

Under Alternatives C and D, wind erosion control will be required during construction of recreation facilities. Long-term protection from wind erosion will be required on roads and on pedestrian areas around campgrounds, day use facilities, and trails. OHV use under Alternative C would increase wind erosion and the potential for increased environmental damage unless it is strictly controlled.

Mitigation

If construction occurs within the study area, native vegetation will be planted in disturbed areas to prevent soil erosion. Soils characteristics and suitability should be considered when planning future development of the study area.

Residual Impacts

No residual impacts have been identified.

LAND USE AND TRANSPORTATION

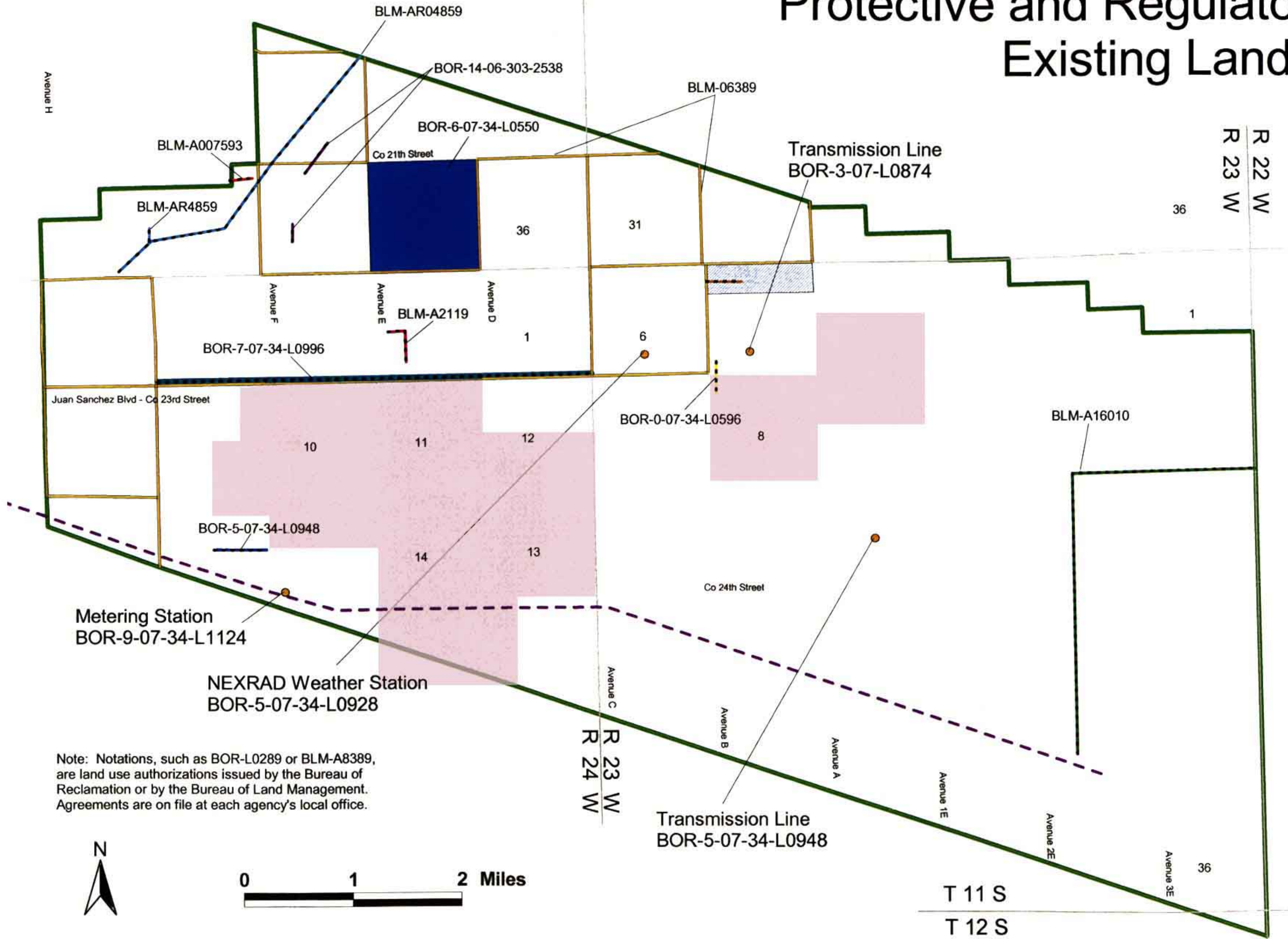
Affected Environment

Over the last several years, this rapidly growing area has attracted the interest of municipal and county planners, land developers, State and Federal agencies, and others seeking land for transportation and utility corridors, rights-of-ways, commercial development, and community recreation. The city of San Luis through its San Luis General Plan and the county of Yuma through its Yuma County 2010 Comprehensive Plan have annexed lands within the study area and have identified future uses and developments as part of their long-range planning. These county and municipal plans have identified open space/recreation, residential, rural, and commercial development as potential land uses for lands under the jurisdiction of Reclamation. Except for the specific items mentioned in this section, no formal requests have been received for using Reclamation lands for other purposes. Requests for future lands will be evaluated and analyzed as they are received. Reclamation will follow existing laws, regulations, policies, and procedures when processing future land use requests. Planners also have defined additional transportation and utility corridors throughout the study area because of the pending development of a new commercial port-of-entry. **Map V-3** shows existing land uses and land use agreements in the study area.

Private and State of Arizona landholdings also exist within the 5-mile zone. Up to 700 residential units could be developed within the privately owned Hillander "C" Irrigation District tract, which is surrounded by Reclamation land within the study area. As with any residential development, planners are actively identifying areas for open space, recreation, utility corridors, roadways, and other commercial developments as they plan any potential development of this tract.

5-Mile Zone

Protective and Regulatory Pumping Unit Existing Land Uses



Note: Notations, such as BOR-L0289 or BLM-A8389, are land use authorizations issued by the Bureau of Reclamation or by the Bureau of Land Management. Agreements are on file at each agency's local office.



Municipal planning considerations in the study area include the effect of the anticipated rapid growth in the San Luis area, whose population is expected to double within the next 6 years.

Existing Land Uses

The primary existing uses of Reclamation lands within the study area are as follows:

- ❖ Protective and Regulatory Pumping Unit (PRPU)
- ❖ Reclamation’s Yuma Desalting Plant sludge disposal site
- ❖ Rolle Airfield
- ❖ Western Area Power Administration transmission lines and Sonora substation
- ❖ Border Patrol drag roads and surveillance towers
- ❖ Variety of land use authorizations and easements

Protective and Regulatory Pumping Unit

The PRPU is the well field within the 5-mile zone authorized by Section 103(a) of Public Law 93-320 (known as the Colorado River Basin Salinity Control Act of 1974 [Act]). Currently, 21 wells have been constructed in the PRPU and are in use. However, the wells within the study area that are adjacent to Hillander “C” are used less than other wells because of their poor water quality. A total of 44 wells have been authorized, and Reclamation plans to construct and activate the remaining 23 wells in the future.

Photograph V-2 shows the PRPU conveyance system, and **photograph V-3** shows a typical well site.

Reclamation currently has the ability to pump only 125,000 acre-feet a year from the PRPU. Historically, however, the PRPU has pumped 450 to 31,000 acre-feet per year with an average of about 10,400 acre-feet per year. From 1998 through 2002, pumping averaged 3,800 acre-feet per year. All of this pumped water has been discharged across the SIB in partial satisfaction of the 140,000-acre-foot water delivery obligations to Mexico. Also see “Groundwater.”

Reclamation’s Yuma Desalting Plant Sludge Disposal Site

Currently 67 disposal cells have been constructed; and of these, 36 cells have had water treatment sludge placed in them. Four of the cells were used to test construction methods. A cell consists of a polyvinyl chloride-lined impoundment into which the calcium carbonate water treatment sludge is pumped, and the solids are allowed to settle as the water evaporates. After the water evaporates, the solids (consisting mainly of calcium carbonate) remain in the lined impoundment. Over the 50-year operating life of the Yuma Desalting Plant (designed to actually operate an average of 3 years out of



Photograph V-2.—PRPU conveyance system.



Photograph V-3.—PRPU well site.

every 10 years, based upon Colorado River salinity requirements), the A-22 waste disposal site may need to occupy up to 1,240 acres. The A-22 site Aquifer Protection Permit No. 100180 was issued in 2003.

Rolle Airfield

Rolle Airfield, originally constructed during World War II on 640 acres, has operated as an auxiliary airfield for the Yuma area for 50 years.

The original lease between Reclamation and Yuma County, dated March 17, 1952, consisted of a license[®] to operate, maintain, and manage the airfield. In 1966, the Yuma County Farm Bureau assumed responsibility for the airfield because it was primarily used to support crop dusting operations in the area. The Yuma County Airport Authority assumed responsibility for the airfield in 1972 to provide a site for civilian pilot training as well as to reduce air traffic conflicts at Yuma International Airport.

In 1973, the original lease between Reclamation and Yuma County was extended so that the county could seek State funds for capital improvements. In 1986, the current lease, No. 6-07-34-L0550, was issued for a term of 25 years. In March 2001, an airport master plan was prepared for the Yuma County Airport Authority. The master plan is a comprehensive analysis of airport needs and alternatives and provides direction for future development. The master plan also documents the airfield's potential as an economic asset to Yuma, Somerton, and San Luis to accommodate an expanding aviation industry.

Western Area Power Administration Sonora Substation and Transmission Lines

The Western Area Power Administration provides power to the PRPU via a 69-kilovolt transmission line from the Gila substation, located 18.9 miles northeast of the Sonora substation, which is southeast of the PRPU. The Sonora substation, which covers about 1 acre, transmits power to an existing 34.5-kilovolt transmission line via a new 2.6-mile section to the easternmost well site in the well field. This use is authorized under lease Bureau of Land Management (BLM) A-16010.

Border Patrol Drag Roads and Surveillance Towers

The Border Patrol maintains numerous drag roads and surveillance towers throughout the study area to help monitor and prevent illegal entry of undocumented aliens into the United States. The Border Patrol currently maintains a 90-foot-wide protective zone along the United States and Mexico border to monitor illegal entry into the United States. No structures are allowed within this protective zone, and the Border Patrol requires full access to monitor illegal activities. Also see "Proposed Future Uses Pending." **Photograph V-4** shows a drag road in the study area.



Photograph V-4.—U.S. Border Patrol drag road.

All Other Known Land Use Agreements (Utilities and Roads)

All other known land use agreements in effect within the study area are shown on figure V-1. (Also see **map V-3** for locations.)

Proposed Future Uses Pending

Border Protection Zone (Roosevelt Easement) Expansion

After the Border Patrol completes proper National Environmental Policy Act compliance, the Border Patrol's 90-foot-wide protective zone will likely be increased to 150 feet along the entire border between the United States and Mexico to better protect Border Patrol agents from stones and other projectiles thrown into the United States. The Border Patrol is requesting this protective zone expansion all along the international boundary and not just in the vicinity of San Luis, Arizona. Reclamation supports this expansion and does not anticipate any conflicts with operation of the 5-mile zone, PRPU, or other Reclamation activities near the international boundary (**photograph V-5**).

City of San Luis Sewer and Water Line

The city of San Luis has submitted an application to Reclamation to construct and operate a 24-inch water and sewer utility corridor primarily to service the port-of-entry and the possible Hillander "C" residential and commercial developments. In the future,

Location	Lessee/Permittee	Administering Agency	Activity	Issue Date	Expiration Date	Map Location
T. 10 S. R. 23 W., sec. 20	Mountain States Telephone	BOR 14-06-303-3445	Telephone cable	7/1/71	6/30/2021	Not shown on map
T. 10 S., R. 23 W., sec. 27; T. 10 S., R. 25 W., sec. 36; T. 11 S., R. 25 W., sec. 1	Mountain States Telephone	BOR 14-06-303-2538	Crossing agreement to construct telephone cable	3/11/68	3/10/2018	Shown on map V-3
T. 10 S., R. 23 W., sec. 27; T. 11 S., R. 24 W., sec. 5, 6; T. 11 S., R. 25 W., sec. 1	Bureau of Reclamation	BLM AR04859	Transmission line	7/23/69	No expiration	Shown on map V-3
T. 10 S., R. 23 W., sec. 26, 27, 31, 32, 33, 35; T. 11 S., R. 24 W., sec. 2, 4, 5, 6, 7, 8, 9, 17; T. 11 S., R. 25 W., sec. 1	County of Yuma	BLM A06389	County road	3/15/76	No expiration	Shown on map V-3
T. 11 S., R. 23 W., sec. 5	Arizona Public Service	BOR 9-07-34-L0705	Transmission line	11/30/88	11/29/2038	Shown on map V-3
T. 11 S., R. 23 W., sec. 5, 8	Arizona Public Service	BOR 0-07-34-L0597	Transmission line	1/1/90	12/31/2039	Not shown on map
T. 11 S., R. 23 W., sec. 5	Arizona Public Service	BOR 3-07-34-L0874	Transmission line	11/9/93	11/8/2023	Shown on map V-3
T. 11 S., R. 23 W., sec. 5, 6, 8; T. 11 S., R. 24 W., sec. 1, 2, 3, 6	U.S. West	BOR 0-07-34-L0596	Telephone line	1/1/90	12/31/2039	Shown on map V-3
T. 11 S., R. 23 W., sec. 5, 8	Southwest Gas	BOR 00LL34-1178	Natural gas pipeline	3/21/01	3/20/2026	Not shown on map
T. 11 S., R. 23 W., sec. 6	National Oceanic and Atmospheric Administration	BOR 5-07-34-L0928	NEXRAD weather station	3/15/95	3/14/2045	Shown on map V-3
T. 11 S., R. 23 W., sec. 16; T. 11 S., R. 24 W., sec. 16	Arizona Public Service	BOR 5-070-34-L0948	Transmission lines	9/16/95	9/15/2045	Shown on map V-3
T. 11 S., R. 24 W., sec. 1, 2, 3, 4, 5	Arizona Public Service	BOR Amend. No. 1, 7-07-34-L0996	Maintenance of transmission lines	11/8/96	11/7/2021	Shown on map V-3
T. 11 S., R. 24 W., sec. 2	Arizona Public Service	BLM A-2119	Gas pipeline	11/28/69	No expiration	Shown on map V-3
T. 11 S., R. 24 W., sec. 5	Arizona Department of Highways	BLM A-034361	Road	11/4/64	No expiration	Shown on map V-3
T. 11 S., R. 24 W., sec. 15	Arizona Public Service	BOR 9-07-34-L1124	Metering station	3/23/79	3/22/2049	Shown on map V-3
T. 10 S., R. 24 W., sec. 33	Arizona Public Service	BLM A - 007593	Transmission line	9/17/73	9/17/2023	Shown on map V-3

Figure V-1.—Other Land Use Agreements in the Study Area.



Photograph V-5.—International boundary.

this water and sewer line may be extended to service the State of Arizona, Department of Corrections, minimum security prison. The utility corridor would parallel 23rd Street. Initial construction and operation of the sewer and water utilities have already begun within existing city of San Luis city limits, and the San Luis High School is already tied to this utility service.

Projects Identified in Municipal and County Planning Documents (Not Pending)

City of San Luis Cemetery

The city of San Luis draft general plan identifies an area within the study area to develop a community cemetery. If a cemetery were to be developed in the future, the city of San Luis would make a formal request to Reclamation to lease or acquire the land. Before finalizing negotiations, future water needs would need to be defined and solutions identified to address water quality requirements needed to sustain such uses. The draft general plan does not contain details of the proposed development. The location of the proposed cemetery is NE ¼ of sec. 4, T. 11 S., R. 24 W.

City of San Luis Golf Course

The city of San Luis draft general plan identifies an area within the study area to develop a golf course. If a golf course were to be developed in the future, the city of San Luis would make a formal request to Reclamation to lease or acquire the land. The draft general plan does not contain details of the proposed development. Before finalizing negotiations, future water needs would need to be defined and solutions identified to address water quality requirements needed to sustain such uses. The location of the proposed golf course is sec. 3, T. 11 S., R. 24 W.

Transportation

Primary access to the study area is via U.S. Highway 95 from Yuma, Arizona, south to San Luis, Arizona, then east on 23rd Street.

U.S. 95 is the only route that connects the existing port-of-entry in San Luis to Interstate 8 in Yuma. This route also serves the prime agricultural areas of the Yuma Valley, and slow-moving farm equipment affects vehicle speed and roadway capacity. As the Yuma County area continues to grow and cross-border activities increase, the delays caused by farm equipment and the lack of roadway capacity will affect traffic operations even more. The Yuma Metropolitan Planning Organization, in association with other local agencies, has conducted studies since the 1980s to evaluate optional routes. Construction of the proposed SR195 is the final result of these transportation studies. (See “State Route 195.”)

Interstate 8, with more than 6.5 million vehicles a year (18,000 per day), passes directly through Yuma. It connects to San Diego to the west and to Interstate 10 between Phoenix and Tucson on the east. In the city of San Luis, another 2.6 million cars and 46,000 commercial vehicles pass between Mexico and the United States each year. Commercial truck traffic is routed onto the 23rd Street corridor, while cars and local commercial traffic use U.S. 95.

Access to the study area from Mexico is via Mexican Federal Highway 2, which parallels the international boundary, northwest to the boundary crossing at San Luis Rio Colorado, Mexico, and San Luis, Arizona, and north along Mexican Federal Highway 3 to the boundary crossing.

Paved access within the study area is provided by 23rd Street which runs east from San Luis to Avenue B, then north on Avenue B for approximately 3 miles to the northern boundary of the study area. Avenue B continues north until it intersects U.S. 95. Numerous unimproved roads (mostly sand) traverse the study area; the most prevalent one is the Border Patrol road that parallels the international boundary through the study area.

Following are proposed transportation routes within the study area.

State Route 195

Commercial and residential traffic in the San Luis and Yuma area is steadily increasing as a direct result of population growth, the enactment of the North American Free Trade Agreement (NAFTA) initiatives, and industrial growth in Mexico. To meet the needs of the increasing numbers of commercial users, as discussed previously, a new commercial port-of-entry is being constructed at the U.S.-Mexico border, about 5 miles east of the current facility. The proposed SR195 will connect the new border crossing to the cities of Yuma and San Luis. A major interchange will be located at 23rd Street and Avenue E.

Specific objectives of the proposed SR195 include the following:

- ❖ Facilitate travel and goods movement between the U.S.-Mexico border crossing at San Luis and the new commercial port-of-entry and Interstate 8
- ❖ Keep trucks and hazardous cargo away from populated and congested areas
- ❖ Relieve existing and future congestion on U.S. 95 in and between Yuma and San Luis

The Federal Highway Administration is currently completing an environmental assessment for the proposed SR195 project.

U.S. Highway 195 Expansion (Rolle Airfield Service)

Currently, access to Rolle Airfield is via a bumpy, primitive dirt road. With any future expansion and increased use of the airfield, plans call to upgrade the highway access. Yuma County long-range plans identify construction of a major road from the proposed SR195 interchange at 23rd Street and Avenue E north along Avenue E to the airfield.

City of San Luis Truck Route (From San Luis to New International Boundary Crossing)

The new commercial port-of-entry will accommodate commercial traffic crossing between Mexico and the U.S. The city of San Luis general plan identifies a route from San Luis to the new port-of-entry for commercial truck traffic. The truck route will parallel the international boundary east from San Luis to 24th Street, then follow 24th Street east to Avenue E, then continue south to the port-of-entry. It will become a major four-lane route with limited access.

Environmental Consequences

Alternative A

Under Alternative A, no comprehensive land use strategy or strategy to limit water use in the study area would be developed, no land transfers or exchanges would be allowed, and existing land uses and cooperation with adjacent landowners would be the same as today. As a result, land use authorizations would continue to be issued on a case-by-case basis, which could lead to conflicting land uses; allow social, physical,

environmental, or facility carrying capacities to be exceeded; adversely affect natural or cultural resources; or adversely affect Reclamation's ability to protect PRPU project purposes. Unrestricted OHV use would result in continued adverse effects. Construction of primary roads would be limited to roads already under consideration and would meet the public's need and demand for access.

Alternative B

Under Alternative B, a comprehensive land use strategy would be developed that would emphasize concentrating land uses in the western portion of the study area while protecting and enhancing the eastern portion of the study area (the Yuma Desert Management Area). Additionally, this land use strategy would use tools, such as Geographical Information System mapping, to better analyze how soil conditions and other environmental factors affect land use suitability and capability decisions. The land use strategy would also establish carrying capacities to determine the location, type, and appropriate number of facilities to be constructed and those that would provide maximum protection of natural and cultural resources. As a result, natural and cultural resources would benefit.

Alternative B would allow land transfers or exchanges that would benefit natural or cultural resources, while protecting authorized Reclamation purposes. This alternative also would provide additional opportunities to protect and enhance species of concern. Additionally, the base acreage of the study area would not be allowed to decrease, which would maintain Reclamation's ability to protect project purposes.

New land use authorizations in the western portion of the study area would be limited to those that are absolutely necessary and would adhere to the requirements of the 2003 Flat-Tailed Horned Lizard Rangeland Management Strategy (Rangeland Management Strategy). As a result, the flat-tailed horned lizard and its habitat would benefit. Existing land use authorizations would be allowed to continue but would be eliminated when possible. In this way, the land base committed to land uses would be reduced over time, furthering the goals of natural and cultural resources conservation and protection. Alternative B would emphasize conducting ground-disturbing activities in a manner to avoid adverse effects or loss of unique desert habitat. Land use authorizations also would emphasize mitigation for habitat losses.

Alternative B would further minimize adverse effects on the environment by prohibiting any landscaping associated with authorized land uses unless it were efficient (e.g., xeriscaping). Additionally, this alternative would not allow uses or activities that adversely affect water quality or endangered or threatened species or their habitat.

Construction of primary roads would be the same as under Alternative A, and existing primary roads would continue to be maintained to minimize the proliferation of parallel or additional routes. No secondary roads would be constructed. These actions would benefit natural and cultural resources. Additionally, aligning utility corridors with the proposed roadway improvements would minimize environmental disturbance.

The public's need and demand for access would be minimally met.

The city of San Luis' and Yuma County's need for residential, rural, and community expansion would likely not be met. Their need for open space and minimal recreation could be accommodated.

Alternative C

Like Alternative B, Alternative C would develop a comprehensive land use strategy. However, Alternative C's land use strategy would maximize recreation, community, and commercial development within the study area. Reclamation would attempt to concentrate this development in the western portion of the study area; however, development could be allowed throughout the study area if appropriate mitigation measures for the flat-tailed horned lizard could be achieved. As a result, Alternative C would affect more land within the study area than Alternative B.

Land transfers and exchanges would be allowed in the western portion of the study area (1) to benefit public recreation facilities and opportunities or (2) to accommodate community or commercial development, while protecting Reclamation's project purposes. As a result, less land may be protected for species of concern or as unique desert habitat than under Alternative B. As under the other alternatives, the base land acreage within the study area would not be allowed to decrease.

The issuance of land use authorizations within the study area would be the same as under Alternative B, except that Alternative C would maximize recreation, community, and commercial development. Reclamation would ensure the compatibility of any land use authorizations with recreation, community, and commercial development. As a result, human development could affect more land than under Alternative B. However, Alternative C would better serve the needs of the cities of San Luis and Yuma because it would be easier for the cities to secure land from the study area for utility corridors, roadways, recreation areas, and other infrastructure development needs and land uses.

Primary road construction and major improvements to existing roads would be allowed within the study area to provide needed access to recreation, community, and commercial developments. Secondary roads would be constructed to provide access to campgrounds, day use facilities, and trailheads. As a result, Alternative C may adversely affect more unique desert habitat than Alternatives A or B. Public demand and need for access would be fully met.

Alternative D

Like Alternatives B and C, Alternative D would develop a comprehensive land use strategy. Alternative D's land use strategy would authorize land uses in the western portion of the study area to benefit limited community, recreation, and commercial development and allow land use authorizations within the Yuma Desert Management Area only for public health, safety, and security purposes. As a result, Alternative D would affect more land than Alternative B but less than Alternative C. However, Alternative D would enhance public safety and security more than Alternative C. All other aspects of land use authorizations would be the same as under Alternative B.

Alternative D would allow the same use of land transfers or exchanges to enhance protection of species of concern or unique desert habitat as Alternative B. However, Alternative D would also allow land transfers or exchanges to benefit limited public recreation, community, and commercial development in the western portion of the study area which could lead to greater adverse effects on the natural environment than under Alternative B.

Secondary roads would be constructed to provide access to campgrounds, day use facilities, and trailheads. Therefore, the environmental effects resulting from the construction of secondary roads would be greater than under Alternatives A or B but less than under Alternative C. Alternative D would allow maintenance on all primary and secondary roads to prevent the proliferation of parallel routes, thereby benefiting natural and cultural resources. Public demand and need for access would be met.

Cumulative Impacts

Both Alternatives C and D would lead to increased visitor use at the same time that the human population of the surrounding area is increasing because of municipal growth. This increased visitation, combined with an increased population, would increase traffic and congestion on the surrounding roads. No other cumulative impacts have been identified.

Mitigation

Under all alternatives, all land use permits would contain specific stipulations to protect existing resources, decrease potential conflicts with adjacent landowners, and prevent land use conflicts within the study area. Additionally, any developments within the Yuma Desert Management Area would require special mitigation to avoid adverse effects or loss of unique desert habitat and mitigation for habitat losses and/or impacts to flat-tailed horned lizard habitat.

Residual Impacts

No residual impacts have been identified.

GROUNDWATER

Affected Environment

Groundwater Availability

Other than the Colorado River, groundwater is the only potentially viable source of water in the study area. Groundwater in the 5-mile zone originates almost exclusively from the Colorado River, either as direct recharge from the river itself, or from water

diverted from the river and applied as irrigation on Yuma Mesa or in Yuma Valley. That portion of water applied as irrigation which neither is consumed by crops nor evaporates directly from the soil percolates down to the water table to recharge the groundwater system.

Reclamation's management priority in the study area is to control groundwater pumping. As discussed previously, Minute No. 242 of the International Boundary and Water Commission (IBWC 242 Minute) limits groundwater pumping in the 5-mile zone to no more than 160,000 acre-feet per year. (See **map V-4** for wells within the study area and within the entire 5-mile zone on the Yuma Mesa.) The United States delivers about 140,000 acre-feet per year at the SIB in partial satisfaction of its 1.5-million-acre-foot treaty obligation to Mexico. The 140,000 acre-feet is a combination of drainage and unused irrigation water from the Valley Division of Reclamation's Yuma Project and water pumped from the PRPU.

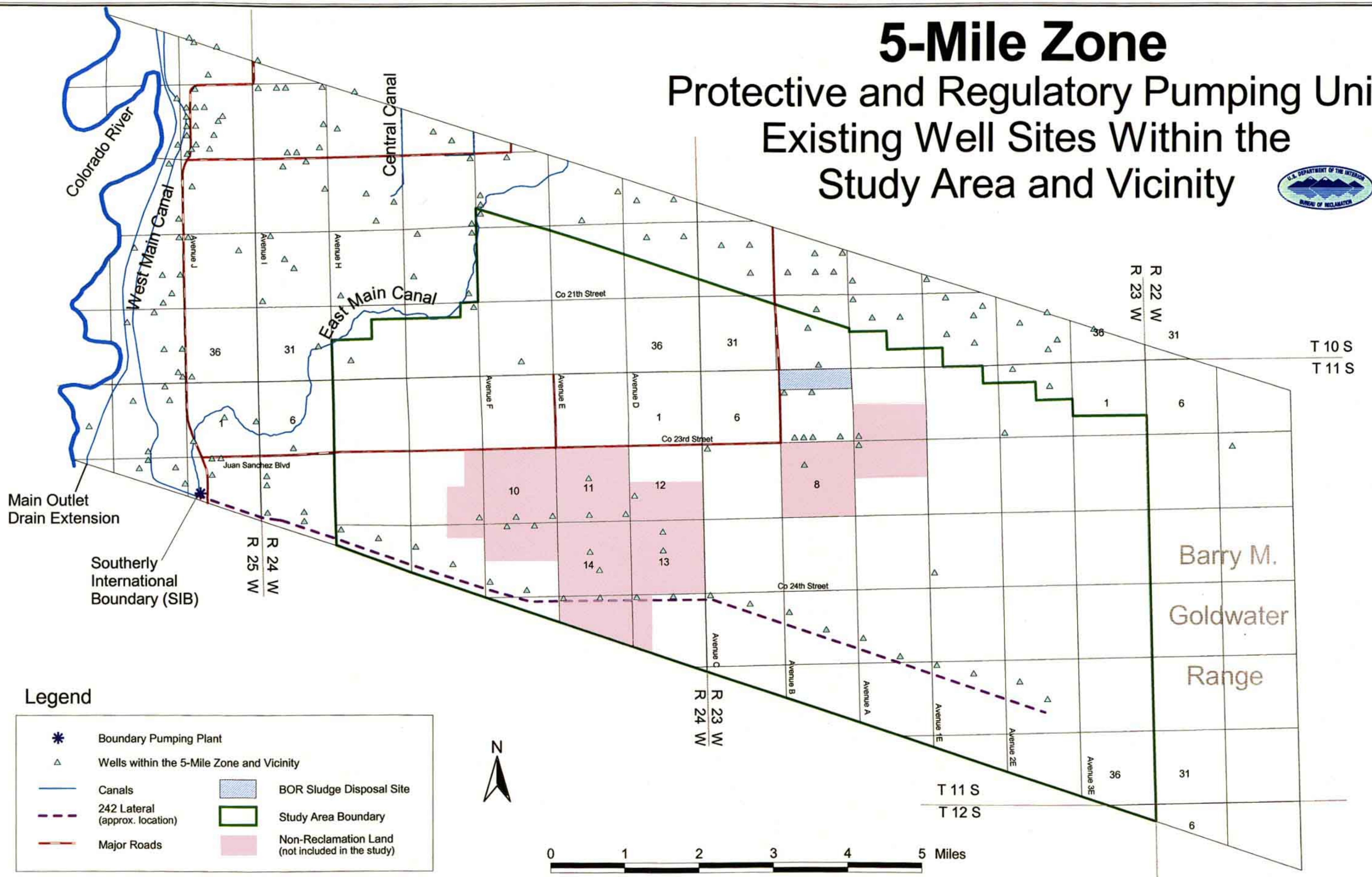
The PRPU began partial operation in 1980. From 1980 through 2002, the average annual pumpage was 10,400 acre-feet, with a high of 31,000 acre-feet in 1991 and a low of 450 acre-feet in 1997. Pumping from the PRPU averaged 3,800 acre-feet per year from 1998 through 2002. All of this pumped water is conveyed into Mexico as part of the 140,000-acre-foot-per-year discharge across the SIB. Additional pumping in the 5-mile zone is done by the Hillander "C" irrigators (averaging about 16,000 acre-feet per year from 1989 through 1999) and by the State of Arizona, Department of Corrections, minimum security prison (averaging about 400 acre-feet per year from 1997 through 2001). The city of San Luis pumps approximately 1,800 acre-feet, and the area around San Luis pumps approximately 5,200 acre-feet.

Before extensive irrigation, the nearly exclusive sources of recharge to groundwater in the Yuma area were the Colorado and Gila Rivers, particularly during flood flows when the rivers overflowed their banks inundating the flood plains. With an average of only about 3 inches of precipitation per year, much of which is lost to evaporation, recharge from precipitation in the Yuma area is a very minor source of recharge. Runoff from nearby mountains (where precipitation averages 4 to 6 inches per year) rarely reaches the Colorado or Gila Rivers. Most of this runoff infiltrates in the sandy and gravelly washes. The major part of this infiltrated water is later evaporated or transpired. Only a small portion reaches the water table.

After 1945, when water was diverted from the Colorado River on a large scale to irrigate Reclamation's Yuma Mesa projects, a large groundwater mound formed as a result of field percolation and, to a lesser extent, canal and lateral seepage losses. By the 1960s, the water table at the crest of the mound was more than 60 feet above predevelopment levels. This groundwater mound significantly changed groundwater flow patterns in the area. Under predevelopment conditions, the estimated underflow across the SIB was about 20,000 acre-feet per year. After development of the Yuma Mesa mound and prior to pumping of Mexico's San Luis Mesa well field, the underflow increased to about 49,000 acre-feet per year due to increased southward gradients created by the mound. Mexico began large-scale pumping in 1973 from its San Luis Mesa well field, located just south of the SIB and east of San Luis Rio Colorado. Between 1973 and 1976, annual pumpage from the well field averaged 102,000 acre-feet. Pumping by Mexico caused groundwater levels in the southern part of Yuma Mesa to decline and considerably

5-Mile Zone

Protective and Regulatory Pumping Unit Existing Well Sites Within the Study Area and Vicinity



Legend

	Boundary Pumping Plant		BOR Sludge Disposal Site
	Wells within the 5-Mile Zone and Vicinity		Study Area Boundary
	Canals		Non-Reclamation Land (not included in the study)
	242 Lateral (approx. location)		
	Major Roads		



increased the southward hydraulic gradient. In 1976, primarily due to pumping in the San Luis Mesa well field by Mexico, the flow across the SIB was estimated to have increased to 75,000 acre-feet per year. Thus, the magnitude of the flow across the SIB is highly dependent upon the level of pumping of the San Luis Mesa well field. From 1972 through 1999, the well field's pumping averaged 67,000 acre-feet per year, with a high of 148,000 acre-feet in 1982 and a low of 0 in 1998 and 1999. Pumping of the PRPU could significantly reduce SIB underflow to Mexico, if the level of pumping were sufficiently high. However, the pumping of the PRPU has always been relatively small compared to the level of pumping of the San Luis Mesa well field—not appreciably affecting the SIB underflow. The volume of water currently stored in the mound is about 1 million acre-feet (assuming a specific yield of 0.25), which is superimposed on the predevelopment storage in the groundwater system.

From 1952 through 1972, the annual flow in the Yuma Valley Main Drain to the Boundary Pumping Plant averaged 126,000 acre-feet. From 1973 through 2002, the flow averaged 95,000 acre-feet. The reason for the drop in drain flow was increased pumping, primarily from the San Luis Mesa well field and Reclamation's Yuma Mesa well field, the latter beginning significant pumping in 1972. Additionally, since 1995, six drainage wells in Yuma Valley have been connected to the Yuma Mesa conduit, resulting in increased discharge of drainage water to the Colorado River above the Northerly International Boundary and less discharge to Yuma Valley drains and the Boundary Pumping Plant.

Reclamation used a groundwater-flow model to estimate the water table decline with full operational pumping in the 5-mile zones of both Mexico's San Luis Mesa well field and the United States' PRPU and pumping in the United States of the Yuma Mesa drainage wells. Results of this modeling indicated that after 50 years of fully developed pumping, the water table would decline more than 100 feet in an elongated central region within the contiguous 5-mile zones. Land subsidence, which has occurred in other areas of large-volume pumping, is not expected to be a significant problem with fully developed pumping of the PRPU and the San Luis Mesa well field in Mexico.

Groundwater Quality

The chemical composition of the native (i.e., pre-irrigation) groundwater in the 5-mile zone is similar to that of recent Colorado River water, except that chloride rather than sulfate is the chief anion constituent. In areas where there has been a history of pumping and irrigation, concentration of chemical constituents has occurred. Also, rising nitrate levels have been observed. According to recent water quality data (1988-99) for the 5-mile zone, total dissolved solids (TDS) ranges from about 800 to 2,300 milligrams per liter (mg/L). The TDS of water in wells near the international boundary used to meet the treaty obligation to Mexico ranges from 800 to 1,700 mg/L. In comparison, the average TDS concentration from all wells on the Yuma Mesa is 1,333 mg/L, and the maximum and minimum concentrations are 3,210 and 644 mg/L, respectively. The Yuma Valley average concentration is 1,536 mg/L; maximum and minimum concentration are 2,790 and 518 mg/L, respectively. Changes in the use of surface water or groundwater on the Yuma Mesa could affect the quality of groundwater in the study area and of the underflow to Mexico.