA, “take” means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, or collect, or to attempt to engage in any such conduct” with respect to a listed species (16 U.S.C. §1532[19]). See “Definitions” in part 11 of this HCP.



Figure 1. Location of the existing well-field area on Santa Clara Pueblo. Red polygon is the Pueblo of Santa Clara boundary. As shown, the middle Rio Grande extends from Cochiti Reservoir downstream to Elephant Butte Reservoir. Inset map shows project location in the southwestern U.S.

1.3 Permit Applicant and Holder

The Pueblo of Santa Clara is the applicant for the incidental take permit and, if a permit is issued by the Service, will be the permit holder.

1.4 Permit Duration

The duration of the section 10(a)(1)(B) permit will be 20 years from the date of issuance of the incidental take permit. The permit would allow the Pueblo of Santa Clara (which includes its business enterprises or assigns) to incidentally take Rio Grande silvery minnow within the geographical boundaries identified in this LEHCP over that time period. In the event that transfer of the permit is proposed, the requirements specified at 50 CFR part 13 section 13.25 would be met. After expiration of the permit any take within the permit area would require re-authorization.

1.5 Plan and Permit Area

The plan area is defined as all of the areas that would be used for all activities described in this LEHCP including conservation measures, and the permit area is defined as the geographic area where the impacts of the LEHCP covered activities occur (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: pages 6-1 through 6-3). The plan and permit area for this LEHCP consist of an approximately 10.9-acre area encompassing a group of four existing, shallow alluvial wells located adjacent to the Rio Grande on lands owned in federally-restricted fee status by the Pueblo of Santa Clara (the well-field area; Figure 2) and the Rio Grande from the well-field area downstream to Elephant Butte Reservoir (approximately 225 river miles; Figure 3). Water would be pumped from the shallow alluvial aquifer, which is under the direct influence of surface water in the Rio Grande (E. Melis, John Shomaker and Associates, Inc., personal communication, 1 November 2017). Rio Grande silvery minnow occurs in the river only in the portion of the plan and permit area between Cochiti Dam and Elephant Butte Reservoir (Figure 3; U.S. Fish and Wildlife Service, 2010: page 15). Consequently, the species may potentially be affected in this reach of the Rio Grande by minor changes in the amount of water flowing in the Rio Grande as a result of the proposed action.

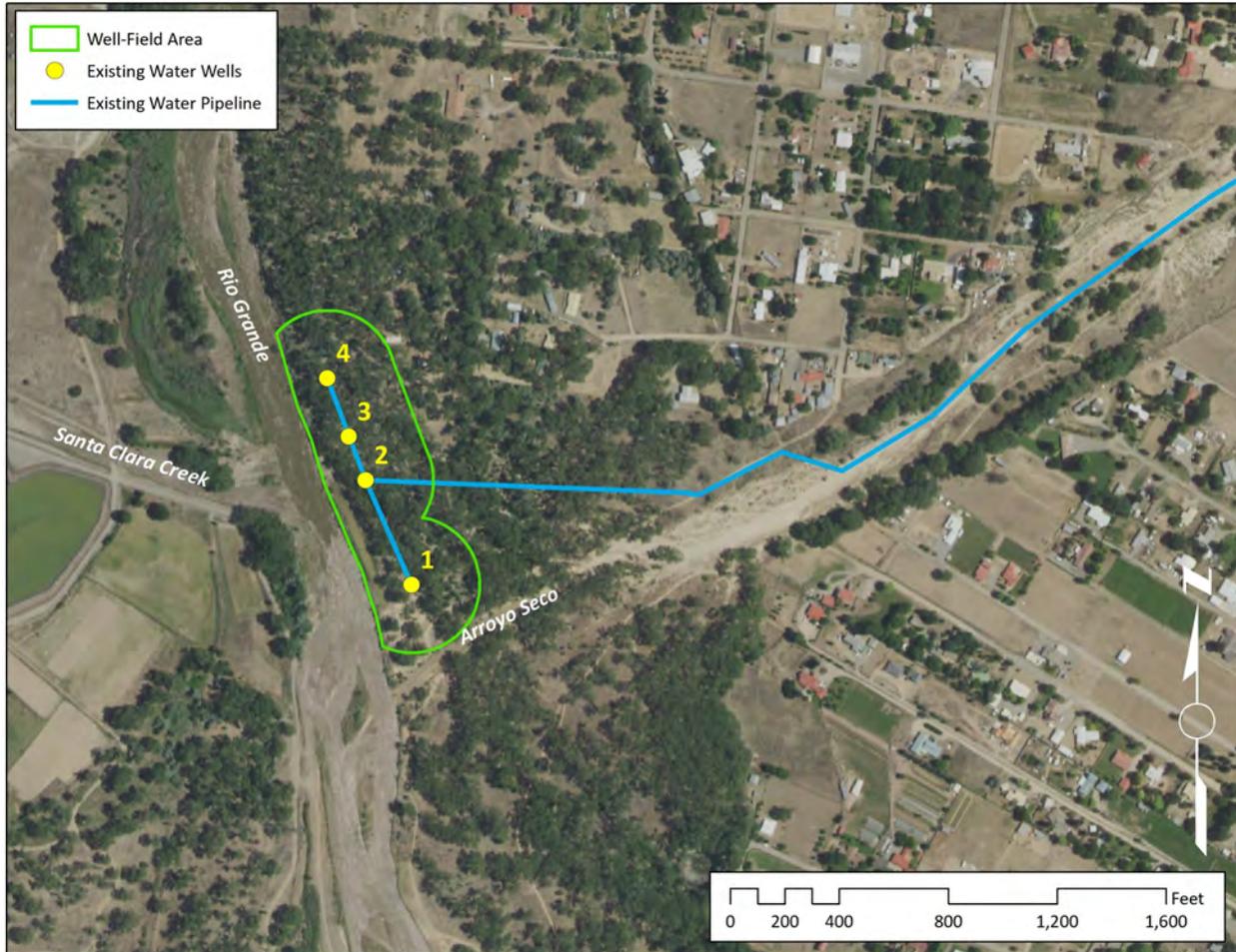
1.6 Description of the Proposed Action

The proposed action involves pumping up to 1 mgd from the four existing, shallow alluvial wells located in the well-field area (Figure 2). Pumping volume will be commensurate with the level of development of the "four corners" area, with the maximum volume of 1 mgd occurring only when the area is fully developed. Development will be phased over time, with full development of the area not occurring for at least several years. The proposed action is a lawful use of the Pueblo of Santa Clara's water rights developed in compliance with applicable federal law and permitting requirements (see Appendix A, sections A.1.4.A through A.1.4.C). Alluvial sediments in the well-field area are about 100 ft thick, and depth to groundwater is approximately 10 to 20 ft below the ground surface. The four existing production wells in the alluvium are completed at depths ranging from 75 to 125 ft below ground level, have 16-inch diameter casings, and are screened from approximately 20 to 60 ft depth. Pumping would be cycled between alternate wells, as opposed to continuous, simultaneous pumping from all four wells. Water withdrawal would be continuous year-round. The pumped water would be delivered through an existing pipeline to the "four corners" area to support economic development there. Water delivered for municipal, residential or commercial purposes would be treated to appropriate standards prior to use. Economic development in the "four corners" area may consist of commercial, residential, and health-care facilities (Souder, Miller and Associates, Inc., 2016).

1.7 Activities to be Covered by Permit

The activity to be covered by the incidental take permit is pumping of up to 1 mgd of water from the four existing, shallow alluvial wells in the well-field area, as described above in section 1.6. This withdrawal amount does not include other water withdrawals at the well-field area that have been deemed part of the environmental baseline for the Rio Grande silvery minnow (U.S. Fish and Wildlife Service, 2016: page 29).

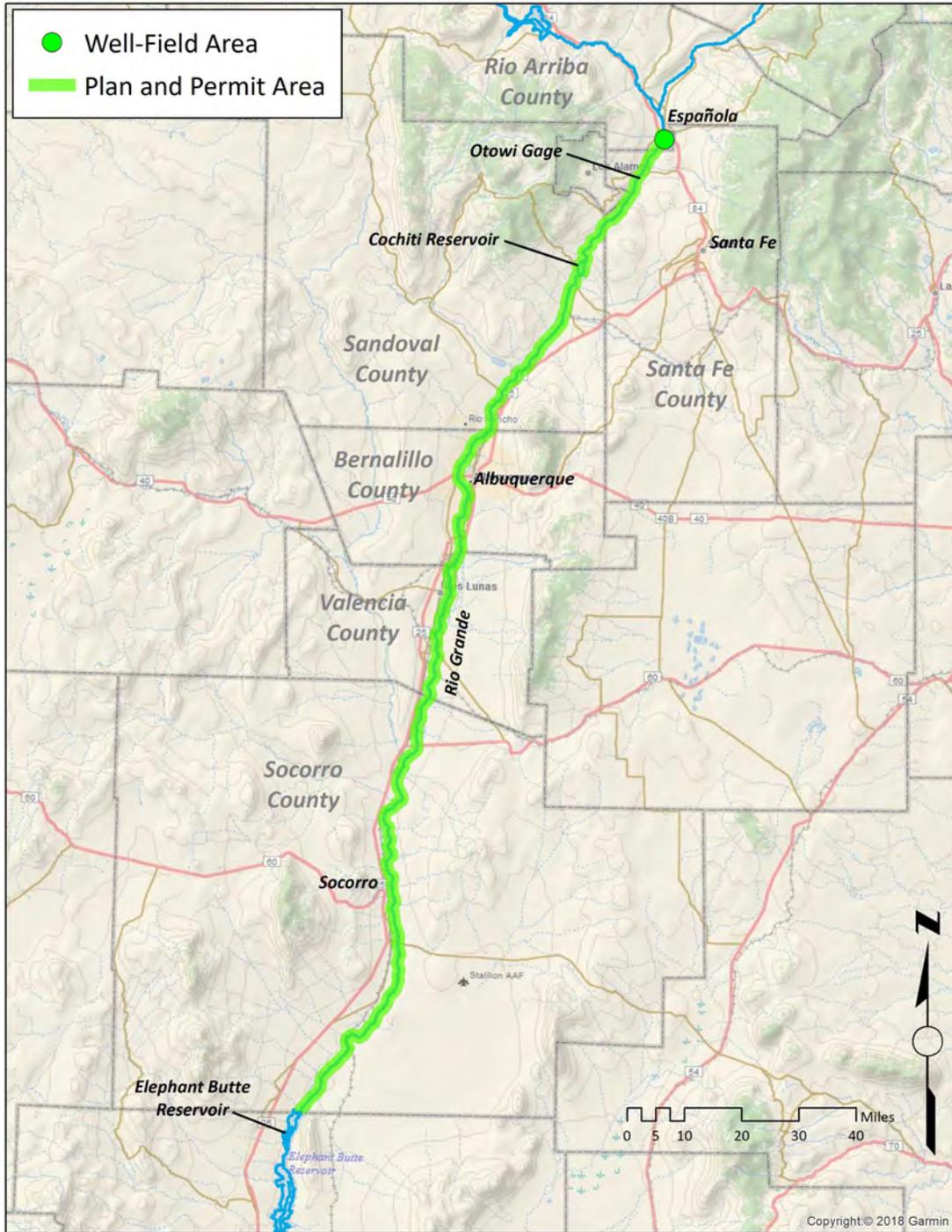
Figure 2. Location of the existing well-field area on Santa Clara Pueblo where pumping would occur. Well #2 is located at Universal Transverse Mercator (UTM) coordinates 402,853 m E and 3,908,712 m N (UTM Zone 13N, North American Datum of 1983) in the NE 1/4 of section 15, Township 20 N, Range 8 E (New Mexico Principal Meridian), Rio Arriba County, New Mexico.



1.8 Species to be Covered by Permit

As described in Appendix B, only Rio Grande silvery minnow would potentially be subject to incidental take from the proposed action. Consequently, only Rio Grande silvery minnow will be covered by the permit.

Figure 3. Location of the plan and permit area, which extends from the well-field area downstream to Elephant Butte Reservoir.



2. COVERED SPECIES

As noted above in section 1.6 and as described in Appendix B, only Rio Grande silvery minnow would potentially be subject to incidental take from the proposed action and therefore is the only species that will be covered by the permit. Rio Grande silvery minnow was listed as endangered in July 1994 (U.S. Fish and Wildlife Service, 1994), and the final rule designating critical habitat for the species was published in February 2003 (U.S. Fish and Wildlife Service, 2003). The recovery plan for Rio Grande silvery minnow was updated and revised in 2010 (U.S. Fish and Wildlife Service, 2010).

2.1 Distribution of Rio Grande Silvery Minnow

Currently, Rio Grande silvery minnow occurs in the middle Rio Grande from Cochiti Dam downstream to Elephant Butte Reservoir (Figure 3). It has been extirpated from the Rio Grande upstream from Cochiti Dam and from the Rio Chama (U.S. Fish and Wildlife Service, 2010: page 15). The species was repatriated to the Rio Grande near Big Bend, Texas as a nonessential, experimental population (U.S. Fish and Wildlife Service, 2010: page 16).

Historically, Rio Grande silvery minnow occurred in the Rio Grande and Pecos River drainages in New Mexico, Texas, and Mexico, where it was one of the most widespread and abundant fish species (Bestgen and Platania, 1991). In the Rio Grande its historical distribution extended from Española, New Mexico, downstream to the Gulf of Mexico, and included the lower Rio Chama and the lower Jemez River in New Mexico (U.S. Fish and Wildlife Service, 2010: page 15).

2.2 Rio Grande Silvery Minnow Ecology and Life History

Within its current range, Rio Grande silvery minnow is usually found in habitats with silt substrates and low or moderate water velocity. These habitats typically include eddies formed by debris piles, pools and backwaters. This species is rarely found in habitats with high water velocities. Rio Grande silvery minnow is most commonly found in habitats with water depths of less than 20 cm (7.9 in) in the summer and 31-40 cm (12.2-15.75 in) in the winter. It is rarely found in habitat with water depth greater than 50 cm (19.7 in). Diet of Rio Grande silvery minnow consists primarily of algae (Platania and Dudley, 2003).

Rio Grande silvery minnow is a pelagic spawner, meaning that its eggs (which are semi-buoyant) are released into the water column where they hatch and develop over a period of about 50 hours as they drift downstream (Platania and Altenbach, 1998; Platania and Dudley, 2003). Spawning occurs during a relatively brief period lasting about one month, coinciding with high flows associated with the spring runoff (Turner *et al.*, 2010; Krabbenhoft *et al.*, 2014). However, the peak in spawning activity typically lasts only several days (Platania and Dudley, 2003). Mortality of spawning fish is high, and over 98 percent of Rio Grande silvery minnow in December of any given year are age 0 fish (*i.e.* fish spawned the previous summer). Few fish survive longer than 13 months. Consequently, successful spawning is vital to persistence of populations of the

species. Over 90 percent of the Rio Grande silvery minnow population variance in the middle Rio Grande appears to be significantly related to the duration, magnitude and timing of spring runoff events (U.S. Fish and Wildlife Service, 2016: Appendix A page 54). The most immediate threats to Rio Grande silvery minnow are fragmentation of river habitat by diversion dams and impoundments, drying of river reaches, and flow modifications that inhibit successful reproduction (Platania and Dudley, 2003; U.S. Fish and Wildlife Service, 2010).

2.3 Rio Grande Silvery Minnow Critical Habitat

Critical habitat for Rio Grande silvery minnow occurs in the plan and permit area in the reach of the Rio Grande from Cochiti Dam downstream to Elephant Butte Reservoir, excluding Pueblo lands of Santo Domingo, Santa Ana, Sandia and Isleta (U.S. Fish and Wildlife Service, 2003). Primary constituent elements of critical habitat include a suitable hydrologic regime, presence of low-velocity habitats, substrates consisting primarily of sand or silt, and sufficient water quality (U.S. Fish and Wildlife Service, 2003: page 8117).

3. ASSESSMENT OF POTENTIAL IMPACTS AND INCIDENTAL TAKE

The proposed action involves withdrawal of up to 1 mgd of alluvial groundwater at the well-field area on lands owned in federally-restricted fee status by the Pueblo of Santa Clara. The alluvial groundwater is under the direct influence of surface water in the Rio Grande. For the purpose of analysis, it is assumed that the groundwater withdrawal will have a direct effect on surface water flow in the Rio Grande. One million gallons per day is equivalent to a constant flow of 1.55 cfs or a volume of 3.07 acre-ft/day, and equates to an annual volume of 1,120 acre-ft/yr.

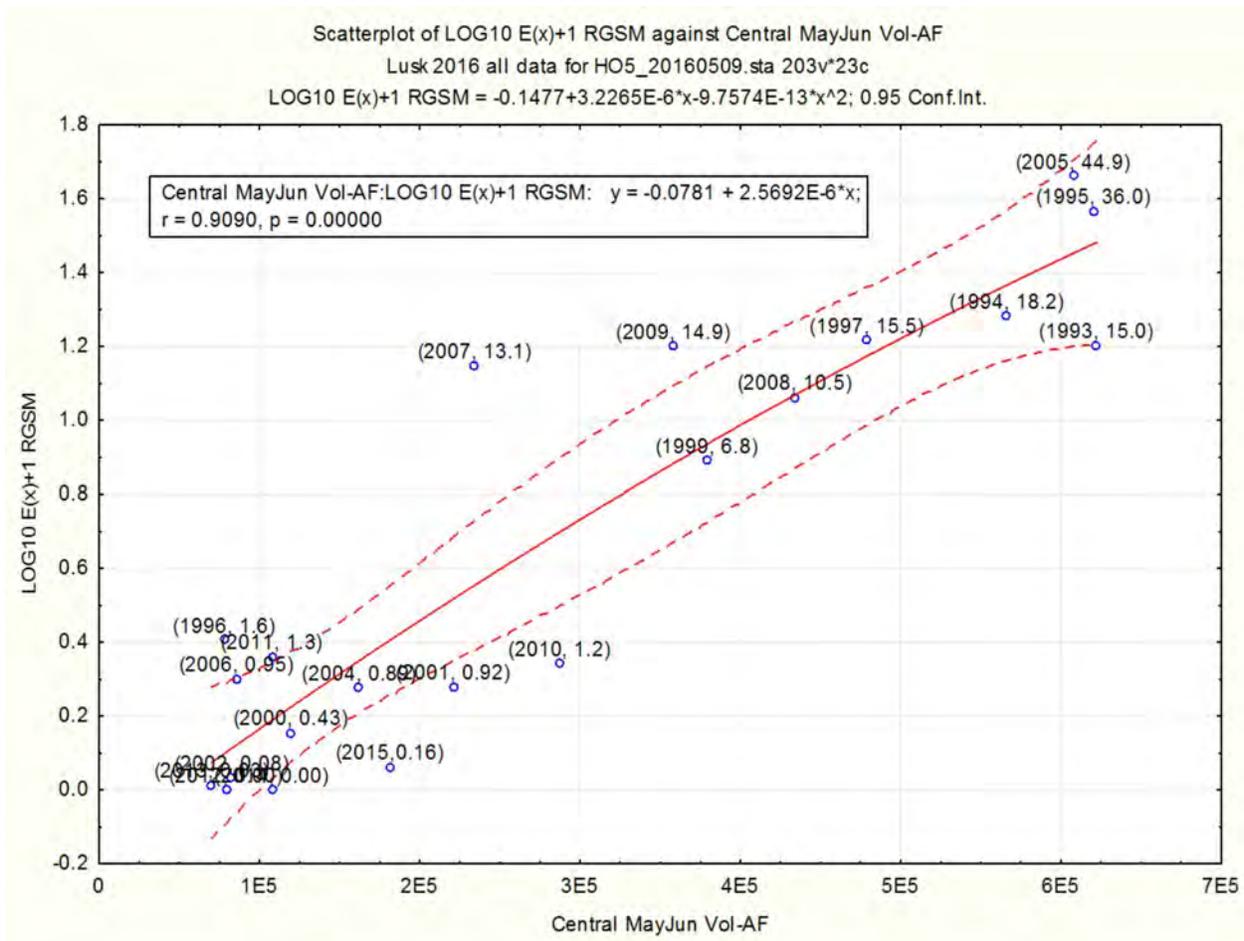
3.1 Direct, Indirect and Cumulative Effects

Overall, a 1.55 cfs (*i.e.* 1,120 acre-ft/yr) withdrawal at the well-field area would have an indiscernible effect on flow of the Rio Grande for two reasons. First, the effect of a 1.55 cfs withdrawal on flow in the Rio Grande at Otowi is undetectable, using current measurement technology, at flows above 52 cfs. This is because 1.55 cfs is within the stream-gage measurement error of +/- 3 percent (U.S. Geological Survey, 1992) at flows above 52 cfs. Recorded flow at Otowi has never been below 52 cfs. The lowest mean daily flow measured at the Otowi Bridge gage since it began recording data in 1895 was 60 cfs. The Otowi Bridge gage is located about 9.3 river miles downstream from the well-field area. Second, annual water volumes of 3,000 acre-ft/yr or less "are negligible to the overall water budget" of the middle Rio Grande (Roach, 2009: pages 16-17). Average annual flow in the Rio Grande at the Otowi Bridge gage is 1,070,000 acre-ft/yr (Roach, 2009: page 25). The proposed action involves withdrawal of up to 1,120 acre-ft/yr, which is only 0.1 percent of the average annual flow at the Otowi Bridge gage. Nonetheless, a reduction in flow associated with the proposed action, albeit very small, would occur. Therefore, the magnitude and intensity of the effect of this flow reduction on Rio Grande silvery minnow was assessed relative to thresholds identified for survival and conservation of the species (U.S. Fish and Wildlife Service, 2016).

Hydrological thresholds for a self-sustaining population in the middle Rio Grande are Rio Grande silvery minnow density in October of at least 1.0 fish/100 m² and approximately 50 percent frequency of site occupancy (U.S. Fish and Wildlife Service, 2016: Appendix A page 20). For recovery, an October density of at least 5.0 fish/100 m² and approximately 75 percent occupancy are required (U.S. Fish and Wildlife Service, 2010: page 70). These thresholds are criteria for survival and conservation, respectively, of the species.

The volumes of spring runoff (*i.e.* total flow volume for the months of May and June) required to meet the conservation and survival density criteria were estimated to be at least 318,000 and 145,000 acre-ft, respectively, as measured at the Rio Grande at Albuquerque stream gage (U.S. Geological Survey station no. 08330000, located at the Central Avenue crossing of the Rio Grande), using the quadratic model developed by the Service (Figure 4; U.S. Fish and Wildlife Service, 2016: Appendix A, page 24).

Figure 4. Polynomial model of Rio Grande silvery minnow October density as a function of May-June flow volume at the Albuquerque gage. The solid red line is the relationship predicted by the quadratic equation and the dashed red lines show the 95-percent confidence bands. Model equation and graph are from U.S. Fish and Wildlife Service (2016).



3.1.1 Effects on Rio Grande Silvery Minnow Density in the Middle Rio Grande

Removal of 1 mgd (3.07 acre-ft/day) from the Rio Grande would reduce total flow volume over the 61-day May-June runoff period by 187 acre-ft (*i.e.* 61 million gallons = 187 acre-ft). A 187 acre-ft reduction would compose only 0.06 percent of the Service's estimated conservation threshold runoff volume at the Albuquerque gage of 318,000 acre-ft and 0.13 percent of the estimated survival threshold runoff volume at the Albuquerque gage of 145,000 acre-ft. A 3.07 acre-ft/day reduction is indiscernible even at flows well below the 145,000 acre-ft survival threshold for Rio Grande silvery minnow (U.S. Fish and Wildlife Service, 2016: Appendix A, page 20). This is exemplified by superimposing a 3.07 acre-ft/day reduction on actual data from 2018, when May-June flow volume at Albuquerque was only 59,318 acre-ft (Figure 5).

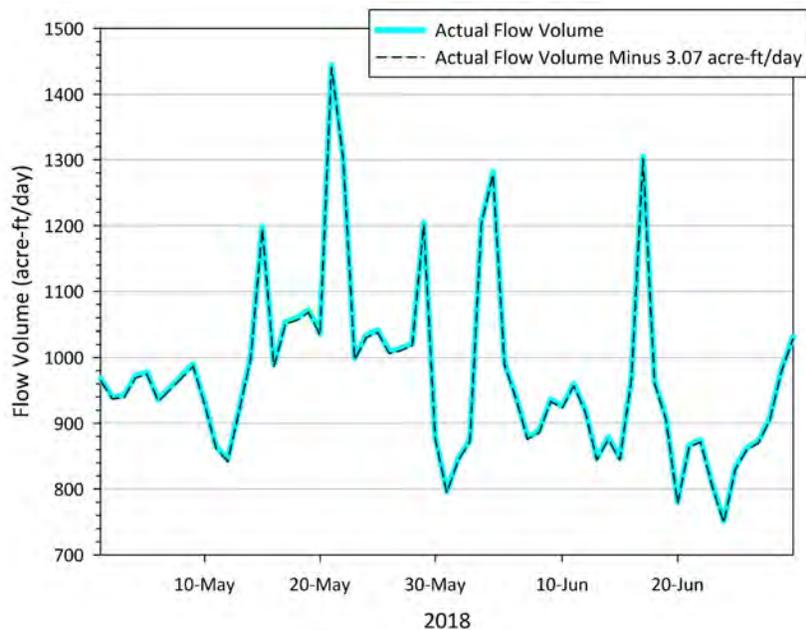


Figure 5. Effect of a 3.07 acre-ft/day reduction in daily May-June flow volume at Albuquerque in 2018. Daily flow volume at the Albuquerque gage was calculated using U.S. Geological Survey mean daily discharge data (https://waterdata.usgs.gov/nm/nwis/dv/?site_no=08330000&agency_cd=USGS&referred_module=sw, accessed on 13 May 2019). Mean daily discharge, in cubic feet per second (cfs), was converted to acre-ft per day using the formula: acre-ft/day = (cfs x 86,400 sec/day)/43,559.9 cubic ft/acre-ft.

At the Service's runoff volume threshold for survival, the small reduction in May-June runoff volume associated with the proposed action translates to an estimated maximum potential decline in Rio Grande silvery minnow October density of 0.25 percent (Table 1; using polynomial regression equation 1 in U.S. Fish and Wildlife Service, 2016: Appendix A, page 22). The potential decline in estimated Rio Grande silvery minnow October density becomes smaller and smaller as spring runoff volumes increase above 145,000 acre-ft at the Albuquerque gage. The modeled density of Rio Grande silvery minnow drops below 1.0 fish/100 m² at May-June runoff volumes at or below the survival threshold of 145,000 acre-ft at the Albuquerque gage. However, applying the polynomial regression model to May-June runoff volumes of less than about 52,500 acre-ft at the Albuquerque gage is extrapolating beyond the limits of the data used by the U.S. Fish and Wildlife Service to develop the model. Consequently, the validity of the model at May-June runoff volumes of less than 52,500 acre-ft at the Albuquerque gage is uncertain.

Table 1. Potential reduction in estimated Rio Grande silvery minnow October density associated with a 187 acre-ft reduction in May-June runoff volume at the Albuquerque gage. The survival threshold criterion is 145,000 acre-ft to achieve 1.0 fish/100 m². Rio Grande silvery minnow density estimates for baseline and reduced flow volumes were calculated using polynomial regression equation 1 in U.S. Fish and Wildlife Service (2016: Appendix A, page 22). Reduction in Rio Grande silvery minnow density was calculated as percentage difference using the formula $|(first\ value - second\ value)/(first\ value + second\ value)/2| \times 100$, where the “|” symbol indicates absolute value.

May-June Runoff Volume at Albuquerque	May-June Runoff Volume at Albuquerque Minus 187 AF	Reduction in Estimated Rio Grande Silvery Minnow October Density (fish/100 m ²)
145,000	144,813	0.25%
140,000	139,813	0.26%
130,000	129,813	0.29%
120,000	119,813	0.32%
110,000	109,813	0.36%
100,000	99,813	0.41%
90,000	89,813	0.49%
80,000	79,813	0.62%
70,000	69,813	0.86%
60,000	59,813	1.45%
52,500	52,313	3.19%

The potential effect of a 187 acre-ft reduction in May-June runoff volume on estimated Rio Grande silvery minnow October density ranges from a 0.25 percent decrease in density at the survival threshold to about a 1.45 percent decrease in density at a runoff volume of 60,000 acre-ft at the Albuquerque gage (Table 1). The lowest May-June runoff volume at the Albuquerque gage recorded since 1993 was 59,318 acre-ft in 2018. The small changes in estimated Rio Grande silvery minnow density associated with a 187 acre-ft reduction in May-June runoff volume are within the 95-percent confidence intervals of the polynomial model (Figure 4). Therefore, the potential effects of a 187 acre-ft reduction during spring runoff, even when runoff volume is at or below the survival threshold, are insignificant when considered alone. However, the small effect of the 187 acre-ft reduction, when added to the impacts of ongoing and future water development and management actions, may have other consequences for Rio Grande silvery minnow survival. Measures that will be implemented to avoid potential cumulative effects are described in section 4.

3.1.2 Effects on Critical Habitat Designated for Rio Grande Silvery Minnow

Effects of the proposed action on critical habitat designated for Rio Grande silvery minnow would be minor and would not result in adverse modification. As noted above in section 2.3, primary constituent elements of critical habitat include: 1) a suitable hydrologic regime, 2) presence of low-velocity habitats, 3) substrates consisting primarily of sand or silt, and 4) sufficient water quality (U.S. Fish and Wildlife Service, 2003: page 8117). A withdrawal of 1 mgd (equivalent to a constant flow of 1.55 cfs and a volume of 1,120 acre-ft/yr) is within the range of measurement error (+/- 3 percent; U.S. Geological Survey, 1992) for flows at the Otowi Bridge gage above 52 cfs, and mean daily flow at the Otowi Bridge gage has not fallen below 60 cfs since measurements started at that location in 1895. Also, 1,120 acre-ft/yr composes only 0.18 to 0.10 percent of total annual flow in very dry year to very wet year flow scenarios, respectively, for the Rio Grande at the Otowi Bridge gage (flow scenarios are from Roach, 2009: page 21). Consequently, the proposed action would have an insignificant effect on hydrologic regime.

Furthermore, the proposed action would not affect the availability of low-velocity habitats. A 1.55 cfs reduction at low flow would result in negligible changes in water level through the middle Rio Grande, ranging from 0.66 mm at the San Felipe gage to 4.03 mm at the Bernardo gage (Table 2). Low flow at selected gage sites was calculated as the 90th percentile of all non-zero mean daily flows (*i.e.* a flow that is exceeded for 90 percent of the non-zero flow record). A third-order logarithm curve was fit to U.S. Geological Survey field measurements of gage height and discharge to calculate water-level reductions associated with a 1.55 cfs decrease in flow at the three selected gage sites (Table 2). All three of the curve-fit equations had adjusted r^2 values greater than 0.98².

Table 2. Water-level decline associated with a 1.55 cfs reduction at low flow at three gage sites in the middle Rio Grande. Low flow for each gage was calculated as the flow that is exceeded for 90 percent of the non-zero flow record.

Stream Gage	Gage No.	Low Flow, cfs	Low Flow Reduced by 1.55 cfs	Water-Level Decline, ft (mm)
San Felipe	08319000	398	396.45	-0.002172 (-0.66)
Albuquerque	08330000	155	153.45	-0.004429 (-1.35)
Bernardo	08331010	48	46.45	-0.013208 (-4.03)

Finally, the proposed action would not have any effect on substrate conditions or water quality in critical habitat designated for Rio Grande silvery minnow because it would not alter sediment input or the chemical composition of water in the Rio Grande. Moreover, because the proposed action would have insignificant effects on flow volume in the middle Rio Grande, it would not alter the concentration of sediment or chemical constituents in the water or sediment transport dynamics.

² r^2 is a statistical measure of how close the data are to the fitted regression line. An r^2 value of 1 indicates that all of the data points lie exactly on the fitted regression line (*i.e.* there is no variation).

3.2 Anticipated Take of Covered Species

Incidental take of Rio Grande silvery minnow from the proposed water withdrawal at the Santa Clara Pueblo well-field area is difficult to quantify because of the very small potential effects on downstream flows, particularly in the context of the magnitude of variability in the relationship between stream flows and Rio Grande silvery minnow density and occupancy. Potential incidental take can be expressed as reduced density associated with small reductions in flow. However, the extent of incidental take associated with the proposed action would be minor, as described in detail above in section 3.1 and summarized below.

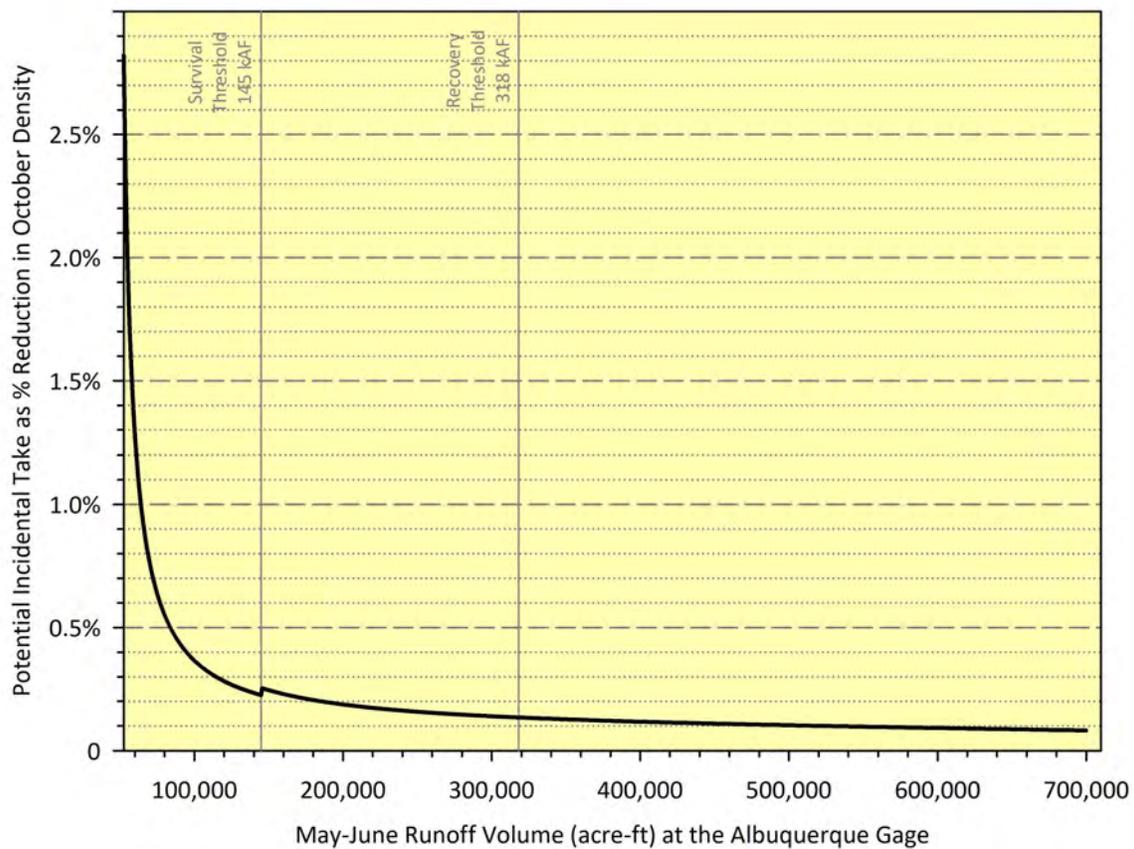
1. The change in river flows associated with the proposed pumping would be so slight as to be undetectable, given current technology, when discharge is above approximately 52 cfs at Otowi gage. River flows this low have never been recorded. Similarly, a 1,120 acre-ft/yr reduction in annual flow volume of the middle Rio Grande would be negligible (see discussion in section 3.1).
2. Proposed pumping would reduce May-June runoff volume by 187 acre-ft (3.07 acre-ft/day), which is only 0.06 percent of the Service's estimated conservation threshold runoff volume at the Albuquerque gage of 318,000 acre-ft and 0.13 percent of the estimated survival threshold runoff volume at the Albuquerque gage of 145,000 acre-ft.
3. The 187 acre-ft reduction in May-June runoff volume would translate to an estimated maximum decline in Rio Grande silvery minnow October density of 0.25 percent at the survival threshold, which would be biologically indiscernible given the confidence intervals of the flow-density relationship (Figure 4). The decline in estimated Rio Grande silvery minnow October density becomes smaller and smaller as spring runoff volumes increase above 145,000 acre-ft at the Albuquerque gage.
4. Implementation of the conservation measure described in section 4 below would minimize indirect effects by reducing the May-June runoff depletion by 21.5 acre-ft, from 187 to 165.5 acre-ft, when May-June runoff is forecast to be at or below the survival threshold (*i.e.* 145,000 acre-ft at the Albuquerque gage).

October density of Rio Grande silvery minnow was used for estimating potential incidental take because: 1) the proposed action involves water withdrawal that may indirectly affect Rio Grande silvery minnow downstream from the well-field area; and 2) the Service's polynomial regression model (U.S. Fish and Wildlife Service, 2016: Appendix A, page 22), which is the best available science for determining flow effects on Rio Grande silvery minnow, uses October density as its output. However, applying the model to May-June runoff volumes of less than about 52,500 acre-ft at the Albuquerque gage is extrapolating beyond the limits of the data used by the U.S. Fish and Wildlife Service to develop the model. Consequently, the validity of the model at May-June runoff volumes of less than 52,500 acre-ft at the Albuquerque gage is uncertain. Therefore, potential incidental take is estimated for May-June runoff volumes of 52,500 acre-ft or more. May-June runoff volumes at Albuquerque less than 52,500 acre-ft would be considered an unforeseen circumstance (see section 6 and definition in section 12). Potential incidental take of Rio Grande silvery minnow is presented in Table 3 and graphically in Figure 6. The extent of potential incidental take presented in Table 3 and Figure 6 includes implementation of the conservation measure described below in section 4. The potential reduction in Rio Grande silvery minnow October density was calculated as percentage difference using the formula $|(first\ value - second\ value)/(first\ value + second\ value)/2| \times 100$, where the “|” symbol indicates absolute value.

Table 3. Potential incidental take of Rio Grande silvery minnow from the proposed action, which includes the conservation measure described in section 4. Estimated mean density of Rio Grande silvery minnow in October was calculated using the polynomial regression from U.S. Fish and Wildlife Service (2016: Appendix A, page 22, equation 1). This equation is: $E(x) = (10^{(-0.1447 + 0.0000032265 \times AF)}) - ((AF^2 \times 0.000000000097574)) - 1$, where $E(x)$ = estimated Rio Grande silvery minnow October density as number/100m² and AF = May-June runoff volume at the Albuquerque gage, in acre-feet. Reduction in Rio Grande silvery minnow density was calculated as percentage difference using the formula $(\text{first value} - \text{second value}) / (\text{first value} + \text{second value}) / 2 \times 100$, where the “|” symbol indicates absolute value.

Baseline		With Proposed Action		Potential Incidental Take as % Reduction in Mean Oct. Density (fish/100 m ²)
Albuquerque Gage May-June Runoff (acre-ft)	Rio Grande Silvery Minnow Mean Oct. Density (fish/100 m ²)	Albuquerque Gage May-June Runoff (acre-ft)	Rio Grande Silvery Minnow Mean Oct. Density (fish/100 m ²)	
700,000	41.9277	699,813	41.8933	0.08%
600,000	26.3485	599,813	26.3243	0.09%
500,000	15.6577	499,813	15.6415	0.10%
400,000	8.7002	399,813	8.6900	0.12%
300,000	4.4005	299,813	4.3943	0.14%
200,000	1.8746	199,813	1.8710	0.19%
150,000	1.0622	149,813	1.0595	0.25%
145,000	0.9936	144,834	0.9913	0.23%
140,000	0.9270	139,834	0.9248	0.23%
130,000	0.7999	129,834	0.7979	0.26%
120,000	0.6805	119,834	0.6785	0.28%
110,000	0.5682	109,834	0.5664	0.32%
100,000	0.4628	99,834	0.4611	0.37%
90,000	0.3639	89,834	0.3623	0.44%
80,000	0.2711	79,834	0.2696	0.55%
70,000	0.1841	69,834	0.1827	0.76%
60,000	0.1025	59,834	0.1012	1.28%
52,500	0.0433	52,313	0.0435	2.82%

Figure 6. Potential incidental take for May-June runoff ranging from 52,500-700,000 acre-ft at the Albuquerque gage. Potential incidental take depicted in the graph includes the conservation measure described in section 4. Estimated mean density of Rio Grande silvery minnow in October was calculated using the polynomial regression from U.S. Fish and Wildlife Service (2016: Appendix A, page 22, equation 1). This equation is: $E(x) = (10^{(-0.1447 + 0.0000032265 \times AF)} - ((AF^2 \times 0.00000000000097574))) - 1$, where $E(x)$ = estimated Rio Grande silvery minnow October density as number/100m² and AF = May-June runoff volume at the Albuquerque gage, in acre-feet. Reduction in Rio Grande silvery minnow density was calculated as percentage difference using the formula $|(\text{first value} - \text{second value}) / (\text{first value} + \text{second value})| \times 100$, where the “|” symbol indicates absolute value.



4. HABITAT CONSERVATION PLAN

4.1 Actions to Minimize Impacts

As described in section 3, when considered alone effects of the proposed action on Rio Grande silvery minnow and its critical habitat are minor. However, when spring runoff is at or below thresholds defined by the Service for survival of the species the effect of the proposed action, while minor considered by itself, may add incrementally to existing and future water management actions to potentially result in cumulative impacts. In order to avoid potential cumulative impacts the following action will be implemented when spring runoff flows are at or below the survival threshold for density (145,000 acre-ft for May-June flow volume at the Albuquerque gage).

The May-June flow volume threshold, defined by flows at the Albuquerque gage, are closely related to flows at the Otowi Bridge as indicated by linear regression of data from 1993 through 2016 (Figure 7). Using this regression equation, a May-June flow volume of 145,000 acre-ft at the Albuquerque gage (the survival threshold for density) corresponds to approximately 205,010 acre-ft at the Otowi Bridge gage.

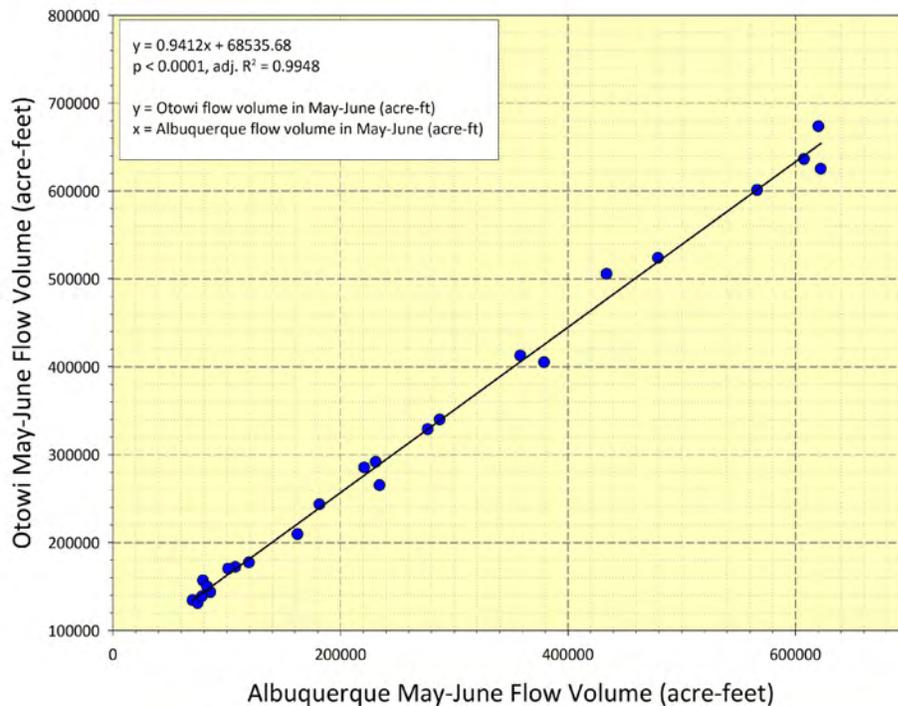


Figure 7. Linear regression of Albuquerque and Otowi spring runoff volumes, 1993 to 2016.

In order to minimize potential impacts to Rio Grande silvery minnow, the 1 mgd pumping for the "four corners" development will be suspended for seven consecutive days in May when the estimated May-June runoff volume at the Otowi Bridge gage is at or below the threshold value of 205,010 acre-ft.

Through this, Santa Clara Pueblo is minimizing potential effects to the maximum extent practicable for the following reasons. First, the duration of peak spawning activity of Rio Grande silvery minnow is typically less than seven days (Platania and Dudley, 2003: 19). Second, the Pueblo cannot meet its objectives to supply water reliably to a regional health facility and other facilities to be built at the "four corners" development if a longer suspension of pumping is imposed upon the Pueblo. There is not an alternate reliable long-term water supply available (see section 11) and constructing or developing facilities to accommodate the entire demand of the "four corners" development for more than seven consecutive days is impracticable and would be inappropriately burdensome on the Pueblo since the best available science indicates the peak spawning period is not more than seven days.

The process for obtaining and evaluating runoff data will be as follows.

- 1) On or about April 1st of every year, the Pueblo of Santa Clara will obtain the Natural Resources Conservation Service's April 1 forecast for the April through July flow volume (50-percent value) at the Otowi gage from <https://www.wcc.nrcs.usda.gov/basin.html>.
- 2) The April through July runoff volume forecast will be adjusted to an estimate of May-June runoff volume using the regression equation shown in Figure 8A. This regression describes the relationship between the April-July forecast and actual May-June runoff volume (calculated using mean daily flow data) at the Otowi gage for the period from 1993 through 2018.
- 3) If the estimate for May-June runoff volume at the Otowi gage is 205,010 acre-feet or less, suspension of the 1 mgd pumping for the "four corners" development will be planned for seven consecutive days in May.
- 4) On or about May 1st, the Pueblo of Santa Clara will obtain the Natural Resources Conservation Service's updated forecast for the May through July flow volume (50-percent value) at the Otowi gage from <https://www.wcc.nrcs.usda.gov/basin.html>.
- 5) The May through July runoff volume forecast will be adjusted to an updated estimate of May-June runoff volume using the regression equation shown in Figure 8B. This regression describes the relationship between the May-July forecast and actual May-June runoff volume (calculated using mean daily flow data) at the Otowi gage for the period from 1993 through 2018.
- 6) If the updated estimate for May-June runoff volume at the Otowi gage is 205,010 acre-feet or less, suspension of the 1 mgd pumping for the "four corners" development will be implemented for seven consecutive days in May. The specific schedule for the seven-day suspension period will be determined by the Pueblo of Santa Clara in consultation with the U.S. Fish and Wildlife Service. If the updated estimate for May-June runoff is above 205,010 acre-ft, no pumping suspension will occur.

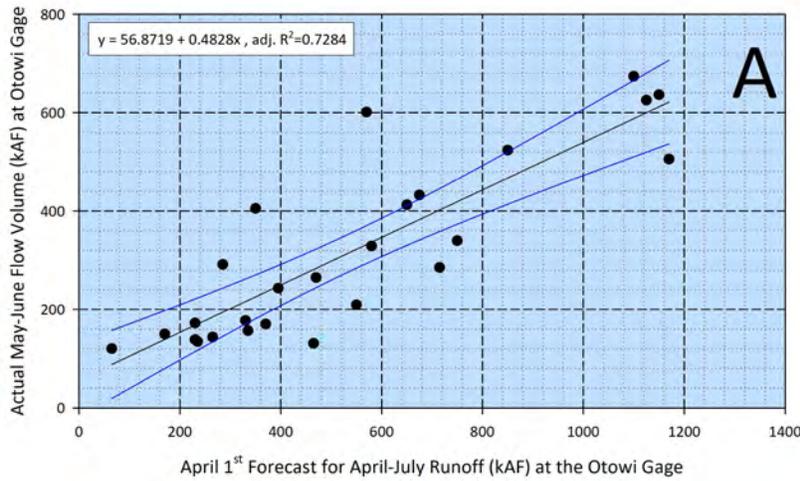
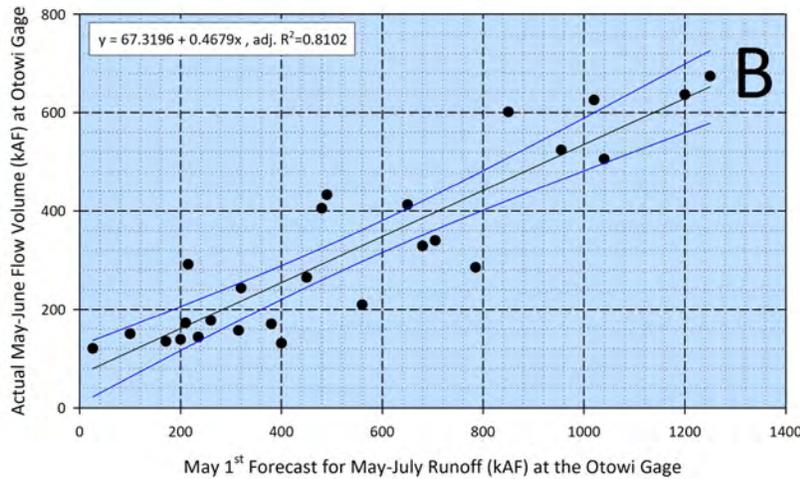


Figure 8. Relationship between NRCS April and May forecasts and actual May-June flow volume at the Otowi gage. Graph "A" shows the April 1 forecast vs. actual May-June runoff at the Otowi gage and graph "B" shows the May 1 forecast vs. actual May-June runoff at the Otowi gage. The blue lines in each graph show the 95% confidence interval bands for the regression equations.



Due to the characteristics of the alluvial aquifer, it is assumed that there will be no lag between suspension of pumping and potential effects on surface flow in the Rio Grande at the well site (Melis and Peery, 2017). Consequently, it is assumed that pumping suspension will have an immediate effect on flows. Eggs of Rio Grande silvery minnow start to appear in the middle Rio Grande in the beginning of May (Turner *et al.*, 2010; Krabbenhoft *et al.*, 2014). Because runoff typically occurs earlier during low-flow years, an effort will be made to schedule the seven-day pumping suspension period sometime during the first two weeks of May when suspension is called for.

Water conservation measures, short-term water storage facilities, and emergency water sources would be used to meet water demand when seven-day pumping suspension is implemented. Short-term water storage facilities may include above-ground tanks and surface-water ponds. Emergency water sources may include existing supply wells located east of the well-field area on lands owned in federally-restricted fee status by

the Pueblo of Santa Clara (the Black Mesa area). The Black Mesa supply wells are in a compartmentalized unit of the Tesuque Formation aquifer, and therefore have limited natural recharge. Past pumping from these wells has exceeded the limited natural recharge resulting in an average water-level decline of 39 to 46 ft/yr from 2004 to 2017, and water production from these wells has decreased markedly (E. Melis, John Shomaker and Associates, Inc., personal communication 1 November 2017). Emergency use of this local, compartmentalized aquifer for water storage and recovery may contribute to providing water during periods of suspended pumping (John Shomaker and Associates, Inc., 2017a). Aquifer recharge may be accomplished gradually by periodically piping portions of the 1 mgd withdrawal to existing supply wells where the water will be put into the compartmentalized aquifer to provide reserve storage.

4.2 Monitoring and Reporting

Monitoring and reporting for this LEHCP follows established guidance, which states that "... monitoring programs for HCPs with lesser impacts of short duration might only involve filing simple reports that document whether the HCP has been implemented as described" (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: pages 10-1 and 10-2).

Total monthly production pumping volumes for the "four corners" development, a description of any pumping suspension that was conducted, and, when applicable, an estimate of potential incidental take of Rio Grande silvery minnow will be available for the Service to review on a quarterly basis (*i.e.* Jan-Mar, Apr-Jun, Jul-Sep, and Oct-Dec). Notification of the availability of quarterly reports will be provided by the Governor of the Pueblo of Santa Clara or the Governor's designee to the Supervisor of the New Mexico Ecological Services Field Office of the U.S. Fish and Wildlife Service no later than 30 days following the end of each quarter. Quarterly reports will be available for inspection at the Pueblo of Santa Clara by appointment at the Pueblo of Santa Clara Governor's Office located at 578 Kee Street in Española (505-753-7330).

Incidental take will be estimated by adding the pumping volume with a seven-day suspension (187 acre-ft - 21.5 acre-ft = 165.5 acre-ft) to the actual May-June runoff volume at the Albuquerque gage. Rio Grande silvery minnow mean October density will then be estimated using the polynomial regression for the actual and adjusted May-June runoff volumes, with the difference indicating the extent of potential incidental take. The polynomial regression equation that will be used is from U.S. Fish and Wildlife Service (2016: Appendix A, page 22, equation 1). This equation is: $E(x) = (10^{(-0.1447 + 0.0000032265 \times AF)}) - ((AF^2 \times 0.0000000000097574)) - 1$, where $E(x)$ = estimated Rio Grande silvery minnow density in October as number/100m² and AF = May-June runoff volume at the Albuquerque gage, in acre-feet. A spreadsheet for monitoring pumping volumes and potential incidental take has been developed to facilitate and standardize monitoring and reporting.

Reporting will address only the 1 mgd withdrawal that is associated with the proposed action. Reporting will not include other water withdrawals from the Santa Clara Pueblo wells in the well-field area that has already been deemed to be part of the environmental baseline for the Rio Grande silvery minnow (U.S. Fish and Wildlife Service, 2016: page 29). This baseline includes ongoing withdrawals from the wells for the 102.4-acre Black Mesa Golf Course, which are approximately 1 mgd (John Shomaker and Associates, Inc., 2017b).

4.3 Funding

Funding will be made available by the Pueblo of Santa Clara to adequately implement the LEHCP, including funding for the measures to minimize and monitor potential incidental take of Rio Grande silvery minnow that may occur in the Middle Rio Grande downstream from the well-field area as an indirect effect of the proposed action.

The Pueblo of Santa Clara's obligations for funding are limited to the conservation, monitoring, and reporting commitments described in this LEHCP and administration of the LEHCP, as summarized below.

1. The Pueblo of Santa Clara's obligations for LEHCP administration, monitoring, and reporting (see generally section 4) include tracking and recording monthly pumping volumes, evaluating spring runoff forecasts, providing notice when a seven-day pumping suspension is triggered, coordinating any necessary pumping suspension with the U.S. Fish and Wildlife Service, maintaining records of pumping volumes, generating quarterly reports, and coordinating with the U.S. Fish and Wildlife Service regarding unforeseen circumstances (see section 6) or any potential amendments to the LEHCP (see section 7).
2. The Pueblo of Santa Clara's conservation obligations consist of suspending pumping from the well-field area for the "four corners" development when called for (see section 4.1) and providing an alternate water supply to the development during pumping suspension. Providing an alternate water supply to the "four corners" development during pumping suspension will be accomplished by implementing measures such as emergency water conservation, drawing from emergency water sources, and using short-term water storage facilities. Emergency water sources may include short-term use of existing, upland supply wells in the compartmentalized Tesuque Formation aquifer, which have small capacity and limited natural recharge (see section 4.1). The compartmentalized Tesuque Formation aquifer may be augmented through artificial recharge by developing aquifer storage and recovery (ASR) wells. The proposed action addresses water needs at full build-out of the "four corners" development. Until such water is needed for the development, however, there will be no pumping to suspend. Development of the "four corners" area will be phased, with full development not occurring for at least several years.

The Pueblo of Santa Clara will provide, or cause to be provided, funding or funding mechanisms sufficient to implement the LEHCP. The Santa Clara Development Corporation (SCDC), a corporation wholly owned by the Pueblo of Santa Clara, will oversee the build-out of the "four corners" development. Existing revenue streams generated by commercial activities administered by the SCDC on the Pueblo of Santa Clara have funded the development of the infrastructure to date and the development of the LEHCP. The Pueblo is in the process of developing a new utility department that may assume oversight of water distribution for SCDC enterprises and may assume the obligations described herein. Monitoring and reporting duties for this LEHCP will be fulfilled by existing departments at the Pueblo of Santa Clara and SCDC as part of the staff's regular duties until such time as the utility department assumes those duties. Funding for any refurbishing or replacement of the existing Tesuque Formation wells or development of additional storage or ASR, if and when needed for pumping associated with the proposed action, will be generated from payments by businesses of the "four corners" development.

5. CHANGED CIRCUMSTANCES

The Habitat Conservation Plan Assurances ("No Surprises") Rule at 50 CFR 17.22(b)(5)-(6) defines "changed circumstances" and describes the obligations of the Permittee and the Service. The Service provides regulatory assurances under the No Surprises policy to Permittees who incorporate provisions for changed or unforeseen circumstances in their HCP and fully and completely implement the terms and conditions of the HCP and incidental take permit. These assurances give Permittees certainty regarding the costs of mitigation and conservation of protected species. Changed circumstances are defined as changes in circumstances affecting a species or geographic area covered by the HCP that can reasonably be anticipated by plan developers and the Service and that can be planned for (*e.g.*, the listing of a new species, fire or other natural catastrophic events in areas prone to such events).

The minor effect of the proposed action on flows in the Rio Grande and the 20-year duration of the permit make the occurrence of any changed circumstances unlikely. The proposed action and mitigation measures in this LEHCP already take into account the Service's polynomial regression model, which provides the best available science predictions regarding climate-associated effects on river flows and Rio Grande silvery minnow. Therefore, no changed circumstances are addressed.

6. UNFORESEEN CIRCUMSTANCES

For the purpose of this LEHCP, unforeseen circumstances are defined as the advent of new conditions that could not have been anticipated in developing this LEHCP and which indicate additional mitigation is needed for Rio Grande silvery minnow. In the event of unforeseen circumstances, the permit holder (the Pueblo of Santa Clara) will not be obligated or required to commit additional lands, additional financial compensation, or be subject to any additional restrictions on lands or other natural resources released for development use, pursuant to the "No Surprises" assurances (U.S. Fish and Wildlife Service, 1998). If unforeseen circumstances do arise which warrant additional mitigation, that mitigation will, to the maximum extent possible, be consistent with the original terms of this LEHCP and will require consent of the Pueblo of Santa Clara. Also, any such changes will be limited to modifications of the measure specified in section 3.1 of this LEHCP for avoidance of impacts to Rio Grande silvery minnow. The "No Surprises" assurances will apply only if the permit holder is properly implementing the LEHCP and has complied with its commitments and obligations.

7. AMENDMENT PROCESS

7.1 Minor Amendments

The Pueblo of Santa Clara or the Service may propose minor modifications to the LEHCP by providing notice to the other. Such notice shall include a statement of the reason for the proposed modification and an analysis of its environmental effects, including its effects on operations under the LEHCP and on covered species. Minor amendments are permissible without amending the underlying section 10(a)(1)(B) permit provided that the Service determines that the changes do not:

- cause additional take of Rio Grande silvery minnow that was not analyzed in connection with the original LEHCP;
- result in operations under the LEHCP that are significantly different from those analyzed in connection with the original LEHCP; or
- have adverse effects on the environment that are new or significantly different from those analyzed in connection with the original LEHCP.

Minor amendments to this LEHCP may include, but are not limited to, corrections of typographic, grammatical, and similar editing errors that do not change the intended meaning or corrections to any figures, tables, or appendices to correct errors or to reflect previously approved changes in the permit or LEHCP. All minor amendments to this LEHCP will be submitted in writing.

7.2 Formal Amendments

Amendments to the LEHCP that are more extensive than the minor modifications described above will be processed as formal amendments in accordance with all applicable legal requirements, including but not limited to the ESA, the National Environmental Policy Act, and the Service's permit regulations. When the Service or the Pueblo of Santa Clara believe that a formal amendment to the LEHCP is required, the Pueblo of Santa Clara will prepare the appropriate documentation for submission to the Service. The documentation will include a description of the event or activity and an assessment of its impacts. The amendment will describe any changes to mitigation measures, if needed, to ensure that Rio Grande silvery minnow is appropriately protected.

8. PERMIT RENEWAL OR EXTENSION

The incidental take permit may be renewed or extended with the approval of the Service. A request to renew or extend the permit must be submitted in writing by the Pueblo of Santa Clara and include the following components.

- The incidental take permit number.
- A certification that all statements and information in the original application are still correct or, if not, a list of changes.
- Specific information concerning what take has occurred under the existing permit and what portions of the project are to be continued.

The request must be made to the U.S. Fish and Wildlife Service's New Mexico Ecological Services Office at least 30 days prior to the permit expiration date. As long as the request is received within 30 days prior to the permit expiration date, the existing permit will remain valid while the renewal or extension is being processed. Changes to the LEHCP that would qualify as a formal amendment will be handled in accordance with section 7.2.

9. SUSPENSION OR REVOCATION

The Service may suspend or revoke the incidental take permit if the Pueblo of Santa Clara fails to implement the LEHCP in accordance with the terms and conditions of the permit or if suspension or revocation is otherwise required by law. Suspension or revocation of the section 10(a)(1)(B) permit, in whole or in part, by the Service shall be in accordance with 50 CFR 13.27-29, 17.32 (b)(8).

10. OTHER MEASURES

No other measures have been identified by the Service as necessary or appropriate for this LEHCP.

11. ALTERNATIVES CONSIDERED

Two alternatives were considered: the Proposed Action and No Action. For the purposes of this LEHCP, the No Action alternative is defined as no pumping from the alluvial wells for the "four corners" development. Accordingly, the No Action alternative would not involve any potential incidental take of Rio Grande silvery minnow.

There are no practicable alternatives for long-term and reliable water sources for the proposed "four corners" development. The only other potential source of water in the area is the compartmentalized unit of the Tesuque Formation aquifer. However, as noted in section 3.1, the local Tesuque Formation aquifer cannot support continued production pumping to meet existing demands, let alone additional demands. Past pumping from the existing production wells in the Tesuque Formation aquifer has exceeded the limited natural recharge. This has resulted in substantial groundwater decline and marked decrease in water production from the wells (E. Melis, John Shomaker and Associates, Inc., personal communication 1 November 2017). The current potential yield from the Tesuque Formation aquifer wells is only approximately 0.3 mgd (D. Heflick, project manager for Santa Clara Development Corporation, personal communication, 24 April 2019). This is substantially less than the 1 mgd needed for the proposed development, and therefore would not meet the project need.

12. DEFINITIONS

Act Endangered Species Act.

Changed circumstances Changes in circumstances that affect a species or geographic area covered by the HCP that can reasonably be anticipated and that can be planned for (*e.g.* listing of a new species, fire or other natural events in areas prone to such events).

ESA Endangered Species Act.

Extirpated Locally extinct, meaning that the species ceases to exist in the specified geographic area though it still exists elsewhere.

LEHCP Low-Effect Habitat Conservation Plan.

Permit area The geographic area where the impacts of the activity occur, and for which an incidental take permit is requested.

Plan area All of the areas that will be used for activities described in the HCP

Service U.S. Fish and Wildlife Service

Take The term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Unforeseen circumstances Changes in circumstances that affect a species or geographic area covered by the HCP that could not reasonably have been anticipated at the time the HCP was developed.

13. LITERATURE CITED

Bestgen, K. R. and S. P. Platania. 1991. Status and conservation of the Rio Grande silvery minnow, *Hybognathus amarus*. *Southwestern Naturalist* 36(2):225-232.

Department of the Interior. 2004. Departmental manual. Series 31: Environmental Quality Programs, Part 516: National Environmental Policy Act of 1969, Chapter 8: Managing the NEPA Process - U.S. Fish and Wildlife Service. Effective date 27 May 2004.

- John Shomaker and Associates, Inc. 2017a. Technical memorandum: Hydrogeologic controls governing ASR (aquifer storage and recovery) at Santa Clara Pueblo. Memo by Erwin Melis to John Pittenger, December 5, 2017 (on file at the Pueblo of Santa Clara).
- John Shomaker and Associates, Inc. 2017b. Technical memorandum: Estimates of golf course water demand. Memo by Michael Jones to Dennis Heflick, May 1, 2017 (on file at the Pueblo of Santa Clara).
- Krabbenhoft, T. J., S. P. Platania, and T. F. Turner. 2014. Interannual variation in reproductive phenology in a riverine fish assemblage: implications for predicting the effects of climate change and altered flows. *Freshwater Biology* 59: 1744-1754.
- Melis, E. A. and R. Peery. 2017. Well report and hydrogeologic evaluation for alluvium along the Rio Grande penetrated by the Riverside test well, Santa Clara Pueblo, New Mexico. Confidential report prepared by John Shomaker and Associates, Inc. for Sullivan Design Group and Santa Clara Development Corporation. 12 pp. + illustrations and appendices (on file at the Pueblo of Santa Clara).
- Platania, S. P. and C. S. Altenbach. 1998. Reproductive strategies and egg types of seven Rio Grande basin cyprinids. *Copeia* 1998 (3):559-569.
- Platania, S. P. and R. K. Dudley. 2003. Summary of the biology of Rio Grande silvery minnow, an endangered species in the middle Rio Grande, New Mexico. American Southwest Ichthyological Research Foundation and Division of Fishes, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico. 30 pp.
- Roach, J. D. 2009. Stochastic hydrologic analysis of the upper Rio Grande surface water system in New Mexico, July 1, 2009. Unpublished report, Sandia National Laboratories. 79 pp.
- Souder, Miller and Associates, Inc. 2016. Final preliminary engineering report, regional health facility site utility master plan for the Santa Clara Pueblo, Sombrillo, Santa Fe County, New Mexico. 80 pp. (on file at the Pueblo of Santa Clara).
- Turner, T. F., T. J. Krabbenhoft, and A. S. Burdett. 2010. Reproductive phenology and fish community structure in an arid-land river system. Pages 427-446 *in*: Gido, K. B. and D. A. Jackson (eds.). *Community ecology of stream fishes: concepts, approaches, techniques*. American Fisheries Society Symposium 73, Bethesda, Maryland.
- U.S. Fish and Wildlife Service. 1994. Final rule to list the Rio Grande silvery minnow as an endangered species, Wednesday, 20 July 1994. *Federal Register* 59(138): 36988-36995.
- U.S. Fish and Wildlife Service. 1998. Habitat conservation plan assurances ('no surprises') final rule, Monday, 23 February 1998. *Federal Register* 63(35): 8859-8873.

- U.S. Fish and Wildlife Service. 2003. Designation of critical habitat for the Rio Grande silvery minnow; final rule, Wednesday, 19 February 2003. Federal Register 68(33): 8088-8135.
- U.S. Fish and Wildlife Service. 2010. Rio Grande silvery minnow recovery plan (*Hybognathus amarus*), first revision. Southwest Region, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 210 pp.
- U.S. Fish and Wildlife Service. 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. U.S. Department of the Interior, Fish and Wildlife Service, New Mexico Ecological Services Field Office, Albuquerque, New Mexico. 192 pp. + appendices.
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 2016. Habitat conservation planning and incidental take permit processing handbook. U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 21 December 2016.

APPENDIX A: EVALUATION OF CATEGORICAL EXCLUSION CRITERIA

The Pueblo of Santa Clara proposes that this plan be evaluated as a low-effect HCP. In order for an HCP to be considered low-effect, a categorical exclusion to detailed analysis under the National Environmental Policy Act must be applicable (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: page 13-11). This requires that four criteria be met. These four criteria are listed below, along with an affirmative determination for each and an associated brief explanation of the determination.

A.1 Categorical Exclusion Screening Criteria

- 1. The effects of the HCP on federally listed, proposed or candidate species covered under the HCP are minor or negligible (Department of the Interior, 2004: §8.5[C][2]).**

As described in sections 3.2 and 4.1 of this LEHCP, any take of Rio Grande silvery minnow that may occur with the proposed action would, after minimization and mitigation measures are implemented, be so minor as to result in negligible effects to the species.

- 2. The effects of the HCP are minor or negligible on all other components of the human environment after implementation of mitigation measures (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: page 13-11; 43 Code of Federal Regulations §46.205).**

Full implementation of the LEHCP, including minimization and mitigation measures described in section 4.1, would result in negligible effects on flow volumes, flow rates, water surface elevation, and other environmental features associated with the Rio Grande, as described in section 3.1 and Appendix B (section B.2.2).

- 3. The incremental effects of the HCP, considered together with the impacts of other past, present, and reasonably foreseeable future actions would not result, over time, in significant cumulative effects to the human environment (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: page 13-11; 43 Code of Federal Regulations §46.205).**

As described in section 4.1, measures taken to avoid impacts would ensure that the proposed action does not have cumulative effects.

4. None of the following 12 extraordinary circumstances listed at 43 Code of Federal Regulations §46.215 apply to the proposed action.

A. Have significant impacts on public health or safety?

The proposed action does not involve any ground disturbance and there would be no air quality, hazardous materials, or noise pollution impacts associated with the proposed action that could affect public health or safety. The proposed action addresses additional water withdrawals from existing infrastructure that has already received Nationwide Permit 12 construction clearance pursuant to Section 404 of the Clean Water Act from the Army Corps of Engineers and Section 401 Certification from Santa Clara Pueblo in accordance with the Santa Clara Pueblo Water Quality Code adopted as amended by the Santa Clara Tribal Council by Resolution No. 2003-27 and approved by the Secretary of the Interior effective as of August 5, 2003 (on file at the Pueblo of Santa Clara). Any water withdrawn from the shallow wells and any aquifer storage and recovery projects for emergency supply use during periods of suspended pumping (see section 4.1) will meet applicable water quality standards.

B. Have significant impacts on such natural resources and unique geographic characteristics as historic or cultural resources; park, recreation, or refuge lands; wilderness areas; wild or scenic rivers; national natural landmarks; sole or principal drinking water aquifers; prime farmlands; wetlands (Executive Order 11990) or floodplains (Executive Order 11988); national monuments; migratory birds, eagles, or other ecologically significant or critical resources?

The proposed action does not involve any ground-disturbing activities, and the existing well and pipeline infrastructure have received cultural resource clearance from the Pueblo of Santa Clara Tribal Historic Preservation Office.

The well-field area is not located in an area designated as a Wilderness, National Wildlife Refuge, Wild and Scenic River, National Natural Landmark or National Monument. The well-field area is not in an area considered or designated as a park or recreation area.

The well-field area is located in the Española Basin Aquifer System Sole-Source Aquifer (U.S. Environmental Protection Agency, 2017 and 2008). The sole-source aquifer designation requires that all federally funded projects that have the potential to contaminate water in the designated area be reviewed by the U.S. Environmental Protection Agency. The proposed action does not have any federal funding and would not involve any discharge of contaminants. All uses and dispositions of water withdrawals associated with the proposed action would be subject to all applicable Clean Water Act or Safe Drinking Water Act standards, depending on use, and would not contaminate the aquifer.

Soils in the well-field area are mapped as Abiquiu-Peralta complex, 0 to 3 percent slopes and Walrees-Abiquiu complex, 0 to 2 percent slopes (Natural Resources Conservation Service, 2017). Neither of these soil map units are classified as prime farmland.

No jurisdictional wetlands will be affected as the proposed action does not involve any ground-disturbing activities (*i.e.* no excavation or placement fill in jurisdictional wetlands would occur with the proposed action). There are no jurisdictional wetlands in the well-field area (U.S. Army Corps of Engineers, 2017).

The well-field area is located in the floodplain of the Rio Grande (Natural Resources Conservation Service, 2017). However, the proposed action does not include any ground-disturbing activities and will not modify the floodplain or alter land use patterns on the floodplain, nor will it alter existing flood risks or hazards or natural and beneficial floodplain values (*cf.* Federal Emergency Management Agency, 2015).

The proposed action will not have any effect on migratory birds, eagles, or other ecologically significant or critical resources. The direct effect of the proposed action consists of minute changes in stream flow. This effect would not translate to any measurable change in habitats along the Rio Grande, as described in section B.2.2 of Appendix B.

C. Have highly controversial environmental effects (defined at 43 CFR 46.30), or involve unresolved conflicts concerning alternative uses of available resources?

The environmental consequences of the proposed action are straightforward and not the subject of substantial dispute. The effect of the proposed action consists of minute changes in flows in the Rio Grande, as described in section 3.1 and section B.2.2 in Appendix B. The right of the Pueblo of Santa Clara to develop its own currently unadjudicated water resources does not constitute an unresolved conflict as this use is recognized and protected under federal law, including, but not limited to, exercise of its time immemorial water rights.

D. Have highly uncertain and potentially significant environmental effects, or involve unique or unknown environmental risks?

As described in section 3.1 and section B.2.2 in Appendix B, effects of the proposed action are known with a high degree of certainty and are not unique or significant because of their low magnitude and intensity.

E. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?

Issuance of an incidental take permit associated with this LEHCP will not constitute a precedent for future action by the Service. There are no related or connected actions that depend upon issuance of an incidental take permit associated with this LEHCP, other than the “four corners” development which is contingent upon implementation of the proposed action. The Service does not have any control or responsibility over the “four corners” development. Therefore, the proposed action does not constitute a precedent for future actions by the Service.

F. Have a direct relationship to other actions with individually insignificant but cumulatively significant environmental effects?

Potential cumulative effects will be avoided with implementation of the measure described in section 4.1.

G. Have significant impacts on properties listed, or eligible for listing, on the National Register of Historic Places?

The proposed action does not involve any ground-disturbing activities, and the proposed action has received cultural resource clearance from the Pueblo of Santa Clara Tribal Historic Preservation Office (Pueblo of Santa Clara, 2017). In addition, because no ground-disturbing activities would occur with implementation of the proposed action, no properties listed or eligible for listing on the National Register of Historic Places would be affected by the proposed action.

H. Have significant impacts on species listed, or proposed to be listed, on the List of Endangered or Threatened Species, or have significant impacts on designated Critical Habitat for these species?

As described in Appendix B, only Rio Grande silvery minnow and its critical habitat are likely to be potentially affected by the proposed action. Potential effects on Rio Grande silvery minnow and its critical habitat are minor, as described in sections 3.1 and 3.2.

I. Violate a Federal law, or a State, local, or tribal law, or a requirement imposed for the protection of the environment?

Implementation of the proposed action and this LEHCP will be in compliance with all federal and Tribal laws regarding protection of the environment. State and local laws do not apply because the plan area is located on land owned in federally-restricted fee status by the Pueblo of Santa Clara.

J. Have a disproportionately high and adverse effect on low income or minority populations (Executive Order 12898)?

The proposed action would facilitate social and economic improvements for the Native American population of the Pueblo of Santa Clara and surrounding minority populations. These beneficial effects would not be realized if the proposed action is not implemented.

K. Limit access to and ceremonial use of Indian sacred sites on Federal lands by Indian religious practitioners or significantly adversely affect the physical integrity of such sacred sites (Executive Order 13007)?

The proposed action would not limit access to or ceremonial use of Indian sacred sites on Federal lands, nor would it adversely affect the physical integrity of any such sites.

L. Contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area or actions that may promote the introduction, growth, or expansion of the range of such species (Federal Noxious Weed Control Act and Executive Order 13112)?

The proposed action does not involve any ground-disturbing activities and therefore would not result in the establishment or spread of any noxious weeds. No non-native species would be introduced to the plan and permit area as a result of the proposed action.

A.2 Literature Cited

Federal Emergency Management Agency. 2015. Guidelines for implementing Executive Order 11988, Floodplain Management, and Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input. 80 pp.

Natural Resources Conservation Service. 2017. Web Soil Survey. <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> (accessed on 11 December 2017).

Pueblo of Santa Clara. 2017. Letter from Governor of Santa Clara Pueblo, J. Michael Chavarria to Dennis Heflick, Tomahawk Consulting LLC, dated 21 April 2017 (on file at the Pueblo of Santa Clara).

U.S. Army Corps of Engineers. 2017. Nationwide Permit (NWP) verification - action no. SPA-2017-00172, Santa Clara Pueblo water supply infrastructure improvements Four Corners economic development area. Letter from Kelly E. Allen, U.S. Army Corps of Engineers Regulatory Program Manager to Tim Harjo, Santa Clara Development Corporation, June 22, 2017.

U.S. Environmental Protection Agency. 2008. Determination of sole source aquifer petition (Española Basin Aquifer System). Federal Register 73(14): 3723.

U.S. Environmental Protection Agency. 2017. EPA sole source aquifers. <https://catalog.data.gov/dataset/national-sole-source-aquifer-gis-layer> (accessed on 11 December 2017).

APPENDIX B: SPECIES EVALUATION

B.1 Listed Species Potentially Occurring in the Permit Area

An official species list was obtained for the permit area from the Service's Information for Planning and Consultation (IPaC) site (see Appendix C). The list identified 17 species, three of which have designated or proposed critical habitat in the permit area (Table B1).

Table B1. Listed or candidate species and designated or proposed critical habitat that may be found in the permit area, summarized from the official species list in Appendix C.

Common Name	Scientific Name	ESA Status	Critical Habitat* in Permit Area?
Wright's marsh thistle	<i>Cirsium wrightii</i>	Candidate	No
Pecos sunflower	<i>Helianthus paradoxus</i>	Threatened	No
Chupadera springsnail	<i>Pyrgulopsis chupaderae</i>	Endangered	No
Socorro springsnail	<i>Pyrgulopsis neomexicanus</i>	Endangered	No
Alamosa springsnail	<i>Tryonia alamosae</i>	Endangered	No
Socorro isopod	<i>Thermosphaeroma thermophilus</i>	Endangered	No
Rio Grande silvery minnow	<i>Hybognathus amarus</i>	Endangered	Yes
Chiricahua leopard frog	<i>Rana chiricahuensis</i>	Threatened	No
Jemez Mountains salamander	<i>Plethodon neomexicanus</i>	Endangered	No
Least tern	<i>Sterna antillarum</i>	Endangered	No
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened	No
Northern aplomado falcon	<i>Falco femoralis septentrionalis</i>	EXPN**	No
Piping plover	<i>Charadrius melodus</i>	Threatened	No
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	Yes
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Threatened	Yes
New Mexico meadow jumping mouse	<i>Zapus hudsonius luteus</i>	Endangered	No
Canada lynx	<i>Lynx canadensis</i>	Threatened	No

* Includes designated and proposed critical habitat

** EXPN = experimental, nonessential

B.2 Sequential Evaluation

The standard for determining whether activities are likely to result in incidental take is whether take is “reasonably certain” to occur in considering both the direct and indirect impacts of the proposed action (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: page 3-2). Application of the “reasonable certainty” standard is done in the following sequential manner in light of the best available scientific and commercial data to determine if incidental take is anticipated (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: page 3-3):

1. A determination is made regarding whether a listed species is present within the area affected by the proposed Federal action;
2. if so, then a determination is made regarding whether the listed species would be exposed to stressors caused by the proposed action (*e.g.* noise, light, ground disturbance); and
3. if so, a determination is made regarding whether the listed species’ biological response to that exposure corresponds to the statutory and regulatory definitions of take.

B.2.1 Step 1 - Presence in Area Affected by Proposed Action

Species presence in the area potentially affected by the proposed action was evaluated using information in IPaC and, when necessary, more detailed information on habitat associations and distribution provided in the U.S. Fish and Wildlife Service’s Environmental Conservation Online System (ECOS) species profiles. Using these sources, it was determined that 11 of the 17 listed species in Table B1 do not occur in the area potentially affected by the proposed action (Table B2), and thus would not be subject to incidental take from the proposed action. Following is a synopsis of the determinations for these 11 species.

- There are no extant populations of Wright’s marsh thistle in the middle Rio Grande corridor.
- The distributions of Chupadera, Socorro and Alamosa springsnails and Socorro isopod do not include the middle Rio Grande corridor.
- Chiricahua leopard frog occurs in some tributaries to the Rio Grande in Sierra County, but the species is not found along the Rio Grande.
- Jemez Mountains salamander, Mexican spotted owl, and Canada lynx are montane species whose distributions do not include the Rio Grande corridor.
- Least tern occur as a breeding bird or migrant in New Mexico only in the lower Pecos River, and are not encountered in the middle Rio Grande except as vagrants.
- Northern alpomado falcon is associated with Chihuahuan desert grassland habitat, which does not occur in the area potentially affected by the proposed action.

Surveys and habitat evaluation were conducted in the well-field area in 2016 for southwestern willow flycatcher, yellow-billed cuckoo, and New Mexico meadow jumping mouse. No yellow-billed cuckoo or New Mexico meadow jumping mouse were observed during any of the surveys. A single migrating southwestern willow flycatcher was detected during the first survey period, on 16 May 2016. There were no additional detections of southwestern willow flycatcher during any of the subsequent four surveys in 2016. Habitat conditions in the well area were considered marginal for these three species (Tierney, 2017).

Table B2. Sequential evaluation of listed species.

Listed Species	Step 1 Present in Potentially Affected Area?	Step 2 Exposed to Stressors?	Step 3 Exposure May Result in Incidental Take?
Wright's marsh thistle	No	---	---
Pecos sunflower	Yes -->	No	---
Chupadera springsnail	No	---	---
Socorro springsnail	No	---	---
Alamosa springsnail	No	---	---
Socorro isopod	No	---	---
Rio Grande silvery minnow	Yes -->	Yes -->	Yes
Chiricahua leopard frog	No	---	---
Jemez Mountains salamander	No	---	---
Least tern	No	---	---
Mexican spotted owl	No	---	---
Northern aplomado falcon	No	---	---
Piping plover	Yes -->	No	---
Southwestern willow flycatcher	Yes -->	No	---
Yellow-billed cuckoo	Yes -->	No	---
New Mexico meadow jumping mouse	Yes -->	No	---
Canada lynx	No	---	---

B.2.2 Step 2 - Exposure to Stressors Associated with the Proposed Action

Six species were carried forward to step 2 of the sequential screening. These six species were determined to be present in the area potentially affected by the proposed action (Table B2). Rio Grande silvery minnow occurs in aquatic habitat of the Rio Grande from Cochiti Dam to Elephant Butte Reservoir. The other five species (Pecos sunflower, piping plover, southwestern willow flycatcher, yellow-billed cuckoo, and New Mexico meadow jumping mouse) are associated with wetland or riparian habitats along the middle Rio Grande. These riparian and wetland habitats along the Rio Grande are supported by shallow groundwater. The proposed action may affect shallow groundwater levels through two pathways: 1) pumping from the shallow alluvial aquifer at the well site and 2) minor changes in stream flow of the Rio Grande downstream from the well site. These two potential effects pathways and exposure of the five species to stressors associated with these pathways are described below.

Well Area Effects Draw-down of alluvial groundwater in the immediate vicinity of the four production wells is unlikely to affect woody riparian vegetation in the 10.9-acre well area (see Figure 2). Depth to groundwater at the well locations is approximately 5.6 ft, and maximum aquifer draw-down at each well is 2.06 ft (Melis and Peery, 2017; Table 5 on page 8). This magnitude of draw-down is close to the threshold reported by Cooper and others (2003) where cottonwoods began to exhibit moisture stress. As noted above, no yellow-billed cuckoo or New Mexico meadow jumping mouse were observed during surveys conducted in the well area in 2016, a single migrating southwestern willow flycatcher was detected during the first survey period on 16 May 2016, and there were no additional detections of southwestern willow flycatcher during any of the subsequent four surveys in 2016. Habitat conditions in the well area were considered marginal for these three species (Tierney, 2017). Pecos sunflower and piping plover are not present in the well area. Consequently, potential minor effects to woody riparian vegetation in the well area from proposed pumping would not result in exposure of Pecos sunflower, piping plover, southwestern willow flycatcher, yellow-billed cuckoo, or New Mexico meadow jumping mouse to any stressors associated with the proposed action.

Downstream Effects The proposed action involves withdrawal of up to 1 mgd (equivalent to a continuous flow of 1.55 cfs or an annual yield of 1,120 acre-ft) of alluvial groundwater at the well site on the Pueblo of Santa Clara. For the purpose of analysis, it is assumed that this may have a direct but minor effect on surface water flow in the Rio Grande. A 1 mgd reduction in Rio Grande flow is considered minor for two reasons. First, 1.55 cfs is within the range of stage-discharge computation error (+/- 3 percent; U.S. Geological Survey, 1992) for flows at the Otowi gage³ above 52 cfs, and mean daily flow at the Otowi gage has not fallen below 60 cfs since measurements started at that location in 1895. Consequently, a 1.55 cfs reduction in flow cannot be discerned from measurement error at the Otowi gage. Second, 1,120 acre-ft/yr composes only 0.18 to 0.10 percent of total annual flow in very dry year to very wet year flow scenarios, respectively, for the Rio Grande at Otowi gage (flow scenarios are from Roach, 2009: page 21).

Shallow groundwater along the middle Rio Grande generally flows from the river outward, through the alluvial aquifer, toward riverside drains (Isaacson, 2009; Papadopulos and Associates, Inc., 2006; Rankin *et al.*, 2016). Consequently, riparian and wetland habitats along the middle Rio Grande may be influenced by water levels in the river. The five riparian- or wetland-associated species present in the area potentially affected by the proposed action may be exposed to a flow-related stressor via this pathway.

The potential for exposure of the five riparian- or wetland-associated species to a flow-related stressor was examined by modeling changes in surface-water elevation at low flows that would result from a flow reduction of 1.55 cfs. This modeling was conducted at three gage sites on the Rio Grande: San Felipe, Albuquerque, and Bernardo. Low flow at each of these gage sites was calculated as the 90th percentile of all non-zero mean daily flows (*i.e.* a flow that is exceeded for 90 percent of the non-zero flow record). A third-order logarithm curve was fit to U.S. Geological Survey field measurements of gage height and discharge to calculate water-level reductions associated with a 1.55 cfs decrease in flow at the three gage

³ The Otowi bridge stream gage on the Rio Grande (U.S. Geological Survey gage no. 08313000) is located approximately 9.3 river miles downstream from the well-field area, at the N.M. Highway 502 bridge over the Rio Grande. Discharge has been measured at the site since 1 February 1895.

sites (Table B3). All three of the curve-fit equations had adjusted r^2 values greater than 0.98.

Water-level declines associated with a 1.55 cfs reduction at low flow are negligible through the middle Rio Grande, ranging from 0.66 mm at San Felipe to 4.03 mm at Bernardo (Table B3). This minute change in water level would not have any discernible effect on riparian or wetland vegetation through the permit area. For example, Scott and others (1999) reported no measurable effect on riparian cottonwoods associated with water table declines of less than 0.5 m. Similar results were reported by Shafroth and others (2000). Consequently, Pecos sunflower, piping plover, southwestern willow flycatcher, yellow-billed cuckoo, and New Mexico meadow jumping mouse would not be exposed to any stressors associated with the proposed action. However, Rio Grande silvery minnow would be exposed to the stressor of flow alteration, albeit minor, associated with the proposed action.

Table B3. Water-level decline associated with a 1.55 cfs reduction at low flow at three gage sites in the middle Rio Grande. Low flow for each gage was calculated as the flow that is exceeded for 90 percent of the non-zero flow record.

Stream Gage	Gage No.	Low Flow, cfs	Low Flow Reduced by 1.55 cfs	Water-Level Decline, ft (mm)
San Felipe	08319000	398	396.45	-0.002172 (-0.66)
Albuquerque	08330000	155	153.45	-0.004429 (-1.35)
Bernardo	08331010	48	46.45	-0.013208 (-4.03)

B.2.3 Step 3 - Species Response to Exposure

The “reasonable certainty” standard does not require a guarantee that take will result from exposure to a stressor associated with the proposed action, but only that a rational basis for a finding of take exists (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 2016: page 3-3). In this context, any reduction in flow in the middle Rio Grande, including that associated with the proposed action, composes a rational basis for potential incidental take of Rio Grande silvery minnow. Consequently, Rio Grande silvery minnow is addressed in this LEHCP.

B.3 Literature Cited

- Cooper, D. J., D. R. D'Amico, and M. L. Scott. 2003. Physiological and morphological response patterns of *Populus deltoides* to alluvial groundwater pumping. *Environmental Management* 31(2): 215-226.
- Isaacson, K. 2009. Modeling riparian groundwater depth as a function of river flow for the Rio Grande at Albuquerque, New Mexico. Unpublished M.S. Thesis, Civil Engineering, University of New Mexico, Albuquerque. 123 pp.
- Melis, E. A. and R. Peery. 2017. Well report and hydrogeologic evaluation for alluvium along the Rio Grande penetrated by the Riverside test well, Santa Clara Pueblo, New Mexico. Confidential report prepared by John Shomaker and Associates, Inc. for Sullivan Design Group and Santa Clara Development Corporation. 12 pp. + illustrations and appendices (on file at the Pueblo of Santa Clara).
- Papadopoulos and Associates, Inc. 2006. Riparian groundwater models for the middle Rio Grande: ESA Collaborative Program FY04. S. S. Papadopoulos and Associates, Inc., Boulder, Colorado. 58 pp.
- Rankin, D. R., G. P. Oelsner, K. J. McCoy, G. J. M. Moret, J. A. Worthington, and K. M. Bandy-Baldwin. 2016. Groundwater hydrology and estimation of horizontal groundwater flux from the Rio Grande at selected location in Albuquerque, New Mexico, 2009-10. U.S. Department of the Interior, U.S. Geological Survey, Scientific Investigations Report 2016-5021.
- Roach, J. D. 2009. Selection of five synthetic flow sequences for detailed analysis with the Upper Rio Grande Water Operations Planning Model. Unpublished report, Sandia National Laboratories. 21 pp.
- Scott, M. L., P. B. Shafroth, and G. T. Auble. 1999. Responses of riparian cottonwoods to alluvial water table declines. *Environmental Management* 23(3): 347-358.
- Shafroth, P. B., J. C. Stromberg, and D. T. Patten. 2000. Woody riparian vegetation response to different alluvial water table regimes. *Western North American Naturalist* 60(1): 66-76.
- Tierney, R. 2017. Biological assessment, replacement and repair of the four corners economic development area's water lines and installation of water wells. Prepared for the Santa Clara Development Corporation (on file at the Pueblo of Santa Clara).
- U.S. Fish and Wildlife Service and National Marine Fisheries Service. 2016. Habitat conservation planning and incidental take permit processing handbook. U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 21 December 2016.
- U.S. Geological Survey. 1992. Policy statement on stage accuracy. Office of Surface Water, Technical Memorandum No. 93.07, 4 December 1992.

APPENDIX C: SPECIES LIST



United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Mexico Ecological Services Field Office
2105 Osuna Road Ne

Albuquerque, NM 87113-1001

Phone: (505) 346-2525 Fax: (505) 346-2542

<http://www.fws.gov/southwest/es/NewMexico/>

http://www.fws.gov/southwest/es/ES_Lists_Main2.html



In Reply Refer To:

October 31, 2017

Consultation Code: 02ENNM00-2018-SLI-0096

Event Code: 02ENNM00-2018-E-00211

Project Name: Permit Area

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

Thank you for your recent request for information on federally listed species and important wildlife habitats that may occur in your project area. The U.S. Fish and Wildlife Service (Service) has responsibility for certain species of New Mexico wildlife under the Endangered Species Act (ESA) of 1973 as amended (16 USC 1531 et seq.), the Migratory Bird Treaty Act (MBTA) as amended (16 USC 701-715), and the Bald and Golden Eagle Protection Act (BGEPA) as amended (16 USC 668-668c). We are providing the following guidance to assist you in determining which federally imperiled species may or may not occur within your project area and to recommend some conservation measures that can be included in your project design.

FEDERALLY-LISTED SPECIES AND DESIGNATED CRITICAL HABITAT

Attached is a list of endangered, threatened, and proposed species that may occur in your project area. Your project area may not necessarily include all or any of these species. Under the ESA, it is the responsibility of the Federal action agency or its designated representative to determine if a proposed action "may affect" endangered, threatened, or proposed species, or designated critical habitat, and if so, to consult with the Service further. Similarly, it is the responsibility of the Federal action agency or project proponent, not the Service, to make "no effect" determinations. If you determine that your proposed action will have "no effect" on threatened or endangered species or their respective critical habitat, you do not need to seek concurrence with the Service. Nevertheless, it is a violation of Federal law to harm or harass any federally-listed threatened or endangered fish or wildlife species without the appropriate permit.

If you determine that your proposed action may affect federally-listed species, consultation with the Service will be necessary. Through the consultation process, we will analyze information contained in a biological assessment that you provide. If your proposed action is associated with

Federal funding or permitting, consultation will occur with the Federal agency under section 7(a)(2) of the ESA. Otherwise, an incidental take permit pursuant to section 10(a)(1)(B) of the ESA (also known as a habitat conservation plan) is necessary to harm or harass federally listed threatened or endangered fish or wildlife species. In either case, there is no mechanism for authorizing incidental take "after-the-fact." For more information regarding formal consultation and HCPs, please see the Service's Consultation Handbook and Habitat Conservation Plans at www.fws.gov/endangered/esa-library/index.html#consultations.

The scope of federally listed species compliance not only includes direct effects, but also any interrelated or interdependent project activities (e.g., equipment staging areas, offsite borrow material areas, or utility relocations) and any indirect or cumulative effects that may occur in the action area. The action area includes all areas to be affected, not merely the immediate area involved in the action. Large projects may have effects outside the immediate area to species not listed here that should be addressed. If your action area has suitable habitat for any of the attached species, we recommend that species-specific surveys be conducted during the flowering season for plants and at the appropriate time for wildlife to evaluate any possible project-related impacts.

Candidate Species and Other Sensitive Species

A list of candidate and other sensitive species in your area is also attached. Candidate species and other sensitive species are species that have no legal protection under the ESA, although we recommend that candidate and other sensitive species be included in your surveys and considered for planning purposes. The Service monitors the status of these species. If significant declines occur, these species could potentially be listed. Therefore, actions that may contribute to their decline should be avoided.

Lists of sensitive species including State-listed endangered and threatened species are compiled by New Mexico state agencies. These lists, along with species information, can be found at the following websites:

Biota Information System of New Mexico (BISON-M): www.bison-m.org

New Mexico State Forestry. The New Mexico Endangered Plant Program:
www.emnrd.state.nm.us/SFD/ForestMgt/Endangered.html

New Mexico Rare Plant Technical Council, New Mexico Rare Plants: nmrareplants.unm.edu

Natural Heritage New Mexico, online species database: nhnm.unm.edu

WETLANDS AND FLOODPLAINS

Under Executive Orders 11988 and 11990, Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and floodplains, and preserve and enhance their natural and beneficial values. These habitats should be conserved through avoidance, or mitigated to ensure that there would be no net loss of wetlands function and value.

We encourage you to use the National Wetland Inventory (NWI) maps in conjunction with ground-truthing to identify wetlands occurring in your project area. The Service's NWI program website, www.fws.gov/wetlands/Data/Mapper.html integrates digital map data with other resource information. We also recommend you contact the U.S. Army Corps of Engineers for permitting requirements under section 404 of the Clean Water Act if your proposed action could impact floodplains or wetlands.

MIGRATORY BIRDS

The MBTA prohibits the taking of migratory birds, nests, and eggs, except as permitted by the Service's Migratory Bird Office. To minimize the likelihood of adverse impacts to migratory birds, we recommend construction activities occur outside the general bird nesting season from March through August, or that areas proposed for construction during the nesting season be surveyed, and when occupied, avoided until the young have fledged.

We recommend review of Birds of Conservation Concern at website www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BCC.html to fully evaluate the effects to the birds at your site. This list identifies birds that are potentially threatened by disturbance and construction.

BALD AND GOLDEN EAGLES

The bald eagle (*Haliaeetus leucocephalus*) was delisted under the ESA on August 9, 2007. Both the bald eagle and golden eagle (*Aquila chrysaetos*) are still protected under the MBTA and BGEPA. The BGEPA affords both eagles protection in addition to that provided by the MBTA, in particular, by making it unlawful to "disturb" eagles. Under the BGEPA, the Service may issue limited permits to incidentally "take" eagles (e.g., injury, interfering with normal breeding, feeding, or sheltering behavior nest abandonment). For information on bald and golden eagle management guidelines, we recommend you review information provided at www.fws.gov/midwest/eagle/guidelines/bgepa.html.

On our web site www.fws.gov/southwest/es/NewMexico/SBC_intro.cfm, we have included conservation measures that can minimize impacts to federally listed and other sensitive species. These include measures for communication towers, power line safety for raptors, road and highway improvements, spring developments and livestock watering facilities, wastewater facilities, and trenching operations.

We also suggest you contact the New Mexico Department of Game and Fish, and the New Mexico Energy, Minerals, and Natural Resources Department, Forestry Division for information regarding State fish, wildlife, and plants.

Thank you for your concern for endangered and threatened species and New Mexico's wildlife habitats. We appreciate your efforts to identify and avoid impacts to listed and sensitive species in your project area. For further consultation on your proposed activity, please call 505-346-2525 or email nmesfo@fws.gov and reference your Service Consultation Tracking Number.

10/31/2017

Event Code: 02ENNM00-2018-E-00211

4

Attachment(s):

- Official Species List

10/31/2017

Event Code: 02ENNM00-2018-E-00211

10/31/2017

Project Summary

Consultation Code: 02ENNM00-2018-SLI-0096

Event Code: 02ENNM00-2018-E-00211

Project Name: Permit Area

Project Type: Water Withdrawal / Depletion

Project Description: Rio Grande indirect-effect area

Project Location:

Approximate location of the project can be viewed in Google Maps:

<https://www.google.com/maps/place/34.73509401410371N106.73511565225311W>



Counties: Bernalillo, NM | Rio Arriba, NM | Sandoval, NM | Santa Fe, NM | Socorro, NM | Valencia, NM

10/1/2017

Event Code: 02BNNM00-2018-00011

Birds

NAME	STATUS
Least Tern <i>Sterna antillarum</i> Population: interior pop. No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3505	Endangered
Mexican Spotted Owl <i>Strix occidentalis lucida</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3196	Threatened
Northern Aplomado Falcon <i>Falco femoralis septentrionalis</i> Population: U.S.A (AZ, NM) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1923	Experimental Population, Non-Essential
Piping Plover <i>Charadrius melodus</i> Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Southwestern Willow Flycatcher <i>Empidonax traillii extimus</i> There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6749	Endangered
Yellow-billed Cuckoo <i>Coccyzus americanus</i> Population: Western U.S. DPS There is proposed critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3911	Threatened

10/1/2017

Event Code: 02ENN00-2018-00311

8

Amphibians

NAME	STATUS
Chiricahua Leopard Frog <i>Rana chiricahuensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1516	Threatened
Jemez Mountains Salamander <i>Plethodon neomexicanus</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4095	Endangered

Fishes

NAME	STATUS
Rio Grande Silvery Minnow <i>Hybognathus amarus</i> Population: Wherever found, except where listed as an experimental population There is final critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1391	Endangered

Snails

NAME	STATUS
Alamosa Springsnail <i>Tryonia alamosae</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4371	Endangered
Chupadera Springsnail <i>Pyrgulopsis chupaderae</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6644	Endangered
Socorro Springsnail <i>Pyrgulopsis neomexicana</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2806	Endangered

10/31/2017

Event Code: 02BNNM00-2018-00011

Crustaceans

NAME	STATUS
Socorro Isopod <i>Thermosphaeroma thermophilus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2470	Endangered

Flowering Plants

NAME	STATUS
Pecos (=puzzle, =paradox) Sunflower <i>Helianthus paradoxus</i> There is final critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/7211	Threatened
Wright's Marsh Thistle <i>Cirsium wrightii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8963	Candidate

Critical habitats

There are 3 critical habitats wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Rio Grande Silvery Minnow <i>Hybognathus amarus</i> https://ecos.fws.gov/ecp/species/1391#crithab	Final
Southwestern Willow Flycatcher <i>Empidonax traillii extimus</i> https://ecos.fws.gov/ecp/species/6749#crithab	Final
Yellow-billed Cuckoo <i>Coccyzus americanus</i> https://ecos.fws.gov/ecp/species/3911#crithab	Proposed