
**Water Acquisition and Management Subcommittee Position Paper:
Supplementing Middle Rio Grande Flows through Pumping from the
Low Flow Conveyance Channel (LFCC)**

Introduction

During the irrigation season, flows in the Middle Rio Grande between the San Acacia Diversion Dam and the headwaters of the Elephant Butte Reservoir can become intermittent, particularly in dry years, potentially causing adverse impacts to the Rio Grande silvery minnow. This reach of the river channel (known as the “floodway” in this reach) is paralleled by a second conveyance, the Low Flow Conveyance Channel (LFCC), which now serves as a riverside drain, and collects significant water from the river channel, as well as from irrigation tailwater, storm runoff and groundwater seepage. One option for maintaining flows in the river channel in this reach is through pumping from the adjacent Low Flow Conveyance Channel (LFCC) into the river channel.

The March 2003 Biological Opinion specifies that Reclamation shall pump water from the LFCC to the river when intermittency is likely. Since 2001, the US Bureau of Reclamation (USBR) (with funding from the Collaborative Program in FY 2002) has undertaken a “Temporary Pumping Program” to fulfill these requirements. The initial pumping program had a total of three stations in the San Acacia Reach. These pumps augmented flows throughout the reach of the Rio Grande within and below the Bosque del Apache National Wildlife Refuge (Refuge). This program reduced the amount of intermittency in the river in 2001. In 2002, the pumping was expanded to five stations located in the San Acacia Reach from about 3 miles upstream of US 380 to near Old Fort Craig. The pumping stations at the southern boundary of the Refuge and Fort Craig created approximately 16 miles of flowing water. A new pumping station located approximately 4 miles north of the southern boundary of the Refuge was constructed during the 2003 season, and will provide approximately 4 miles of additional flowing water when sufficient water is available in the LFCC. With these pumping stations, flow can be maintained for approximately 20 continuous miles of river, from near the middle of the Refuge, to Elephant Butte Reservoir. The total available pumping capacity for all pump locations is now approximately 200 cfs, although the maximum total combined rate is limited to 150 cubic feet per second. As the reservoir decreases in water surface area and volume, the length of the river that the pumps maintain could be longer.

During the 2001, 2002, and 2003 irrigation seasons, the temporary LFCC pumping program helped to minimize conservation water releases from Abiquiu, Heron and El Vado reservoirs by reducing the amount of water required to keep the Socorro reach continuous from November 16 through June 15, and reducing the rate of release required to meet the BO Wet Year requirement of 100 cfs at San Marcial during the same period. The USBR has proposed a feasibility study for the design and construction of permanent pumping facilities in this reach. These permanent pumping facilities could increase the efficiency and reliability of the pumping operations, and may decrease the cost in the long term if the program is continued significantly into the future. The WAM allocated FY2003 funding to this feasibility study.

Permitting

The Bureau of Reclamation submitted to the Office of the State Engineer (OSE) Application number 4799, on August 11, 2000, and again on August 24, 2000, requesting emergency authorization to pump water from the LFCC into the Rio Grande for the protection and propagation of wildlife. On August 24, 2000, the OSE responded, giving permission, with specified conditions. On September 25, 2000, the OSE received a letter of protest regarding this permit application from the Elephant Butte Irrigation District, stating “That Protestant believes that the granting of such application may impair Protestant’s ability to deliver project water in the Rio Grande Project, due to the potential increased losses to evaporation and seepage.”

On May 18, 2001 and again on May 31, 2001, the USBR submitted to the OSE Application number 4799 (2), to continue the pumping from the LFCC to the Rio Grande, and was again granted emergency authorization, with conditions, on June 20, 2001. During 2002, USBR operated the portable pumps under the same Emergency Authorization to Pump Water from the Low Flow Conveyance Channel and into the Rio Grande (SEO File No. 4799 (2) granted by the New Mexico Office of the State Engineer on March 5, 2002 in response to the Affidavit filed on March 1. Under the terms of the March 5, 2002 Emergency Authorization, USBR was authorized to pump from the LFCC and into the Rio Grande subject to the following conditions (provided here for 2002):

1. "The total combined pumping rate shall not exceed 150 cfs. Depletions resulting from the operation of the pumps shall be offset with water from an appropriate source. Pumps shall not operate if appropriate water for offset is not available. State Engineer shall determine the depletions to the Rio Grande system resulting from the diversion under this authorization using the best available data and commonly accepted engineering practices. The State Engineer will give due consideration to water released from storage into the Rio Grande system as a result of leases of water by Reclamation. Reclamation shall provide to the State Engineer proof of available water for offset."
2. "Reclamation shall install measuring devices as outlined in Reclamation's letter, filed March 4, 2002, and an attachment to this authorization. Records shall be kept and submitted to the State Engineer of the date and duration of pumping, and the beginning and ending totalized flow, from each operating pump, on a monthly basis."
3. "Reclamation shall submit a map acceptable to the State Engineer when pump locations are changed or when pumps are added or deleted."
4. "Reclamation shall install, operate and maintain automated gage stations at two locations on the Rio Grande as approved by the State Engineer before March 1, 2003."
5. "The Reclamation shall utilize the highest and best technology available to ensure conservation of water to the maximum extent practical and pursuant to the August 2, 2000 Agreed Order and the October 5, 2000 Supplement to Agreed Order in *Minnow v. Keys*."
6. "This authorization shall expire on December 31, 2002, or when the State Engineer enters his final decision on pending Application, numbered 4799 (2), or upon violation of a condition imposed herein, whichever occurs first."
7. "Issuance of this authorization does not obligate favorable consideration of the pending application by the State Engineer."

The emergency authorization expired on December 31, 2002. The New Mexico State Engineer has not issued a final decision on pending Application number 4799 (2). As of the end of the 2003 irrigation season, the USBR has installed flow gages with telemetry at three of the five pumping sites, but has not yet complied with this requirement at the remaining two sites.

USBR LFCC Pumping Program History

The Bureau's Temporary Pumping Program involves operation and maintenance of 17 portable diesel-driven pumps to transfer water from the LFCC to the Rio Grande. During the 2002 irrigation season, the pumps were located at the following five locations between Socorro and Elephant Butte Reservoir on the LFCC (Figure 1):

- Neil Cupp Diversion Structure (approximately 2.8 miles north of the Highway 380 Bridge in San Antonio)
- North Boundary of Bosque del Apache Diversion Structure

- Mid-Bosque del Apache Diversion Structure (site added August 2002; located near the geographic center of the Bosque del Apache National Wildlife Refuge. This site provides additional operational flexibility for managing river recession events)
- South Boundary of Bosque del Apache
- Fort Craig (approximately 5 miles downstream of the San Marcial LFCC gage)

Pumping discharge at each location is measured using either sheet pile weirs or flow meters (depending on the constraints presented by each pumping site). Discharge measurements made at the Neil Cupp, North Boundary Bosque del Apache, and South Boundary Bosque del Apache pumping stations are transmitted via telemetry installations at these locations, and are posted on Bureau's ET Toolbox web site: www.usbr.gov/rsmg/awards/Nm/rg/RioG/gage/schematic/SCHEMATICsouth.html

Measurement and telemetry installations will be completed at the Middle Bosque del Apache and Fort Craig pump stations during the 2003-2004 calendar year. The telemetry equipment was purchased using New Mexico Interstate Stream Commission funding provided via Cooperative Agreement NO. 02-CF-40-6110, Agreement for Cooperative Program for Water Conservation Measures Along the Rio Grande, Middle Rio Grande Project.

Pump operation and maintenance is performed using a contractor, with Bureau's Socorro Field Office personnel acting as backup. Personnel are scheduled to provide 24 hour/day, 7 day/week coverage of pump operation and maintenance. Pumping operations may occur as early as March and as late as November depending on observed conditions along the Rio Grande. Since 2001 Reclamation's Socorro office and the New Mexico Interstate Stream Commission have provided 24-hour "river eyes" surveillance of the Rio Grande to help determine the condition of river flows and coordinate operation of pumping and endangered fish rescue efforts.

The following total amounts of water were pumped from the LFCC to the Rio Grande floodway in 2001 and 2002:

- 2001 - 25,200 AF
- 2002 - 32,500 AF

For the year 2002, pumping operations occurred from March 15 through September 30. The following table (Table 1) lists the approximate annual volume pumped by location during the 2002-pumping season:

Pumping Location	No. of Pumps	Approximate Annual Volume (acre-ft)
Neil Cupp	4	7,260
North Boundary Bosque del Apache NWR	3	3,850
Middle Bosque del Apache NWR	2	30
South Boundary Bosque del Apache NWR	5	17,210
Fort Craig	3	4,120
Total	17	32,470

Biological Opinion Requirements:

Many of the “Reasonable and Prudent Alternatives” (RPAs) contained within the USFWS’ *March 17, 2003 Biological and Conference Opinion of the Effects of Actions Associated with the Programmatic Biological Assessment of the Bureau of Reclamation’s Water and River Maintenance Operations, Army Corps of Engineers’ Flood Control Operation, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico* (BiOp) either require or are supported by the Bureau of Reclamation’s LFCC pumping operations. Water Operations Elements G, K, and O specifically reference pumping from the LFCC as a tool for managing recessions in flow and maintaining river connectivity to provide habitat for the Rio Grande silvery minnow and the southwest willow flycatcher. Water Operations Elements E, H, and L require continuous flows in the Rio Grande from Cochiti Dam to the southern boundary of silvery minnow habitat from November 16 through June 15. The LFCC pumps have proven instrumental in maintaining river connectivity south of San Acacia diversion dam during the early spring period when runoff flows can be insufficient to maintain a continuous river while MRGCD is actively diverting from the mainstem and water is being captured and stored in El Vado Reservoir on the Rio Chama. Water Operations Element D requires that water be provided to active flycatcher territories supported by the existing LFCC pumping sites from June 15 through September 1. Several of the Elements state the total pumping capacity must meet or exceed the total capacity of the pumps used during the 2002 irrigation season, which was approximately 150 cfs.

Rio Grande Silvery Minnow LFCC Pumping and Operational ChallengesVariable LFCC flow rates

The greatest current challenge to LFCC pumping operations is the highly variable nature of the flows within the Low Flow Conveyance Channel.

- Flows within the LFCC are directly impacted by MRGCD and Bosque del Apache irrigation operations through either direct diversion from the LFCC or irrigation return flows through system drains and groundwater seepage.
- LFCC flows also tend to mirror flow conditions within the Rio Grande because these systems are hydraulically connected through the shallow groundwater aquifer.
- During periods of extended drought such as experienced the past three summers, LFCC flows have been observed to decrease rapidly as flow conditions with the Rio Grande deteriorate. Thereby, these conditions create a situation where LFCC water becomes unavailable for pumping at precisely the time when it would be most beneficial.
- The Bosque del Apache National Wildlife Refuge diverts water from the same point as the North Boundary pumping station. At North Boundary, the LFCC pumping operations are often in direct competition with Bosque del Apache to utilize limited flows within the LFCC. Therefore, the success of the pumping operations at this location are dependent on the Bosque del Apache and the Socorro Field Division of USBR working cooperatively to manage LFCC pumping operations and Bosque del Apache diversion requirements at North Boundary.
- The MRGCD diverts water directly from the LFCC upstream of the Neal Cupp pumping station, which can reduce the rate of flow available for pumping at Neal Cupp. Again, the success of the pumping operations at this location are dependent on the MRGCD and the Socorro Field Division of USBR working cooperatively to manage LFCC pumping operations and MRGCD diversion requirements Neil Cupp.

Operational changes within the MRGCD and Bosque del Apache distribution and irrigation systems can dramatically impact the volume of water returning to the LFCC through drains and return seepage. Return flows into the LFCC decrease in parallel with reduced flows within the MRGCD and Bosque del Apache irrigation systems, resulting in a decrease in the rate of flow available for the LFCC pumps. Changes in

the routing of water through the MRGCD and Bosque del Apache systems can dramatically alter the rate of flow returning to the LFCC through drains or seepage, as well as the location along the LFCC that these return flows occur. This routing change can result in localized reductions or increases in flows within the LFCC. LFCC pumping operations can be negatively impacted when these reductions occur in close proximity to one of the LFCC pumping stations.

San Marcial Gage Reporting Frequency

The BO contains flow requirements at certain times of the year for the gage in the Rio Grande floodway at San Marcial. LFCC pumping operations aid greatly in assuring that these flow targets can be met. Therefore, gage readings at this site can be an important factor in determining LFCC pumping operations. San Marcial flow data on the USGS Real-time website is currently updated at 4 hour intervals. The variable nature of San Marcial flows combined with the 4 hour interval between gage updates, as well as the travel times between the pumping locations and the gage, creates a situation where flows can be reported as stable or increasing at one point in time, yet dip below the flow targets prior to the following 4 hour update. This situation complicates the pumping operations, and necessitates the performance of regular, on the ground observations of river conditions at San Marcial.

The following table (Table 2) provides estimates of the time it takes flows to reach San Marcial from the various pumping stations.

Pumping Station	Distance to San Marcial	Estimated Travel Time
Neil Cupp	21.6 miles	18 hours
North Boundary	15.6 miles	13 hours
South Boundary	5.4 miles	5 hours

Conclusions

- The operation of a pumping program to pump water from the LFCC to the Rio Grande floodway when intermittency is likely in the San Acacia reach of the Rio Grande is a requirement of the Programmatic Biological Opinion of March 17, 2003.
- The USBR has implemented a “temporary” pumping program, utilizing portable pumps, in the San Acacia reach of the Rio Grande since 2000. This program pumped 25,000 to 35,000 acre-feet of water from the LFCC into the Rio Grande floodway in 2001 and 2002, respectively, and has been successful in maintaining flows in some critical sub-reaches.
- USBR’s LFCC pumping program is performed pursuant to permitting actions of the New Mexico Office of the State Engineer.
- The LFCC pumping program can help to minimize conservation water releases by reducing the amount of water required to keep the Socorro reach continuous from November 16 through June 15, or reducing the rate of release required to meet the Wet Year requirement of 100 cfs at San Marcial during the same period. The pumps have been used to maintain river continuity prior to June 15 when water is being stored in El Vado and/or MRGCD is diverting for irrigation.
- The WAM allocated funds in FY 2003 to the USBR for the completion of a feasibility study for the construction of permanent pumping plants, which could improve the efficiency and reliability of the system, and lower the long-term cost if the pumping program is expected to be continued significantly into the future.
- The design and construction of permanent pumping facilities is not recommended if re-engineering of the river channel in the San Acacia reach (see WAM position paper on this topic) is deemed feasible and has any likelihood of being performed.

Figure 1 – Map Showing Low Flow Conveyance Channel Pumping Locations

