Dolores Project Colorado, Final Supplement to the Final Environmental Statement

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Dolores Project
Colorado

FINAL SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT

This Final Supplement to the Final Environmental Statement (FES) to the Dolores Project describes project modifications since completion of the 1977 Final Environmental Statement on May 9, 1977, (FES 77-12) and a Finding of No Significant Impact approved May 11, 1981, for the addition of two hydroelectric powerplants to the project. The project modifications include adding salinity control and changing the alignment of the Towaoc Canal from west of Cortez, Colorado, to the east of the city. In addition, refinements would be made to the project plan by deleting Monument Creek Reservoir and the Cortez-Towaoc Municipal and Industrial Pipeline from the plan; combining the capacities of two pumping plants into one plant near Dove Creek, Colorado; constructing a delivery pumping plant near Cahone, Colorado, as an economical alternative to increasing pipe size; increasing the capacities of the McPhee and Towaoc Powerplants; and improving the operation, maintenance, and replacement of the project by installing a computerized system.

For further information on the processing or content of this document, please contact the Regional Environmental Officer, Bureau of Reclamation, 125 South State Street, PO Box 11564, Salt Lake City, Utah 84114, or call commercial (801) 524-5580 or FTS 588-5580.

Draft Statement No. INT-DES 76-44 dated November 1, 1976

Final Statement No. INT-FES 77-12 dated May 9, 1977

Draft Supplement to the FES No. INT-DES 88-11

Date filed with the EPA: March 2, 1988

Final Supplement to the FES No.

Date filed with the EPA:
The Dolores Project is located in Montezuma and Dolores Counties in southwestern Colorado. The area, predominantly rural and agriculturally oriented, is part of a region frequently referred to as the Four Corners because of the unique juncture of the States of Utah, Colorado, New Mexico, and Arizona. The northeastern edge of the project area lies within the Dolores River Basin and the remainder within the San Juan River Basin. Both basins are a part of the Upper Colorado River Basin.

Within this area is the city of Cortez, the Montezuma County seat and major commercial center; the town of Dove Creek, the Dolores County seat; and Townsend, the headquarters of the Ute Mountain Ute Tribe. The town of Dolores is located on the Dolores River upstream of McPhee Dam and Reservoir, just north of Cortez and the Montezuma Valley area. Montezuma County, which contains major project features, had a population of 16,310 in 1980, according to the U.S. Census. Most of the irrigated agricultural land in the area lies in Montezuma Valley in the eastern portion of the drainage around Cortez.

The three areas served by the Dolores Project are Montezuma Valley in the central part of the project area, Dove Creek to the northwest, and Townsend to the south. All areas are mostly rural and agricultural. Montezuma Valley and Dove Creek are within the boundaries of the Dolores Water Conservancy District (DWCD). The Montezuma Valley Irrigation Company (MVIC) is the oldest distributor of water in the project area, having diverted water from the Dolores River to the McElmo Creek drainage for approximately 100 years to serve irrigators and municipal and industrial water users in the valley.

Regulatory Compliance

This Draft Supplement to the Final Environmental Statement (FES) was prepared pursuant to Section 102(2) of Public Law 91-190, the National Environmental Policy Act (NEPA) of 1969 and Section 1302.9(c) of the Council on Environmental Quality’s Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. This Draft Supplement, in conjunction with the 1977 FES and the 1981 Finding of No Significant Impact, provides additional NEPA compliance and puts the Dolores Project in compliance with Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; Public Law 95-217, Clean Water Act; Public Law 95-206, Clean Air Act; Public Law 93-207, Endangered Species Act; Public Law 94-194, Wildlife Coordination Act; Public Law 99-665, as amended by Public Law 96-515, the National Historic Preservation Act; Public Law 96-97, the Archeological Resources Protection Act of 1979; and applicable environmental regulations or instructions of the Bureau of Reclamation.

SUMMARY

Introducing

SUMMARY (Continued)

Purpose and Need

The purpose of this Draft Supplement to the Final Environmental Statement is to describe the environmental impacts that would occur from the proposed modifications of adding salinity control as a purpose to the Dolores Project in southwestern Colorado and of changing the alignment of the Towaoc Canal from the west to the east of Cortez. Both of these modifications would occur in the McElmo Creek drainage, and this supplement primarily focuses on that drainage. The FES was completed in April 1977 and filled with the Council on Environmental Quality on May 9, 1977 (FES 77-12). A Finding of No Significant Impact on the addition of two hydroelectric powerplants to the project was approved on May 11, 1981.

The salinity control modification would include lining sections of the Lone Pine and Upper Hermosa irrigation laterals in the WEC system to prevent seepage; abandoning the Rocky Ford Ditch, a major contributor of salt, and incorporating its flows into the new alignment of the Towaoc Canal east of Cortez; abandoning the MVIC’s Lower Hermosa lateral and Highline Ditch and also including their flows, along with the Ute Mountain Ute Indian Tribe’s full service irrigation project water supply, in the Towaoc Canal; and constructing eight buried pipe laterals from the Towaoc Canal to the Rocky Ford Ditch service area.

In the Colorado River Basin, salt pickup from the McElmo Creek drainage and other sources has resulted in a deterioration of the quality of Colorado River water over the long term as river flows have been developed for man’s beneficial uses. At its headwaters in the mountains of north-central Colorado, the Colorado River has a salinity concentration of approximately 50 milligrams per liter (mg/L). Downstream the concentration progressively increases because of irrigation diversions and salt contributions from a variety of sources; in 1985, salinity averaged 807 mg/L at Imperial Dam, the last major diversion point in the United States. Future water development in the basin is projected to increase salinity to an average of 963 mg/L at Imperial Dam by the year 2010. Peak salinities are predicted to approach 1,200 mg/L in some years.

In response to the Federal Water Pollution Control Act and its amendments (Public Law 92-500), the seven Colorado River Basin States1/ in 1972 adopted the Environmental Protection Agency approved numeric criteria for three points on the lower Colorado River as shown in Summary Table 1 on the following page.

1/ The waters of the Colorado River are divided by a compact agreed to by the seven Colorado River Basin States (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming).
The goal of the salinity control program is to maintain concentrations at or below these criteria. Salinity control measures of the Soil Conservation Service (SCS) and the Bureau of Reclamation (Reclamation) to date are removing 150,800 tons of salt annually from the Colorado River system. Over a million tons of salt per year will need to be removed by the year 2010 to maintain average salinity below the numeric criteria level of 879 mg/L at Imperial Dam.

In the McElmo Creek area, salt loading primarily results from conveyance seepage in the WIC system and from irrigation deep percolation into the ground water system. This seepage water dissolves salts from the soil and the underlying Mancos Shale and then surfaces in McElmo Creek. Return flows to McElmo Creek, including surface and ground water, have an estimated combined salinity level of approximately 1,990 mg/L, while the estimated concentration of the ground water alone is approximately 3,900 mg/L. With the Dolores Project in operation, the total salt pickup from the area would be approximately 144,200 tons annually. The objective of the proposed salinity control features is to decrease the amount of salt leaving the study area and entering the Colorado River system.

As noted above, the Towaoc Canal would be realigned from the west to the east of the City of Cortez. In the 1977 FES, the Towaoc Canal would convey full service irrigation water to the Towaoc area along the western alignment independent of all WIC facilities. In recent years, however, a reevaluation of the Towaoc Canal alignment has identified several factors in addition to achieving salinity control benefits, favor a realignment of the canal to the east of Cortez. These factors are significant economic savings in right-of-way and land acquisition costs as well as significant public support because it would prevent the disturbance and loss of agricultural land by using the existing Lower Hermosa Lateral and Highline Ditch alignments. Additionally, using the east alignment and combining the canals would decrease the salt loading effect of the Towaoc Canal by an estimated 7,300 tons per year.

The Dolores Project interrelates with other Federal projects currently under investigation or construction by the U.S. Department of Agriculture. These projects include the proposed on-farm improvement program in Montezuma Valley being developed by the SCS and the Agricultural Stabilization and Conservation Service (ASCS). Public Laws 93-320 and 98-569 authorize the Secretaries of Interior and Agriculture to cooperate in implementing any project involving control of salinity from irrigation sources. The recommended plan developed by the SCS would remove an estimated average of 38,000 tons of salt annually. The ASCS would provide assistance to operators for installing needed structural measures in implementing the SCS plan.

Refinements to the Project Plan
Since the 1977 FES, some refinements to the project plan have been made as a result of economic and design criteria considerations. Such refinements are a normal function of the design and construction process and do not contribute to further environmental impacts. These refinements include the following.

1. In September 1977, the NMCD signed a repayment contract with the United States providing, among other things, for repayment, with interest, of all project costs allocated to Municipal and Industrial water, including storage of water in Monument Creek Reservoir and the delivery of water in the Cortez-Towaoc Municipal and Industrial pipeline from McPhee Reservoir to the Ute Mountain Ute Reservation.

When the cost of the project allocated to municipal and industrial water use was projected to exceed the limits of the Dolores Project repayment contract, a need arose to modify the project. Consequently, the State of Colorado agreed to dropping the Monument Creek Dam and Reservoir and 1.2 miles of pipeline from the project. The negotiations on the Animas-La Plata Project resulted in dropping the remaining 12.1 miles of pipeline from the project. The NMCD has agreed to construct these two facilities without Federal financing, subject to financing from the State through the construction fund of the Colorado Water Conservation Board.

2. Since the 1977 FES, Reclamation determined that the efficiency of the operation of the project in the Dove Creek area could be improved by combining the capacities of the Monument Creek and Cross Canyon Pumping Plants for sprinkler irrigation into one pumping plant, the Dove Creek Pumping Plant, to serve full service land in the Dove Creek area. This pumping plant will be located at the Cross Canyon site.

3. Because some of the land to be served by the Cahone Pumping Plant and Laterals, as described in the 1977 FES,
4. After the McPhee and Towaoc Powerplants were added to the project in 1981, further analysis revealed a need to modify their capacities. For the McPhee Powerplant, turbine design capacity was based on releases of 25 to 75 cfs. In 1981, the normal minimum design capacity was a 50-cfs turbine. Since then, Reclamation has determined that more efficient use of the water could be made by increasing this design capacity to 75 cfs and that additional flexibility could be gained by using a combination of two turbines and one generator. Consequently, the capacity of the McPhee Powerplant has been increased from 980 kilowatts (kW) to 1,350 kW. A reanalysis of the Towaoc Powerplant revealed that increased capacity could be obtained by using a turbine with less head loss and reduced maximum static head losses. Subsequently, the powerplant capacity has been increased from 10,500 kW to 12,200 kW.

5. Some refinements have been made to the operation, maintenance, and replacement of the project since 1977. To provide a timely and coordinated operation of the water storage and conveyance facilities on the delivery system of the project, a computerized Programmable Master Supervisory Control System would be used to automate the operation. This system would generate control functions at predetermined times and interpret control functions on the Great Cut Pumping Plant; the checks along the Dove Creek, South, and Towaoc Canals; the six sprinklerhead pumping plants; and the two powerplants. In addition, this system would allow monitoring and remote control of the releases from McPhee Dam. The operation of project canals will be based on a scheduled delivery concept. Irrigators will order water in advance. In addition, pumping plants and checks along the canals will contain instruments to monitor changes in water demand downstream and automatically adjust to meet these changes.

SUMMARY (Continued)

Alternatives

Reclamation considered one viable alternative and no action alternative on the project modifications. The viable alternative passed the four tests—completeness, effectiveness, efficiency, and acceptability—used to identify viable plans that would meet the goals of the salinity control program and the guidelines of the Department of the Interior and the Bureau of Reclamation.

During the planning process a number of alternatives were developed and studied but were dropped from further consideration by 1984 for the following reasons.

1. Using saline water to transport coal in a slurry pipeline. This alternative does not pass the test of completeness because no potential users could be found.

2. Withdrawing the use of highly saline land. This plan failed the acceptability test because most residents do not want to move or disrupt their lives and are unwilling to sell. The State of Colorado is also opposed to taking land out of agricultural production.

3. Collecting saline water and using it for industrial cooling. This alternative failed the test of completeness because no firm commitments were obtained from power companies in using this water, although some interest was shown. The plan may be a viable alternative in the future if additional salinity reduction needs were met.

4. Collecting and evaporating saline water. The three alternatives for evaporating saline flows failed the test of efficiency because their costs per ton of reduction in salinity, discussed below, were beyond what is currently being considered for implementation under the Colorado River Water Quality Improvement Program. They also failed the test of acceptability because the evaporation of saline water is not considered a beneficial use in Colorado.

5. Constructing desalting plants. The construction of three different types of desalting plants was investigated, but each failed the test of efficiency because of high costs. The methods included solar, reverse osmosis, and electrodialysis.

Twelve additional lateral lining segments were studied as part of the irrigation system improvements plan. They were not included in the irrigation system improvements plan because their cost effectiveness exceeded what was being considered for implementation.
SUMMARY (Continued)

Reclamation has used criteria of cost effectiveness and maximizing salinity reduction to select the recommended salinity reduction measures. Under the criterion of cost effectiveness, those plans resulting in the greatest reduction of salinity in the Colorado River system for the least cost would be recommended for implementation first. The cost-effectiveness criterion is based on total annual costs and the resulting average salinity reduction at Imperial Dam, expressed in dollars per ton of salt removed.

Project modifications

The project modification of irrigation system improvements would consist of lining three segments of the Lone Pine Lateral totaling 8.3 miles and one segment of the Upper Hermana Lateral totaling 0.5 mile, abandoning the Lower Hermana Lateral and the Highline and Rocky Ford Ditches and combining their flows with the new alignment of the Towaoc Canal totaling 25 miles, and installing eight buried pipe laterals totaling 7.0 miles to convey water from the Towaoc Canal to serve the Rocky Ford Ditch service area.

Measures would be employed to reduce deer and elk entrapment within the two concrete-lined sections of the Towaoc Canal. Approximately 689 acres of land were acquired downstream of McPhee Dam for mitigation and enhancement. Approximately 215 acres of this land were acquired as mitigation for riparian and wetland habitat losses resulting from the project. The remaining 474 acres were acquired for fish and wildlife and recreation enhancement. Of the 215 acres required for mitigation, the U.S. Fish and Wildlife Service recommended that 24 acres be developed as wetland habitat to compensate for wetland habitat losses expected to result from lateral and ditch lining. Reclamation, however, through coordination with the Environmental Protection Agency, the Fish and Wildlife Service, and the Colorado Division of Wildlife, developed a 75-acre plan to offset these losses.

Under the cultural resources mitigation plan, Reclamation would propose to excavate some sites, avoid some sites, propose that many sites are already adequately mitigated by the Class III survey recording, and accept the necessary loss of some sites without any further work beyond the Class III survey recording.

Reclamation has established a 10-year program to monitor the effects of salinity control on water quality in the Colorado River.

Right-of-Way

Right-of-way for the Lone Pine and Upper Hermana Laterals, currently 50 feet in width, would be widened to 200 feet. The MWIC would be responsible for acquiring the right-of-way for these two lateral sections and the Rocky Ford Pipe Laterals. Reclamation would acquire a 25-foot right-of-way for the Towaoc Canal. A total of 1,700 acres would be required for this purpose.

Construction Headquarters

The Cortez Projects Office of the Bureau of Reclamation would be the headquarters for the construction of the salinity control features and the other features of the Dolores Project.

Operation, Maintenance, and Replacement

Since salinity features would be added to the project in the MWIC system, a progressive program for the operation and maintenance of lined sections would be needed to continue the control of seepage. Reclamation would enter into a contract with the MWIC detailing the responsibilities of the company for the proper operation and maintenance of all salinity control features, except the Towaoc Canal.

Administration

The MWCO is negotiating with the MWIC and the Tribe for their subcontracting the operation and maintenance responsibilities of the salinity control facilities and the Towaoc laterals, respectively. The Bureau of Land Management would develop and administer 476 acres of the enhancement land, and the Colorado Division of Wildlife would administer 215 acres of the mitigation land.

Development Program

Beginning in 1989, the construction of the salinity control features would take 4 years to complete and would be integrated with the established project construction program. The sections of the Lone Pine and Upper Hermana Laterals would be earth lined during the nonirrigation months from October to May. The Towaoc Canal would be constructed as a new canal close to the existing Lower Hermana lateral and Highline Ditch to allow construction during the irrigation season. The Rocky Ford Pipe Laterals would be constructed with a minimum of interruption to MWIC operations.

Effects of project modifications on salinity

The 1977 FES reported that 10,080 tons of salt annually to the Colorado River system would occur annually as a result of implementing the plan of development. This analysis, based only on the salt loading effect of irrigating full service land, did not include the effect of canal seepage or the increased deliveries to the MWIC area. An analysis made since completion of the 1977 Definite Plan Report reveals that 90,970 tons of salt annually would be contributed from canal seepage, including 7,500 tons from the Towaoc Canal on the west alignment and 33,070...
tons from other project canals. The total salt loading from project land and canals for the 1977 FES plan would be 30,600 tons annually.

The project modification of changing the alignment of the Towaoc Canal would eliminate the 7,500 tons of annual salt loading that would have occurred with the west alignment. The construction of the salinity control features would further reduce salt loading by an additional 24,500 tons (rounded) annually at a cost effectiveness of $83 per ton of salt removed. The total effect of all project modifications, including the realigning of the Towaoc Canal, would be an annual reduction of approximately 32,000 tons. The net effect of the project, including project modifications, would be an increase of 18,850 tons of salt per year, as shown in Summary Table 2.

Summary Table 2

<table>
<thead>
<tr>
<th>Project Area</th>
<th>Revised Salt Loading</th>
<th>Revised Salt Project</th>
<th>Salt Loading Modified</th>
<th>Salt Project</th>
<th>Salt Project</th>
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<tbody>
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<td>Towaoc Canal</td>
<td>+10,080</td>
<td>+31,150</td>
<td>0</td>
<td>+31,150</td>
<td></td>
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<tr>
<td>Salinity control features</td>
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<td>+7,500</td>
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<tr>
<td>Total project</td>
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<td>+7,500</td>
<td>+32,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Since the 1977 FES, salt loading analyses have included seepage from project canals as well as the irrigation of project land.
2 The salinity effects of canal seepage were not estimated in the 1977 FES.
3 Salinity control was not a part of the 1977 FES plan.
4 This salt reduction does not include the on-farm program of the SCS for reducing salt loading.

No action alternative

The no action alternative with respect to the salinity control program is included to allow a comparison between the construction of salinity control features and the anticipated future without salinity control. This alternative would consist of constructing the Dolores Project as described in the 1977 FES and in the Finding of No Significant Impact for the addition of hydroelectric power at McPhee Dam and at the Towaoc Canal. This no action alternative assumes no expenditure of salinity control funds by Reclamation. Under the no action alternative, the SCS on-farm program for removing 38,000 tons of salt annually would be impacted, but the reduction in tons of salt removed is unquantifiable.

Summary of Environmental Impacts

Land use

Trends in land use in Montezuma County would probably continue with or without the project modifications. The major enterprise is cattle ranching; of lesser importance is the growing of commercial fruits and vegetables. Small hobby farms would replace existing farms and ranches. Parts of the county, particularly along major roads, would see increased urbanization. Some county bridges and roads and private farm road crossings would be reconstructed. Since the lined sections of project conveyance features would generally be near or on the existing alignment, no significant relocations would occur.

Scenery

Over the short term, heavy equipment, increased human activity, and construction scars would detract from scenery in construction areas. Once construction is completed and reseeding of the disturbed areas is accomplished, vegetation would reestablish itself and the affected areas would look much as they do now.

Air and noise quality

The project modifications would not have long-term effects on ambient air quality but would have short-term impacts during the 4-year construction period. Emissions and dust from construction equipment and the moving of earth and aggregate would increase particulate levels and decrease air quality locally during construction, but air quality is expected to remain in the acceptable level. Dust abatement procedures would be undertaken during construction. Noise generated by construction equipment would be a short-term nuisance to people living near the affected ditches and laterals, but measures would be instituted to reduce noise levels. All of the construction activities, however, would take place away from any population concentrations.

Water quantity and quality

The average annual salt pickup in the McPhee Creek drainage would be 117,880 tons with the project modifications and 144,180 tons without them, resulting in an annual reduction of 26,300 tons due to project modifications plus 5,700 tons removed from outside the McPhee Creek drainage for a total annual reduction of 32,000 tons. The 32,000 tons consist of 24,500 tons removed as a result of salinity control features and 7,500 tons that would not enter the system as a result of realigning the Towaoc Canal east of Cortez. This reduction of 32,000 tons annually would also result in a reduction in salinity at Imperial Dam of 2.9 mg/l.
SUMMARY (Continued)

Vegetation and wildlife

Short-term impacts would include the temporary loss of some vegetation during construction until disturbed areas are revegetated. Long-term impacts would result from a reduced quantity and quality of habitat for some wildlife species and a gain to other habitat for other species. Losses in the dryland cover types would primarily result from the expansion of the urban community, such as housing and businesses, and would occur with or without the proposed modifications.

Cottonwood trees provide habitat to a number of birds and mammals. Bald eagles are known to use these trees for nesting. During construction activities, cottonwood trees would be avoided to the extent practical, and any large raptor nest would receive special consideration and be reported to the environmental officer.

The vegetation analysis was performed by the U.S. Fish and Wildlife Service using a habitat prediction model to assess the baseline habitat quality and the impacts to wildlife and to quantify the mitigation needs associated with project modifications. Of the 379 acres of wetland habitat in the drainage dependent on lateral seepage, 89 acres would be lost because of the project modifications. With the development of 75 acres of wetland area, there would be a net project loss of 14 acres of wetland. All wildlife habitat losses would be compensated with the proposed mitigation measures.

Because of a smooth, hard surface, the two concrete-lined sections of the Towac Canal totaling 4.6 miles would present a threat to the existing deer and elk through entrapment and eventual drowning. Mitigation for this potential loss would be accomplished by one or more of the following: fencing; constructing escape structures within the concrete-lined sections of the canal; and/or installing crossover ramps over the canal. Construction activities may temporarily disturb resident deer and elk herds, but no long-term impacts are anticipated.

Flood plains and wetlands

The project modifications would not affect the existing flood plains under the provisions of Executive Order 11988, Floodplain Management, because of the design of the features and the minimal amount of water involved. In accordance with the Wetlands Protection Act, Executive Order 11990, Reclamation examined various alternatives to reduce salinity and considered their impacts on wetlands. No viable alternative to the project modifications would accomplish the objectives of the salinity program. The project modifications accomplish the environmental task of salinity control under existing laws. Reclamation, based on coordination with the Environmental Protection Agency, the Fish and Wildlife Service, and the Colorado Division of Wildlife, would develop replacement wetlands. Reclamation would provide funds from the salinity control program to the Colorado Division of Wildlife to operate and maintain these wetlands.

Fish

Fisheries management of the streams in the McElmo Creek area would remain unchanged with or without the project modifications. Because of the poor quality water and low survival rate, no fish stocking would be conducted. No adverse impacts to the fishery resource would occur with the project modifications. Water quality would improve as salinity levels are decreased, thereby positively affecting those fish living in the McElmo Creek.

By supplementing the MVIC's water supply, the project would generally have a stabilizing effect on Narraguinnep Reservoir. Once the project modifications were constructed and operational, Rocky Ford Ditch would be abandoned. Totten Reservoir would serve no irrigation purpose to the MVIC, but the necessary quantity up to 800 acre-feet of project water would be made available to maintain water quality and sustain the fishery. The MVIC would continue to operate and maintain Totten Dam and Reservoir with annually appropriated funds authorized by salinity control legislation.

Threatened and endangered species

In accordance with Section 7 of the Endangered Species Act, Reclamation provided the U.S. Fish and Wildlife Service a Biological Assessment on the Colorado squawfish and the bald eagle. This assessment contains the conclusion of Reclamation that there would be little or no effect on the endangered species by the project modifications. The Fish and Wildlife Service issued a Biological Opinion that the project modifications would not jeopardize the continued existence of the Colorado squawfish or the bald eagle.

Recreation

During the short-term, construction on the project modifications would have a negative impact on any recreational use of the laterals and ditches, such as hiking and bird watching. The stabilizing of Narraguinnep Reservoir would have a positive effect on the visual and recreational aspects of the reservoir. Under MVIC management of Totten Reservoir, its recreational use would continue.

Cultural resources

Construction of the salinity control features described elsewhere will destroy or damage a majority of the 129 recorded cultural resources, thereby creating an irreversible adverse effect. A specific mitigation plan for the canal and lateral features of the Dolores Project was
accepted by the Colorado State Historic Preservation Office in 1983. Once the final alignment of the Towaoc Canal was determined, Reclamation would propose steps to mitigate the impacts to the cultural resource sites, including data recovery and, where possible, avoidance. At the borrow areas and gravel sources yet to be surveyed, avoidance of recorded sites would be emphasized. At the end of the cultural resources mitigation program, the artifacts and reports would be curated at the Anasazi Heritage Center near Dolores, Colorado.

Social and economic conditions

Reclamation estimates the county population between 1989 and 1994 would increase with the construction of the project modifications. Without their construction, some construction workers and their families would move from the area between 1992 and 1994 when construction on the Dolores Project phases out. With the project modifications, some of those construction workers and their families would remain to work on these features. Their presence for these 3 years would have a slightly greater impact on population growth than with the no action alternative. Since enough skilled workers are available in the area, no influx of new workers is expected. No significant long-term effects are expected with the addition of the project modifications. Public services, such as treated water and sewage, fire and police protection, schools, and social services, have sufficient capacity to deal with the effects of their construction. Construction of these project modifications would provide a total of 215 direct employment person years between 1989 and 1994. No long-term effects on employment would occur with the construction of the project modifications.

With construction of the project modifications, an estimated $6.3 million would be paid in total on-site wages between 1989 and 1994. The effect on the local economy would be to soften the general decline in wages and buying power during the construction period. The median individual and household income for the county would stabilize somewhat, but it would begin declining again on completion of the project modifications. The long-term effect on income is expected to be insignificant because the construction program is small and of relatively short duration.

With and without construction of the project modifications, single-family dwellings would probably be plentiful. With construction, a reduction in the number of vacancies would occur between 1989 and 1994. Rental rates, which declined in 1986, may also stabilize slightly during the construction period. The number of county households would be approximately 1 percent greater with the construction of the project modifications.

SUMMARY (Continued)

Construction of the project modifications would have a negligible effect on area services. Since most of the construction workers and their families already live in the county, no increase in services would be necessary to accommodate them.

Effects on the irrigation system

The project modifications would improve the efficiency of the MVIC system. The system would be improved by lining existing lateral sections, abandoning the Rocky Ford Ditch and Lower Hermas and Highline Ditches and combining their flows in the Towaoc Canal, and installing a closed pipe lateral system from the Towaoc Canal to the Rocky Ford Ditch service area. The new lateral system would develop gravity pressure, making sprinkler irrigation possible for that area. This use would, in turn, allow for greater crop yields. The increased efficiency of the MVIC system would reduce conveyance losses by an average of 7,900 acre-feet per year.

Consultation and Coordination

Public Involvement

Throughout the study phase on the project modifications, the general public and interested and affected agencies, groups, and individuals had the opportunity to participate. Reclamation considered the information, opinions, and expressed desires of the public in evaluating project development and the salinity problem. Federal, State, local, and private interests, including the MVIC, the DMWD, and the Ute Mountain Ute Tribe, participated as members of planning teams by attending meetings and through personal contact. Reclamation coordinated with and received assistance from the U.S. Fish and Wildlife Service, the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, and the Colorado Division of Wildlife. Reclamation provided general information on project development to local people through newspapers, radio programs, graphic displays, and public meetings.

Issues and Implementation

During the study of the project modifications, a number of issues and recommendations were made by various agencies, groups, and the public. The following paragraphs discuss the issues raised and their implementation or resolution.

McElmo Canyon residents, who depend on return flow from the Montezuma Valley for part of their irrigation supply, expressed their concern that if salinity control measures are implemented, the upstream return flows may decrease. Reclamation believes that these farmers, who irrigate approximately 500 acres, would realize no significant change in water supply with the construction of salinity control features.
SUMMARY (Continued)

Some landowners in the MVIC were concerned about irrigation shortages during dry years. During dry years, the use of a call system by the MVIC for nonproject water stored in McPhee Reservoir and more efficient use of water early in the irrigation season could result in water being available later in the irrigation system.

The MVIC board expressed interest in the alternative for piping the entire system. Reclamation explained that the piping alternative would be too high in cost compared to the amount of salt removed from the Colorado River.

The MVIC also expressed interest in retaining Totten Reservoir for use by local water user entities after the Towaoc Canal is completed, if the operating costs would not be too prohibitive. The MVIC will operate and maintain Totten Reservoir.

In 1982, Reclamation advised the DWCD that the cost ceiling for municipal and industrial water would be exceeded. The Dolores Water Conservancy District, the Bureau of Reclamation, and the Colorado Water Conservation Board concluded that a change in cost allocation procedures and State financing of two single-purposes municipal and industrial features—the Monument Creek Reservoir and the pipeline from McPhee Reservoir—would solve the problem. The Dolores Water Conservancy District agreed to assume this obligation itself, subject to the availability of financing from the Colorado Water Conservation Board construction fund. Construction of Dolores Project features was thereby allowed to continue under the existing repayment contract with the exclusion of these two features. Under the Agreement in Principle Concerning the Colorado Ute Indian Water Rights Settlement and Binding Agreement for Animas-La Plata Project Cost Sharing, June 30, 1980, the remaining portion of the Cortez-Towaoc Municipal and Industrial Pipeline was deleted from the Dolores Project. The State of Colorado will assume the obligation to construct this portion of the pipeline.

SUMMARY (Continued)

The Ute Mountain Ute Tribe has expressed the following concerns: need for accelerated construction of its canal and lateral system; a review of project land and consideration of alternative land; construction of tribal features through the newly founded construction company (Neeninmiuchi Tribal Construction Authority); development of tribal recreation opportunities; and control over operation, maintenance, and replacement of tribal-related project features. Concerning accelerating construction, Reclamation maintains that a repayment contract, on which negotiations are continuing, must first be signed. The current schedule, therefore, is acceptable to the tribe. Reclamation examined land north and west of Towaoc, but additional operation and maintenance costs would have been incurred through the need for pumping water to this land. The tribe desires to assume as much as possible of the construction of project facilities on the reservation, and the authority of Public Law 93-638 may allow this concept. The DWCD is negotiating with the tribe for their subcontracting the operation and maintenance of laterals on the reservation. As described in the 1977 FES plan, Reclamation will make available 800 acre-feet of water annually to the tribe for fish and wildlife enhancement.

On other environmental issues, the Colorado Division of Wildlife recommended against lining conveyance facilities, constructing a coal slurry pipeline, and withdrawing saline land from service because each would reduce the quantity and quality of existing wetlands. The division favored ponding and evaporating small creek flows and using saline water for industrial cooling.

According to the Colorado Division of Wildlife, the purchase of the 689 acres downstream of McPhee Dam completes the remaining mitigation on the project. The U.S. Fish and Wildlife Service in its final Planning Aid Memorandum concurs with the Colorado Division of Wildlife on this opinion.

Short- and Long-Term Environmental Effects

Summary Table 3 on the following page shows the short- and long-term effects of the project modifications on various resources. The short-term effects would last for the 4 years of construction; the long-term effects would be for the 50-year life of the project.

Comparison of Alternative Plans and Selection of the Proposed Plan

The proposed plan was selected because (1) it was the only plan studied that passed all four tests of viability (completeness, effectiveness, efficiency, and acceptability), (2) it is acceptable to the public and supported by the MVIC and DWCD, (3) it is compatible with the on-farm
SUMMARY (Continued)

plan recommended by the SCS in that it would provide gravity head for sprinkler irrigation service to the Rocky Ford Ditch and Aztec Divide service areas, and (4) it would maximize salinity reduction and is the most cost-effective alternative.

The no action alternative would not result in any salinity reduction. Summary Table 4 on page S-18 compares the proposed project modification with the no action alternative.

---

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<th>Resource</th>
<th>Short-term affects</th>
<th>Long-term affects</th>
<th>Relationship of short-term use of project modifications</th>
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<tr>
<td>Local economy</td>
<td>Yes</td>
<td>No</td>
<td>Construction of these project modifications would have a positive effect on the local economy by providing a total of 215 direct employment person-years, resulting in approximately $6.3 million in salaries between 1989 and 1996.</td>
</tr>
<tr>
<td>Housing</td>
<td>Yes</td>
<td>No</td>
<td>During construction, a reduction would occur in the number of vacancies.</td>
</tr>
<tr>
<td>Population</td>
<td>Yes</td>
<td>No</td>
<td>Construction workers and their families would offset an expected decline in population.</td>
</tr>
<tr>
<td>Services</td>
<td>No</td>
<td>No</td>
<td>Local services would have sufficient capacity to deal with the effects of construction.</td>
</tr>
<tr>
<td>Energy</td>
<td>Yes</td>
<td>No</td>
<td>The energy for vehicles and machinery would be a short-term commitment of resources.</td>
</tr>
<tr>
<td>Scenery</td>
<td>Yes</td>
<td>No</td>
<td>Over the short term, construction activities would detract from economy.</td>
</tr>
<tr>
<td>Air and noise</td>
<td>Yes</td>
<td>No</td>
<td>Emissions and dust from construction equipment would have a short-term effect on these qualities.</td>
</tr>
<tr>
<td>Water</td>
<td>No</td>
<td>Yes</td>
<td>The project modifications would prevent 7,900 acre-feet of water annually from being lost through the conveyance system and remove 32,000 tons of salt per year compared to the 1977 FES plan.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Yes</td>
<td>Yes</td>
<td>Short-term impacts on vegetation would result from construction. Revegetation would offset these losses. Long-term impacts would result from the loss of 89 acres of wetlands. Reclamation, the Fish and Wildlife Service, and the Colorado Division of Wildlife determined the development of 75 acres would affect this loss.</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Yes</td>
<td>Yes</td>
<td>Construction would temporarily affect some wildlife species. Minor losses of wetlands would cause the loss of certain species. Long-term impacts to deer and elk populations would be minor as escape ramps and fencing along concrete sections of the canals would help prevent loss.</td>
</tr>
<tr>
<td>Fish</td>
<td>No</td>
<td>Yes</td>
<td>The project modifications would have a stabilizing effect on Harrington and Totten Reservoirs. The water supply for Totten Reservoir would ensure its continued as a fishery.</td>
</tr>
<tr>
<td>Endangered species</td>
<td>No</td>
<td>No</td>
<td>The Fish and Wildlife Service's Biological Opinion states that the project modification would not likely jeopardize the Colorado squawfish or the bald eagle.</td>
</tr>
<tr>
<td>Recreation</td>
<td>Yes</td>
<td>Yes</td>
<td>Construction would have a negative impact on the use of laterals and ditches. Stabilizing of Harrington Reservoir and water supply for Totten Reservoir would be positive effects.</td>
</tr>
<tr>
<td>Cultural resources</td>
<td>Yes</td>
<td>Yes</td>
<td>Significant cultural resources have been identified within potentially disturbed areas. These resources would be mitigated through survey recording, excavation, and avoidance, where possible.</td>
</tr>
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<td>Canal lining (miles)</td>
<td>NCL</td>
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<td>Buried pipe laterals (miles)</td>
<td>NC</td>
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<tr>
<td>Permanent rights-of-way (acres)</td>
<td>NC</td>
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<td>Private land (Federal acquisition)</td>
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<td>Wildlife habitat (acres)</td>
<td>Upland</td>
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<td>Wetland2</td>
<td>10,310</td>
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<td>Impact to fisheries</td>
<td>NC</td>
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<td>NC</td>
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<td>Cultural resources present</td>
<td>129</td>
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<td>Salt loading reduction (tons)</td>
<td>NC</td>
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<td>Net effect on salt loading (tons)6</td>
<td>NC</td>
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<td>Seepage reduction (acre-feet)</td>
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<td>Irrigation systems</td>
<td>Improved system</td>
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<td>Employment (direct--person years)</td>
<td>NC</td>
</tr>
<tr>
<td>Construction costs (1987 prices in millions)</td>
<td>$23,168</td>
</tr>
<tr>
<td>Increase in annual operation, maintenance and replacement costs4</td>
<td>NC</td>
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<tr>
<td>Cost effectiveness per ton of salt removed ($/ton)5</td>
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1/ NC = No significant change.
2/ slashes indicate increases—minuses indicate decreases.
3/ Although total wildlife losses would be offset, 14 acres of wetland would be lost—the difference between 89 acres lost and the replacement of 75 acres created through project mitigation.
4/ Under the no action alternative, the SCS on-farm program for removing 38,000 tons of salt would be impacted, but the reduction in tons of salt removed is unquantified.
5/ The total salt reduction is for the off-farm program by the Bureau of Reclamation and does not reflect the on-farm program of the SCS.
6/ The net effect includes salt loading for the Dolores Project from irrigating new project land and the seepage of project canals minus the salt removed by lining MVIC laterals, abandoning MVIC ditches that seep, and combining an MVIC lateral and ditch with flows of the Towaoc Canal on the east side of Cortez.
7/ Would be reduced to $74,000 annually upon completion of the 10-year salinity control monitoring program.
8/ Cost effectiveness reflects the annual cost for each ton of salt removed from the Colorado River system.

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Dolores Project General Map No. 71-400-56 Frontispiece

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enhancement and protection of the quality of water available from the Colorado River. Public Law 90-569 of October 30, 1964, authorized construction of the McElmo Creek Unit salinity control features as part of the Dolores Project.

For those desiring to review the FES in conjunction with this supplement copies are available in the libraries and Bureau of Reclamation offices listed below.

Libraries

Cortez City Library, Cortez, Colorado
Durango Public Library, Durango, Colorado
Fort Lewis College Library, Durango, Colorado
University of Colorado Library, Boulder, Colorado
Colorado State University Library, Fort Collins, Colorado

Bureau of Reclamation offices

Bureau of Reclamation
Denver Office - Building 67
Denver Federal Center
Denver, Colorado 80225

Bureau of Reclamation
Washington Office
Office of Environmental Affairs
Interior Building
18th and C Streets, NW
Washington, DC 20240

Bureau of Reclamation
Durango Projects Office
835 Second Avenue
Durango, Colorado 81302-0640

Regulatory Compliance

This supplement was prepared pursuant to Section 102(2)(C) of Public Law 91-190, the National Environmental Policy Act (NEPA) of 1969 and Section 1502.4(c) of the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. This draft supplement, in conjunction with the 1977 FES and the 1981 FONS I, will serve to provide compliance with Executive Order 11990, Protection of Wetlands; Executive Order 11988, Floodplain Management; Public Law 95-217, Clean Water Act; Public Law 88-206, Clean Air Act; Public Law 93-205, Endangered Species Act as amended; Public Law 83-364, Fish and Wildlife Coordination Act; Public Law 89-465, as amended by Public Law 96-515, the National Historic Preservation Act; Public Law 96-95, the Archeological Resources Protection Act of 1979; and applicable environmental regulations or instructions of the Bureau of Reclamation (Reclamation).
CHAPTER I PURPOSE AND NEED

Project Setting

The Dolores Project is located in Montezuma and Dolores Counties in southwestern Colorado just east of the Colorado-Utah State line and north of the Colorado-New Mexico State line. The area is predominantly rural and agriculturally oriented. It is part of a region frequently referred to as the Four Corners area because of the unique juncture of the States of Utah, Colorado, New Mexico, and Arizona. The northeastern edge of the project area lies within the Dolores River Basin and the remainder in the San Juan River Basin. Both basins are a part of the Upper Colorado River Basin.

Within this area is the city of Cortez, the Montezuma County seat and major commercial center; the town of Dove Creek, the Dolores County seat; and Towaoc, the headquarters of the Ute Mountain Ute Tribe. Smaller farming communities include Lewis, Arriola, Lebanon, Cahone, Pinta, Arche, and Yellow Jacket. The town of Dolores is located on the Dolores River upstream of McPhee Dam and Reservoir, just north of Cortez and the Montezuma Valley area. The communities of Stoner and Mancos are located outside of the project area to the northeast and east of Cortez, respectively.

The project area is in the transition zone between the San Juan Mountains to the northeast and the mesas and canyons of the Colorado Plateau to the west. Elevations range from 5,000 to nearly 7,000 feet throughout most of the project area. Two prominent geologic features in the southern part of the project area, Sleeping Ute Mountains and Mesa Verde, rise to 10,000 and 8,400 feet, respectively.

Montezuma County had a population of 16,510 in 1980; its largest city, Cortez, had a population of 7,095 in 1980 (U.S. Bureau of the Census, 1980). The Colorado Department of Local Affairs estimates that the county population was 18,806 in 1983, the peak year of Dolores Project operations in the Four Corners area with any growth rate trending downward in 1985. The composite annual county growth rate between 1980 and 1985 was 1.8 percent. It is projected that Montezuma County’s rate of growth will continue to decline as the Dolores Project nears completion and then return to a moderate 2 percent annual growth rate.

The ethnic and racial composition of Montezuma County in 1980 included approximately 86.1 percent white, 10.0 percent American Indian, and 3.9 percent all other. The Spanish origin ethnic group accounted for about 8.2 percent of the total population. Persons of Spanish origin may be of any race (U.S. Bureau of the Census, 1980).

During 1986 and 1987, depressed oil and gas prices contributed to the marked curtailment of oil and gas operations in the Four Corners region. Since a significant portion of Montezuma County’s labor force relies on the oil and gas industry for employment, county unemployment rates have risen noticeably over the past few years. Average annual unemployment rate trends showed 8.6 percent in 1983, the peak year of Dolores Project construction, and 13.6 percent in 1986. A 1-month peak unemployment rate of 21.0 percent occurred in March 1987.

As the Dolores Project is completed and the conversion from dryland to sprinkler irrigation occurs, the local economy will begin to revive. Agriculture and tourism will experience significant benefits from the Dolores Project’s recreation and irrigation features.

Most of the irrigated agricultural land in the area lies in Montezuma Valley in the eastern portion of the drainage around Cortez. Agricultural production focuses on livestock production, and crop land is used for the production of livestock feed. In the Dove Creek area, pinto beans, alfalfa hay, and wheat are the primary crops of dryland farming. Irrigation of land occurs on the Ute Mountain Ute Indian Reservation along U.S. Highway 160-666. Cattle grazing occurs on the sparse natural vegetative cover of the area.

The three areas served by the Dolores Project are Montezuma Valley in the central part of the project area, Dove Creek to the northeast, and Towaoc to the south. Montezuma Valley and Dove Creek are within the boundaries of the Dolores Water Conservancy District (DWCD). The MVIC is the oldest distributor of water in the project area, having diverted water from the Dolores River for approximately 100 years to serve irrigators and municipal and industrial water users in the valley.

Dolores Project Plan

The Dolores Project will store and regulate flows of the Dolores River for irrigation and municipal and industrial (M&I) use. The project will also provide hydroelectric power generation, flood control, water recreation, and industrial and fish and wildlife enhancement and mitigation measures, area economic development, and cultural resources mitigation.

Construction on the project began in 1977 and is about 64 percent complete.

Primary storage will be provided by the already completed McPhee Reservoir, which extends 10 miles along the Dolores River immediately downstream from the town of Dolores, as shown on Figure 1 on the following page which depicts the project as described in the 1977 PES. Formed by McPhee Dam and the Great Cut Dike (completed), the reservoir has a capacity of 381,000 acre-feet and a maximum surface area of 4,470 acres. Dawson Draw Reservoir, northwest of Arriola, is planned specifically for fish and wildlife purposes. Project water will be diverted through Great Cut Dike into MVIC Canal No. 2 and 4” lateral to the MVIC irrigation system. Water will also be diverted through the new Dolores Tunnel, extending from McPhee Reservoir to the Dolores Canal, an enlargement of the MVIC East and West Lateral through the Town of Power Plant, and into the existing irrigation system of the MVIC and the proposed Towaoc Canal.

The project will provide an annual average supplemental irrigation supply of 13,700 acre-feet of project water to the existing MVIC system
INDEX MAP

EXPLANATION

Supplemental Irrigation Service Limits
Existing Irrigation Service Limits
Proposed Dam and Reservoir
Proposed Diversion
Proposed Canal
Proposed Pumping Plant
Proposed Pipeline/Lateral
Proposed Reservoir

General Map

1977 Plan

FIGURE 1

UNITED STATES DEPARTMENT OF AGRICULTURE
WATER AND POWER RESOURCES SERVICE
UPPER COLORADO REGION
DOLORES PROJECT
COLORADO
GENERAL MAP
MAP NO. 71-400-76
AUGUST, 1976
to supplement the irrigation of 26,300 acres of land. An average annual full service irrigation supply of 54,300 acre-feet of project water will be used to irrigate 27,420 acres of full service land in the Dolores area and 22,900 acre-feet will be used to irrigate 7,900 acres of full service land in the Towaoc area. All of this land was certified following completion of the 1977 FES. In addition, McPhee Reservoir will annually supply 6,200 acre-feet of water for fishing, 1,600 acre-feet for Towaoc, 800 acre-feet for Dove Creek, and 900 acre-feet for rural domestic use within the Dolores Water Conservancy District. The proposed powerplants at McPhee Dam and on the Towaoc Canal will generate 1,350 kilowatts (kW) and 12,200 kW, respectively, for use in the Colorado River Storage Project power system.

Measures are included in the project plan for recreation and fish and wildlife. Recreation facilities are either constructed or planned at the two project reservoirs and at eight locations on the Dolores River downstream of McPhee Reservoir. Releases from McPhee Reservoir will provide whitewater boating and will maintain the stream fishery in the Dolores River where public access for fishing and other recreation use will be provided along the first 10 miles below the dam. McPhee Reservoir now provides a fishery resource, and Dawson Draw Reservoir will be maintained as a fishery. Land at the two reservoirs and along project canals will be managed for wildlife, and Dawson Draw Reservoir will be managed specifically for waterfowl and upland game habitat, as a fishery, and for wildlife activities.

The Dolores Project plan includes an archeological program to investigate numerous significant archeological sites found in the project area. Such sites have been excavated or will be excavated or avoided during construction, as described in greater detail in the 1977 FES.

The DMCU will administer project Reclamation and joint-use facilities. The DMCU is negotiating with the M&I and the Tribe for their participation in the operation and maintenance responsibilities of the salinity control facilities and the Towaoc laterals, respectively. The Colorado Division of Wildlife (CDOW) will administer fish and wildlife areas and fish stocking at Dawson Draw Reservoir. The Forest Service administers land and recreation at McPhee Reservoir, and the CDOW administers fish stocking at the reservoir. The Forest Service and CDOW together developed the management plan for land surrounding McPhee Reservoir. The Forest Service, the Bureau of Land Management, the CDOW, and Reclamation manage their respective areas downstream of McPhee Dam under the Lone Dome Management Plan.

Refinements to Project Plan

Some refinements to the project plan have been made since the FES as a result of economic and design criteria considerations. Such refinements are a normal function of the design and construction process and do not contribute to further environmental impacts. These refinements, included to update the reader, are the following.

In September 1977, the DMCU signed a repayment contract with the United States providing, among other things, for repayment, with interest, of all project costs allocated to M&I water, including storage of water in Monument Creek Reservoir and the delivery of water in the Cortez-Towaoc M&I Pipeline from McPhee Reservoir to the Ute Mountain Ute Reservation.

When the cost of the project allocated to M&I water use was projected to exceed the limits of the Dolores Project repayment contract, a need arose to modify the project. Consequently, the State of Colorado agreed to drop Monument Creek Dam and Reservoir and 7.2 miles of the Cortez-Towaoc M&I Pipeline from the project. The negotiations on the Animas-La Plata Project resulted in dropping the remaining 12.3 miles of pipeline from the project. The DMCU has agreed to construct these two features without Federal financing and subject to financing from the State through the Colorado Water Conservation Board's construction fund. No work is anticipated to begin on Monument Creek Reservoir in the near future. The portion of the Cortez-Towaoc M&I Pipeline from the Dolores Tunnel to the City of Cortez Treatment Plant was constructed in 1987 by the State of Colorado. Construction of the remainder of the pipeline is expected to be completed by late 1988. Additional NEPA compliance for Monument Creek Reservoir, if necessary, would be accomplished following formulation of a specific plan by the State. NEPA compliance for the Cortez-Towaoc M&I Pipeline was accomplished in the 1977 FES.

Since the 1977 FES, it was determined that the efficiency of the operation of the project in the Dove Creek area could be improved by combining the capacities of the Monument Creek and Cross Canyon Pumping Plants for sprinkler irrigation into one pumping plant, the Dove Creek Pumping Plant, to serve full service land in the Dove Creek area. This pumping plant will be located at the Cross Canyon site.

Since some of the land to be served by the Cahone Pumping Plant and Laterals, as described in the 1977 FES, was much higher than any other land in that block, Reclamation determined that a separate booster pumping plant for that area, the Delivery 110 Pumping Plant, would be the more economical alternative to increasing the pipe size of the entire Cahone delivery system. The pumping plant will have a maximum capacity of 2,4 cubic feet per second (cfs) to irrigate 160 acres of full service land on the Cahone system of the Dove Creek area.
people; Great Cut 'F' Pumping Plant, and washyards; the Dolores Irrigation District plant; the Lands East and west of downstream of the town of Dolores; Reaches 1 and 2 of the Dove Creek Canal; the plugging of the MVIC Tunnel and the construction of its replacement, the Dolores Tunnel; cultural resources mitigation; the Unassal Heritage Center; McPhee recreation facilities; House Creek, Ormanian, and Lone Dome roads; House Creek and McPhee recreation boat ramps; and the acquisition of recreation and wildlife mitigation land.

The acquisition of recreation land is in fulfillment of a commitment made in the 1977 FES to provide fisherman access for 10 miles along the Dolores River below McPhee Reservoir. Reclamation purchased the 649-acre Bradfief Ranch of which 213 acres will mitigate wildlife habitat losses expected to result from the construction of project modifications. The remaining 474 acres are enhancement for recreation and fish and wildlife purposes. The Bureau of Land Management has eliminated grazing on these 474 acres and will designate fish and wildlife as a management priority. Fisherman access will be provided, and the Bureau of Land Management will develop the recreation site with overnight camping and a raft launching area.

Table 1 below contains a schedule for the completion of construction activities.

<table>
<thead>
<tr>
<th>Feature or activity</th>
<th>Completion date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Williams Draw Road</td>
<td>September 1989</td>
</tr>
<tr>
<td>Pleasant View Pumping Plant and laterals</td>
<td>September 1989</td>
</tr>
<tr>
<td>Hovenweep laterals</td>
<td>September 1989</td>
</tr>
<tr>
<td>Ruin Canyon Pumping Plant and laterals</td>
<td>September 1990</td>
</tr>
<tr>
<td>McPhee Dam Powerplant</td>
<td>September 1990</td>
</tr>
<tr>
<td>Reach 1, Dove Creek Canal</td>
<td>December 1990</td>
</tr>
<tr>
<td>Dove Creek Pumping Plant and laterals</td>
<td>September 1991</td>
</tr>
<tr>
<td>Dawson Draw Dam</td>
<td>October 1991</td>
</tr>
<tr>
<td>Reach 1, Towaoc Canal/</td>
<td>January 1992</td>
</tr>
<tr>
<td>Towaoc Canal Powerplant</td>
<td>June 1992</td>
</tr>
<tr>
<td>Reach 2, Towaoc Canal/</td>
<td>December 1992</td>
</tr>
<tr>
<td>Reach 3, Towaoc Canal and laterals</td>
<td>January 1993</td>
</tr>
<tr>
<td>Rocky Ford pipe laterals/</td>
<td>September 1993</td>
</tr>
<tr>
<td>Lining of MVIC laterals</td>
<td>October 1993</td>
</tr>
</tbody>
</table>

/ Contingent on National Environmental Policy Act compliance.

Water deliveries were made to the Fairview and Cahone areas in 1987 and will be made to the MVIC in 1988, to the Pleasant View area in 1991, and to the Cross Canyons and Monument Creek portions of the Dove Creek area in 1992. The Land on the Ute Mountain Ute Reservation is anticipated to receive water in 1994.

4. Since the McPhee and Towaoc Powerplants were added to the project in 1981, further analysis revealed a need to modify their capacities. For the McPhee Powerplant, turbine design capacity was based on releases of 25 to 75 cfs. In 1981, the normal minimum design capacity was a 50-feet turbine. Since then, Reclamation has determined that more efficient use of the water could be made by increasing this design capacity to 75 cfs and that additional flexibility could be gained by using a combination of two turbines and one generator. Consequently, the capacity of the McPhee Powerplant has been increased from 90 kWh to 1,350 kWh. A reanalysis of the Towaoc Powerplant revealed that increased capacity could be obtained by using a state-of-the-art turbine with less head loss and reduced maximum static head losses. Consequently, the powerplant capacity has been increased from 10,500 kWh to 12,200 kWh.

5. Some refinements have been made to the operation, maintenance, and replacement of the project since 1977. To provide a timely and coordinated operation of the water storage and conveyance facilities on the project's delivery system, a computerized Programmable Master Supervisory Control System will be used to automate the operation. This system will perform selected control functions at predetermined times and interpret control functions on the Great Cut Pumping Plant; the checks along the Dove Creek, South, and Towaoc Canals; the six sprinkler-head pumping plants; and the two powerplants. In addition, this system will allow monitoring and remote control of the releases from McPhee Dam.

The operation of project canals will be based on a scheduled delivery concept. Irrigators will order water in advance. In addition, pumping plants and checks along the canals will contain instruments to monitor changes in water demand downstream and automatically adjust to meet these changes.

The system will require full-time monitoring during the irrigation season to allow operators to respond to emergency conditions at project facilities and to make adjustments in the programmed operation. Pumping plant operators will make periodic inspections of control points along the canals and perform any necessary maintenance.

Project Status

The following features or activities on the project have already been completed: McPhee Dam and Reservoir, including relocations of
CHAPTER I

PURPOSE AND NEED

Relationships to Other Activities

The Dolores Project interrelates with other Federal projects currently under investigation or construction by the U.S. Department of Agriculture (USDA). These projects include the proposed McElmo Creek Salinity Control Project, an on-farm improvement program in Montezuma Valley being developed by the Soil Conservation Service (SCS) and the Agricultural Stabilization and Conservation Service (ASCs). While Reclamation’s plan interfaces with that of the other agencies, it could be implemented independently.

Soil Conservation Service

Public Laws 93-320 and 98-569 authorize the Secretaries of the Interior and Agriculture to cooperate in implementing any project involving control of salinity from irrigation sources. To establish a program for effective implementation of specific cooperative activities called for by Title II, the Department of the Interior and the Department of Agriculture entered into a Memorandum of Understanding effective November 1974 and renewed on August 23, 1986. The Bureau of Reclamation and the Soil Conservation Service (SCS) entered into a Memorandum of Agreement effective March 1975 and renewed on August 18, 1986. As a result of these memoranda, Reclamation has studied the potential salinity control improvements on the McElmo Creek Unit laterals and the SCS has analyzed on-farm improvements and, where necessary, improvement of some off-farm laterals. While the SCS and Reclamation are working closely with each other and coordinating their investigations and salinity control proposals to ensure their compatibility, each agency will implement and fund its own program.

A public involvement effort conducted by the SCS and Reclamation identified the alternatives most acceptable with local interests. Alternatives proposed by the SCS are described in the USDA report released in January 1978, entitled Off-Farm Irrigation Improvements, McElmo Creek Unit Salinity Control Study, Montezuma County, Colorado. The most favorable plan includes off-farm irrigation water management, including devices for measuring irrigation water; the use of sprinkler irrigation; on-farm and off-farm ditch lining; and other conservation methods.

The USDA plan would remove an estimated average of 38,000 tons of salt annually. The plan would take about 16 years to implement. The initiation of construction, however, is dependent on Congressional authorization and funding anticipated to begin in 1991.

Agricultural Stabilization and Conservation Service

The ASCs has, in the past, provided cost-sharing payments to assist farmers and ranchers in implementing conservation measures on their land from limited funding available through the Agriculture Conservation Program. However, should the USDA salinity control program be implemented, the ASCs will provide cost-share assistance to operators for installing salinity control measures using funds available through the USDA’s Colorado River Salinity Control Program.

CHAPTER I

PURPOSE AND NEED

Public Involvement

Throughout the study phase for the project modifications, the general public and interested and affected agencies, groups, and individuals had the opportunity to participate in the study. Reclamation considered the information, opinions, and expressed desires of the public in evaluating project development and the salinity problem. Federal, State, local, and private interests, including the NRDC and the DMC in Cortez, Colorado, and the Ute Mountain Ute Tribe in Toaosa, Colorado, participated as members of planning teams by attending meetings and through personal contact. Reclamation coordinated with and received assistance from the Fish and Wildlife Service, the SCS, the ASCs, and the Colorado Division of Wildlife. Reclamation provided general information on project development to local people through newspapers, radio programs, graphic displays, and public meetings. A more thorough discussion of public involvement issues is provided in Chapter IV, “Consultation and Coordination.”

Need for the Action

Colorado River Basin Salinity

In the Colorado River Basin, salt pickup from the McElmo Creek drainage and other sources has resulted in a deterioration of the quality of Colorado River water over the long term as river flows have been developed for man’s beneficial use. At its headwaters in the mountains of north-central Colorado, the river has a salinity concentration of approximately 50 milligrams per liter (mg/L). Downstream, the concentration progressively increases because of irrigation diversions and salt contributions from a variety of sources; in 1985, salinity averaged 607 mg/L at Imperial Dam, the last major diversion point in the United States.

Future development in the basin is projected to increase salinity to an average of 963 mg/L at Imperial Dam by the year 2010. Peak salinities are predicted to approach 1,200 mg/L in some years.

Water of 1,000 mg/L or less is generally considered to be satisfactory for irrigating most crops, although concentrations of 500 mg/L can have detrimental effects on salt-sensitive crops. Water exceeding 1,000 mg/L may be used only on land with good drainage and for crops with high salt tolerances. According to the EPA’s secondary drinking water standards, public drinking water should be less than 350 mg/L.

The salinity level of the Colorado River results from two general causes—salt loading and salt concentration. Salt loading is the addition of salt to the river from such sources as the dissolving of salt from saline geologic formations, irrigation return flows, and saline springs and seeps. The annual salt load of the river into Lake Powell in

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CHAPTER I PURPOSE AND NEED

the Lower Colorado River Basin, under present conditions, is estimated at about 9 million tons. Salt concentration results from consumptive use reducing the volume of water without reducing the total salt carried. Some examples include irrigation, M&I use, transpiration by native vegetation, and evaporation. When water is used and reused along the entire length of the Colorado River, salt loading and salt concentrating contribute to increased levels of salinity. Levels will probably continue to increase because the existing and future demands on the river exceed its dependable supply.

In the Lower Colorado River Basin, high salinity levels adversely affect more than 18 million people and about 1.7 million acres of irrigated farm land in the United States. Those affected most are the M&I water users in the Los Angeles-San Diego area and irrigators in southern California, especially in the Imperial Valley and in Arizona.

According to a Reclamation study (Water and Power Resources Service, 1980) indexed to January 1986 prices, estimated economic losses in the Lower Basin average $56 for each ton of salt entering the Colorado River system. These losses consist of approximately $36.40 in M&I losses and $19.60 in agricultural losses per ton of salt. The losses from M&I use occur mainly from increased water treatment costs, increased pipe corrosion and appliance wear, increased soap and detergent needs, and decreased drinking water palatability. For irrigators, the higher salt concentrations cause decreased crop yields, loss of productive land, change to more salt-tolerant crops, increased leaching and drainage needs, and increased management costs.

Historical salinity concentrations fluctuate annually with the total basin water supply but, as the Upper Basin States continue to develop their compact-allocated water, salinity levels will increase at Imperial Dam. Between 1949 and 1970, the general trend of the concentration at the dam has been upward, but since 1970 salinity levels have decreased because of several consecutive years of high runoff. Without improved quality control projects, this temporary remedial improvement project will not reduce salinity significantly. However, the trend may reverse itself when hydrologic conditions return to more normal levels and as upstream development occurs. It is projected that salinity at the present level of development should normally vary between 635 and 1,035 mg/L, with an average of 820 mg/L. About 5 percent of the time, however, salinity could vary outside this range as it did in 1985 with a salinity of 607 mg/L.

In response to the Federal Water Pollution Control Act and its 1972 amendments, P.L. 92-500, the seven Colorado River Basin States acting through the Colorado River Basin Salinity Control Forum, developed numeric criteria and a basin-wide plan of implementation for salinity control. In 1975, the states adopted these water quality standards for salinity. Pursuant to Section 303(c)(1) of the Clean Water Act, the basin states reviewed the standards in 1978, 1981, 1984, and 1987. The numeric criteria are shown in Table 2.

<table>
<thead>
<tr>
<th>Numeric criteria for the Lower Colorado River</th>
<th>Annual average concentration (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below Hoover Dam</td>
<td>723</td>
</tr>
<tr>
<td>Below Parker Dam</td>
<td>747</td>
</tr>
<tr>
<td>At Imperial Dam</td>
<td>879</td>
</tr>
</tbody>
</table>

The goal of the salinity control program is to maintain concentrations at or below these criteria. SCS and Reclamation salinity control measures to date are removing 140,800 tons of salt annually from the Colorado River system. Over a million tons of salt per year will need to be removed by the year 2010 to maintain average salinity below the numeric criteria level of 879 mg/L at Imperial Dam. Even at this level of salinity reduction, there will still be temporary but significant excursions beyond 879 mg/L due to the natural variations in climatic conditions and water usage.

McElmo Creek Salt Loading

McElmo Creek originates in Montezuma County in southwestern Colorado and flows west into the San Juan River in southeastern Utah. The creek drains a total of 720 square miles. At the Colorado-Utah State line, a gauging station, the last one on McElmo Creek, measures a drainage area of 350 square miles. The salinity study focused on the upper 225 square miles of that drainage, as shown in Figure 2 on the following page. The salinity study results were extrapolated to include a segment of the Lone Pine Lateral, a feature of the NVIC that drains into Yellow-jacket Canyon outside the intensive study area, and all of the Navajo Wash area south of Aztec Diversion, which drains outside the McElmo Creek drainage into the San Juan River.

Investigations indicate that salt loading in the McElmo Creek area primarily results from conveyance system seepage and irrigation deep percolation into the ground water system. This seepage water dissolves salts from the soil and the underlying Navajo Shale and then surfaces in McElmo Creek. Return flows from McElmo Creek, including surface and ground water, have an estimated combined salinity level of approximately 1,990 mg/L, while the estimated concentration of the ground water alone is approximately 1,100 mg/L. It is estimated that if the Dolores Project is in operation, as described in the 1977 PES, the annual inflow to the intensive study area would average 312,500 acre-feet with an average salt load of 29,500 tons. An estimated 75 percent of this inflow would...

[1] The waters of the Colorado River are divided by a compact agreed to by the seven Colorado River Basin States (Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming).

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EXPLANATION

- INTENSIVE STUDY AREA BOUNDARY (NELMO CREEK UNIT)
- DRAINAGE INTO YELLOW JACKET CANYON
- DRAINAGE INTO NAJAO WASH

SCALE OF MILES

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
LOWER COLORADO REGION
DOLORES PROJECT
COLORADO
SALINITY CONTROL STUDY AREA
MAP NO. 71-405-1803
MAY 1987

FIGURE 2
be consumptively used within the area by crops, natural vegetation, and evaporation, while annual outflow would average an estimated 79,100 acre-feet, with an average annual salt load of 173,700 tons. Under these conditions, it is estimated that the total salt pickup from the area would be approximately 144,200 tons. The objective of the salinity control features proposed in this report is to decrease the amount of salt leaving the study area and entering the Colorado River system.

Change in alignment of Towaoc Canal

In the 1977 FES, the Towaoc Canal would have conveyed full service irrigation water to the Towaoc area along an alignment west of Cortez. Heading on the Dolores Canal about 1.1 miles below the outlet of the Dolores Tunnel, the canal would extend southward for 44.3 miles to full service lands in the Towaoc area. Under the 1977 FES plan, the Towaoc Canal would follow an alignment independent of all MVIC facilities.

In recent years, however, re-evaluation of the Towaoc Canal alignment has identified several factors, in addition to achieving salinity control benefits, favoring a rerouting of the canal along an alignment to the east of Cortez. Reclamation determined that significant economic savings in right-of-way and land acquisition costs could be achieved by combining Towaoc Canal flows with those of the Lower Hermosa Lateral and the Highline Ditch in a new canal. Upper reaches of the new canal would follow an alignment adjacent and parallel to the Lower Hermosa Lateral and Highline Ditch. Further, the proposed new alignment has significant public support because it would prevent the disturbance and loss of agricultural land by using the existing Lower Hermosa Lateral and Highline Ditch alignments. Additionally, using the east alignment and combining the canals would decrease the salt loading effect of the Towaoc Canal by an estimated 7,500 tons per year.

Reclamation also determined that significant additional cost savings and salt load reduction could be achieved by abandoning the Rocky Ford Ditch, a high salt contributor proposed for abandonment under the salinity control modification to the Dolores Project. The flows of the ditch would also be combined into the Towaoc Canal at its east alignment.
CHAPTER II
MODIFICATIONS AND ALTERNATIVES

Development of Alternatives

The purpose of evaluating alternatives for the salinity features was to compare plans directed toward reducing the salt loading to the Colorado River from the McElmo Creek drainage. The scope of the investigation was restricted to the evaluation of off-farm solutions since, as discussed in Chapter I, the Soil Conservation Service is evaluating potential on-farm solutions.

Each alternative plan was studied at a level of detail and accuracy to permit valid comparisons and was subjected to the four tests of viability which are completeness, effectiveness, efficiency, and acceptability. Completeness is the extent to which a plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. Effectiveness is the extent to which an alternative alleviates the specified problem and achieves the desired results. Efficiency requires that a plan be the most cost effective, considering all adverse effects of achieving specified objectives when comparably evaluated. Acceptability is the workability and viability of a plan in the sense of acceptance by the public and compliance with existing laws and regulations. Alternative plans passing all four tests are considered viable plans and are investigated in greater detail.

Public Law 92-500 sets forth a public policy of nondegradation of water quality that is not governed by traditional economic evaluation of benefits and costs, but rather by the accomplishment of the objective at the least cost. Consequently, Reclamation has used a criteria of cost-effectiveness and maximizing salinity reduction to select the recommended salinity reduction measures. Under the criterion of cost effectiveness, those plans resulting in the greatest reduction of salinity of the Colorado River system for the least cost would be recommended for implementation first. The cost-effectiveness criterion is based on total annual costs, and the resulting average salinity reduction at Imperial Dam is expressed in dollars per ton of salt removed.

The planning process was carried out by a planning team. Formed subsequent to the initiation of the study on the McElmo Creek Unit in November 1977, the team was supported by subteams representing recreational, cultural, and water resources, as well as agricultural, social/economic, legal/institutional, engineering, and biological concerns. The subteams generated and reviewed baseline data and made plan recommendations. The main planning team reviewed and interpreted data on salt loading in the basin and reviewed and assisted in formulating alternatives. From February 1978 through November 1981, a public meeting and several planning team meetings were held to identify and review problems and issues related to water and land resources; environmental, social, and economic issues; and public involvement. Since 1981, less emphasis has been given to involving the general public in plan formulation and attention was directed more toward coordinating with local governments, the Ute Mountain Ute Indian Tribe, the DWCD, and the MWC.

A wide range of possible methods for reducing salt loading from the basin area was investigated by the planning team, including irrigation system improvements to reduce seepage, withdrawing the use of highly saline lands, collecting saline water and using it for industrial cooling, collecting and evaporating saline water, using saline water to transport coal in a slurry pipeline, and constructing desalting plants. However, only one alternative—irrigation system improvements—passed the four tests and became a viable alternative. The purpose of this chapter is to describe briefly the four tests that were used to evaluate each alternative plan.

For the viable alternative, various segments of ditches and laterals were analyzed on an incremental basis to determine the most cost-effective lining alternative that would result in maximum salt load reduction. Each increment could be constructed independently of other increments, and the decision was made to be logical and practical resulting in the general public and local unbroken segment of canal. Each increment was also planned to provide for continuity and ease of operation and maintenance and to allow the determination of salt loading attributed to the increment. Following the elimination of the least cost-effective increments, the alternative of irrigation system improvements was selected as one of the project modifications. This alternative and the alternative of no action are presented below.

Alternatives

Irrigation system improvements (proposed plan)

Plan Concept and Accomplishments

The project modification of irrigation system improvements would consist of lining segments of the Lone Pine and Upper Hermanna Laterals, abandoning the Lower Hermanna Lateral and the Highline and Rocky Ford Ditches and combining their flows with the new alignment of the Towaco Canal and installing eight buried pipe laterals from the Towaco Canal to serve the Rocky Ford Ditch service area. Monitoring would be implemented to measure the effect on salt loading to the Colorado River system. Measures would be employed to reduce deer and elk entrapment within two concrete-lined sections of the Towaco Canal, and 75 acres of land would be developed as wetland habitat to compensate for wetland habitat losses expected to result from canal lining. Implementation of the salinity control features would reduce salt loading to the Colorado River system by an estimated 24,500 tons (rounded) annually at a cost effectiveness of $83 per ton of salt removed. An additional 7,500 tons annually would not enter the system because the Towaco Canal would
be moved from the west of Cortez, as described in the 1977 FES, to the east of Cortez. Table 3 below shows the salinity control features and the anticipated salt load reduction.

Table 3

<table>
<thead>
<tr>
<th>Feature</th>
<th>Maximum capacity (cfs)</th>
<th>Length improved (miles)</th>
<th>Tons of salt removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open laterals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lone Pine Lateral/</td>
<td>162</td>
<td>8.8</td>
<td>7,478</td>
</tr>
<tr>
<td>Upper Hermosa Lateral</td>
<td>110</td>
<td>3</td>
<td>1,135</td>
</tr>
<tr>
<td>Towaco Canal</td>
<td>420</td>
<td>25.0</td>
<td>3,405</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td>36.3</td>
<td>12,018</td>
</tr>
<tr>
<td>Buried pipe laterals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rocky Ford Pipe Laterals</td>
<td>93</td>
<td>2/7.0</td>
<td>12,455</td>
</tr>
<tr>
<td>(combined capacity for 8 laterals)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (rounded)</td>
<td>41.0</td>
<td>26,500</td>
<td></td>
</tr>
</tbody>
</table>

1/ Includes a 0.8-mile (rounded) segment that would be a pipe drop. 2/ The length of 7.0 miles does not include the 9.2 miles of sub-laterals.

Features and Measures

Lone Pine Lateral—Three sections of the Lone Pine Lateral, consisting of two to three segments each and totaling approximately 8 miles, would be earth lined, as shown on the Frontispiece Map and Figure 3 on the following page. One 0.8-mile segment of section 3, not shown on the Frontispiece Map or Figure 3 as such, would be a pipe drop. The capacities of the earth-lined sections would range from 162 to 56 cfs; the capacity of the pipe drop would be 56 cfs. Table 4 below shows the capacities and lengths.

Table 4

<table>
<thead>
<tr>
<th>Section</th>
<th>flow (cfs)</th>
<th>Length (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>62</td>
<td>3.46</td>
</tr>
<tr>
<td>2</td>
<td>128-109</td>
<td>2.58</td>
</tr>
<tr>
<td>3</td>
<td>71-56</td>
<td>2.27</td>
</tr>
<tr>
<td>Total</td>
<td>185</td>
<td>8.30</td>
</tr>
</tbody>
</table>

1/ All sections would be earth-lined except a portion of section 3, consisting of a 0.8-mile (rounded) pipe drop.

Twenty-eight constant-head-orifice (CHO) farm turnouts would be replaced in rehabilitating segments of the Lone Pine Lateral. A new 26-cfs-capacity CHO turnout would be constructed for the Garret Ridge Lateral. One new road crossing would be needed.

A portion of section 3, consisting of a 0.8-mile-long pipe-drop structure 30 inches in diameter, would be required to lower the lateral elevation about 140 feet. This structure would replace an existing lateral section located in a natural drainage. Three drop structures would be required in section 1 to drop the water surface approximately 12 feet, and section 3 would require seven drop structures to lower the lateral elevation another 32 feet. New culverts would be constructed to provide cross-drainage protection for the lined sections.

Since the lateral would be earth lined, except for the pipe segment, neither game fencing nor escape ramps would be necessary. Safety nets or cages would be placed over the inlet of the drop structures. No fencing would be installed except to replace existing fences removed during construction or, where necessary, to keep livestock out of the lateral right-of-way.

Upper Hermosa Lateral—Approximately 0.5 mile of the Upper Hermosa Lateral would be earth lined. The lined section would have a maximum capacity of 110 cfs.

One check-drop structure would be constructed to drop the lateral elevation about 4 feet. Two CHO turnouts would be required, each having a capacity of approximately 1 cfs. One cross-drainage culvert would be constructed. Since this section would also be earth lined, no game fencing or escape ramps would be needed. The only new fencing required would replace existing fences removed or damaged during construction.

Towaco Canal—As noted earlier, a portion of the Towaco Canal originally proposed in the 1977 FES plan to be located on the west side of Cortez would be replaced by an alternate alignment. The alternate alignment would parallel the existing Lower Hermosa Lateral and Highline Ditch in the WMC, with some adjustments that will shorten the canal. One example of this is a siphon approximately 3/4 mile in length just above U.S. Highway 160. This siphon would require that 2.2 miles of lateral be built using the alignment of the existing Highline Ditch and lateral to serve six landowners who cannot be served by using the new alignment. The new alignment would consist of Reach 1, extending from the Towaco Powerplant to the end of the existing Lower Hermosa Lateral near U.S. Highway 160, and Reach 2, extending from this point to the end of the existing Highline Ditch. Flow in the Towaco Canal would include the supplemental service flows of the Lower Hermosa Lateral and Highline Ditch for the WMC, totaling 185 cfs, and the full service flows for the Ute Mountain Ute Tribe, totaling 135 cfs. As a salinity control measure, the flows of Rocky Ford Ditch below McElmo Creek, totaling approximately 100 cfs, would be included in the new alignment of the Towaco Canal. The Rocky Ford Ditch would extend from near the town of Towaco at the end of the Highline Ditch to the full service land to the southwest.
Ford Ditch would be disposed of at the discretion of the individual landowners. The total distance for Reaches 1 and 2 of the new alignment is 25.0 miles in length with a maximum capacity of 420 cfs. The canal would be constructed on land adjacent to the existing Lower Hermosa Lateral and Highline Ditch, which would be disposed of at the discretion of the individual landowner's discretion. The remainder of the Towaoc Canal below Reach 2 would deliver water as described in the 1977 PWS.

Designs and cost estimates were based on the assumption that the Towaoc Canal would be constructed using three types of lining—earth, concrete, and membrane. The lining type assumed for any particular section was selected based on geologic considerations and the availability of construction materials. Concrete lining was selected for only those sections, totaling 4.6 miles, having steep cross slope areas with significant rock excavation.

The structures needed for the canal will include 16 checks, 8 pipe road crossings, 8 pipe lateral turnouts, 6 drop structures, 1 division box, 1 rectangular inclined drop, 12 siphons, 128 CHO turnouts, and 2 pipe chutes. Insufficient data are available to size the individual CHO farm turnouts and pipe turnouts for the Rocky Ford and Highline Ditch service areas. Consequently, the turnouts were sized to handle the flows for each respective ditch.

New cross-drainage facilities would be required along the entire canal. Fifty-five culverts would accommodate the cross drainages. Approximately 1.3 miles of interceptor ditches would need to be cleared out and another 1.4 miles of new interceptor ditches would be constructed to prevent runoff from entering the new canal. The water would be diverted to areas where cross drainage is presently provided.

Reclamation, USFWS, and CDOW would evaluate the concrete sections of the canal and take appropriate measures to limit wildlife mortality. The earth- and membrane-lined sections would not require escape structures. Safety nets or cages would be used at the inlet to siphons.

Rocky Ford Pipe Laterals.—Eight buried pipelines, totaling 7.0 miles (rounded), would be constructed to convey water from the Towaoc Canal to existing headgates along the Rocky Ford Ditch. Many of the headgates are located in groups, with considerable distance between each group, making it more economical to construct eight pipelines instead of one major pipeline for the entire Rocky Ford Ditch service area. Sublaterals would be constructed from the main pipelines to deliver the water to each headgate. New farm turnouts, compatible for use with sprinkler irrigation, would be constructed in place of existing turnouts.

For landowners deciding not to convert to sprinkler irrigation, a concrete energy dissipator would be installed to dissipate the head developed in the pipe laterals. Existing open ditches could continue to be used after the head had been reduced. Unpressurized water would be
provided through lateral number 7 to serve the existing Ute Mountain Lateral and Duncan Ditch in the Aztec Divide area. Design information on the eight buried pipe laterals is summarized in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Rocky Ford pipe laterals</th>
<th>Head-</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe</td>
<td>Length (miles)</td>
<td>Diameter (inches)</td>
</tr>
<tr>
<td>1</td>
<td>1.40</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>1.50</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>0.70</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>0.91</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>0.91</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>0.95</td>
<td>18</td>
</tr>
<tr>
<td>7</td>
<td>0.84</td>
<td>42</td>
</tr>
<tr>
<td>8</td>
<td>0.83</td>
<td>42</td>
</tr>
<tr>
<td>Total</td>
<td>6.98</td>
<td>(rounded)</td>
</tr>
</tbody>
</table>

Fish and wildlife measures.—As noted previously, Reclamation purchased 689 acres of private property located along the Dolores River near Bradfield Bridge approximately 10 miles downstream of McPhee Reservoir. This land is primarily riparian habitat. Of this total, 215 acres were purchased as mitigation for the anticipated loss of wildlife habitat associated with the project modifications; the remaining 474 acres were designated as fish and wildlife enhancement to provide wildlife habitat and fishing access as part of the planned recreational development downstream of McPhee Reservoir.

The U.S. Fish and Wildlife Service (FWS) recommended that 24 acres of wetlands be developed, but Reclamation, in consultation with the Environmental Protection Agency (EPA), agreed to create or enhance 75 acres of wetlands, which would restore other wetland values in addition to replacing the wildlife values.1 The Colorado Division of Wildlife would operate and maintain the 75 acres of wetland habitat with Reclamation salinity control funds.

The remaining mitigation land would offset riparian losses and the disturbance of wildlife resulting from construction of the project. The Colorado Division of Wildlife would remove any of the acreage fished and wildlife enhancement land would also be eliminated by fencing, thus allowing riparian vegetation to increase. The Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the Colorado Division of Wildlife all agreed that this

1/ Although wildlife habitat losses would be mitigated by project measures, 14 acres of other wetland values, such as flood retention, would remain a net loss.

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habitat development would be suitable mitigation of wildlife and habitat losses.

As requested by the U.S. Fish and Wildlife Service, additional mitigation measures would be employed to minimize deer and elk entrapment within the two concrete-lined sections of the Towaoc Canal totaling 4.6 miles. Mitigation for this potential loss would be accomplished by one or a combination of the following: fencing, constructing escape structures within the concrete-lined sections of the canal; and/or installing escape structures over the canal. The design, number of escape structures, and placement of these features will be jointly agreed to by the Bureau of Reclamation, the Fish and Wildlife Service, and the Colorado Division of Wildlife. Also, these agencies will jointly review records kept of all animals trapped within the canal.

During construction, the contractors will, when practical, avoid damaging existing cottonwood trees.

With the abandonment of the Rocky Ford Ditch, Totten Reservoir would no longer serve an irrigation purpose for the MVIC. To maintain the water quality of the reservoir and the fishery in the reservoir, Reclamation would make available up to 800 acre-feet of project water reserved for fish and wildlife purposes. Funds for operation and maintenance would come from appropriations under the Colorado River Water Quality Improvement Program. The MVIC would manage the reservoir.

Cultural resources measures.—On July 24, 1976, Reclamation signed a Memorandum of Agreement with the Colorado State Historic Preservation Office and the Federal Advisory Council on Historic Preservation to implement measures to mitigate adverse impacts from Dolores Project construction to significant cultural resources. A specific mitigation plan for the irrigation system improvements was accepted by the Colorado State Historic Preservation Office in a letter dated April 7, 1983.

Reclamation would submit a site-specific mitigation plan to the Colorado State Historic Preservation Office once the final alignments and borrow areas for the irrigation system improvements were determined. While not all 129 sites recorded to date would be adversely impacted, it is likely that most would be heavily damaged or destroyed by salinity control feature construction. Under the mitigation plan, Reclamation would propose to excavate some sites, avoid some sites, propose that many sites are already adequately mitigated by the Class III survey recording, and accept the necessary loss of some sites without any further work beyond the Class III survey recording. Specifications for construction would be reviewed before issuance to ensure avoidance of some sites, and inspectors would be advised of the requirement to notify the agency in case previously unknown buried cultural resources are encountered during construction. Cultural resources mitigation associated with construction of project modifications will become part of the Dolores Archeological Program and artifacts and reports from the mitigation program would be curated at the Anasazi Heritage Center near Dolores, Colorado.
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Salinity monitoring program—Reclamation anticipates a 10-year program to monitor the effects of salinity control on water quality in the Colorado River, but this program will be reviewed and updated on a yearly basis. This program, begun in 1983, to establish a baseline of data, would continue during the 5 years of construction and continue for 2 years after completion of construction. The program would be performed by Reclamation personnel and through contracts with the United States Geological Survey (USGS) for installing and maintaining continuous stage recorders and electroconductivity meters on McElmo Creek. Reclamation would also collect and analyze water quality data at selected locations on a monthly basis. The monitoring program would be funded by operation and maintenance appropriations under the Colorado River Water Quality Improvement Program.

Geology and Construction Materials

Geology.—The McElmo Creek Basin is within the Four Corners Structural Platform of the Greater Colorado Plateau Province. The vicinity has been folded and faulted slightly by the uplift of Sleeping Ute Dome and the San Juan Dome to the east. The area is located in a zone of low historic seismic activity.

The bedrock exposed within McElmo Creek Basin ranges from Triassic-through Tertiary-aged strata. The Dakota Sandstone comprises over half of the exposed bedrock. The Morrison Formation and Mancos Shale make up most of the remaining exposed bedrock, except for the older rocks exposed in McElmo Canyon and younger rocks exposed on Mesa Verde and around Sleeping Ute Mountain. Most of the irrigated land is located in Montezuma Valley, a broad valley underlain by Mancos Shale and Dakota Sandstone, both of the Cretaceous Age.

The Mancos Shale is an easily eroded, dark gray, marine shale, having a maximum thickness of about 1,800 feet. Much of the shale is covered with surface materials but is well exposed on the cliffs of Mesa Verde and in eroded remnants throughout the valley.

The Dakota Sandstone is exposed in much of the area north of McElmo Creek, forming gentle southward-dipping slopes. West of Cortez, the sandstone also underlies the dissected plateau area. The sandstone is resistant to erosion and includes a middle member of interbedded sandstone, shale, and coal. With a maximum thickness of about 300 feet, the sandstone forms the cap rock above the incised canyons. Underlying the Dakota Sandstone and making up the valley sides of many of the incised canyons is the Morrison Formation, a variegated formation of sandstone and shale.

Construction materials.—The construction materials for lining the Lone Pine and Upper Hermana Laterals and constructing Reaches 1 and 2 of the Towaoc Canal would be acquired from private sources, including pipe for a section of the Lone Pine Lateral and for the Rocky Ford Pipe Laterals. Concrete for lining 4.4 miles of the Towaoc Canal and the various canal structures would probably be made in a batch plant near the proposed canal. Table 6 shows the type and quantity of materials required for construction. Potential material source areas are shown in Figure 3 on page 23.

<table>
<thead>
<tr>
<th>Type of material</th>
<th>Earth Lining</th>
<th>Gravel</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lone Pine Lateral</td>
<td>83,000</td>
<td>14,800</td>
<td>470</td>
</tr>
<tr>
<td>Upper Hermana Lateral</td>
<td>5,100</td>
<td>960</td>
<td>70</td>
</tr>
<tr>
<td>Towaoc Canal</td>
<td>356,000</td>
<td>205,200</td>
<td>12,190</td>
</tr>
<tr>
<td>Total</td>
<td>444,100</td>
<td>220,960</td>
<td>12,730</td>
</tr>
</tbody>
</table>

Pipe totaling 0.75 mile in length and 30 inches in diameter would be required for an elevation drop on the Lone Pine Lateral. Approximately 6.8 miles of pipe for the Rocky Ford Pipe Laterals and 9.2 miles of pipe for the sublaterals, ranging in diameter from 15 to 42 inches, would be required for the Rocky Ford and Aztec Divide service areas. Pipe for the Rocky Ford Laterals and pipe for 4,000 feet of section 3 of the Lone Pine Lateral would be obtained from a commercial source and transported to the area by the contractors.

Most of the earth-lining material for the Lone Pine and Upper Hermana Laterals may be obtained at short-to-moderate haul distances of 0.1 to 2.7 miles. Gravel for road base and canal lining protection would not be available at the site. The closest gravel source would be near McPhee Reservoir, with haul distances of approximately 3.5 miles for the northern section of the Lone Pine Lateral and 12.0 miles to the other sections and 7.5 miles for the Upper Hermana Lateral. A commercial quarry is located near the town of Dolores with haul distances of 15 to 20 miles for the Lone Pine Lateral and 12 to 15 miles for the Upper Hermana Lateral. The road base material source near McPhee Reservoir could also be considered for aggregate on the Upper Hermana Lateral, reducing haul distances to about 7.5 miles.

For the construction of the Towaoc Canal, Reaches 1 and 2, a short-age exists of quality lean clays in the vicinity of the Highline Ditch, as well as a shortage of quality aggregate for concrete lining. Cost estimates for the Towaoc Canal were made assuming that significant portions would be membrane lined, thereby reducing the need for large quantities of concrete lining material. Lean clays required for the earth-lined sections of the canal could be obtained from three sources along the proposed alignment. These sources contain materials with properties similar to those used for the Dove Creek Canal. Haul distances would vary from 0.1 mile to 12 miles from each source to the beginning of Reach 1 and the end of Reach 2. These source areas are located so that maximum haul distances along the canal alignment should be less than 6 miles away.

Gravel materials for road base and for gravel protection of the canal lining may be acquired from four sources near the proposed alig-
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Haul distances from each source to the opposite ends of the canal range from nearly 0.1 to 12.0 miles. The four sources of material are located so that the maximum haul distances would be less than 8 miles by existing roads, if all sources were used. Other gravel deposits exist along the flank of the Sleeping Ute Mountains.

Large quantities of quality concrete aggregate are not available near the alignment of Reaches 1 and 2 of the Towaoc Canal. Gravel sources for road base may provide quantities of concrete-quality aggregate. Haul distances for these possible sources range from 2.0 to 14.4 miles to opposite ends of Reaches 1 and 2 along existing roads. Other sources were not investigated because their haul distances would be even greater. Only small volumes of concrete would be required for the earth-lined sections, and these could probably be supplied by local commercial sources.

Rights-of-Way

Rights-of-way for the Lone Pine and Upper Hermanna Laterals, currently 30 feet, would be widened to 200 feet and require 46 and 8.9 acres, respectively. The Lone Pine pipe drop would require 70 feet of right-of-way totaling 6.4 acres. The MVIC would be responsible for acquiring right-of-way for these two lateral sections and the Rocky Ford Laterals, which would require a 70-foot right-of-way totaling 135.8 acres. Reclamation would acquire a 250-foot right-of-way for the Towaoc Canal and would acquire approximately 1,640 acres of private land for construction right-of-way. The total number of acres required for this purpose for the project modifications would be approximately 1,700 acres.

Relocation of Property

No major relocation would be required for construction of the salinity control features. Precautions would be taken during construction to minimize disturbance of existing utilities and water conveyance facilities, bridges, as well as road crossings, would be replaced, as necessary, but would remain passable during construction. All fences removed for construction would be restored.

Conditions Precedent to Construction

Prior to construction, an operation and maintenance agreement would be required between the United States and the MVIC stipulating that the MVIC would assume all obligations relating to the continued operation and maintenance of the improved laterals, including cross-drainage features. Since ownership of the proposed improvements, except for the Towaoc Canal, would remain in the name of the MVIC, the agreement would have to specifically address the authority granted to Reclamation to periodically evaluate the company's operation and maintenance performance. In addition, provisions in the agreement would describe the action Reclamation could take if the MVIC's operation and maintenance performance threatened the objectives of the salinity control program. The agreement would also specify that any additional water supplies resulting from increased irrigation efficiencies be used in a manner that would not increase salt loading to the Colorado River system.

All lands acquired for fish and wildlife mitigation or enhancement purposes will be managed in accordance with provisions of a General Plan that identifies the purposes for which the land is to be managed, the managing agency, and provides the authority to transfer or convey the lands to the designated management entity. In addition, site-specific wildlife management plans will be developed or existing plans will be expanded to cover management of the area. At present, an interim agreement between Reclamation and the Colorado Division of Wildlife has been developed to ensure operation and maintenance of the wildlife mitigation area. A stipulation was included in the land transfer from Reclamation to the Bureau of Land Management to ensure that the land will be maintained primarily for fish and wildlife and recreation enhancement. Lands transferred to the Bureau of Land Management will also be subject to provisions of a General Plan. An agreement would also be needed between Reclamation and the MVIC on its management of Totten Reservoir.

Effects of Project Modifications on Salinity

The 1977 FES reported that 10,080 tons of salt loading to the Colorado River system would occur annually as a result of implementing the plan of development. This analysis was based only on the salt loading effect of irrigating full service land and did not consider the effect of canal seepage. Analyses since the completion of the 1977 Definite Plan report reveal that 40,570 tons of salt annually would be contributed from canal seepage, including 7,500 tons from the Towaoc Canal from the west alignment and 33,070 tons from other project canals. The total salt loading from project land and canals in the 1977 FES plan would be 50,650 tons annually, as shown in Table 7.

<table>
<thead>
<tr>
<th>Effects of project modifications on salinity (Unit: tons of salt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Salt loading</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Project area</td>
</tr>
<tr>
<td>Dolores Project area---project land and canals</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Towaoc Canal---west alignment</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total project effect</td>
</tr>
</tbody>
</table>

1/ Since the 1977 FES, salt loading analyses have included seepage from project canals as well as the irrigation of project land.
2/ The salinity effects of canal seepage were not estimated in the 1977 FES.
3/ Salinity control was not a part of the 1977 FES plan.
4/ This salt reduction does not include the on-farm program of the RSCS for reducing salt loading.
The change in alignment of the Towaco Canal described in this supplement to the FES would eliminate the 7,500 tons of annual salt loading that would have occurred with the west alignment. The construction of the salinity control features would further reduce salt loading by an additional 24,500 tons annually. The total effect of all project modifications, including the realigning of the Towaco Canal, would be an annual reduction of the total project salt loading of approximately 12,000 tons. The net effect of the project, including project modifications, would be an increase of 18,650 tons of salt per year.

Construction Headquarters

The Cortez Projects Office of the Bureau of Reclamation would be the headquarters for the construction of the salinity control features and the other features of the Dolores Project.

Operation, Maintenance, and Replacement

Since salinity features would be added to the project in the MVIC system, a progressive program for the operation and maintenance of lined sections would be needed to continue the control of seepage. Reclamation would enter into a contract with the MVIC that details the responsibilities of the company for the proper operation and maintenance of all salinity control features, except the Towaco Canal, which would be operated and maintained by the DNCD according to Reclamation criteria.

Administration

The DNCD is negotiating with the MVIC and the Tribe for their subcontracting the operation and maintenance responsibilities of the salinity control facilities and the Towaco laterals, respectively. The MVIC and Tribe would be responsible for operating the headgates serving their respective land. The Bureau of Land Management would develop and administer the 474 acres of enhancement land, and the Colorado Division of Wildlife would administer the 215 acres of mitigation land.

Estimated Project Costs

The total construction cost for the Dolores Project is estimated at $460,000, based on actual costs of completed features and January 1987 prices for the features not yet completed. The separable costs for constructing salinity control features would total $23,164,000. The annual operation, maintenance, and replacement cost for the Dolores Project is estimated at $1,773,700 and would decrease by $17,400 annually after 10 years when the salinity monitoring program is completed. The total annual operation, maintenance, and replacement cost for the salinity control features is estimated at $91,500 for the first 10 years. These costs would drop to $74,000 after 10 years when the monitoring program is complete.
### Table 8
Comparison of alternative plans

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Existing condition</th>
<th>No Proposed action plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canal lining (miles)</td>
<td>1/NC</td>
<td>2/34.3</td>
</tr>
<tr>
<td>Buried pipe laterals (miles)</td>
<td>NC</td>
<td>+7.0</td>
</tr>
<tr>
<td>Permanent rights-of-way (acres)</td>
<td>Private land (Federal acquisition)</td>
<td>NC</td>
</tr>
<tr>
<td>Private land (MVIC acquisition)</td>
<td>NC</td>
<td>+297.2</td>
</tr>
<tr>
<td>Wildlife habitat (acres)</td>
<td>Upland</td>
<td>128</td>
</tr>
<tr>
<td>Wetland</td>
<td>10,310</td>
<td>NC</td>
</tr>
<tr>
<td>Impact to fisheries</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>Impact on endangered species</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>Cultural resources site present</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Salt loading reduction (tons)</td>
<td>1/NC</td>
<td>2/24,500</td>
</tr>
<tr>
<td>Net effect on salt loading (tons)/</td>
<td>+18,650</td>
<td></td>
</tr>
<tr>
<td>Seepage reduction (acre-feet)</td>
<td>NC</td>
<td>7,900</td>
</tr>
<tr>
<td>Irrigation systems</td>
<td>Improved system</td>
<td>No</td>
</tr>
<tr>
<td>Automated delivery system</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Sprinkler pressure</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Employment (direct—person years)</td>
<td>NC</td>
<td>215</td>
</tr>
<tr>
<td>Construction costs (1987)</td>
<td>$23,168</td>
<td></td>
</tr>
<tr>
<td>Increase in annual operation, maintenance, and replacement costs/</td>
<td>NC</td>
<td>91,400</td>
</tr>
<tr>
<td>Cost-effectiveness per ton of salt removed</td>
<td>($/ton)</td>
<td>83</td>
</tr>
</tbody>
</table>

1/ NC = No significant change.
2/ Flumes indicate increases; minus signs indicate decreases.
3/ Although total wildlife loading would be offset, 14 acres of wetland would be lost—the difference between 89 acres lost and the replacement of 75 acres created through project mitigation.
4/ Under the no action alternative, the SCS on-farm program for removing 38,000 tons of salt would be impacted, but the reduction in tons of salt removed is unquantified.
5/ The total salt reduction is for the off-farm program by the Bureau of Reclamation and does not reflect the on-farm program of the SCS.
6/ The net effect includes salt loading for the Dolores Project from the irrigation of new project land and the seeping of project canals minus the salt removed by lining MVIC laterals, abandoning MVIC ditches that seep, and combining an MVIC lateral and ditch with flows of the Towaoc Canal on the east side of Cortez.
7/ Would be reduced to $74,000 annually upon completion of the 10-year salinity control monitoring program.
8/ Cost-effectiveness reflects the annual cost for each ton of salt removed from the Colorado River system.
Evaporation

Three alternatives for disposing of saline water through evaporation were considered. These alternatives included diverting and evaporating the total flow of McElmo Creek, diverting and evaporating only the saline winter flows, and ponding and evaporating selected small creeks and draws tributary to McElmo Creek. Evaporating the total flow of McElmo Creek included a 681,000-acre-foot reservoir located on McElmo Creek near the Colorado-Utah State line. Evaporating only the saline winter flows included two evaporation ponds, one on Mud Creek with a capacity of 75,000 acre-feet and one in Rincon Basin just east of the State line with a capacity of 113,000 acre-feet. Water would be pumped to the potential Mud Creek Reservoir and would be delivered by gravity to the Rincon Basin Reservoir site. This alternative would be the most cost effective of the three since the diverted water would be more concentrated because of the lack of dilution from irrigation water in the summer and snowmelt during the winter. The selective pumping alternative included 6 ponds in Alkali Draw, 25 ponds in Hartman Draw, and 1 pond in Mud Creek.

All three alternatives failed the test of efficiency because their costs per ton of salt removed were beyond those currently being considered for implementation under the Colorado River Water Quality Improvement Program. They also failed the test of acceptability because the evaporation of saline water is not considered a beneficial use in Colorado.

Desalting plants

The construction of three different types of desalting plants was investigated, but each failed the test of efficiency because of high costs. The methods included solar, reverse osmosis, and electrodialysis.

Summary of other alternatives considered

Table 9 below shows the amount of salt each alternative would remove and its cost effectiveness.

Table 9
Summary of other alternatives considered

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Potential salt removed annually (tons)</th>
<th>Cost effectiveness ($/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal slurry pipeline</td>
<td>40,000</td>
<td>79</td>
</tr>
<tr>
<td>Land withdrawal</td>
<td>42,000</td>
<td>95</td>
</tr>
<tr>
<td>Industrial cooling</td>
<td>60,000</td>
<td>100</td>
</tr>
<tr>
<td>Evaporation of selected highly saline flows</td>
<td>42,000</td>
<td>141</td>
</tr>
<tr>
<td>Evaporation of total McElmo Creek flows</td>
<td>115,000</td>
<td>214</td>
</tr>
<tr>
<td>Evaporation of small creek and draw flows</td>
<td>51,000</td>
<td>329</td>
</tr>
<tr>
<td>Desalting plants</td>
<td>90,000</td>
<td>52</td>
</tr>
</tbody>
</table>

1/ Appraisal-level estimate, January 1982 price level.

Additional increments to the irrigation system improvement plan

Twelve additional lateral lining increments were studied as part of the irrigation system improvements plan. These increments are shown in Table 10 with their lengths in feet, the number of tons removed, and the estimated cost effectiveness. They were not included in the irrigation system improvements plan because their cost effectiveness exceeded what was being considered for implementation.

Table 10
Lateral lining increments not included under the irrigation system improvement plan/

<table>
<thead>
<tr>
<th>Canal/lateral segment/</th>
<th>Length to be lined (feet)</th>
<th>Salt removed annually (tons)</th>
<th>Cost effectiveness ($/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lone Pine 8</td>
<td>928</td>
<td>68</td>
<td>109</td>
</tr>
<tr>
<td>Lone Pine 9</td>
<td>5,449</td>
<td>377</td>
<td>137</td>
</tr>
<tr>
<td>Upper Hermosa 4</td>
<td>13,218</td>
<td>786</td>
<td>144</td>
</tr>
<tr>
<td>Upper Hermosa 3</td>
<td>2,200</td>
<td>131</td>
<td>155</td>
</tr>
<tr>
<td>Lone Pine 3</td>
<td>9,236</td>
<td>471</td>
<td>159</td>
</tr>
<tr>
<td>Lone Pine 7</td>
<td>5,896</td>
<td>303</td>
<td>169</td>
</tr>
<tr>
<td>Lone Pine 13</td>
<td>8,451</td>
<td>300</td>
<td>253</td>
</tr>
<tr>
<td>Lone Pine 15</td>
<td>9,900</td>
<td>245</td>
<td>271</td>
</tr>
<tr>
<td>Upper Hermosa 6</td>
<td>6,181</td>
<td>189</td>
<td>301</td>
</tr>
<tr>
<td>Upper Hermosa 2</td>
<td>10,260</td>
<td>333</td>
<td>386</td>
</tr>
<tr>
<td>Lone Pine 7</td>
<td>4,992</td>
<td>157</td>
<td>407</td>
</tr>
<tr>
<td>Upper Hermosa 5</td>
<td>4,032</td>
<td>43</td>
<td>800</td>
</tr>
</tbody>
</table>

1/ Segment refers to small portions of the laterals studied as separate or contiguous increments during plan formulation.

2/ January 1986 price level.
CHAPTER III

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

The only viable alternative to constructing the plan described in Chapter II is no action on the irrigation system improvement plan and realigning the Towaoc Canal from the west to the east of Cortez. The Dolores Project would then be constructed as described in the 1977 FES and the 1981 Finding of No Significant Impact. Impacts associated with the no action alternative are those described in these two documents. Those impacts would occur if the project were implemented without constructing the project modifications described in this supplement.

Under the no action alternative, the effectiveness of the SCS on-farm improvement plan for reducing salt loading by approximately 38,000 tons per year would be reduced by an unquantifiable amount. This would occur because no gravity head would be provided by the closed pipe lateral to the Rocky Ford Ditch and Aztec Divide service areas.

The affected environment in this chapter is Montezuma County since the effects of constructing the project modifications, except for reducing salinity levels at Imperial Dam, would be felt only in that county. No attempt has been made to update the total project impacts described in the 1977 FES.

Land Use

Trends in land use in Montezuma County would probably continue with or without the project modifications. The major enterprise is cattle ranching; the major crops are alfalfa, wheat, other small grains, and pasture and corn for silage. Of lesser importance is the growing of commercial fruits and vegetables. Small hobby farms are replacing some farms and ranches. Parts of the county, particularly along major roads, would see increased urbanization.

Existing rights-of-way for the Lone Pine and Upper Hermosa Laterals, currently 50 feet, would be widened by an additional 150 feet by acquiring approximately 14,480 acres, respectively, of private land through construction easements. The Lone Pine Lateral pipe drop would require 70 feet of right-of-way totaling 6.4 acres. An easement 250 feet wide totaling approximately 1,410 acres would be acquired for the Towaoc Canal. For the Rocky Ford pipe laterals, it would be necessary to acquire a 70-foot construction easement. A total of 135.8 acres would be acquired for construction of all eight Rocky Ford laterals and sublaterals. The existing Rocky Ford Ditch right-of-way would revert to the owner.

Some county bridges and roads and private farm road crossings would be reconstructed. Since the lined sections of project conveyance features
CHAPTER III

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

would generally be near or on the existing alignment, no significant relocations other than the existing canal sections and structures would occur.

Scenery

Affected environment

The salinity control area is located in a rural, agricultural setting marked by a variety of scenery and generally unobstructed views. The scattered farms, many surrounded by clusters of trees, provide occasional breaks in the terrain and add a degree of perspective. The farms are characterized by pastures; livestock; brush fence rows; occasional orchards; and irrigation ditches, laterals, and structures.

Environmental consequences

Once construction is completed and revegetation of the disturbed areas is accomplished, vegetation would reestablish itself and the affected areas would look much as they do now.

Air and Noise Quality

Affected environment

Montezuma County is rural, with few industries to affect air quality or noise levels. According to the Colorado Department of Health (1984), Mesa Verde National Park, which has the only air quality monitoring station in Montezuma County, meets the national ambient air quality standards for total suspended particulates. The National Park is designated as Class I, and its air quality is excellent. Most suspended particulates occur because of unpaved roads, dried mud on streets, and a prevailing wind capable of moving suspended particulates. Noise levels are acceptable because of the rural nature of the area and the small population.

Environmental consequences

The project modifications would not have long-term effects on ambient air quality but would have short-term impacts during the 4-year construction period. Emissions and dust from construction equipment and the moving of earth and aggregate would increase particulate levels and decrease air quality locally during construction, but air quality is expected to remain in the acceptable level. Dust abatement procedures would be undertaken during construction. Noise generated by construction equipment would be a short-term nuisance to people living near the affected ditches and laterals, but measures would be instituted to reduce noise levels. All of the construction activities, however, would take place away from any population concentrations.

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AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Water Quantity and Quality

Affected environment

The salinity control area has water diverted to it from the Dolores River or its tributaries. As shown in Table 11, Reclamation prepared a water and salt budget on the area to identify its flows and consumptive use, based on the implementation of the 1977 FES plan. An average of 312,500 acre-feet of water would enter the study area annually, including canal inflow of 139,000 acre-feet and precipitation of 173,500 acre-feet, with a salt load of approximately 29,500 tons. An average of 79,100 acre-feet of water would leave the area, with an average annual salt load of 173,700 tons. The total anticipated salt pickup from the study area is estimated at 144,200 tons annually.

Table 11

Comparison of 1977 FES plan

<table>
<thead>
<tr>
<th>Water volume (acre-feet per year)</th>
<th>Salt load (ton)</th>
<th>Salt reduction with project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977 FES plan</td>
<td>1977 FES plan</td>
<td>1977 FES plan</td>
</tr>
<tr>
<td>Within Yellow Creek basin</td>
<td>139,000</td>
<td>139,000</td>
</tr>
<tr>
<td>Inflow to basin</td>
<td>139,000</td>
<td>139,000</td>
</tr>
<tr>
<td>Canal inflow</td>
<td>173,500</td>
<td>173,500</td>
</tr>
<tr>
<td>Precipitation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (for all averages)</td>
<td>312,500</td>
<td>312,500</td>
</tr>
<tr>
<td>Consumptive use</td>
<td>57,700</td>
<td>57,700</td>
</tr>
<tr>
<td>Grapes</td>
<td>57,700</td>
<td>57,700</td>
</tr>
<tr>
<td>Other</td>
<td>174,900</td>
<td>174,900</td>
</tr>
<tr>
<td>Canal evaporation</td>
<td>317,400</td>
<td>317,400</td>
</tr>
<tr>
<td>Total</td>
<td>517,900</td>
<td>517,900</td>
</tr>
<tr>
<td>Outside Yellow Creek basin</td>
<td>173,700</td>
<td>173,700</td>
</tr>
<tr>
<td>Salt pickup</td>
<td>79,100</td>
<td>79,100</td>
</tr>
<tr>
<td>Outside Yellow Creek basin</td>
<td>144,200</td>
<td>144,200</td>
</tr>
<tr>
<td>Lone Pine Lateral</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pan del Rio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt load reduction</td>
<td>132,000</td>
<td></td>
</tr>
</tbody>
</table>

1. Measured at Yellow Creek below 6th Creek.
2. Canal seepage from this portion of the Lone Pine Lateral drains down Yellow Creek Canyon, which joins Yellow Creek downstream of the canalite station.
3. Seepage from this wash does not drain into Yellow Creek.

Environmental consequences

With or without project modifications, as shown in Table 11, annual canal inflow would average 139,000 acre-feet. Grapes would consume approximately 57,700 acre-feet annually. The remainder would return to Yellow Creek and to the San Juan River, or through other drainages to the San Juan River, either as surface spills and tailwater or by entering the ground water system as seepage and deep percolation. Outflow from the area would average 81,900 acre-feet and 107,400 tons of salt annually.
with the project modifications and 79,100 acre-feet carrying 173,700 tons of salt without the modifications. The average annual salt pickup would be 177,900 with the project modifications and 144,200 tons without the modifications, resulting in a reduction of 26,300 tons plus 5,700 tons which would be removed from outside the McKelmo Creek drainage for a total of 32,000 tons removed. The 32,000 tons includes 24,500 removed as a result of salinity control features and 7,500 tons that would not even be a factor as a result of abandoning the Towac Canal's alignment to the west of Cortez. In comparison to the 1977 FES plan, the project modifications would reduce salinity at Imperial Dam by 2.4 mg/L.

Under the no action alternative, no reduction in salt loading would result from the off-farm program of the Bureau of Reclamation. The impact of the no action alternative on the SCS on-farm program is unquantifiable. The SCS program is reduce salt loading by 38,000 tons annually. This program would be less effective because the closed water loop to the Rocky Ford and Aztec Divide service areas under Reclamation's proposed plan would not be constructed.

The net reduction in canal seepage resulting from project modifications would average 7,900 acre-feet annually. The 7,900 acre-feet includes 6,630 acre-feet reduced as a result of constructing salinity control features and 1,270 acre-feet that would not enter the system as a result of abandoning the Towac Canal's alignment west of Cortez. The benefits of the project could partially be offset if the water prevented from seeping were used on new land with saline soils that would increase salt loading.

In the WIC system, the ownership of irrigation water is not associated with any particular parcel of land, and shares of water may be freely exchanged throughout the area. Since shareholders are delivered irrigation water proportionally to the amount of shares they own, Reclamation assumed the water prevented from seeping would be distributed evenly to all shareholders. Water rights associated with this water would be a matter between the State of Colorado and the WIC, but Reclamation would not enter into agreements with the WIC and MCD consistent with the objectives of the salinity program. Provisions in these agreements would describe the action Reclamation could take if their operation and maintenance performance threatened the objectives of the salinity control program. To ensure that the objectives of the salinity program would be realized, Reclamation would establish agreements with the WIC concerning operation and maintenance procedures and the use of additional water resulting from increased irrigation efficiencies so that salinity control improvements would be used in a manner that would not increase salt loading to the Colorado River system. A monitoring program, as noted in Chapter II, would be instituted to determine the salt load after the completion of the project modifications.

**Vegetation and Wildlife**

**Affected environment**

Irrigated cropland in the Montezuma Valley consists primarily of alfalfa, wheat hay, and pasture. Native vegetation in the area varies with elevation and soils. Pinon pine and juniper are scattered over most of the nonagricultural area and are interspersed with sagebrush. In addition, herbaceous plants are found in the Montezuma Valley area. Pasture, sagebrush, and wetlands are found in the valley bottoms.

A distinct zone of riparian vegetation consisting mainly of cottonwood and willows, dense brush, forbs, and shrubs is found along portions of McKelmo Creek and its tributaries and also along the canal sections within the unit area. Wetlands totaling 1,024 acres provide forage and cover for wildlife and appear to be more closely dependent on irrigation return flows than on ditch and lateral seepage losses. Seepage from the WIC conveyance system has created 379 acres of wetland habitat in several areas in the valley. Surplus irrigation water exits the fields as either surface flow, deep percolation, or as shallow ground water flow. The value of these wetlands as wildlife habitat has been diminished as a result of agricultural use.

Most mule deer and elk may be found northeast of the McKelmo Creek drainage (Burick, 1978). Small mammals include cottontail rabbit, snowshoe hare, and a variety of furbearers and other small nongame mammals (Somers, 1979). Numerous types of birds inhabit or migrate through the project area. Waterfowl and shorebird habitat, although somewhat limited in extent, is found at reservoirs in the area and in marshy areas in Montezuma Valley. Several species of upland and migratory birds, including grouse, pigeons, and doves, are found in and near the area. Gambel’s quail chukar, and ring-necked pheasants have been introduced but are not present in large numbers. Both migratory and resident species of song birds are abundant along McKelmo Creek and other areas of brush, trees, or marshy vegetation. Amphibians are not abundant since much of the area is dry, but salamanders, frogs, and toads are present at some areas. Reptiles in the area are numerous and include such species as the midget-faded rattlesnake, Great Basin gopher snake, horned lizard, and side-blotched lizard.

Cottonwood trees and other riparian species along existing canals provide habitat to a number of birds and mammals (Graham, 1985). Bald eagles are known to use these trees for nesting.

**Environmental consequences**

Short- and long-term impacts on vegetation and wildlife would result from implementation of the project modifications. Short-term impacts would involve changes to the riparian vegetation during construction until disturbed areas are revegetated. Long-term impacts would result from a reduced quantity and quality of habitat for some wildlife species and a sale in some locations for some species. Losses in the dryland cover types would result primarily from the expansion of the urban community, such as housing and businesses, and would occur with or without the proposed modifications.

Of the 379 acres of wetland habitat in the drainage dependent on lateral seepage, 135 acres were estimated to be lost by the project
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Modifications using the Habitat Evaluation Procedures (Fish and Wildlife Service, 1984). This figure was changed after additional analysis (see section in this chapter under “Compliance with Executive Orders on Flood Plains and Wetlands” on page 41). This loss would affect wetland user species such as the yellow-breasted chat, montane vole, mallard, and the sora. Another vegetation type would replace the wetlands and create a different habitat for wildlife.

Upland species which use sagebrush, grassedwwood, pasture, and hayland for cover, such as the sage sparrow, badger, ring-necked pheasant, and the great horned owl, would gain 155 acres of habitat with development of the project modifications. Through the Habitat Evaluation Procedures (HEP), gains in upland habitat were used to offset losses to wetland habitat because some wildlife species can use this cultivation. Overall, however, a net loss of wildlife values would occur and could be replaced by developing 24 acres of wetlands (Fish and Wildlife Service, 1984). The relatively small amount of mitigation is due to two factors. First, the wetlands involved are frequently associated with pasture and hayland or areas used as open rangeland. As such, they are subjected to the disturbances of normal agricultural practices and domestic livestock grazing. These influences reduce the quality of the vegetation occurring in the wetland and, therefore, reduce the overall quality of the wetland as wildlife habitat (USDI, December 20, 1982). Secondly, the wetlands are such that they are utilized by upland wildlife and, therefore, this portion of their value can be replaced by more traditional upland habitat.

Large and small species of mammals now inhabiting the area would leave during construction activities, but because of the minimal disruption to vegetation and land forms, populations would likely return to preconstruction levels.

In addition to wildlife losses from canal lining, combining the Towac Canal and the Highline Ditch and abandoning the Rocky Ford Ditch would cause the loss of riparian habitat along the old ditches and the new alignment. Two major concerns are associated with this change. First, the loss of riparian habitat along the existing Highline and Rocky Ford Ditches would result as seepage is reduced and existing riparian vegetation is removed during construction. Second, the potential for deer and elk to disperse into the environment will now exist within the concrete-lined sections of the Towac Canal. The Colorado Division of Wildlife estimated that 52% and 27% cottonwood trees now exist along the 23 miles of the Highline Ditch and the 13 miles of the Rocky Ford Ditch, respectively. These trees provide habitat for a variety of wildlife species and, particularly, to the federally endangered bald eagle.

The Colorado Division of Wildlife assessed the impacts of the Towac Canal on large animal populations and an existing cottonwood tree located along the canal alignment. Because of its smooth, hard surface, the existing cottonwood trees located along sections of the Towac Canal replace a type of vegetation which would present a threat to deer and elk through entrapment and eventual drowning. The Colorado Division of Wildlife estimated that from April through September, the period of peak operation of the canal, the deer population was 4.7 deer per square mile. A significant elk population also existed in the area. During this period, the probability of large animals becoming entrapped and possibly drowning was at its highest. The Colorado Division of Wildlife concluded that as many as 40 deer annually could become entrapped in the 23-mile reach if it were concrete lined.

This potential loss would be avoided by one or more of the following: fencing; constructing escape structures; and/or installing crossover ramps along and within the concrete-lined sections of the canal. Construction activities may temporarily disturb resident deer and elk herds, but no long-term impacts are anticipated.

It is not possible to predict at the present time the actual number of cottonwood trees that would be lost due to the construction of the Towac Canal because of the unknown construction needs and the vagaries of local surface and subsurface water conditions which influence the maintenance of the cottonwood trees. Therefore, the impact analysis assumed a “worst case” analysis; i.e., all cottonwood trees would be lost. To offset this loss of habitat, 215 acres, consisting primarily of heavily grazed riparian habitat, were purchased downstream of McPhee Reservoir. This area would be managed by the Colorado Division of Wildlife and, in the opinion of Reclamation, the Fish and Wildlife Service, and the Colorado Division of Wildlife, offset the “worst case” assumption used in this analysis. Additionally, during construction activities, cottonwood trees would be avoided to the extent practical and any large raptor nests would receive special consideration and be reported to the environmental officer.

Compliance with Executive Orders on Flood Plains and Wetlands

The project modifications would not affect the existing flood plains under the provisions of Executive Order 11988, Floodplain Management, because of the design of the features and the minimal amount of water involved.

The curtailment of seepage discussed in the preceding section would reduce wetland vegetation by 155 acres. In accordance with Executive Order 11990, Protection of Wetlands, Reclamation examined various alternatives to reduce salinity and considered their impacts on wetlands. No viable alternative to the project modifications would accomplish the objectives of the salinity program. The project modifications accomplish the environmental objective of salinity control under existing laws. Based on the RRP analysis and the recommendations of the Fish and Wildlife Service, the development of 24 acres of wetlands would mitigate the wildlife values associated with the loss of wetland habitat. Wetland areas are shown on figure 4, a wetland sites map. On September 29, 1987, the RRP asked Reclamation to revise wetland losses for values other than fish and wildlife with the goal of full replacement of the acres lost. Because no standard methodology exists to quantify and integrate other
wetland values into a single index, Reclamation was only able to review the changes of wetland acreages associated with the Dolores Project. Through this review process, Reclamation determined that wetlands would be created along wasteways associated with the project irrigation system, and additional wetlands would develop naturally from minor return flow from irrigated cropland. An estimated 66 acres of this type of wetland would be created by the canal wasteways, thus leaving a total of 89 acres to be mitigated under EPA's request. Wetland areas created by return flow from irrigated fields would somewhat offset these 89 acres. The number of acres could not be accurately determined because over 28,000 acres of project land will be newly irrigated with project water, and new pockets of wetlands will be created. Any remaining wetland losses will be offset as a result of applying water to this dry-farmed land. Reclamation believes that through its mitigation efforts all wildlife values will have been compensated, and through project development the creation of new wetland habitat in the project area would offset other wetland values.

Fish

Affected environment

An aquatic inventory of McElmo Creek and all of its tributaries was conducted in 1977 and 1978, and a summary is available in a Colorado Division of Wildlife (CDOW) report (Smith, 1979). Reclamation collected additional fisheries data on McElmo Creek through 1980.

McElmo Creek

Water quality, high seasonal water temperatures, and widely fluctuating flows combine to limit the composition of fish species that can inhabit McElmo Creek. A wide variety of highly tolerant fish species, however, were found during sampling. The creek supports a limited fish population of flannelmouth and bluehead suckers, fathead minnows, carp, speckled dace, and red shiners in its upper reaches, while tributaries downstream provide better quality habitat that allow these same species to flourish.

The creek was stocked with catchable-size rainbow trout in the 1950's and 1960's, but this stocking was discontinued in 1967 when the CDOW determined the creek did not provide suitable habitat for trout. Under present conditions, McElmo Creek has little or no value as a sport fishery.

Reservoirs

The Colorado Division of Wildlife manages the only established fisheries within Montezuma Valley, and these are found within several reservoirs operated primarily for irrigation purposes, such as Narraguinnep and Totten Reservoirs. These stocked reservoirs lie in the upper drainage of McElmo Creek.
TYPICAL WETLAND SITE

Wetland Site •
CHAPTER III AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Environmental consequences

McElmo Creek

According to the Colorado Division of Wildlife (Smith, 1979), fishery management of the streams in the McElmo Creek area would remain unchanged with or without the project modifications. Because of the poor quality water and low survival rate, no fish stocking would be conducted. No adverse impacts to the fishery resource would occur with the project modifications. Water quality would improve as salinity levels are decreased, thereby positively affecting those fish living in McElmo Creek.

Reservoirs

By supplementing the MVIC's water supply, the project would generally have a stabilizing effect on Narraguinnep Reservoir. Once the project modifications were constructed and operational, Rocky Ford Ditch would be abandoned. Since Totten Reservoir would serve no irrigation purpose to the MVIC, abandonment of this fishery would be a project impact. To ensure the protection of this fishery, up to 800 acre-feet reserved in McPhee Reservoir for fish and wildlife purposes would be made available to preserve existing water quality and sustain the fishery. The MVIC would continue to operate and maintain Totten Dam and Reservoir with funds available under salinity control legislation.

Threatened and Endangered Species

Affected environment

The endangered fish and wildlife species historically identified in the San Juan River drainage by the U.S. Fish and Wildlife Service are the Colorado squawfish, hontail chub, humpback chub, and the bald eagle. The hontail and humpback chubs are no longer thought to occur in the San Juan drainage. Bald eagles occur in the area as wintering residents.

A March 12, 1980, biological assessment was prepared to address impacts the 1977 FES Dolores Project plan would have on threatened and endangered species. Although Reclamation concluded the project would not affect these species, the Fish and Wildlife Service determined that the project may affect the Colorado squawfish, hontail chub, and humpback chub in the Colorado River and issued a jeopardy opinion for the Dolores Project until a recovery implementation plan could be established for these endangered fish.
CHAPTER III  AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Reclamation and representatives of other Federal and State fish and wildlife agencies have developed a recovery implementation plan for the endangered native fish in the Colorado and Green River systems. Implementation of the recovery plan will offset effects to endangered fish that could result from existing features of the Dolores Project. The salinity features and modifications to the project would only impact habitats in the San Juan River drainage, which is not now covered by the implementation plan. With a plan of recovery for the listed fish in effect, Section 7 consultation on the Dolores Project would be completed. A new Nonjeopardy Opinion from the Fish and Wildlife Service is expected.

No State or federally listed threatened or endangered fish species have been collected from McElmo Creek or any of its tributaries. The federally listed endangered fish species, the Colorado squawfish, is native to the San Juan River drainage and throughout the Colorado River system. Over the last few decades, squawfish populations have declined greatly. Ovastream dams, water diversions, and competition from exotic fish species have all contributed to their decline. The Fish and Wildlife Service has determined.

Minimal effort has been expended in sampling the San Juan River for identifying potential habitat for the squawfish compared to sampling efforts in other parts of the Upper Colorado River drainage. From 1962 to 1987, the only verified collection of squawfish from the San Juan River occurred in April 1978 (VTN, 1978) when a single juvenile specimen was caught in the area of Aneth, Utah, near the mouth of McElmo Creek.

In April 1987, Reclamation, in cooperation with the Fish and Wildlife Service and the States of Utah and New Mexico, initiated a more intensive survey of the San Juan River from Farmington, New Mexico, to the confluence with Lake Powell. In May and October of 1987, two adult and one juvenile squawfish, respectively, were collected in the San Juan River in New Mexico. Additionally, one adult squawfish was captured in Lake Powell within 2 miles of the confluence with the San Juan River.

In September 1987, researchers from the Utah Division of Wildlife Resources recaptured the Lake Powell squawfish near Bluff, Utah, approximately 24 miles upstream of the confluence. Recent collections of young-of-the-year squawfish also indicate reproduction is occurring in the San Juan River upstream of Bluff.

Environmental consequences

In accordance with Section 7, Interagency Cooperation Regulations (50 CFR 402) of the Endangered Species Act (16 U.S.C. 1531 et. seq.), Reclamation provided the U.S. Fish and Wildlife Service a Biological Assessment on the Colorado squawfish and the bald eagle. This assessment contains Reclamation's conclusion that there would be little or no effect on the endangered species from the project modifications. The Fish and Wildlife Service issued a Biological Opinion on August 1986. In accordance with the Fish and Wildlife Service's opinion, the project modifications would not likely jeopardize the continued existence of the Colorado squawfish or the bald eagle.

The recent collection of adult and young-of-the-year squawfish were not addressed in the Biological Assessment. Reclamation's assessment, however, did recognize the potential presence of Colorado squawfish in the San Juan River. Since the modifications to the project would not change the flow of the San Juan River, no additional impacts would occur to this species.

Recreation

Affected environment

Within the McElmo Creek area, recreational opportunities are limited primarily to reservoirs, such as Narraguinneep, Puett, Summit, and Totten, which, as noted above, the Colorado Division of Wildlife stocks with fish. Totten Reservoir has a good fishery, serving about 5,000 anglers annually. Typical recreational activities include warm-water fishing, some hunting and trapping, boating, swimming, and hiking and bird watching along ditches and laterals.

McElmo Creek offers little opportunity for recreation because it flows mostly through private land with restricted public access. Some duck and small game hunting occurs on land where permission to hunt has been granted.

Environmental consequences

During the short term, construction on the project modifications would have a negative impact on any recreational use of the laterals and ditches, such as hiking and bird watching. The stabilizing of Narraguinneep Reservoir would have a positive effect on the visual and recreational aspects of the reservoir. Through MVIC's continued management of Totten Reservoir, recreational use would remain unchanged.

Cultural Resources

Affected environment

Two Class III cultural resources surveys were performed in 1985 and 1986 (Kuckelman, 1986) on the proposed new route of the Towoac Canal, Reaches 1 and 2; Rocky Ford Laterals; three Lone Pine Lateral sections; Upper Iberman Lateral; and four borrow areas near the Lone Pine Laterals. These surveys recorded 129 prehistoric (mostly Anasazi) and historic cultural resources. Prehistoric site types range from small lithic scatters up to large multi-room black villages, although most habitation sites are small in size. The historic sites range from artifact fresh scatters to hometelis with outbuildings and dugouts. A Class III survey has been conducted on the site Mountain Ute Reservation.
The Colorado State Historic Preservation Office, in a letter dated April 28, 1987, determined 22 of 26 prehistoric sites recorded for the four borrow areas and three Lone Pine Lateral segments were eligible for the National Register of Historic Places under criterion (d) of 36 CFR 60. Reclamation has determined that 97 of the remaining 103 cultural resources from the 1985 survey are eligible for the Register, and the Colorado State Historic Preservation Office has concurred.

Environmental consequences

Construction of the salinity control features described elsewhere will destroy or damage a majority of the 129 recorded cultural resources, thereby creating an irreversible adverse effect, as defined in the Advisory Council on Historic Preservation Rule 36 CFR 800.3a. Although the project modifications were not an original part of the Dolores Project, procedures for mitigation of adverse impacts to significant cultural resources were agreed to by Reclamation in a Memorandum of Agreement dated July 24, 1978 (amended February 1, 1983) between Reclamation, the Colorado State Historic Preservation Office, and the Federal Advisory Council on Historic Preservation. A specific mitigation plan for the canal and lateral features of the Dolores Project was accepted by the Colorado State Historic Preservation Office in a letter dated April 7, 1983.

Once the final alignment of the Towaca Canal is determined, Reclamation would propose steps to mitigate the impacts to the cultural resource sites, including data recovery and, where possible, avoidance. Even with a data recovery program, it is unlikely that many sites would have any work done on them beyond the current Class III survey recording, while some sites would be totally missed by construction of the Towaca Canal. At the borrow areas and gravel sources yet to be surveyed, avoidance of recorded sites would be emphasized. At the end of the cultural resources mitigation program, the artifacts and reports would be curated at the Anasazi Heritage Center near Dolores.

Social and Economic Analysis

The social and economic data were developed by using the 1980 U.S. Census of the Population; the Dolores Monitoring Study; the Bureau of Reclamation Economic Assessment Model (BREAM); the Bureau of Reclamation Social, Economic, and Demographic Analysis Programs (SEADAP) for Computer Utilization; the Colorado State Demographers Office; the Colorado State

Table 12

<table>
<thead>
<tr>
<th>Year</th>
<th>Labor Force</th>
<th>Total Employment</th>
<th>Unemployment Rate (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>6,930</td>
<td>6,790</td>
<td>12.7</td>
</tr>
<tr>
<td>1981</td>
<td>7,138</td>
<td>6,980</td>
<td>17.2</td>
</tr>
<tr>
<td>1982</td>
<td>7,656</td>
<td>6,971</td>
<td>14.4</td>
</tr>
<tr>
<td>1983</td>
<td>9,401</td>
<td>8,401</td>
<td>10.5</td>
</tr>
<tr>
<td>1984</td>
<td>9,295</td>
<td>8,262</td>
<td>13.8</td>
</tr>
<tr>
<td>1985</td>
<td>9,650</td>
<td>8,650</td>
<td>10.5</td>
</tr>
<tr>
<td>1986</td>
<td>8,883</td>
<td>7,883</td>
<td>11.6</td>
</tr>
</tbody>
</table>

The population of Montezuma County, according to the Bureau of the Census, grew from 12,952 in 1970 to 14,510 in 1980, a compound annual increase of 2.5 percent (Commerce, 1970 and 1980). For Cortez, the population was 6,032 in 1970 and 7,095 in 1980, a compound annual increase of 1.6 percent. The State of Colorado grew at a compound annual rate of 2.7 percent between 1970-80. The Colorado Department of Local Affairs, State Demographers Office, estimates that the population of Montezuma County was 15,806 in 1983, the peak year of construction of the Dolores Project, and declined to 18,031 in 1985. The compound annual growth rate in Montezuma County between 1980 and 1985 was 1.4 percent. During that period, the State of Colorado grew at an annual rate of 2.3 percent.

To the cultural sites, the population of Montezuma County in 1980 included approximately 80.1 percent white, 10.0 percent American Indian, and 3.9 percent all other. The Spanish origin ethnic group accounted for about 5.7 percent of the total population. Persons of Spanish origin may be of any race (U.S. Bureau of the Census, 1980).

Montezuma County's age structure differs slightly from the State's. In 1980, the county's median age was 29.2, the State's was 28.4. The population of the county over age 45 was 29 percent compared to 26 percent for the State (U.S. Bureau of Census, 1980).

The Montezuma County labor force was 4,343 in 1970 (U.S. Census, 1970), 6,626 in 1980 (Colorado State Bureau of Labor and Employment, 1985), and 6,032 in 1980 (Colorado Division of Employment). Unemployment rates for the county were 7.5 percent in 1970 (U.S. Census), 7.7 percent in 1980, and 11.6 percent in 1986. The following trends reflect the unemployment trends in Montezuma County from 1980 through December 1986.
**CHAPTER III**  
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Construction on the Dolores Project began with a construction work force of 6 in 1978 and reached a maximum of 442 in 1983.

Per capita personal income for Montezuma County in 1970 was $2,049 (Bureau of Reclamation, Baseline Data System) compared to $3,886 for the State of Colorado. In 1980, the county average personal income was $8,088 compared to the State average of $10,147 (Commerce, April 1986). The compound annual growth rate for county per capita income between 1970 and 1980 was 12.7 percent, compared to 10.1 percent for Colorado. By 1984, the county per capita income was $10,630 and Colorado's was $13,848. The gap between the two figures is continuing to widen. Between 1980 and 1984, the county per capita income growth rate slowed to 7.1 percent annually, while the State's rate declined to 8.1 percent. Local officials believe the lack of industry in the county accounts for its significantly lower per capita income.

Table 13 on the following page reflects median personal and household income and the percentage of people below the poverty level for the City of Cortez, Montezuma County, and the State of Colorado for 1979 (Bureau of the Census, 1970 and 1980).

In 1979, Montezuma County median household income was 23 percent below the State average and median personal income was 27 percent below the State average. In Cortez, median household income and median personal income were, respectively, 16 and 14 percent below the State average. The percentage of Cortez residents below the poverty level is approximately the same as Cortez as the State average and, in the county, 50 percent more than the State average (Bureau of the Census, 1970 and 1980).

The information in Table 14 on the following page from the Bureau of Economic Analysis shows the total wages for 1984 in Montezuma County for the various areas of employment as well as the percent of the total by job type (Bureau of Economic Analysis, April 1986). In 1987, a housing surplus was evident in the project area. According to the Montezuma County Housing Authority, an abundance of rental units exist and rents have fallen from $50 to $100 below the levels of 1981 and 1982. Vacant rental units now comprise approximately 25 percent of the rental housing units. Vacant houses on the market make up approximately 20 to 25 percent of the owner-occupied homes (Coldwell-Banker, 1986 and 1987). The county has been coping with the housing surplus since 1984, and local housing officials foresee little relief in the near future.

The Montezuma-Cortez School District had a fall 1986 enrollment of 3,141 students. The student-teacher ratio was approximately 17:1. Montezuma County is served by South Memorial Hospital and Vista Grande Nursing Home, with capacities of 61 and 76 patients, respectively. During the spring of 1987, the nursing home was filled to capacity. Thirteen dentists now serve the county, and 18 physicians serve the county for a physician/patient ratio of 9:1. The sheriff's department, police in three cities, and the State Highway Patrol provide law enforcement in

---

**Table 13**  
Income analysis for 1979/

<table>
<thead>
<tr>
<th>Area</th>
<th>Median income</th>
<th>Percent of persons below poverty level</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Cortez</td>
<td>$15,085</td>
<td>9</td>
</tr>
<tr>
<td>Montezuma County</td>
<td>13,971</td>
<td>15</td>
</tr>
<tr>
<td>State of Colorado</td>
<td>18,057</td>
<td>10</td>
</tr>
</tbody>
</table>

**Table 14**  
Income by sector in Montezuma County (1984)/

<table>
<thead>
<tr>
<th>Sector</th>
<th>Total wages</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>24,273,000</td>
<td>4</td>
</tr>
<tr>
<td>Mining</td>
<td>17,015,000</td>
<td>14</td>
</tr>
<tr>
<td>Construction</td>
<td>23,812,000</td>
<td>20</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>4,714,000</td>
<td>4</td>
</tr>
<tr>
<td>Transportation, communication and public utilities</td>
<td>8,768,000</td>
<td>7</td>
</tr>
<tr>
<td>Trade</td>
<td>18,938,000</td>
<td>16</td>
</tr>
<tr>
<td>Finance, insurance, and real estate</td>
<td>3,185,000</td>
<td>3</td>
</tr>
<tr>
<td>Services</td>
<td>11,537,000</td>
<td>10</td>
</tr>
<tr>
<td>Government2/</td>
<td>25,239,000</td>
<td>21</td>
</tr>
<tr>
<td>Other</td>
<td>999,000</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>118,500,000</td>
<td>100</td>
</tr>
</tbody>
</table>

1/ Bureau of Economic Analysis, April 1986.  
2/ All levels.
the county, with 13, 24, and 6 officers, respectively. The county jail, with a capacity of 50 inmates, is the only facility in the county. In the spring of 1987, the daily use rate was 43 inmates. The Montezuma County Department of Social Services has a staff of 24 serving a 1987 caseload of approximately 1,500. The caseload for Aid to Families with Dependent Children was 241. The Cotxte Volunteer Fire Protection District has 24 volunteers providing fire protection and rescue service to Cortez and the adjacent area. In 1986, fire and rescue calls totaled approximately 220.

Environmental Consequences

Table 15 on the following page shows the projected population of Montezuma County and Cortez from 1986 through 1994 with and without the construction of project modifications.

Reclamation estimates the county population between 1989 and 1994 would increase with the construction of the project modifications, as shown in Table 15. Without this construction, some construction workers and their families would move from the area between 1992 and 1994 when activity on the Dolores Project will wind down. With the project modifications, some of those construction workers and their families would remain to work on these features. Their presence for these 3 years would have a slightly greater impact on population growth than with the no action alternative. Since enough skilled workers are available in the area, no influx of new workers is expected. No significant long-term effects are expected with the addition of the project modifications. Public services, such as treated water and sewage, fire and police protection, schools, and social services, have sufficient capacity to deal with the effects of this construction.

Construction of these project modifications would provide a total of 215 direct employment person years between 1989 and 1994 (Bureau of Reclamation, 1984, SEWP). The distribution of new jobs among construction and government workers is shown in Table 16 on the following page.

In 1992, the peak year of construction, the project construction worker-related population would account for about 1 percent of Montezuma County’s population.

Table 15 shows project construction sector employment projections are not available for the peak year. However, based on first quarter 1986 employment levels for Montezuma County, the estimated peak of 114 jobs created by the salinity features would account for 20 percent of the construction sector employment.

No long-term effects on employment would occur with construction of the project modifications.

Table 15

<table>
<thead>
<tr>
<th>Year</th>
<th>Area</th>
<th>Population, previous year</th>
<th>Change from previous year</th>
<th>Population, proposed plan year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>County</td>
<td>18,199</td>
<td>168</td>
<td>18,693</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>7,807</td>
<td>40</td>
<td>7,873</td>
</tr>
<tr>
<td>1987</td>
<td>County</td>
<td>18,351</td>
<td>152</td>
<td>18,351</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>7,873</td>
<td>66</td>
<td>7,936</td>
</tr>
<tr>
<td>1988</td>
<td>County</td>
<td>18,500</td>
<td>149</td>
<td>18,553</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>7,936</td>
<td>63</td>
<td>7,999</td>
</tr>
<tr>
<td>1989</td>
<td>County</td>
<td>18,645</td>
<td>155</td>
<td>18,673</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>7,999</td>
<td>63</td>
<td>8,011</td>
</tr>
<tr>
<td>1990</td>
<td>County</td>
<td>18,787</td>
<td>142</td>
<td>18,844</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>8,060</td>
<td>61</td>
<td>8,084</td>
</tr>
<tr>
<td>1991</td>
<td>County</td>
<td>18,925</td>
<td>138</td>
<td>19,015</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>8,119</td>
<td>59</td>
<td>8,157</td>
</tr>
<tr>
<td>1992</td>
<td>County</td>
<td>19,058</td>
<td>133</td>
<td>19,244</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>8,176</td>
<td>57</td>
<td>8,256</td>
</tr>
<tr>
<td>1993</td>
<td>County</td>
<td>19,187</td>
<td>129</td>
<td>19,312</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>8,231</td>
<td>55</td>
<td>8,289</td>
</tr>
<tr>
<td>1994</td>
<td>County</td>
<td>19,313</td>
<td>126</td>
<td>19,318</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>8,285</td>
<td>54</td>
<td>8,287</td>
</tr>
</tbody>
</table>

1/ Colorado State Demographers Office, Bureau of Reclamation, Monitoring Study and SEWP, and Construction Worker Survey.

Table 16

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>16,250</td>
<td>15</td>
<td>55</td>
<td>115</td>
<td>91</td>
<td>20</td>
</tr>
<tr>
<td>Government</td>
<td>2</td>
<td>9</td>
<td>7</td>
<td>13</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>18,252</td>
<td>17</td>
<td>62</td>
<td>127</td>
<td>101</td>
<td>20</td>
</tr>
</tbody>
</table>
Table 17 presents an estimate of the annual salaries that would be accrued by government and construction workers from fiscal year 1989 through fiscal year 1994 by constructing the project modifications. The project is based on January 1987 construction costs.

Table 17

<table>
<thead>
<tr>
<th>Year</th>
<th>Sector</th>
<th>Wages</th>
<th>Estimated Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>Construction</td>
<td>528,600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>54,000</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>Construction</td>
<td>614,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>115,000</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Construction</td>
<td>966,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>181,000</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>Construction</td>
<td>1,991,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>374,000</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>Construction</td>
<td>1,408,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>264,000</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>Construction</td>
<td>62,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Government</td>
<td>12,000</td>
<td></td>
</tr>
</tbody>
</table>

1/ Bureau of Reclamation, 1984, SEDAP.
2/ Fiscal year.

With construction of the project modifications, an estimated $6.3 million would be paid in total onsite wages between fiscal year 1989 and fiscal year 1994. The effect on the local economy would be to soften the general decline in wages and buying power during the construction period. The median individual and household income for the county would stabilize somewhat, but it would begin declining again on completion of the project modifications. With no action, decreases in income would occur as Dolores Project construction decreases. The long-term effect on income is expected to be insignificant because the construction program is small and of relatively short duration.

With and without construction of the project modifications, single-family dwellings would probably be plentiful. With construction, a reduction would occur in the number of vacancies between 1989 and 1994. Rental rates, which declined in 1986, may also stabilize slightly during the construction period. The number of county households would be approximately 1 percent greater with the construction of the project modifications.

Construction of the project modifications would have a negligible effect on area services. Since most of the construction workers and their families already live in the county, no increase in services would be necessary to accommodate them.

Effects on the irrigation system

The project modifications would improve the efficiency of the NIC system. The system would be improved by lining existing lateral sections, abandoning the Rocky Ford Ditch and Lower Hermosa and Highline Ditches and combining their flows in the Tomoaq Canal, and installing a closed pipe lateral system from the Tomoaq Canal to the Rocky Ford Ditch service area. The new lateral system would develop gravity pressure, making sprinkler irrigation possible for that area. This use would, in turn, allow for greater crop yields. The increased efficiency of the NIC system would reduce conveyance losses by an average of 7,400 acre-feet per year.

Short- and Long-Term Environmental Effects

Table 18 on the following page shows the short- and long-term effects of the project modifications on various resources. The short-term effects would last for the 4 years of construction; the long-term effects would be for the 50-year life of the project. Attachment B contains a list of environmental commitments associated with construction of the project modifications.

Cumulative Impacts

Introduction

The purpose of this section is to describe the cumulative impacts expected from 19 Reclamation developments constructed or under construction in the Upper Colorado River Basin from approximately 1960 to 1976 and from implementing 7 developments considered for construction in the Upper Basin after 1976. The developments constructed or under construction include 4 storage units and 14 participating projects of the Colorado River Storage Project (CRSP) and the Fryngpan-Arkansas Project. The developments considered for construction after 1976 include the sale of water from an existing reservoir, two developments presently under construction, three developments which are ready for construction, and the proposed Dolores Project modifications. The individual developments considered are shown in Figure 5 and listed in Table 19 along with actual or anticipated completion dates. Although some of the developments will not be completed for several years, they are considered to be "in place" since construction has started and, in some cases, substantial portions have been completed.

Several CRSP participating projects are not included in future development projections for various reasons. The Uintah Unit of the Central Utah Project was determined to be infeasible as previously presented. Reclamation is presently attempting to formulate a feasible plan for the unit. The San Miguel and West Divide Projects, both in Colorado, are not included since planning on those projects has been concluded. The Fruitland Mesa Project in Colorado and the Savery-Pot Hook Project in

Chapter 111 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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Table 15: Short- and long-term effects resulting from project modifications

<table>
<thead>
<tr>
<th>Resource</th>
<th>Short-term effects</th>
<th>Long-term effects</th>
<th>Relationship of short-term use of environment and long-term productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local economy</td>
<td>Yes</td>
<td>No</td>
<td>Construction of these project modifications would have a positive effect on the local economy by providing a total of 213 direct employment person-years, resulting in approximately $6.3 million in salaries between 1993 and 1994.</td>
</tr>
<tr>
<td>Housing</td>
<td>Yes</td>
<td>No</td>
<td>During construction, a reduction would occur in the number of vacancies.</td>
</tr>
<tr>
<td>Population</td>
<td>Yes</td>
<td>No</td>
<td>Construction workers and their families would offset an expected decline in population.</td>
</tr>
<tr>
<td>Services</td>
<td>No</td>
<td>No</td>
<td>Local services would have sufficient capacity to deal with the effects of construction.</td>
</tr>
<tr>
<td>Energy</td>
<td>Yes</td>
<td>No</td>
<td>The energy for vehicles and machinery would be a short-term commitment of resources.</td>
</tr>
<tr>
<td>Scenery</td>
<td>Yes</td>
<td>No</td>
<td>Over the short term, construction activities would detract from scenery.</td>
</tr>
<tr>
<td>Air and noise</td>
<td>Yes</td>
<td>No</td>
<td>Emissions and dust from construction equipment would have a short-term effect on these qualities.</td>
</tr>
<tr>
<td>Water</td>
<td>No</td>
<td>Yes</td>
<td>The project modifications would prevent 1,900 acre-feet of water annually from being lost through the conveyance system and remove 32,000 tons of salt per year compared to the 1977 PES plan.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Yes</td>
<td>Yes</td>
<td>Short-term impacts on vegetation would result from construction. New vegetation would offset these losses. Long-term impacts would result from the loss of 89 acres of wetlands. Declaration, the Fish and Wildlife Service, and the Colorado Division of Wildlife determined the development of 75 acres would offset this loss.</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Yes</td>
<td>Yes</td>
<td>Construction would temporarily affect some wildlife species. Minor losses of wetlands would cause the loss of certain species. Long-term impacts to deer and elk populations would be minor as escape ramps and fencing along concrete sections of the canals would help prevent loss.</td>
</tr>
<tr>
<td>Fish</td>
<td>No</td>
<td>Yes</td>
<td>The project modifications would have a stabilizing effect on Harragunmeep and Totten Reservoirs. The water supply for Totten Reservoir would ensure its continuing as a fishery.</td>
</tr>
<tr>
<td>Endangered species</td>
<td>No</td>
<td>No</td>
<td>The Fish and Wildlife Service's Biological Opinion states that the project modification would not likely jeopardize the Colorado squawfish or the bighorn.</td>
</tr>
<tr>
<td>Recreation</td>
<td>Yes</td>
<td>Yes</td>
<td>Construction would have a negative impact on the use of laterals and ditches. Stabilizing of Harragunmeep Reservoir and water supply for Totten Reservoir would be positive effects.</td>
</tr>
<tr>
<td>Cultural resources</td>
<td>Yes</td>
<td>Yes</td>
<td>Significant cultural resources have been located within potentially disturbed areas. These resources would be mitigated through survey recording, excavation, and avoidance, where possible.</td>
</tr>
</tbody>
</table>

FIGURE 4
UPPER COLORADO STREAM SYSTEM
Table 19

<table>
<thead>
<tr>
<th>Development and location (State)</th>
<th>Actual or estimated completion date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRSP storage units</td>
<td></td>
</tr>
<tr>
<td>Wayne N. Aspinal Unit, Colorado</td>
<td>1977</td>
</tr>
<tr>
<td>Flaming Gorge Unit, Wyoming and Utah</td>
<td>1963</td>
</tr>
<tr>
<td>Glen Canyon Unit, Utah and Arizona</td>
<td>1965</td>
</tr>
<tr>
<td>Navajo Unit, Colorado and New Mexico</td>
<td>1963</td>
</tr>
<tr>
<td>CRSP: participating projects</td>
<td></td>
</tr>
<tr>
<td>Florida Project, Colorado</td>
<td>1963</td>
</tr>
<tr>
<td>Paonia Project, Colorado</td>
<td>1962</td>
</tr>
<tr>
<td>Silt Project, Colorado</td>
<td>1966</td>
</tr>
<tr>
<td>Smith Park Project, Colorado</td>
<td>1963</td>
</tr>
<tr>
<td>Hammond Project, New Mexico</td>
<td>1963</td>
</tr>
<tr>
<td>Central Utah Project, Utah</td>
<td></td>
</tr>
<tr>
<td>Bonneville Unit</td>
<td>1995</td>
</tr>
<tr>
<td>Jensen Unit</td>
<td>1989</td>
</tr>
<tr>
<td>Vernal Unit</td>
<td>1961</td>
</tr>
<tr>
<td>Upalco Unit</td>
<td>1961</td>
</tr>
<tr>
<td>Emery County Project, Utah</td>
<td>1965</td>
</tr>
<tr>
<td>Lyman Project, Wyoming</td>
<td>1980</td>
</tr>
<tr>
<td>Seedskadee Project, Wyoming</td>
<td>1976</td>
</tr>
<tr>
<td>Navajo Indian Irrigation Project, New Mexico</td>
<td>1976</td>
</tr>
<tr>
<td>San Juan-Chama Project, New Mexico</td>
<td>1976</td>
</tr>
<tr>
<td>Bostwick Park Project, Colorado</td>
<td>1971</td>
</tr>
<tr>
<td>Dallas Creek Project, Colorado</td>
<td>1989</td>
</tr>
<tr>
<td>Dolores Project, Colorado</td>
<td>1976</td>
</tr>
<tr>
<td>Fryingpan-Arkansas Project, Colorado</td>
<td>1976</td>
</tr>
</tbody>
</table>

Developments considered for construction after 1976

Grand Valley Unit, Colorado (Colorado River Basin Salinity Control Project) 2003

Paradox Valley Unit, Colorado (Colorado River Basin Salinity Control Project) 1993

Animas-La Plata Project, Colorado and New Mexico (CRSP) 2000

Ruedi Reservoir Round 2 Water Sale, Colorado (Fryingpan-Arkansas Project) 1988

Lower Gunnison Basin Unit, Colorado (Colorado River Water Quality Improvement Program) 1996

Uinta Basin Unit, Utah (Colorado River Water Quality Improvement Program) 1999

Dolores Project modifications 1996

1/ Authorized for construction but deferred indefinitely.
2/ Fontenelle Dam and Reservoir were completed in 1964. Irrigation development has been deferred indefinitely.

62
<table>
<thead>
<tr>
<th>Development</th>
<th>Full service</th>
<th>Supplemental service</th>
<th>Irrigation supply (acre-feet)</th>
<th>Gross crop value</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1975 production in Upper Colorado</td>
<td></td>
<td></td>
<td></td>
<td>$79,941,000</td>
<td></td>
</tr>
<tr>
<td>1975 CRSP production(^2)/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida Project</td>
<td>5,730</td>
<td>13,720</td>
<td>25,700</td>
<td>1,057,000</td>
<td></td>
</tr>
<tr>
<td>Paonia Project</td>
<td>2,370</td>
<td>12,930</td>
<td>20,100</td>
<td>1,352,000</td>
<td></td>
</tr>
<tr>
<td>Silt Project</td>
<td>2,120</td>
<td>4,480</td>
<td>12,800</td>
<td>548,000</td>
<td></td>
</tr>
<tr>
<td>Smith Fork Project</td>
<td>1,420</td>
<td>8,060</td>
<td>10,300</td>
<td>251,000</td>
<td></td>
</tr>
<tr>
<td>Hammond Project</td>
<td>3,930</td>
<td></td>
<td>18,500</td>
<td>733,000</td>
<td></td>
</tr>
<tr>
<td>Central Utah Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jensen Unit(^2)/</td>
<td>440</td>
<td>3,640</td>
<td>4,600</td>
<td>167,000</td>
<td></td>
</tr>
<tr>
<td>Vernal Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-palco Unit(^2)/</td>
<td>42,610</td>
<td>17,900</td>
<td>7,056,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emery County Project</td>
<td>770</td>
<td>17,210</td>
<td>473,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lyman Project</td>
<td>36,000</td>
<td>49,000</td>
<td>486,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navajo Indian Irrigation Project(^2)/</td>
<td>105,000</td>
<td></td>
<td>19,256,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bostwick Park Project</td>
<td>1,320</td>
<td>4,290</td>
<td>305,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dallas Creek Project</td>
<td>20,850</td>
<td>11,200</td>
<td>622,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolores Project(^2)/</td>
<td>35,360</td>
<td>90,900</td>
<td>13,200,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>158,460</td>
<td>204,870</td>
<td>46,108,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fryingpan-Arkanas Project production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total production in basin with CRSP and FY-Ark Project (1976 modified base)</td>
<td>158,460</td>
<td>204,870</td>
<td>672,600</td>
<td>126,049,000</td>
<td></td>
</tr>
<tr>
<td>Percent attributable to CRSP and FY-Ark Project</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)/ Exclusive of irrigated pasture and livestock production.

\(^2\)/ From 1969 Agricultural Census indexed to 1975. Does not include production from CRSP developments or the Fryingpan-Arkansas Project.

\(^3\)/ Based on data from 1975 Bureau of Reclamation crop reports.

\(^4\)/ Based on 1975 per acre values for nearby existing projects.
Developments considered for construction after 1976 is planned for power generation. The Paradox Valley Unit and Anillas-La Plata Project would consume 37,300 and 163,000 MWh of power, respectively, which would represent a cumulative average loss of 200,300 MWh annually from the area power base. This amount of power would meet the residential needs of nearly 24,000 households for 1 year.

Municipal and Industrial Water

Developments considered for construction after 1976.—None of the developments considered for construction after 1976 is planned for power production. The Paradox Valley Unit and Anillas-La Plata Project would consume 37,300 and 163,000 MWh of power, respectively, which would represent a cumulative average loss of 200,300 MWh annually from the area power base. This amount of power would meet the residential needs of nearly 24,000 households for 1 year.

Municipal and Industrial Water

Developments constructed or under construction.—The municipal and industrial (MAI) water supply from developments constructed or under construction amounts to a total of 431,100 acre-feet annually, including about 70,100 acre-feet for municipal uses and 361,000 acre-feet for industrial use. Based on an estimated average annual per capita use of 0.25 acre-foot, the municipal water could supply a population of about 280,000.

The largest single use of industrial water is for steam-electric power generation. The supply available from individual developments is shown in Table 23.

Developments considered for construction after 1976.—Of the seven developments considered for construction after 1976, only the Anillas-La Plata Project and the Ruedi Reservoir Round 2 Water Sale would provide water for MAI use. The Anillas-La Plata Project would develop 80,100 acre-feet for residential use in local communities. The Ruedi Reservoir Water Sale would provide about 11,600 acre-feet for municipal use and 44,400 acre-feet for industrial use.

Recreation

Developments constructed or under construction.—Developments constructed or under construction are expected to provide nearly 5 million recreation-days annually, or 13 percent of the overall basin total. The greatest contribution would be to water-related recreation, which is scarce in the largely semiarid to arid Upper Colorado River Basin. This

Table 21

Summary of annual gross crop values from developments considered for construction after 1976

<table>
<thead>
<tr>
<th>Development</th>
<th>Irrigated acreage</th>
<th>Suppl.</th>
<th>Gross crop value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full</td>
<td>mental</td>
<td>Suppl.</td>
</tr>
<tr>
<td>1976 modified base</td>
<td>158,460</td>
<td>204,890</td>
<td>672,600</td>
</tr>
<tr>
<td>Developments considered for construction after 1976</td>
<td>2/</td>
<td>2/</td>
<td>2/</td>
</tr>
<tr>
<td>Grand Valley Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paradox Valley Unit</td>
<td>61,470</td>
<td>8,630</td>
<td>118,100</td>
</tr>
<tr>
<td>Anillas-La Plata Project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruedi Reservoir Round 2 Water Sale</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Gunnison Basin Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uinta Basin Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolores Project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total crop production</td>
<td>219,930</td>
<td>213,500</td>
<td>790,700</td>
</tr>
<tr>
<td>Percent increase</td>
<td>39%</td>
<td>60%</td>
<td>18%</td>
</tr>
</tbody>
</table>

1/ Exclusive of irrigated pasture and livestock production.
2/ No significant increases in crop values are anticipated because these units involve the improvement of existing irrigation systems and no increase in irrigated acreage is expected.
CHAPTER III
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Table 22
Power capability of developments constructed or under construction compared with 1975 consumption in market area.

<table>
<thead>
<tr>
<th>Development</th>
<th>Name Plate Capacity</th>
<th>Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(MW)</td>
<td>(MW)</td>
</tr>
<tr>
<td>Vernon A. Karst Unit</td>
<td>60</td>
<td>269,000</td>
</tr>
<tr>
<td>Blue Mesa Dam</td>
<td>120</td>
<td>364,200</td>
</tr>
<tr>
<td>Narrow Point Dam</td>
<td>28</td>
<td>173,000</td>
</tr>
<tr>
<td>Crystal Dam</td>
<td>108</td>
<td>505,000</td>
</tr>
<tr>
<td>Flaming Gorge Unit</td>
<td>1,031</td>
<td>4,236,000</td>
</tr>
<tr>
<td>Glen Canyon Unit</td>
<td>136</td>
<td>319,000</td>
</tr>
<tr>
<td>Central Utah Project</td>
<td>10</td>
<td>70,000</td>
</tr>
<tr>
<td>Bearmouth Unit</td>
<td>11</td>
<td>37,000</td>
</tr>
<tr>
<td>Dolores Project</td>
<td>213</td>
<td>96,000</td>
</tr>
<tr>
<td>Total</td>
<td>1,498</td>
<td>4,092,000</td>
</tr>
</tbody>
</table>

Power plant area consumed:
- California: 25,468,000
- Colorado: 15,797,000
- Nevada: 1,671,000
- New Mexico: 6,748,000
- Utah: 1,644,790
- Wyoming: 4,442,000
Total: 36,850,000

(1) Based on 1975 annual reports, Colorado River Storage Project and participating projects for fiscal year 1976. For developments completed and authorized plans for developments under construction, name plate capacity refers to powerplant capacity, not actual generation. Figures shown do not include average annual peaking requirements of 8 MW of capacity at peak loads and 30,400 MWh of energy for the Bearmouth Unit and 14,000 MWh of energy for the Dolores Project.
(2) Based on the 1975 Energy Production System in the States of the Rocky Mountain Region by Charles M. Kielce, Los Alamos Scientific Laboratory of the University of California.

Table 23
Municipal and industrial water use for use within Upper Colorado River Basin from developments constructed or under construction (Unit: acre-feet)

<table>
<thead>
<tr>
<th>CRSP</th>
<th>Nasho Unit</th>
<th>Central Utah Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glen Canyon Unit</td>
<td>142,000</td>
<td></td>
</tr>
<tr>
<td>Nasho Unit</td>
<td>64,000</td>
<td></td>
</tr>
<tr>
<td>Central Utah Project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jensen Unit</td>
<td>18,000</td>
<td></td>
</tr>
<tr>
<td>Vernal Unit</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>Upalco Unit</td>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td>Emery County Project</td>
<td>6,000</td>
<td></td>
</tr>
<tr>
<td>Lyman Project</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>Seedskadee Project</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>Dallas Creek Project</td>
<td>28,000</td>
<td></td>
</tr>
<tr>
<td>Dolores Project</td>
<td>8,700</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>433,200</td>
<td></td>
</tr>
<tr>
<td>Fryxpan-Arkansas Project</td>
<td>7,900</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>431,100</td>
<td></td>
</tr>
</tbody>
</table>

is reflected in Table 24, which shows 33 percent of the fishing and 27 percent of the boating in the basin occurs at these developments. From an economic standpoint, these contributions are significant, since recreation and tourism are major basin industries.

One of the tradeoffs for the new recreational opportunities has been the elimination of whitewater boating in the canyons of the Lake Powell (Glen Canyon Unit), Flaming Gorge, and McPhee Reservoir (Dolores Project) basins. Some reservoirs, particularly Lake Powell, have altered the aesthetics of the landscape by inundation. These areas now receive increased recreational use because of the improved access and facilities, but the value of the experience is slightly diminished by the increased number of visitors.

Developments considered for construction after 1976—of the seven developments considered for construction after 1976, only one would increase the annual recreational use base. As shown in Table 25, the Animas-La Plata Project would result in an additional 361,300 recreation-days. The project would cause the loss of some river rafting and kayaking, while providing reservoir boating, fishing, sightseeing, and related recreation. The Grand Valley, Paradox Valley, Lower Gunnison Basin, and Uinta Basin Units and Dolores Project modifications would not result in any net losses in recreational use with implementation of recommended fish and wildlife and revegetation measures.

Employment Opportunities

Developments constructed or under construction—Developments constructed or under construction account for about 3,300 permanent jobs annually, including 3,870 in agriculture and 430 associated with operation and maintenance, as shown in Table 26. Total employment in the basin in the 1976 modified base, including developments constructed or under construction, is about 169,300, with the latter accounting for approximately 2 percent of the total. The impact of these developments on agricultural employment is more significant, however, amounting to about 16 percent of the total.

Developments considered for construction after 1976—Developments considered for construction after 1976 may increase permanent jobs by as many as 415, including 380 in agriculture and 35 associated with operation and maintenance. Temporary employment would amount to a total of about 14,213 person-years over the various construction periods for the seven developments. These opportunities are outlined in Table 27.

Aquatic wildlife

Habitat Changes

Developments constructed or under construction—These developments have resulted in a slight increase (about 1 percent) in the miles of cold water fishery in the Upper Colorado River Basin and an estimated 37 percent decrease in the miles of warm water fishery (see Table 28).
TABLE 24
Recreational use at developments constructed or under construction

(Units—annual recreation-days)

<table>
<thead>
<tr>
<th>Development</th>
<th>Fishing/Boating</th>
<th>Picnicking</th>
<th>Camping</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Colorado River Basin</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRSP recreational use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wayne N. Apgar Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flaming Gorge Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glen Canyon Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navajo Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paonia Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silt Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smith Park Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hammond Projects/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Utah Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jensen Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vernal Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upalco Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emery County Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lyman Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedskadee Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navajo Indian Irrigation Project/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Juan-Chama Project/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bestwick Park Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dallas Creek Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolores Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8,922,500</td>
<td>5,986,120</td>
<td>10,979,250</td>
<td>4,998,100</td>
</tr>
</tbody>
</table>

Percent attributable to CRSP and Fryngpan-Arkansas Project (1976 modified base)

9,953,600 5,948,020 10,337,150 2,507,130 4,843,100 1,464,880 9,753,790 44,707,670

1/ Includes use for reservoirs and improved streama.
2/ Does not include hunting use on project agricultural lands.
3/ Includes swimming, hiking, and water skiing.
5/ No recreational facilities or uses in the Upper Colorado River Basin.

TABLE 25
Recreational use at developments considered for construction after 1976

(Units—annual recreation-days)

<table>
<thead>
<tr>
<th>Development</th>
<th>Fishing/Boating</th>
<th>Picnicking</th>
<th>Camping</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Valley Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paradox Valley Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animas-La Plata2/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Randy Reservoir Round 2 Water Sale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Gummison Basin Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uinta Basin Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolores Project modifications/</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9,922,500</td>
<td>5,986,120</td>
<td>10,979,250</td>
<td>4,998,100</td>
</tr>
</tbody>
</table>

Percent increase 0.7 0.6 0.6 2.7 1.1 0.9 0.8

1/ Includes use for reservoirs and improved streams.
2/ Does not include hunting use on project agricultural lands.
3/ Includes swimming, hiking, and water skiing.
4/ No net losses with implementation of fish and wildlife mitigation plans.
5/ Assumes use to start with project completion. Does not include whitewater boating losses in the Animas River.
### Table 26

Average annual permanent employment opportunities at developments constructed or under construction (Unit—number of jobs)

<table>
<thead>
<tr>
<th>Employment in Upper Colorado River Basin</th>
<th>Agriculture</th>
<th>Operation and maintenance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRSP employment</td>
<td>Direct</td>
<td>Indirect</td>
<td></td>
</tr>
<tr>
<td>Storage units and Seed-shades Project</td>
<td>230</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Florida Project</td>
<td>120</td>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>Florida Project</td>
<td>300</td>
<td>70</td>
<td>370</td>
</tr>
<tr>
<td>Silt Project</td>
<td>70</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>Smith Park Project</td>
<td>70</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>Hammond Project</td>
<td>50</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>Central Utah Project</td>
<td>230</td>
<td>230</td>
<td></td>
</tr>
<tr>
<td>Bonneville Unit Collection System</td>
<td>80</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Jensei Unit</td>
<td>100</td>
<td>20</td>
<td>120</td>
</tr>
<tr>
<td>Vernal Unit</td>
<td>170</td>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>Upper Unit</td>
<td>100</td>
<td>30</td>
<td>130</td>
</tr>
<tr>
<td>Every County Project</td>
<td>190</td>
<td>40</td>
<td>230</td>
</tr>
<tr>
<td>Loom Project</td>
<td>170</td>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>Navajo Indian Irrigation Project</td>
<td>930</td>
<td>180</td>
<td>1,110</td>
</tr>
<tr>
<td>Bestwick Park Project</td>
<td>40</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Dallas Creek Project</td>
<td>40</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Dolores Project</td>
<td>370</td>
<td>70</td>
<td>440</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>1,032</strong></td>
<td><strong>190</strong></td>
<td><strong>1,222</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12,285</strong></td>
<td><strong>585</strong></td>
<td><strong>12,870</strong></td>
</tr>
</tbody>
</table>

CRSP and Fryingpan-Arkansas Project employment

<table>
<thead>
<tr>
<th>Total employment in basin with CRSP and Fryingpan-Arkansas Project (1976 modified base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,285 5,585 17,870 431 151,000 169,301</td>
</tr>
</tbody>
</table>

Percent attributable to CRSP and Fryingpan-Arkansas Project

<table>
<thead>
<tr>
<th>Percent attributable to CRSP and Fryingpan-Arkansas Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 16 16 100 0 2</td>
</tr>
</tbody>
</table>

1/ Exclusive of CRSP and Fryingpan-Arkansas Project.
The warm water fishery consists primarily of nongame species such as suckers, chubs, and minnows and a small game fish population, with catfish being the most abundant species. These changes constitute a net effect of reducing the miles of sport stream fishery in the Upper Colorado River Basin by 6 percent.

Fishery impacts from developments constructed or under construction are presented in Table 29, which shows some of the more significant tradeoffs which have occurred. For instance, 413 miles of stream fishery were inundated to create off water fishery impoundments of approximately 267,000 surface acres. Moreover, some of the better trout stream fishing in the Upper Basin has been created below these reservoirs. Fifteen miles of the Colorado River below Glen Canyon is accessible by motorboat, and another 45 miles of good quality fishing is available below Lee’s Ferry, although it is not easily accessible to fishermen. Seventy-three miles of the Green River below Fontenelle and 26 miles of the Gunnison River below Flaming Gorge are rated good to excellent. The Wayne Aspinall Unit inundated 40 miles of the Gunnison River formerly regarded as one of the better cold water stream fisheries in the entire basin; however, an excellent fishery has developed for 29 miles downstream from Crystal Dam.

Certain developments such as the Bonneville Unit are still under construction, and related stream impacts are estimates. Completion of an instream flow agreement and negotiation of an adequate mitigation plan are intended to compensate for losses as they occur.

Developments considered for construction after 1976.—None of the seven developments considered for construction after 1976 would reduce the miles of cold or warm water stream fishery. The Animas-La Plata Project would result in development and improvement of about 3,650 acres of reservoir fisheries, and the Paradox Valley Unit would result in enhancing 7 miles of warm water fishery (Table 30). These measures would increase angler-use days by 55,000 annually.

**Endangered Fish Species**

**Developments constructed or under construction.**—Three endemic fish species unique to the Colorado River and its larger tributaries (generally the downstream portions of the Green, Yampa, Gummison, and San Juan Rivers) are of particular concern in evaluating impacts of the developments constructed or under construction. These species are the Colorado squawfish, bonstall chub, and humphack chub and, because of a change in habitat and decline in population, these species have been classified as endangered by the Fish and Wildlife Service.

These fish evolved in the harsh, natural river and larger tributaries which are characterized by warm water, large seasonal flow fluctuations, heavy silt loads, extreme turbulence, and a wide range of dissolved solid concentrations. Populations have declined drastically, however, as a result of changes in aquatic habitat caused by streamflow depletion and impoundments, dumping of wastes and pollution, introduction of exotic game and nongame fish, and physical and chemical alterations.
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## Table 29
Fishery impacts from developments constructed or under construction

<table>
<thead>
<tr>
<th>Stream impacted</th>
<th>Length (miles), quality, and type of fisheries</th>
<th>Loss of use (angle-days)</th>
<th>Reason for loss of use (angle-days)</th>
<th>Use (angle-days)</th>
<th>Estimation of use (angle-days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wayne v. ops. Unit</td>
<td>Blue Vena Reservoir</td>
<td>20 (E) CV</td>
<td>Improved water quality, lower temperature</td>
<td>20,100</td>
<td>82,700</td>
</tr>
<tr>
<td></td>
<td>Morse Point Reservoir</td>
<td>8 (P-F) CV</td>
<td>Same as above</td>
<td>25,000</td>
<td>126,800</td>
</tr>
<tr>
<td></td>
<td>Crystal Reservoir</td>
<td>20 (P-F) CV</td>
<td>Same as above</td>
<td>10,000</td>
<td>207,000</td>
</tr>
<tr>
<td></td>
<td>Planting Cattle Unit</td>
<td>10 (E) CV</td>
<td>Same as above</td>
<td>42,000</td>
<td>207,000</td>
</tr>
<tr>
<td></td>
<td>Glen Canyon Unit</td>
<td>186 (F-P) WW</td>
<td>Not available</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yavapai Unit</td>
<td>35 (P) WW</td>
<td>Not available</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Florida Project (Leon)</td>
<td>3 (P) WW</td>
<td>None</td>
<td>600</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>Pomona Project (Pomona)</td>
<td>4 (P) WW</td>
<td>None</td>
<td>300</td>
<td>2,600</td>
</tr>
<tr>
<td></td>
<td>Silt Project (Sllie Gap)</td>
<td>2 (P) WW</td>
<td>None</td>
<td>350</td>
<td>28,600</td>
</tr>
<tr>
<td></td>
<td>Smith Park Project (Crawford)</td>
<td>2 (O) WW</td>
<td>None</td>
<td>400</td>
<td>26,700</td>
</tr>
<tr>
<td></td>
<td>Central Yavapai Project</td>
<td>13 (F-P) WW</td>
<td>Reduced flows, temperature, and turbidity</td>
<td>10,000</td>
<td>5,593,800</td>
</tr>
<tr>
<td></td>
<td>Sonoma Unit Collection System</td>
<td>7 (E-G) WW</td>
<td>Reduced flows, temperature, and turbidity</td>
<td>2,000</td>
<td>13,300</td>
</tr>
<tr>
<td></td>
<td>Jamestown Unit (Bad Plant)</td>
<td>5 (E) WW</td>
<td>Reduced flows, temperature, and turbidity</td>
<td>9,500</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td>Vernal Unit (Stieflaker)</td>
<td>10 (O) WW</td>
<td>Habitat structures and Improved flows</td>
<td>800</td>
<td>3,700</td>
</tr>
<tr>
<td></td>
<td>Upper Unit</td>
<td>10 (O) WW</td>
<td>None</td>
<td>800</td>
<td>2,600</td>
</tr>
<tr>
<td></td>
<td>Nane Lake</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Twin Peaks</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Fourteen high</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Big Sand Wash</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Emery County Project</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Josie Valley</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Hunting</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Lumber Project</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Neaka Cabin</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Steetle</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Sandaksdes Project</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Bostwick Park Project</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Dallas Creek Project</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Delores Project</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>McPhee</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Totten Reservoir</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Harrington Reservoir</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Dawson Creek</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Grounding</td>
<td>10 (O) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>Fryingpan-Santana Project</td>
<td>8 (E) WW</td>
<td>None</td>
<td>2,600</td>
<td>800</td>
</tr>
</tbody>
</table>

### Notes
1. Quality factors given as follows: E = excellent; G = good; F = fair; P = poor; and O = no sport fisheries. CV denotes cold water fisheries and WW represents warm-water fisheries.
2. Quality of the fishery is not given as it may vary with the age of the impoundment and the type and degree of management applied.
3. Construction of the following: enlargement of Strawberry Reservoir, construction of Castle Hallam, Starvation, Current Creek, and Lower and Upper Stilwater Reservoirs; and stabilization of Tibble Fork Reservoir.
4. Does not reflect a recently negotiated increase flow agreement which would provide 50 percent of the historical habitat and thus reduce the losses shown by 50 percent.
6. An existing reservoir to be improved with minimized irrigation drawdowns.
7. Existing reservoirs to be improved through stabilization.
8. An existing reservoir to be improved with provision of minimum pool.
9. Operation of the Opalo Units would degrade a 400-acre cold water fishery at Big Sand Wash Reservoir and result in a loss of 1,500 angle-days.
### Table 30

Fishery impacts from developments considered for construction after 1976

<table>
<thead>
<tr>
<th>Development</th>
<th>Length (miles)</th>
<th>Increase in use (angler-days)</th>
<th>Type of improvement of fishery</th>
<th>Length (miles)</th>
<th>Loss of use (angler-days)</th>
<th>Type of degradation of fishery</th>
<th>Acres and type of fishery created or improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Valley Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paradox Valley Unit/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animas-La Plata Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ridges Basin Reservoir</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern Ute Reservoir</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruedi Reservoir Round 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Sale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Gunnison Basin Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uinta Basin Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolores Project modifications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,656 acres and fishery type</td>
</tr>
<tr>
<td>Warm water fishery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cold water fishery</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3,656 acres and fishery type</td>
</tr>
</tbody>
</table>

1/ Quality factors given as E = excellent, G = good, F = fair, P = poor, and 0 = no sport.
2/ No significant fishery impacts are anticipated because the unit involves improvement of existing irrigation systems.
3/ Includes an offstream, 3,600-acre pond that would have no value for aquatic life.
4/ Water surface fluctuations and reservoir drawdown could impact fish production and aesthetics and, ultimately, fisherman use.

Total Estimated use (angler-days) = 55,000
Within the Lower Colorado River Basin (the area below Glen Canyon Dam), these species are rare or nonexistent, basically due to construction and operation of approximately 15 impoundments which control the lower river and have significantly altered its habitat. These species have recently been reintroduced in some areas.

In the Upper Basin, an estimated 1,150 miles of stream were occupied by endangered fish prior to implementing the developments constructed or under construction. These developments have inundated 364 miles of this habitat and modified temperatures in another 435 miles, as shown in Table 31.

Table 31
Loss of river habitat for endangered fish species in Upper Colorado River system from developments constructed or under construction (Unit—miles)

<table>
<thead>
<tr>
<th>Project and river</th>
<th>Eliminated</th>
<th>Loss due to</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wayne N. Aspinall Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gunnison River</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Flaming Gorge Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green River</td>
<td>72</td>
<td>65</td>
<td>137</td>
</tr>
<tr>
<td>Glen Canyon Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colorado River</td>
<td>186</td>
<td>1/280</td>
<td>466</td>
</tr>
<tr>
<td>San Juan River</td>
<td>71</td>
<td></td>
<td>71</td>
</tr>
<tr>
<td>Navajo Unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Juan River</td>
<td>35</td>
<td>40</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>364</td>
<td>435</td>
<td>799</td>
</tr>
</tbody>
</table>

1/ Altered habitat in Lower Basin caused by Glen Canyon Dam.

The Glen Canyon Unit, in addition to inundating 186 miles of habitat in the Upper Basin, also altered flow and water quality downstream for many more miles, including the Marble and Grand Canyon areas once considered significant habitat for native fish. Before the impoundment of Navajo Reservoir, squawfish were found throughout the San Juan River. Prior to filling, 35 miles of the San Juan and 21 miles of a tributary, Pine River, were treated with rotenone and fish kills were observed as far downstream as Shiprock, New Mexico, about 65 miles below the dam. Prior to closing Flaming Gorge Dam, the Fish and Wildlife Service conducted a fish eradication program in the reservoir basin and tributary area downstream to Dinosaur National Monument. This program eliminated many native fishes in this section of the Green River but did not permanently alter the river habitat. The Wayne N. Aspinall Unit dams have not directly affected any of the original fish habitat, but associated changes in flow and temperature in the 50-mile stretch of the Gunnison River between Delta and Grand Junction, Colorado, have probably contributed to a decrease in numbers of native species.
Unlike the large storage units discussed above, the smaller developments constructed or under construction have not eliminated the Colorado River endangered fish habitat. The developments in total, however, have depleted mainstream flows, changed water quality, and may have indirectly affected endangered fish. The degree to which the projects may adversely affect these fish is difficult to estimate because of the lack of information concerning life history and habitat requirements. Studies now being completed by the Fish and Wildlife Service should identify these lifestage requirements and define specific parameters required for fish protection.

Developments considered for construction after 1976—The seven developments considered for construction after 1976 would not directly affect any known endangered species populations by inundation or by discharge of tailwaters into inhabited areas. The fish stocked in reservoirs and streams would not be expected to travel the substantial distances necessary for them to compete with endangered fish populations. As Table 32 shows, the Grand Valley, Lower Gunnison Basin, and Uinta Basin salinity control units and the Dolores Project modifications are located near endangered fish habitat; however, these units do not involve storage or stocking and do not include major features which could alter that habitat.

Table 32

<table>
<thead>
<tr>
<th>Development</th>
<th>Feature</th>
<th>Location</th>
<th>Miles from project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Valley</td>
<td>Irrigation system</td>
<td>Colorado River at Grand</td>
<td>0</td>
</tr>
<tr>
<td>Unit</td>
<td>Improvements</td>
<td>Junction, Colorado</td>
<td></td>
</tr>
<tr>
<td>Paradox Valley</td>
<td>Brine well field</td>
<td>Colorado River at mouth</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of Dolores River, Utah</td>
<td></td>
</tr>
<tr>
<td>Animas-La Plata</td>
<td>Ridges Basin and</td>
<td>San Juan River near</td>
<td>75</td>
</tr>
<tr>
<td>Project</td>
<td>Southern Ute</td>
<td>Shiprock, New Mexico</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reservoirs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruedi Reservoir</td>
<td>Sale of reservoir</td>
<td>Colorado River at Grand</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Water</td>
<td>Junction, Colorado</td>
<td></td>
</tr>
<tr>
<td>Lower Gunnison</td>
<td>Irrigation system</td>
<td>Gunnison River downstream</td>
<td>120</td>
</tr>
<tr>
<td>Basin Unit</td>
<td>Improvements</td>
<td>stream from Delta,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Colorado</td>
<td>15</td>
</tr>
<tr>
<td>Uinta Basin</td>
<td>Irrigation system</td>
<td>Green River above and</td>
<td>18</td>
</tr>
<tr>
<td>Unit</td>
<td>Improvements</td>
<td>below mouth of Duchesne River,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Utah</td>
<td>25</td>
</tr>
<tr>
<td>Dolores Project</td>
<td>Irrigation system</td>
<td>San Juan River conjugate</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Improvements</td>
<td>reservoirs with McElmo Creek</td>
<td></td>
</tr>
</tbody>
</table>

Although tolerances of the endangered fishes for temperature, turbidity, salinity, and flow changes have not been fully determined,
Several developments have already received Nonjeopardy Opinions, including the Animas-La Plata Project; the Lower Gunnison Basin, Paradox Valley, Grand Valley, and Uinta Basin Units; and the Dolores Project modifications. Data required to render biological opinions on the remaining projects have been collected and made available to the Fish and Wildlife Service.

To help determine impacts and resolve conflicts between the endangered fishes and water development, a Colorado River Coordinating Committee was formed in April 1984. With representatives from the States of Colorado, Utah, and Wyoming, as well as water development and environmental groups, the Bureau of Reclamation, and the Fish and Wildlife Service, the committee has now developed a recovery implementation plan to allow for continued development while actively recovering the fish. Approval of the plan and its occurrence is currently early in 1988.

Terrestrial wildlife

Developments Constructed or Under Construction

Because of the many variables involved and the limited data available on wildlife populations, no attempt has been made to estimate changes in terrestrial wildlife populations caused by developments constructed or under construction. Indications of the effects on the wildlife, however, can be gained from studying changes in habitat. In this analysis, five broad types of habitat—riparian, aspen-conifer, pinyon-juniper, grassland, and cropland—have been considered as key habitat, or habitat essential to preserving a species, with emphasis on such game species as mule deer, elk, moose, bighorn sheep, pronghorn antelope, sage grouse, turkey, and waterfowl. Of these, a total of about 4.2 million acres in the Upper Basin is considered key habitat. Reservoir and irrigation developments constructed or under construction have reduced this habitat by about 214,070 acres, or less than 1 percent. This reduction is not a total loss to wildlife, since most key habitat has been replaced by reservoirs and irrigated cropland which have value to a variety of waterfowl, small game, and nongame species. Although these changes appear small in relation to the total habitat, they have significant impacts in localized areas and are one of the many causes of factors placing pressure on wildlife in the basin. A summary of the habitat changes is presented in Table 33.

In addition to the habitat changes tabulated, adverse impacts on wildlife result from constructing such facilities as canals, powerlines, recreation areas, and access roads. Some reservoirs such as Flaming Gorge have indirectly affected key habitat by interfering with historic big game migration routes. Irrigation developments have also affected big game management as localized control measures are aimed at halting crop depredation on newly irrigated cropland. On the other hand, controlled livestock grazing within rights-of-way for some reservoirs has benefited wildlife.

---

**Table 33**

<table>
<thead>
<tr>
<th>Key Habitat in Upper Colorado River Basins</th>
<th>Specific Wildlife Developments</th>
<th>Desert shrub, brushland, pinyon, juniper</th>
<th>Grassland</th>
<th>Cropland, pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland Changes</td>
<td></td>
<td>Aspen, conifer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wayne N.roppnell Int/</td>
<td>-1,770</td>
<td>-400</td>
<td>-4,200</td>
<td>-2,070</td>
</tr>
<tr>
<td>Flaming Gorge Unit</td>
<td>-1,770</td>
<td>-400</td>
<td>-4,200</td>
<td>-2,070</td>
</tr>
<tr>
<td>Glen Canyon Unit/</td>
<td>-90</td>
<td>-90</td>
<td>-3,190</td>
<td></td>
</tr>
<tr>
<td>Hæwje Unit</td>
<td>-150</td>
<td>-150</td>
<td>-3,190</td>
<td>-4,000</td>
</tr>
<tr>
<td>Florida Project</td>
<td>-10</td>
<td>-100</td>
<td>-5,190</td>
<td>-5,190</td>
</tr>
<tr>
<td>Farmington Project/</td>
<td>-5</td>
<td>-100</td>
<td>-5,190</td>
<td>-4,000</td>
</tr>
<tr>
<td>Silt Project</td>
<td>-50</td>
<td>-150</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Salt Flat Project</td>
<td>-10</td>
<td>-150</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Hammond Project</td>
<td>-50</td>
<td>-150</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Central Utah Project</td>
<td>-10</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Bannock Unit Collection System</td>
<td>-10</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Smuggler Unit</td>
<td>-10</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Idaho Unit</td>
<td>-10</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Emery County Project/</td>
<td>-50</td>
<td>-150</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Lenses Project</td>
<td>-10</td>
<td>-150</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Innebagon Project</td>
<td>-10</td>
<td>-150</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Nevada Irrigation Project</td>
<td>-2,860</td>
<td>-2,860</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Bullhead Creek Project</td>
<td>-100</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Dolores Project</td>
<td>-300</td>
<td>-300</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>-7,130</td>
<td>-7,130</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Pinyon-juniper Project changes</td>
<td>-100</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>-100</td>
<td>-100</td>
<td>-2,100</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>182,670</td>
<td>182,670</td>
<td>2,100</td>
<td></td>
</tr>
</tbody>
</table>

1/ Data on quantity of riparian habitat are scarce. Habitat losses were estimated on the basis of acreage inundated, with the exception of Flaming Gorge, Wayne N. Hoppnell, and Glen Canyon Units, where habitat figures were taken from preimprovement studies.
2/ Includes pinyon-juniper woodland, mountain brush, salt desert shrub, and northern and southern desert shrub.
5/ For years 1971 to 1975.
Loess of riparian shrub habitat, amounting to about 7,330 acres, are especially important to local areas because of the relative scarcity of such vegetation and its importance to a diversity of species. Mule deer, and elk to a lesser extent, use these areas for food and cover. Other wildlife groups, including foragers, nongame birds, small mammals, and birds of prey, are more dependent on this vegetative type and have been adversely affected by its loss. For example, at the Glen Canyon Unit, a narrow strip of riparian habitat was probably a critical green belt in this desert environment and inundation of this strip was a significant regional loss.

The loss of approximately 2,560 acres of aspen-conifer forest habitat (Table 33) has probably not been significant because of the small acreages associated with individual developments and the relative abundance of such habitat in the Upper Basin. Such land, however, is important to deer and elk for food, cover, and fawning and calving areas.

Some of the most significant losses are tied to the loss of approximately 189,770 acres of brushlands and playon-juniper woodlands in the basin. In much of the basin, these areas are winter range for deer and elk, and some areas also provide key habitat for antelope and sage grouse. Cottontail rabbits and numerous nongame species also utilize this habitat. In terms of key habitat available, this acreage loss does not appear significant basinwide but often includes crucial areas for individual herds or groups of animals.

Lake Powell inundated a total of 153,290 acres of primarily barren land. This acreage included 2,930 acres of low quality desert grasses (Indian ricegrass, galleta, and desert shrubs) which provided little food and cover for wildlife and 90 acres of riparian habitat.

Developments constructed or under construction have increased irrigated croplands and pasture by about 111,330 acres. This land plus associated small patches of seeds, fence rows, and waste areas are important feeding areas during certain times of the year for game species such as rabbits, pheasants, doves, quail, and waterfowl. Small mammals, nongame birds, and raptors also extensively use such habitat.

Developments constructed or under construction increased the surface areas of flat water in the Upper Basin by more than 300 percent. This habitat is of value to wildlife, waterfowl, and shorebirds in particular because it provides newly created reservoir fishing.

Some losses of habitat, such as riparian, are difficult if not impossible to replace. Wildlife mitigation and enhancement programs, however, are being undertaken to offset wildlife habitat losses incurred by the developments. For example, a national wildlife refuge and four waterfowl production areas are being developed to replace losses and enhance waterfowl habitat. These include the Seedskadee National Wildlife Refuge in Wyoming; the Brown’s Park, Desert Lake, and Stewart Lake Waterfowl Management Areas in eastern Utah; and the Miller Neas Waterfowl Management Area at Wasyo Reservoir in New Mexico.

Big game range is being acquired and developed to mitigate losses of habitat incurred by construction of the various developments. To date, approximately 78,850 acres of big game range have been acquired in the Upper Colorado River Basin. Most of this land is near areas affected by the developments and will provide substantial replacement or mitigation of big game losses.

Developments Considered for Construction After 1976

The seven projects considered for construction within the basin after 1976 would result in losses of riparian; aspen-conifer; desert shrub, brush, and playon-juniper; and grassland habitats and an increase in irrigated cropland (Table 34). The losses represent a small portion of the total habitat available but are significant to some local areas. Because of the importance of the lost habitat to game species, 12,770 acres of the same type of land are planned for acquisition and initial development to compensate for wildlife losses.

<table>
<thead>
<tr>
<th>Riparian Landscape</th>
<th>Asop-conifer</th>
<th>Desert</th>
<th>Grassland</th>
<th>Cropland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1976</td>
<td>188,770</td>
<td>111,330</td>
<td>153,290</td>
<td>2,560</td>
</tr>
<tr>
<td>After 1976</td>
<td>-3,000</td>
<td>-5,000</td>
<td>-2,560</td>
<td>2,560</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Riparian Landscape</th>
<th>Asop-conifer</th>
<th>Desert</th>
<th>Grassland</th>
<th>Cropland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before 1976</td>
<td>188,770</td>
<td>111,330</td>
<td>153,290</td>
<td>2,560</td>
</tr>
<tr>
<td>After 1976</td>
<td>-3,000</td>
<td>-5,000</td>
<td>-2,560</td>
<td>2,560</td>
</tr>
</tbody>
</table>

Water availability and salinity

The amount of water available for development in the Upper Colorado River Basin has been conservatively estimated at an average of 5.8 million acre-feet annually. Of this, approximately 1.7 million acre-feet will be used by the developments constructed or under construction. Another 205,300 acre-feet of water would be used annually by three of the seven developments considered for construction after 1976. The Lower Gunnison Basin Unit would save 2,000 acre-feet of depletions, and the Grand Valley and Winta Basin Units and Dolores Project modifications...
are not expected to change depletions. Depletions associated with the developments constructed, under construction, or considered for construction are displayed in Table 35.

Salinity

Historical and projected data were used to estimate a range of salinity effects at Imperial Dam from the individual developments. The minimum and maximum impacts for each development are shown in Table 35. The range shown is due to natural year-to-year variations in flow and salinity in the basin and effects of other developments on flow and salinity.

Because of the complex interaction of depletions, salinity, water supply, and development schedules, the individual impacts are not directly cumulative. The CERS model was used to evaluate the cumulative effects of three levels of development: (1) developments constructed or under construction, (2) five of the six developments considered for construction after 1976, and (3) the proposed Uinta Basin Unit.

The cumulative impact of the developments constructed or under construction increases the average salinity at Imperial Dam by as much as 175 mg/L. Nearly a third of the increase is attributable to depletions caused by reservoir evaporation, but these reservoirs also tend to stabilize the riverflow and thereby reduce the seasonally high salinity that formerly occurred in the Colorado River.

The cumulative effect of six of the seven developments considered for construction after 1976 would decrease the average salinity at Imperial Dam by as much as 27 mg/L. Nearly a third of the decrease is attributable to depletions caused by evaporation, but these reservoirs also tend to stabilize the riverflow and thereby reduce the seasonally high salinity that formerly occurred in the Colorado River.

Predictions of future salinity levels in the basin indicate that salinity at Imperial Dam could exceed 1,000 mg/L by 2010 without additional salinity control measures. For a detailed summary of the salinity problem and the Colorado River Water Quality Improvement Program, see Quality of Water, Colorado River Basin, Progress Report, Nov. 13, January 1987.

Cumulative Effects of Reclamation and SCS Plans

The purpose of this section is to describe the cumulative effects of the salinity control modifications by Reclamation and the on-farm program of the SCS. Reclamation would line 34.1 miles of WIC's existing canals and install 7 miles of buried pipe laterals and the SCS would install 215 miles of buried pipe laterals to provide gravity and pumped

<table>
<thead>
<tr>
<th>Depletions (acre-feet/yr)</th>
<th>Change in salt loading (tons/yr)</th>
<th>Range of individual project salinity impacts for 1941-2046 (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project or Unit</td>
<td>Minimum</td>
<td>Maximum</td>
</tr>
<tr>
<td>Wayne H. Aspinall Unit</td>
<td>9,000</td>
<td>0</td>
</tr>
<tr>
<td>Fleming Gorge Unit</td>
<td>65,000</td>
<td>0</td>
</tr>
<tr>
<td>Glen Canyon Unit</td>
<td>525,000</td>
<td>0</td>
</tr>
<tr>
<td>Navajo Unit</td>
<td>26,000</td>
<td>0</td>
</tr>
<tr>
<td>Florida Project</td>
<td>14,000</td>
<td>11,500</td>
</tr>
<tr>
<td>Pemola Project</td>
<td>10,000</td>
<td>4,700</td>
</tr>
<tr>
<td>Silt Project</td>
<td>6,000</td>
<td>12,200</td>
</tr>
<tr>
<td>Smith Fork Project</td>
<td>6,000</td>
<td>2,800</td>
</tr>
<tr>
<td>Hammond Project</td>
<td>10,000</td>
<td>7,900</td>
</tr>
<tr>
<td>Central Utah Project</td>
<td>146,000</td>
<td>21,600</td>
</tr>
<tr>
<td>Bonneville Unit</td>
<td>13,000</td>
<td>33,200</td>
</tr>
<tr>
<td>Jamez Unit</td>
<td>12,000</td>
<td>27,700</td>
</tr>
<tr>
<td>Vernal Unit</td>
<td>12,000</td>
<td>6,200</td>
</tr>
<tr>
<td>Utah Project</td>
<td>8,000</td>
<td>0</td>
</tr>
<tr>
<td>Lyras Project</td>
<td>10,000</td>
<td>0</td>
</tr>
<tr>
<td>Seedskade Project</td>
<td>281,000</td>
<td>0</td>
</tr>
<tr>
<td>Navajo Indian Irrigation Project</td>
<td>267,000</td>
<td>220,000</td>
</tr>
<tr>
<td>San Juan-Chama Project</td>
<td>110,000</td>
<td>166,000</td>
</tr>
<tr>
<td>Rootville Park Project</td>
<td>4,000</td>
<td>11,200</td>
</tr>
<tr>
<td>Dallas Creek Project</td>
<td>37,000</td>
<td>9,800</td>
</tr>
<tr>
<td>Dolores Project</td>
<td>81,000</td>
<td>50,650</td>
</tr>
<tr>
<td>Fryinges-Antelope Project</td>
<td>29,000</td>
<td>3,200</td>
</tr>
</tbody>
</table>

Subtotal                  | 1,733,000              | 357,760         | 1/ to 17    |

Development considered for construction after 1976

<table>
<thead>
<tr>
<th>Project or Unit</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paradox Valley Unit</td>
<td>1,000</td>
<td>180,000</td>
</tr>
<tr>
<td>Animas-La Plata Project</td>
<td>150,000</td>
<td>0</td>
</tr>
<tr>
<td>Roebide Reservoir Round 2 Water Sale</td>
<td>49,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Lower Gunnison Basin Unit</td>
<td>-20,000</td>
<td>-141,000</td>
</tr>
<tr>
<td>Grand Wash Basin Unit 2</td>
<td>0</td>
<td>186,600</td>
</tr>
<tr>
<td>Uinta Basin Unit 3</td>
<td>0</td>
<td>2/25,500</td>
</tr>
</tbody>
</table>

Subtotal                  | 205,500                | 354,370         | 1/ to 17    |

Proposed development

Dolores Project modifications

<table>
<thead>
<tr>
<th>Project or Unit</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1,928,500</td>
<td>-208,810</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project or Unit</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed development</td>
<td>1/</td>
<td>2/</td>
</tr>
</tbody>
</table>

1/ The range of effects considers the uncertainty of the hydrosalinity analysis as well as a wide range of hydrologic and development conditions. The maximum annual range represents the widest variation in salinity impacts possible by a project in any 1 year of operation. The average impact would fall approximately midway between these extremes.

2/ Salinity Control Units.

3/ The higher impacts of the individual developments cannot be added directly because of synergetic effects.
pressure to 19,700 acres of land in the MVIC area. Permanent rights-of-way would total 1,410.5 acres through Federal acquisition and 297.2 acres acquired by the MVIC.

The cumulative effect on wildlife habitat from Reclamation's salinity control modifications would be a gain of 14 acres of upland habitat and a loss of 16 acres of wetlands habitat. The SCS on-farm program would result in a gain of 1,750 acres of upland habitat and a loss of 1,750 acres of wetlands habitat. No impacts would occur to the fishery in McElmo Creek or to endangered species in the project area as a result of the salinity control program. Reclamation performed two Class III surveys for cultural resources in the affected area and discovered 129 prehistoric and historic sites. If cultural resources were discovered during implementation of the SCS on-farm plan, the State Historic Preservation Officer would assess the value of the site and institute a salvage program for valuable artifacts. The cumulative effect of both programs annually would be a reduction in salt loading of 62,500 tons and a reduction in seepage of 16,900 acre-feet. Direct employment would total 313 person-years as a result of both plans.

The construction costs for Reclamation's salinity control plan would total $23,168,000 based on January 1987 prices. SCS's on-farm program would cost $23,320,000 based on July 1981 prices. The cost effectiveness per ton of salt removed would be $83 for the Reclamation off-farm program and $64 for the SCS on-farm program.

Table 36 on the following page lists the effects of both plans and their cumulative effects.
CHAPTER IV
CONSULTATION AND COORDINATION

Introduction

During the salinity investigation under the McElmo Creek Unit, all issues identified and opinions received from individuals, groups, and other agencies were carefully considered. When salinity control was authorized as part of the Dolores Project, Reclamation continued to coordinate with representatives of the Montezuma Valley Irrigation Company and the Dolores Water Conservancy District, as well as the Colorado Division of Wildlife, the Soil Conservation Service, and the Fish and Wildlife Service.

Among the public involvement activities conducted during the planning studies were public meetings, small group meetings, meetings with individuals, news releases, open houses, and displays at county fairs. Since the Soil Conservation Service and the Bureau of Reclamation are coordinating their salinity control efforts, many of the public involvement activities were prepared and conducted jointly by the two agencies.

The program was designed to inform the public and to provide the public with a voice in the decisionmaking process. This chapter presents a record of consultation, coordination, and public involvement and describes how these activities affected the modifications described in this supplement.

The chapter has been organized according to the major issues, with a chronological account of the specific activities associated with each issue. The issues involve hydrology and water quality; alternatives analysis; the Towaoc Canal; Totten Reservoir; full service land; project operation and maintenance; Monument Creek Reservoir; tribal features, irrigated land, and the operation and maintenance of tribal facilities; on-farm and off-farm programs; cultural resources; endangered species; and environment.

Hydrology and Water Quality

Coordination activities

In April 1981, a Notice of Intent to Prepare an Environmental Impact Statement was published in the Federal Register, and on May 13, 1981, an environmental scoping meeting was held in Cortez, Colorado. The meeting was held to identify significant environmental issues that should be addressed in the environmental impact statement. Approximately 20 people attended the meeting. The only concern expressed at the meeting was from McElmo Canyon residents who depend on return flow from the Montezuma Valley for part of their irrigation supply. Their concern was
that if salinity control measures are implemented, the upstream return flows may decrease. Since then, Reclamation has met with individual farmers in McElmo Canyon to discuss their problems and needs relating to the project.

Authorizing legislation for constructing the salinity features states that water prevented from seeping resulting from the construction cannot be applied to land in any manner that would increase salinity in the Colorado River. Some affected landowners in Montezuma Valley have expressed discontent with this provision and fear that extremely dry years would bring irrigation restrictions on some of their land.

Results and implementation

The farmers in the McElmo Canyon area, because of the small amount of irrigated acreage (approximately 500 acres), would realize no significant change in water supply with the construction of salinity control features. The MVIC's possible use of the canal system for water stored in McPhee Reservoir would result in water being available late in the irrigation season. The MVIC would call for this water when the demand arises for supplemental water by shifting its demand pattern through conserving spring flows in McPhee Reservoir for use in late summer and early fall. If the MVIC irrigators have land that would not contribute to salt loading, they would be able to irrigate this land.

Alternative Analysis

Coordination activities

In April 1981, Reclamation presented four alternative plans to the MVIC board. The plans included (1) concrete lining 32 miles of ditch and lateral sections within their system, (2) combining the Rocky Ford Ditch with the Highline Ditch and lining selected lateral sections, (3) converting the entire MVIC system to pipe, and (4) using McElmo Creek water as cooling water in powerplants located at the Four Corners Generating Station. The board expressed interest in the alternative for converting their entire system to pipe.

Reclamation met with the Ute Mountain Ute Tribe in April 1981 to discuss alternative plans, including the alternative of piping saline flows for powerplant cooling in the Four Corners area. The tribe stated the proposed plan would have no significant impacts on the reservation and that the piping of saline water for cooling purposes would be satisfactory if the pipe were buried and proper reimbursement to the tribe were made for any pipe crossing tribal land.

In July 1981, Reclamation presented detailed information on the proposed plan for salinity control features to the members of the MVIC board. Since the board favored the alternative of converting their entire system to pipe so that gravity pressure could be obtained for sprinkler irrigation, they questioned why this plan was not a viable alternative.

Results and implementation

Reclamation explained to the MVIC that the alternative of converting their system to pipe would be too high in cost compared to the amount of salt removed from the Colorado River.

The alternative of piping saline flows for powerplant cooling in the Four Corners area was not viable because of a lack of commitment from power companies. If, in the future, this alternative were to become viable, Reclamation would coordinate this option with the Ute Mountain Ute Tribe.

Towaoc Canal

Coordination activities

1982

In June 1982, Reclamation met with the MVIC board to review the refinements made in the proposed plan. At this meeting, Reclamation presented the possibility of rerouting the proposed Towaoc Canal and combining its flows with the Highline Ditch and Lower Hermosa Lateral. The board did not object to this proposal since using a canal alignment adjacent to ones already in use would minimize damage to agricultural land from construction of a new canal and significant economic savings could be realized.

1983-84

Early in 1983, Reclamation again discussed with the MVIC board the possibility of rerouting the proposed Towaoc Canal. The board responded with a letter to Reclamation on March 11, 1983, supporting the rerouting of the canal through its system. On March 29, 1983, at a meeting with the MVIC and the DWC, Reclamation discussed the advantages of the reroute for the benefit of both the salinity program and the Dolores Project.

In 1984, Reclamation met with the MVIC to discuss the abandonment of the Rocky Ford Ditch. The MVIC had specific concerns about the need for the ditch as a drain and whether the MVIC or Reclamation would fill in the ditch.

Reclamation also met several times in 1983 and 1984 with the Ute Mountain Ute Tribe to discuss moving the Towaoc Canal from the west of Cortez to the east of Cortez and combining tribal water with that of the MVIC. At these meetings, the tribe noted that potential savings in operation, maintenance, and replacement costs associated with the Dolores Project are of primary concern to the tribe. The tribe has expressed
support for the new alignment of the Towaoc Canal and combining it with the Highline Ditch and the Lower Hermosa Lateral.

1987

In April 1987, Reclamation met with the State of Colorado, the Montezuma Valley Irrigation Company, and the Ute Mountain Ute Tribe on operation, maintenance, and replacement costs of the Towaoc Canal.

Over the past 2 years, the tribe expressed concerns with the interpretation of salinity legislation on the allocation of operation, maintenance, and replacement costs to salinity control. These costs will include only the separable and specific costs of these specific facilities and will not include any joint costs of the other project facilities. The tribe believes the legislation does not equitably allocate the operation and maintenance savings associated with the Joint Towaoc Canal construction and believes these savings should be passed along to the tribe.

Results and implementation

Reclamation continues to coordinate with the State of Colorado, the Montezuma Valley Irrigation Company, the Dolores Water Conservancy District, and the Ute Mountain Ute Tribe on the proposed Towaoc Canal on the east side of Cortez. Allocations made in April 1987 show that salinity funds would assume approximately 18 percent of the total costs for operation, maintenance, and replacement. All parties are in agreement with this method of allocating operation, maintenance, and replacement costs. Additional coordination must occur between Reclamation and the MVIC on the MVIC historical costs used in this projection, as well as on the disposition of the Rocky Ford Ditch.

Totten Reservoir

Coordination activities

1985

In the fall of 1985, Reclamation began discussions with the MVIC on the future of Totten Reservoir. With construction of the Towaoc Canal, each irrigation company would no longer regulate water to the Rocky Ford Ditch, which would be abandoned. The MVIC and DWCD have both expressed concern for retaining Totten Reservoir for use by local water user entities after completion of the Towaoc Canal if the operating costs, particularly liability insurance for maintaining the reservoir, would not be too prohibitive.

1987

In April 1987, Reclamation talked with the MVIC on the future of Totten Reservoir.

CHAPTER IV CONSULTATION AND COORDINATION

Results and implementation

The MVIC would operate and maintain Totten Reservoir with up to 800 acre-feet of water made available for fish and wildlife purposes. Funds to operate and maintain the reservoir would be made available under salinity control legislation.

Full Service Land

Coordination activities

The DWCD signed the project repayment contract in September 23, 1977. Also, full service farmers signed individual water petitions in 1977 with the DWCD for the delivery of project irrigation water. In 1985, some of the full service irrigators representing ownership of approximately 15 percent of the land in the project area became concerned with the existing poor agricultural economy and their potential inability to satisfy the obligations of their water petitions. They are asking financial relief in having to convert dryland farming to full service irrigation.

In November 1986, 17 claimants from the full service area filed a tort claim against the United States; the claim was denied in June 1987. In August 1987, the claimants filed a lawsuit against the Dolores Water Conservancy District to rescind the petitions and to collect an undisbursed amount of damages.

Results and implementation

Several meetings were held in 1986 with these concerned irrigators and the DWCD to find some short-term solutions to this problem. Reclamation is aware of the economic climate facing today's farmers and has the flexibility within existing policies and the existing repayment contract to help alleviate some of the economic concerns of the DWCD and the full service farmers. Reclamation is working with the DWCD to clarify the implementation of the repayment contract regarding the establishing of development blocks for irrigation water, the delivery of project water during the startup period, and the initiation of repayment.

Project Operation and Maintenance

Coordination activities

1981

In May 1981, Reclamation met with the MVIC board to discuss the Grand Valley Unit, a similar salinity control unit near Grand Junction, Colorado, and to discuss the contract agreement between Reclamation and the Grand Valley Irrigation Company. A representative of Reclamation's Grand Junction Projects Office described the unit and the agreements
made with the local water district and irrigation companies and answered questions.

In October 1981, board members of the MVIC were taken on a field trip of the Grand Valley Unit near Grand Junction, Colorado, to see the results of lining canals in Grand Valley for salinity control. This trip was successful in showing what could be done for salinity control by lining canals and improving existing irrigation delivery systems.

Since October of 1984, three meetings were held with representatives from the DWCD and MVIC to discuss the various modifications to the project operation study. These modifications include the following: (1) increasing MVIC's diversion for the current right of 806.9 cfs; (2) shifting the irrigation demand pattern by conserving spring flows, which will be stored in McPhee Reservoir, for use in late summer and early fall through a call system; and (3) combining items 1 and 2, above, with the water prevented from seeping by constructing the salinity control features.

Results and implementation

As noted above under Hydrology and Water Quality, the MVIC may use a call system to ensure having water late in the irrigation season.

Monument Creek Reservoir and Cortez-Towaoc Municipal and Industrial Pipeline

Coordination activities

In September 1977, the DWCD signed a repayment contract with the United States providing for repayment, with interest, of all project costs allocated to non-Indian M&I water, including storage of water in Monument Creek Reservoir for Dove Creek and the delivery of water in the Cortez-Towaoc M&I pipeline from McPhee Reservoir to the Ute Mountain Ute Reservation.

In the spring of 1982, Reclamation advised the DWCD that the cost ceiling for M&I water would be exceeded, as noted in Chapter II.

Results and implementation

In 1982, the Dolores Water Conservancy District, the Bureau of Reclamation, and the Colorado Water Conservation Board concluded that a change in cost allocation procedures and State financing of two single-purpose M&I features, the Monument Creek Reservoir and the pipeline from McPhee Reservoir to Cortez, would solve the problem. The DWCD agreed to assume this obligation itself, subject to the availability of financing from the Colorado Water Conservation Board construction fund. Construction of Dolores Project features was thereby allowed to continue under the existing repayment contract with the exception of these two features.

Under the Agreement in Principle Concerning the Colorado Ute Indian Water Rights Settlement and Binding Agreement for Animas-La Plata Project Cost Sharing, June 30, 1986, the remaining portion of the Cortez-Towaoc M&I pipeline was deleted from the Dolores Project. Again, the State of Colorado will assume the obligation to construct this portion of the pipeline.

Tribal Features, Irrigated Land, and Operation and Maintenance of Tribal Facilities

Coordination activities

Reclamation met several times between 1984 and 1987 with the Ute Mountain Ute Tribe on various issues concerning tribal features. The tribe has sought accelerated construction of its canal and lateral system. Other issues discussed at these meetings include (1) a review of project land and consideration of alternative land; (2) construction of tribal features through the newly founded construction company (Weemiuuch Tribal Construction Authority); (3) development of tribal recreation opportunities; and (4) control over operation, maintenance, and replacement of tribal-related project features.

Results and implementation

Concerning accelerating construction, Reclamation maintains that a repayment contract, on which negotiations are continuing, must first be signed. The current schedule is acceptable to the tribe. Reclamation examined land north and west of Towaoc, but additional operation and maintenance costs would have been incurred through the need for pumping water to this land. The tribe desires to assume as much as possible of the construction of project facilities on the reservation. The authority of Public Law 93-638 may allow this concept. The tribe now agrees with the plan to have the DWCD operate and maintain the Towaoc Canal, and the tribe will operate and maintain the laterals on the reservation. As described in the 1977 FES plan, Reclamation will make available 800 acre-feet of water annually to the tribe for fish and wildlife enhancement.
CHAPTER IV CONSULTATION AND COORDINATION

On-and Off-farm Programs

Coordination activities

1979-87

Reclamation coordinated closely with the Soil Conservation Service throughout the study to ensure that the proposed plans for each of the two agencies for salinity control would serve to complement the other.

Results and implementation

Both Reclamation and the Soil Conservation Service are continuing to coordinate the two programs with each other and the MVIC.

Cultural Resources

Coordination activities

1976

Reclamation signed a Memorandum of Agreement (amended February 1, 1983) with the Colorado State Historic Preservation Office (SHPO) and the Federal Advisory Council on Historic Preservation to mitigate adverse impacts from Dolores Project construction to significant cultural resources.

1982

A Class II cultural resource survey was filed with the Colorado State Historic Preservation Officer in September 1982.

1983-87

Reclamation proposed a general mitigation plan for the canal and laterals features of the project to the Colorado SHPO, who accepted it in a letter dated April 7, 1983. More recently, on April 23, 1986, and April 3, 1987, Reclamation sent site forms and a report (Kuckelman, 1986) on the Class III survey to the Colorado SHPO with a request for a determination of National Register eligibility for the recorded sites.

Results and implementation

The Colorado SHPO gave a partial eligibility response in a letter dated April 28, 1987. Further consultation on a site-specific mitigation plan, under the terms of the existing Memorandum of Agreement, will be initiated once the final alignment and borrow areas are determined.

Endangered Species

Coordination activities

1980

Reclamation agreed to perform additional studies on endangered fish species in the Colorado River system and to examine the possibilities of changing flow releases to improve the opportunities of these fish to recover.

The Fish and Wildlife Service wrote a Biological Opinion on the impact of the project on the endangered Mesa Verde cactus. The FWS noted that the cactus were found along the southern boundary of the Ute Mountain Ute Reservation but that the project would have no impact on the cactus.

1984

In accordance with Section 7, Interagency Cooperation Regulations (50 CFR 402) of the Endangered Species Act (16 U.S.C. 1531 et. seq.), Reclamation provided the Fish and Wildlife Service a Biological Assessment on endangered species as a result of constructing salinity control features in the McElmo Creek Unit area, specifically the Colorado squawfish and the bald eagle.

1985

While performing environmental clearance work for seismic surveys on the reservation, the Fish and Wildlife Service found the Mesa Verde cactus farther north than originally believed. The range of the cactus was, consequently, expanded.

Results and implementation

The Fish and Wildlife Service gave its Biological Opinion in a memorandum dated August 30, 1984, that the salinity control features of the Dolores Project would not jeopardize the continued existence of the Colorado squawfish and the bald eagle.

The Bureau of Reclamation and the Fish and Wildlife Service have decided to conduct reconnaissance surveys in 1988 or 1989 on the reservation in the project area to determine if the Mesa Verde cactus is growing there. The results of these surveys will determine what future action, if any, will be necessary.
In formulating alternatives and selecting a proposed plan for salinity control, Reclamation coordinated with and received assistance from several other Federal and State agencies. A multiple agency team consisting of personnel from the Bureau of Reclamation, the Fish and Wildlife Service, the Soil Conservation Service, and the Colorado Division of Wildlife evaluated potential environmental impacts of alternative plans and made recommendations on how to either avoid the impacts or mitigate for them. The team recommended that any alternative which would dry up the flows of McElmo Creek be dropped from consideration because of the associated loss in riparian habitat. The Colorado Division of Wildlife further recommended against lining conveyance facilities, constructing a coal slurry pipeline, and withdrawing saline lands from service because each would reduce the quantity and quality of existing wetlands. The division favored ponding and evaporating small creek flows and using saline water for industrial cooling.

In its December 13, 1985, final Planning Aid Memorandum on the new alignment for the Towaoc Canal, the Fish and Wildlife Service recommended that, in addition to the purchase of the Bradfield Ranch downstream of McPhee Reservoir by Reclamation, the following mitigation measures be employed.

1. "Provide deer escape structures along 16,800 feet proposed to be concrete lined and at every control structure, drop structure, or siphon. These escape structures may be designed as a feature of the canal itself, such as steps along the upper edge of the canal. Whatever design is decided upon should be approved by the Colorado Division of Wildlife and the Fish and Wildlife Service, as well as the Bureau of Reclamation. It should also be noted that additional structures or changes may be needed if, after installation, it is determined there are problems."

2. "Provide a crossover ramp or underpass for deer on the 10,000-foot, concrete-lined section upstream of Highway 101. This would best be accomplished at one or more of the natural washes in the area."

3. "Records should be kept of any deer or elk found trapped, dead or alive, in the canal. This report (to be developed by the Bureau of Reclamation) should include, but not be limited to, the date, time, location, and any other specifics which might pertain. This information should be compiled once a year and reviewed by an advisory team made up of personnel from the Bureau of Reclamation, the Colorado Division of Wildlife, and the Fish and Wildlife Service to determine if there are any problems which need to be rectified."

4. "Canal alignment will avoid existing cottonwood trees and contractors will be made aware of their importance."

5. "Grazing should be eliminated from the Dolores River mitigation lands. This will offset riparian habitat losses dependent on seepage from the existing Highline Canal and total loss of the Rocky Ford Ditch."

6. "Provide sufficient water to Totten Reservoir to maintain the current water level and fishery values."

Reclamation met with the Fish and Wildlife Service and the Colorado Division of Wildlife to discuss the possible alternatives for developing 24 acres of wetlands, as recommended by the Habitat Evaluation Procedures Analysis. Reclamation presented four alternatives, including no action, and, at the meeting, these agencies decided to pursue two of the development alternatives located at the Bradfield Ranch.

**Results and implementation**

Reclamation would implement each of the measures outlined above by the Fish and Wildlife Service in the following ways.

1. During construction, Reclamation would employ measures to reduce the occurrence of big game entrapment within concrete-lined sections of the Towaoc Canal. This goal would be accomplished either by constructing fences to keep animals away from the canal or installing deer and elk escape structures within the canal and building crossover ramps. Reclamation would consult with the Colorado Division of Wildlife and the Fish and Wildlife Service on designing these features.

2. As noted above, Reclamation would either fence the concrete sections or build crossover ramps.

3. Reclamation would assist the Colorado Division of Wildlife in setting up a system of recording on all deer and elk trapped within the canal for joint review by the Bureau of Reclamation, the Fish and Wildlife Service, and the Colorado Division of Wildlife.

4. During construction of the canals, care would be taken to avoid any unnecessary damage to cottonwood trees.
5. The livestock grazing on both the mitigation and enhancement lands will cease in 1987 when the grazing permits expire (already implemented) to eliminate competition between these animals and wildlife species and to reduce impacts to the habitat because of overgrazing.

6. Reclamation would provide the necessary water (up to 800 acre-feet annually) to maintain the water quality in Totten Reservoir and thereby preserve the fishery. The NVIC will manage the reservoir with operation and maintenance funds provided through the legislation authorizing salinity control.

According to the Colorado Division of Wildlife, the purchase of the Bradfield Ranch downstream of McPhee Reservoir completes the remaining mitigation on the project. This purchase consisted of 215 acres of mitigation land and 474 acres of enhancement land. In addition, Reclamation would develop 75 acres of mitigation land for wetland habitat and provide, through the salinity control authorizing legislation, the necessary funds for operation and maintenance. The Fish and Wildlife Service in its final Planning Aid Memorandum concurs with the Colorado Division of Wildlife on this opinion.

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CHAPTER IV
CONSULTATION AND COORDINATION

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National Park Service
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Superintendent, Mesa Verde National Park, Mesa Verde, Colorado
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Colorado River Board of California, Los Angeles, California
Colorado River Commission of Nevada, Las Vegas, Nevada
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Representative James Dyer, Denver, Colorado

Local Government

City Manager, Dove Creek, Colorado
City of Cortez, Cortez, Colorado
Dolores County Commissioners, Dove Creek, Colorado
Mancos Town Government, Mancos, Colorado
Monterezuma County Assessor’s Office, Cortez, Colorado
Monterezuma County Commissioners, Cortez, Colorado

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American Canoe Association, Denver, Colorado
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Colorado Mountain Club, Denver, Colorado
Colorado Open Space Council, Denver, Colorado
Colorado River Basin Salinity Control, Bountiful, Utah
Colorado River Water Conservation District, Glenwood Springs, Colorado
Colorado University Wilderness, Boulder, Colorado
Colorado Water Congress, Denver, Colorado
Colorado White Water Association, Boulder and Lakewood, Colorado
Colorado Wildlife Federation, Boulder, Colorado
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Defenders of Wildlife, Rock Springs, Wyoming
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CHAPTER IV

CONSULTATION AND COORDINATION

Local Agencies and Private Organizations (Continued)

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John Porter, Cortez, Colorado
Environmental Defense Fund, Denver, Colorado
Friends of the Earth, Moab, Utah
Four Corners Expositions, Mancos, Colorado
Four Corners Regional Commission, Farmington, New Mexico
Four Corners Resource Institute, Durango, Colorado
Four Corners Wilderness Workshop, Flagstaff, Arizona
Harris Water Engineering, Durango, Colorado
League of America, Inc., Colorado Division, Westminster, Colorado
Mancos Water Conservancy District, Mancos, Colorado
Montezuma Resource Forum, Dolores, Colorado
Montezuma Valley Irrigation Company, Cortez, Colorado
National Audubon Society, Boulder, Colorado
National Parks and Conservation, Cottonwood, Arizona
National Wildlife Federation, Boulder, Colorado
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New Mexico Wildlife Federation, Albuquerque, New Mexico
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Sierra Club, Rocky Mountain Chapter, Steamboat Springs, Colorado
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Chairman, Ute Mountain Ute Tribe, Towaoc, Colorado
Vice Chairman, Ute Mountain Ute Tribe, Towaoc, Colorado
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ATTACHMENT A
LIST OF PREPARERS

The Upper Colorado Region, Bureau of Reclamation, Box 11568, 125 South State Street, Salt Lake City, Utah 84147 prepared this Supplement to the Final Environmental Statement. The persons listed below from the Durango Projects Office prepared significant background material or participated significantly in preparing the report and are listed in alphabetical order.

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ATTACHMENT A

LIST OF PREPARERS

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<td>11 years</td>
<td>Fisheries analysis</td>
</tr>
<tr>
<td>Don Moosaw</td>
<td>Supervisor of environmental studies</td>
<td>B.S., Systematics and ecology</td>
<td>12 years</td>
<td>Environmental analysis and mitigation</td>
</tr>
<tr>
<td>Pat Schumacher</td>
<td>Civil Engineer</td>
<td>B.S., Civil Engineering</td>
<td>13 years</td>
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</tr>
<tr>
<td>John Simons</td>
<td>Hydrologist</td>
<td>B.S., Civil Engineering</td>
<td>12 years</td>
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</tr>
<tr>
<td>Paul J. Stuart</td>
<td>Supervisor of planning support</td>
<td>M.S., Agricultural Economics</td>
<td>11 years</td>
<td>Economic analysis</td>
</tr>
<tr>
<td>Christopher Vogl</td>
<td>Technical Publications Writer</td>
<td>M.A., English</td>
<td>12 years</td>
<td>Lead writer</td>
</tr>
</tbody>
</table>

ATTACHMENT B

ENVIRONMENTAL COMMITMENTS

The Bureau of Reclamation made the following environmental commitments for the modifications to the plan of development for the Dolores Project.

1. Two hundred and fifteen acres of land were acquired downstream of McPhee Dam as mitigation land for riparian habitat losses resulting from the project and 474 acres were acquired as enhancement land. The Colorado Division of Wildlife will administer and develop the 215 acres of mitigation land and the Bureau of Land Management will administer and develop the 474 acres of enhancement land. This land is primarily riparian and has excellent potential for wildlife development. Reclamation would develop 75 acres of wetland to mitigate the 89 acres of wetland habitat lost as a result of constructing the project modifications. The Colorado Division of Wildlife would operate and maintain these wetlands with funds provided through the salinity control program. All lands acquired for the purpose of fish and wildlife mitigation or enhancement will be identified and included under the provisions of a General Plan.

2. As requested by the Fish and Wildlife Service, mitigation measures would be employed to reduce the occurrence of deer and elk entrapment within concrete-lined sections of the Towaoc Canal. This goal would be accomplished one of two ways: (1) by fencing the animals out of the canal or (2) construction of both deer and elk escape structures within the canal and crossover ramps. The design, number of escape structures, and placement of these features would be jointly agreed to by the Fish and Wildlife Service, the Colorado Division of Wildlife, and the Bureau of Reclamation. Also, records would be kept of all deer and elk trapped within the canal and jointly reviewed by these agencies.

3. With the abandonment of the Rocky Ford Ditch, Totten Reservoir would no longer serve an irrigation purpose for the Montezuma Valley Irrigation Company (MVIC). The MVIC will continue to operate and maintain the reservoir for fish and wildlife purposes. Reclamation will make 800 acre-feet of unallocated project water available to maintain the fishery, and operation and maintenance funds will be made available under salinity control legislation.
4. During construction of the canals, care would be taken to avoid any unnecessary damage to cottonwood trees.

5. Livestock grazing on both the mitigation and enhancement lands was to cease in 1987 when the current grazing permits expire (already implemented) in order to eliminate competition between these animals and wildlife species and to reduce impacts to the habitat because of overgrazing.

6. Contractors would be required to cease work immediately should they discover evidence of cultural resources during construction. Work would not resume until such evidence was properly evaluated by qualified cultural resources specialists.

7. All disturbed landscape not required for project purposes would be rehabilitated immediately after project construction.

8. All construction activities would comply with applicable Federal and State laws, orders, and regulations relating to air and water quality. This compliance would include obtaining proper permits and complying with any limitations imposed by these permits. A water quality management plan would be required of each contractor prior to initiating construction.

9. All construction contractors would be required to comply with Federal and State laws concerning the use of pesticides and hazardous wastes.

10. A program of survey recording, data recovery, and avoidance, where possible, would be carried out for significant cultural resources. Construction specifications would be required for areas where sites can be avoided. Inspectors would be directed to report any previously unknown buried cultural resource discovery during construction.

ATTACHMENT C

United States Department of the Interior
FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
2060 Administration Building
1745 West 1700 South
Salt Lake City, UT 84104-5110

MEMORANDUM

TO: Regional Director, Upper Colorado Regional Office, U.S. Bureau of Reclamation, Salt Lake City, Utah
FROM: Field Supervisor, Ecological Services, Salt Lake City, Utah
SUBJECT: Final Planning Aid Memorandum on Towaoc-Highline Canal Portion of the Dolores Project

This final Planning Aid Memorandum discusses the wildlife concerns related to construction and operation of the Towaoc-Highline Combination Canal. A meeting was held in Montrose on November 15, 1985, to discuss concerns raised by the Colorado Division of Wildlife and your office on the draft. Changes to the Draft were suggested at that meeting and are included in this memorandum.

The canal realignment, a salinity control feature, was a portion of the McElmo Creek Unit of the Colorado River Water Quality Improvement Program (CRWQIP). On October 30, 1984, the President authorized salinity reduction as a project purpose of the Dolores Project. This legislation allows the McElmo Creek Unit to be integrated into and constructed in conjunction with the Dolores Project.

The Towaoc-Highline Combination Canal is the primary salinity control feature of the Dolores Project. This canal will transport water from the Dolores Canal near McPhee Reservoir to lands in the Towaoc, Colorado, area, a distance of about 26 miles. This canal will service currently irrigated lands in the Montezuma Valley in addition to new lands to be irrigated in the Towaoc area on the Ute Mountain, Ute Indian Reservation. The proposed Towaoc-Highline Canal will follow the existing Montezuma Valley Irrigation Company Canal (Highline Canal) to the Ute Mountain, Ute Indian Reservation. The Highline Canal will be
enlarged to approximately four times its current size to a maximum of 435 cubic feet of water per second (CFS). This enlarged canal would eliminate the need for the Rocky Ford Canal which parallels the Highline Canal.

There are three primary fish and wildlife concerns associated with this project: 1) Potential for deer and elk being trapped in the concrete lined sections of the Towaoc-Highline Canal and drowned; 2) Loss of riparian habitat (i.e. cottonwood trees) which will be destroyed during construction or die due to a reduction of seepage from the lined canal or complete removal of the canal (Rocky Ford); and 3) Totten Reservoir fishery.

In November of 1984 FMS contracted with the Colorado Division of Wildlife (COOW) to conduct the Drought Project. The Towaoc-Highline Canal would have on big game and cottonwoods. The COOW report dated May 1985 stated that all areas along the canal were being used by deer and that use by elk was found along the southern portion of the canal as well. There is deer use throughout the year with peak use during the winter months of December, January, February and March when animals habitually move to lower elevations. The area provides good food and cover, however, the canal separates the agricultural areas, which are heavily used by deer and elk for feeding, and the pinyon juniper areas that provide good resting cover. This necessitates the animals crossing the canal several times a day. High concentrations of deer were seen during the early spring on adjacent alfalfa fields.

During the period (April through September) when the canal would be operating at maximum capacity and pose its greatest potential for drowning deer and elk, the COOW estimated a resident deer population at 4.7 deer/sq. mi. In addition, the COOW states the deer herd in this area is increasing annually. The results of the study indicated the potential exists for deer and elk becoming trapped in the steep-sided concrete lined portions of the canal. This has been shown to be a problem in the Grand Junction area where a 2 mile section of the Towaoc-Highline Canal was lined in 1981. Since that time 26 deer and 2 elk have been trapped in the canal. Ten of the deer were drowned (drowned) when removed, the remaining animals were rescued alive and released. The Grand Valley Canal is in an area that has relatively low deer densities as compared to the Montezuma Valley. The COOW Report estimates 40 deer/year could be trapped in a 23 mile section of the Towaoc-Highline Canal from Hartman Draw to its present end if it was totally concrete lined, similar in design to the Grand Valley Canal. However, we understand the canal will not be totally concrete lined. Instead a gradually sloped earthen lined canal would be constructed over most of the 26 miles of the canal. Current plans call for two sections to be lined from the powerhouse 6,800 feet downstream and from Highway 160, 10,000 feet upstream. This 3 1/4 miles of lined canal will still provide the potential for deer and elk being trapped. Therefore, we suggest these two sections be constructed to allow deer and elk a means to escape. If ramps are used, they should be no more than 1 mile apart. If possible the concrete sections of the canal should be designed with steps along the upper edge to allow deer and elk easy escape along its entire length.

Escape ramps should also be placed at any obstructions such as drop structures, control structures or siphons. These escape structures should include a walkout ramp and deflection device. We have included some photos from the Western Reservoir and Riparian Habitat Improvement Handbook of construction similar to what we believe could be accomplished on the Towaoc-Highline Canal. In addition the 10,000 foot section upstream of Highway 160 should have at least one crossover ramp or underpass so deer can migrate across the canal. If the final design requires additional sections of the canal to be concrete lined, escape ramps should be placed at those locations as well. We believe the escape ramps or other designs should be placed on both sides of the canal so deer will be able to migrate across the canal as they necessitate. As final details for the canal lining become available, the FWS and the CDOW would like to be involved in their review for placement of the escape ramps or other designs and crossover/under areas.

All entities involved with the canal including local landowners should be made aware of the potential for deer being trapped in the canal. These people should be instructed who to contact if deer or elk are seen in the canal. A report will be compiled of all noted deer and elk interactions with the canal. This report to be developed by BR should detail the date, time, location and any other pertinent information. The report will also include any other observations of elk found trapped, dead or alive in the canal. Annually these forms should be gathered and all information compiled by BR to determine if a problem exists anywhere along the canal. From this information an advisory group made up of the CDOW, BR and FWS will meet to determine if additional steps need to be taken to prevent deer from being trapped. These steps could include modifications of the canal, fencing or other means determined by the advisory group.

The second major wildlife concern is related to loss of riparian habitat currently associated with the canals and their seepage. The CDOW study indicated a total of 524 cottonwood trees along the 23 miles of the Highline Canal and 275 cottonwoods along the 13 miles of the Rocky Ford Canal. These counts represent minimum numbers due to the inherent limitations of the aerial photography used for counting. In addition to the work done by the CDOW, your Durango Office mapped vegetation on 13 random segments (approximately 533 ft. X 520 ft. each) along the Highline and Rocky Ford Canals. This information will be useful in determining changes in vegetation along the canals once lining is
completed. The potential exists for much of the wetland habitat along the canal to dry up. In addition some of the cottonwoods along the Highline Canal may need to be removed during construction. These riparian areas provide critical habitat for numerous species of mammals and birds. The CDOW has documented nesting bald eagles in the Montezuma Valley as recently as 1983. One nest located near Arriola is in a cottonwood tree along the Hermana Canal. In 1984 and 1985 golden eagles nested at the above site. Another nest located in a cottonwood tree just north of Totten Reservoir was used for several years by bald eagles through 1983. This riparian habitat and associated cottonwoods provide prime wildlife habitat which will potentially be lost due to project construction and operation. The contractors should be made aware of the importance of the cottonwoods dead or alive along the canal and instructed to avoid destroying them.

To mitigate the loss of riparian habitat, the Bureau has acquired the Black property (near Bradfield Bridge on the Dolores River below McPhee Reservoir). This acquisition of approximately 200 acres of mitigation land and 400 acres of enhancement land will be used to offset the riparian habitat losses discussed above. In addition, grazing should be removed from the riparian area along the Dolores River to improve the existing riparian habitat. This should compensate for the wildlife habitat losses we anticipate will result from the canal lining in the Montezuma Valley and Towaoc Area.

Another concern we have with the project is the potential loss of Totten Reservoir. Since Rocky Ford Ditch will no longer be needed we are concerned that Totten Reservoir, the regulation reservoir for the Rocky Ford Ditch, will also be eliminated. Totten Reservoir provides a tremendous amount of recreation for residents in the Cortez area. The CDOW estimates there were 4,000 anglers/year use in 1984. The fishery in the reservoir is made up of blue gill, yellow perch, largemouth bass, northern pike, walleye, channel catfish and crappie. We request that Totten Reservoir continue to receive enough water to maintain its current water level and fishery values.

In summary, we request the Bureau provide the following mitigation, in addition to acquisition of the Black property, for habitat losses associated with construction and operation of the Towaoc-Highline Canal:

1. Provide a crossover ramp or underpass for deer on the 10,000 foot concrete lined section upstream of Highway 160. This would best be accomplished at one or more of the natural washes in the area.

2. Records should be kept of any deer or elk found trapped dead or alive in the canal. This report to be developed by BR should include, but not be limited to, the date, time, location and any other specifics which might pertain. This information should be compiled once a year and reviewed by an advisory team made up of BR, CDOW and FWS to determine if there are any problems which need to be rectified.

3. Grazing should be eliminated from the Dolores River mitigation lands. This will offset riparian habitat losses dependent on seepage from the existing Highline Canal and total loss of the Rocky Ford Canal.

4. Provide sufficient water to Totten Reservoir to maintain the current water level and fishery values.

The above list of mitigation features is a tentative list of those items we believe are necessary to offset the anticipated impacts associated with construction and operation of the Towaoc-Highline Canal. As more detailed project plans become available the CDOW and FWS should be involved in their review and given the opportunity to provide additional comments and recommendations as we believe necessary.

This report constitutes the Final Planning Aid Memorandum on the Towaoc-Highline Canal portion of the Dolores project.

Literature Cited

Escape Ramps P5.4

Exhibit 3. Revised Richmond deer escape ramp (water flow is left to right).

Exhibit 1. Richmond deer deflector and escape ramp, Okanagan Canal, British Columbia.
Formal public hearings were held at the Anasazi Heritage Center in Dolores, Colorado, on April 21, 1988, from 3:00 to 5:00 p.m. and 6:30 to 8:30 p.m. to receive comments on the Draft Supplement to the FES. A notice of availability of the draft environmental statement and the notice of the public hearings were published in the Federal Register on March 8, 1988. News releases announcing the public hearing were also provided to local and regional media on April 11, 1988.

James Limb of the Regional Solicitor's office of the Department of the Interior in Salt Lake City presided over both hearings. Approximately nine people attended both sessions. One person, John Porter, General Manager of the DWDG, spoke at the hearings. He made comments on the releases for hydroelectric power, the 800 acre-feet of water to be made available for Totten Reservoir, the concrete-lined 4.6 miles of the Towaoc Canal, and the Fish and Wildlife Service's Biological Opinion on Threatened and Endangered Species.

An official court reporter made a transcript of both hearings. A verbatim transcript is available for public inspection at the following locations:

Upper Colorado Regional Office
Bureau of Reclamation
125 South State Street
Salt Lake City, Utah 84147

Durango Projects Office
Bureau of Reclamation
835 E. Second Avenue
Durango, Colorado 81301

Cortez Projects Office
Bureau of Reclamation
60 South Cactus
Cortez, Colorado 81321

Denver Office
Bureau of Reclamation, Building 67
Denver Federal Center
Denver, Colorado 80225

Comments and Responses

Included in this section are responses to comments received from Federal and State agencies on the Draft Supplement to the Final Environmental Statement. Where appropriate, changes have been made in the text to reflect the comments. Page numbers cited in the Comments/Response section refer to those in the Initial Draft Supplement to the FES. The complete comment letters are attached at the end of this section in the order listed below.

Responses to letters from Federal agencies

U.S. Department of Agriculture, Soil Conservation Service, Denver, Colorado
U.S. Department of the Army, Corps of Engineers, Sacramento District, Sacramento, California
We suggest replacing this paragraph with:

"The ASCS has in the past, provided cost-sharing payments to assist farmers and ranchers in implementing conservation measures on their land from limited funding available through the Agricultural Conservation Program. However, should the USDA salinity control plan be implemented the ASCS will provide cost-share assistance to operators for installing salinity control measures using funds available through the USDA's Colorado River Salinity Control Program."

Response: The paragraph has been revised as suggested.

Comments from the Army Corps of Engineers, Sacramento, California, Letter of April 13, 1988

3. Comment:

1. Page 5-11, paragraph 1 - Has it been specifically determined that all of the wetland losses accrue directly to areas that are supported solely by lateral seepage?

Response:

Based on the seepage rates in the canals of these areas and the location of the wetlands, Reclamation has determined the conveyance system directly supports these particular wetland areas.

4. Comment:

2. Page 9, paragraph 1 and 2 - Will any of the recreational commitments require the placement of fill material in non-irrigation induced wetlands or "waters of the United States"?

Response:

None of the recreational developments would require dredge or fill of wetland areas.

5. Comment:

3. Page 19, figure 3 - A number of the material source areas are adjacent to natural drainages. Will any naturally occurring wetlands or waterways be impacted at the borrow sites or along borrow transportation routes?

Response:

No, the areas selected for borrow material were evaluated based on the type of material and cost. Working in any wet area would result in higher costs. Since sources exist outside of these areas, they were chosen for use as borrow areas.
Section on [IL 1]

The wetland mitigation plan involves rebuilding an existing irrigation system. To do this, a new headgate structure would have to be placed in the Dolores River. When plans for this mitigation are developed, Reclamation will consult with the Corps of Engineers and acquire all of the necessary permits.

Comment:
5. Page 25, paragraph 2 - see comment 3.

Response:
Please see response to comment 3.

Comment:
6. Page 38, paragraph 2 - Do non-irrigation induced wetlands exist along McElmo Creek, and will they or the creek itself be impacted by fill activities?

Response:

Some wetland areas along McElmo Creek are not associated with irrigation. The project would not have an impact on McElmo Creek or these areas.

Comment:
7. Page 41, paragraph 1 - see comment 4.

Response:

Comments from the Fish and Wildlife Service, Grand Junction, Colorado, memorandum of April 29, 1968

Comment:
S-7 - Right of Way - We note that the canal right of way will be increased from 50 feet to 200 feet. We suggest that all areas within this right of way not needed for canal or road be enhanced for wildlife by planting shrubs and grass species beneficial to wildlife. We also request that spraying be kept to a minimum in this area to enhance the area for nesting birds and small mammals.

Response:

The 200-foot right-of-way easement would remain in effect only during construction. After construction, a 120-foot right-of-way easement would be used for operation and maintenance. Reclamation would seed this permanent right-of-way easement with grasses compatible with the surrounding area, to prevent erosion of the canal, and, if possible, for fish and wildlife purposes. Since the right-of-way consists of an easement, not ownership, the area cannot be designated and seeded for fish and wildlife purposes. The landowner would have to rehabilitate the remaining 80 feet along the easement. In addition, Reclamation plans to consult with the DOW on seed mixtures for use along the right-of-way of Reaches 2 and 3 of the Towaoc Canal.

Comment:
S-8 & 9 - Effects of project modifications on salinity - We note here that there will be a net increase of 18,650 tons of salt annually added in the Dolores Area, and ultimately the Colorado River System. Of concern is that additional habitat will be lost as additional salinity control measures are instituted to offset this overall increase in salinity.

Response:

Congress foresaw that development would increase the salt load of the Colorado River and thus authorized the salinity control program to offset the effects of development on salinity as the upper basin states developed their Colorado River Compact-apportioned water. Measures are associated with each of the individual salinity control units to mitigate for lost habitat.

Comment:
S-10 - Water quantity and quality - Here it sounds as if the project will have a positive effect by reducing the salt at Imperial Dam by 2.9 mg/l. According to the table on page 5-9 this may be misleading.

Response:

This section only deals with the impacts on water quality resulting from the modifications described in this supplement, a reduction of 2.9 mg/l at Imperial Dam. Summary Table 2 reflects the effect of the modifications on the total Dolores Project, a net increase of 18,650 tons, rather than an increase in salinity from project land and canals of 43,150 tons.
This document supplements the FES completed in 1977. In that document, all of the cultural resources are identified in the text and in a map on pages B-40 through B-47. All project features to be constructed have had a Class III cultural resource survey completed on them, and no impacts are going to accrue to the sites mentioned in the letter as a result of the project.

15. Comment:
Under Threatened and Endangered Species, no mention is made of the peregrine falcons, which nest on the escarpment of Mesa Verde National Park and hunt over the Montezuma Valley. Nor is there mention of threatened prairie falcon, which is also found in the area. Prairie dogs are quite common throughout the Montezuma Valley; mention of the possibility of the presence of the black-footed ferret seems appropriate.

Response:
As noted in the text of the 1977 FES on pages C-24 and C-25, Reclamation conducted surveys for the peregrine falcon and black-footed ferret and in conjunction with the Fish and Wildlife Service determined no impacts would occur to these species as a result of the project. The Fish and Wildlife Service issued a non-jeopardy opinion on the project in August 1984.

16. Comment:
In the section on Project Setting, no mention is made of Mesa Verde National Park, Hovenweep, and Yucca House National Monuments, or the Lowry Ruins. The project, during construction and when completed, will be visible from overlooks in Mesa Verde National Park.

Response:
During project construction, people viewing the area from the overlooks may be able to see activities of some sort occurring many miles to the north and northwest. Since the salinity control features would be constructed several miles away in an area consisting of farms and roads, the impact was considered insignificant and, therefore, not mentioned. After construction, the area would appear as it does today.

17. Comment:
The section on Air Noise [sic] Quality (page 35) mentions that Mesa Verde National Park is a Class I area under the Clean Air Act. There should be provisions incorporated into the final project design that will ensure that Class I increment levels will not be exceeded during construction and project implementation.

Response:
All Reclamation-issued contracts include sections requiring the contractor to comply with all federal, state, and local standards relating to air quality. No exception would be made on this project. Reclamation also has an Environmental Commitment Checklist for each contract to ensure compliance with environmental commitments as well as to determine the level of compliance once construction is completed.
Our remaining concern is the level of wetland mitigation portrayed in the Draft Supplement. We met with Bureau staff in September 1987, and presented our concerns about the mitigation plan which was available at that time. The September plan indicated the Bureau would be mitigating the habitat losses associated with 155 acres of lost wetlands with the creation of 24 acres of wetlands. EPA disagreed with this approach because it did not address all wetlands values. As a result of the September meeting, the Bureau agreed to re-evaluate the project impact area to assess whether the project would result in wetland creation which had not been claimed as credit in the wetland analysis. EPA also agreed that the Bureau could mitigate the 155 acres anywhere within the Bureau Project area, not just within the salinity control portion of the project. We also understood that 155 acres was not an extremely large number of wetlands to mitigate considering the opportunities available within the project area.

The Draft Supplement documents the results of that analysis and indicates there would be 66 acres of wetlands created as a result of project operation. EPA requests that maps which indicate the location and size of these areas be supplied to this office as will as included in the Final EIS for public review. At this time, EPA agrees that the prediction of 66 acres of wetlands being created by project operations is reasonable.

**Response:**

The text on page 41 has been changed to read as follows: "Through this review process, Reclamation determined that wetlands would be created along wasteways associated with the project irrigation system, and additional wetlands could develop naturally from minor return flow from irrigated cropland. An estimated 66 acres of this type of wetland would be created by the canal wasteways, thus leaving a total of 89 acres to be mitigated under EPA's request. Wetland areas created by return flow from irrigated fields would somewhat offset these 89 acres. The number of acres could not be accurately determined because over 28,000 acres of project land will be newly irrigated with project water, and not parcels of wetlands will be created. Any remaining wetland losses will be offset as a result of applying water to this dry-farmed land. Reclamation believes that through its mitigation efforts all wildlife values will have been compensated, and through project development the creation of new wetland habitat in the project area would offset other wetland values."

A map showing the location of wetland habitat to be created by the project wasteways has been added to the document following page 41. This map shows only the location and a representation of the formation of the 66 acres created by canal wasteways and does not attempt to indicate the numerous wetland areas to be formed by return flows from irrigated fields.

**19. Comment:**

Our remaining concern is with the level of mitigation proposed for the remaining 89 acres of lost wetlands. The Bureau has reanalyzed the initial mitigation site proposed in 1987 and determined that 21 acres could be created through rehabilitation of an existing irrigation ditch and thereby better managing an existing water supply (page 41 of Draft Supplement). The discussion also indicates the new water management would allow the preservation and enhancement of 54 acres of existing wetlands. EPA does not normally give mitigation credit for preservation and enhancement of existing wetlands. One circumstance under which this is considered is when the wetlands are under a very high risk of elimination and not protected under the authority of the CWA or other wetland protection authorities such as the wetland protection Executive Order (E.O. 11990). We do not believe that to be the case in this situation.

The Draft Supplement indicates the wetlands in the mitigation area would be lost, or reduced in value, under the no Federal action alternative. We request further explanation of why the wetlands would be lost under the no action alternative. The Bureau should document what created the wetlands in the first place (i.e. natural ground water supply, alluvial flow, irrigation, etc.) and what would cause this source to be eliminated under the no-action alternative. Given the present information, and discussions with Bureau staff, EPA must conclude there are between 14 and 68 acres of wetlands remaining to be mitigated to meet the 155 acre goal.

**Response:**

The text on page 41 has been rewritten to be more explicit about the preservation and enhancement of the 54 acres of existing wetland. Old ox-bows of the river formed these wetland areas. Over time, these ox-bows filled in with sediment and organic material. Their primary sources of water originally were from snow melt early in the year and irrigation return flow in the summer. Once held in private ownership, this land was acquired through purchase and exchange and is now being managed by the Division of Wildlife (DOW) and the U.S. Forest Service. The DOW manages the land primarily as a fishing corridor and riparian wildlife area. Management for wetland purposes would require an adequate water supply, new facilities for diverting water, and funding for the operation and maintenance of ditches and diversion structures. By implementing Reclamation's proposed mitigation plan, these areas would not only be preserved and enhanced, but new areas would also be created. Without the plan, this land would succeed to riparian communities rather than wetlands.
Page 5-3, first paragraph, fourth sentence: The USBR report "1987 Joint Evaluation of Salinity Control Programs in the Colorado River Basin" November 1987, reports the current level of salt removal to be 140,000 tons per year. This discrepancy should be cleared up.

Response:

The number has been changed to 140,800 tons annually, (For further clarification, see Comment/Response No. 26.)

Page 5-3, last sentence and S-4 continuation: The report should make reference to P.L. 98-569 which authorized USDA's Colorado River Salinity Control (CRSC) Program.

Response:

The last sentence on page 5-3 has been changed to read, "Public Laws 93-320 and 98-569 authorize the Secretaries of Interior and Agriculture to cooperate in implementing any project involving control of salinity from irrigation sources."

Page 5-4, second sentence: The SCS plan is the recommended plan.

Response:

The text has been changed to read, "recommended plan."

Page 5-8, last paragraph, fifth line: The 1987 Evaluation Report shows a cost effectiveness of $82/ton. This difference in the two USBR reports should be resolved.

Response:

The cost effectiveness shown in the draft supplement reflects the latest economic values.

Page 5-8, Table 1: Cost effectiveness, as noted above.
The purpose of the Cumulative Impacts Section is to identify specifically those impacts caused by the U.S. Bureau of Reclamation projects on the Colorado River. The 1987 Joint Evaluation of the Salinity Control programs in the Colorado River Basin should be referred to for a comprehensive review of the plan to control salinity in the Basin.


28. Comment:
1. Page S-5, paragraph 4. The report implies that the minimum releases are 75 cfs in a dry year, 50 cfs in a normal year, and 75 cfs in a wet year. This paragraph needs to be clarified so that the turbine design capacities do not imply that the minimum bypass requirements are the same. The minimum bypasses are 20 cfs in a dry, 50 cfs in a normal, and 75 cfs in a wet year.

Response:
The purpose of the text was to explain the sizing of the power plant and not to show minimum releases. To clarify this distinction, the text has been amended to read, "releases of 25 to 75 cfs."

29. Comment:
2. Page S-7, "Project Modifications". The report notes that 215 acres of land were acquired as mitigation for riparian and wetland losses resulting from the project. Of this 215 acres, the U.S. Fish and Wildlife Service recommended that 24 acres be developed as wetland habitat to compensate for wetland habitat losses. However, Reclamation, through coordination with EPA, USFWS and the CDOW, developed a 75 acre plan to offset the losses. This plan is explained in further detail on pages 38 to 41 of the supplement.

We feel that the addition of more of the narrative from pages 38 through 41 to the summary on page S-7 would clarify that 215 acres of heavily grazed riparian habitat were purchased to offset the loss of 155 acres of wetlands under a worst case scenario. Furthermore, out of the 215 acres purchased, 75 acres [sic] were included in a management plan that develops 21 acres of new wetlands and enhances 54 acres of riparian habitat into quality wetlands.

Response:
Reclamation agrees with the comment and hopes that EPA will also recognize the value of the proposed wetland plan. Since the section to which reference is made is a summary, however, Reclamation, believes the addition of detailed information would reduce the summary's effectiveness in highlighting the proposed salinity control effort and its impacts. The section, therefore, remains as written.

30. Comment:
3. Page S-8, "Administration". The Dolores Water Conservancy District (DWCD) will administer the entire Towaoc Canal. However, it is our understanding that there will be subcontracting agreements between DWCD and the Montezuma Valley Irrigation Company (MVIC) and between DWCD and the Ute Mountain Utes (Utes), although those are not yet finalized. We would suggest that you update this point in the "Administration" on S-8 and in the "Issues and Implementation" section on S-13.

Response:
Added to the text on pages S-8 and 29 is the following: "The DWCD is negotiating with the MVIC and the Tribe for their subcontracting the operation and maintenance responsibilities of the salinity control facilities and the Towaoc laterals, respectively." On page S-13, the following sentence has been added: "The DWCD is negotiating with the Tribe for their subcontracting the operation and maintenance of laterals on the reservation."

31. Comment:
4. Page S-11, "Fish and Wildlife". In the last paragraph the report states that 4.6 miles of the Towaoc Canal will be lined and will present dangers to elk and deer. We suggest that wording be added to clarify that the 4.6 miles are concrete lined and that this mileage is in two segments, rather than one continuous segment.

Response:
The paragraph has been rewritten to read as follows, "Because of its smooth, hard surface, the two concrete-lined sections of the Towaoc Canal totaling 4.6 miles would present a threat...."
32. **Comment:**

5. Page S-11, "Floodplains and Wetlands". The comments made under point 2 herein are appropriate here as well.

**Response:**

Please see the response to comment 29.

33. **Comment:**

6. Page S-11, "Fish". The report states that Totten Reservoir will serve no irrigation purpose to MVIC (upon completion of the project it should be added), but that 800 acre feet of project water will be available to maintain water quality and sustain the fishery. We feel a comment would be appropriate here as to whether or not all 800 acre feet of project water must go to Totten Reservoir annually or whether part might be available for the same purpose at other sites if Totten does not require all of it.

**Response:**

The text has been amended to read as follows, "...but the necessary quantity up to 800 acre-feet of project water would be made available to maintain water quality and to sustain the fishery." The project would use only the quantity necessary to accomplish this purpose. Any unused water would be available for fish and wildlife purposes elsewhere in the project area.

34. **Comment:**

7. Page S-10, "Water Quantity and Quality". Some comments about water saved due to reduced seepage losses would be appropriate here. It is our understanding that water saved will be subject to Colorado water law and through water service contracts with Reclamation.

**Response:**

Saved water is discussed on page 37 of the report. NEPA Guidelines and Reclamation Instructions specify a summary should not exceed 15 pages, the approximate length of one in the supplement.

35. **Comment:**

8. Page S-14, "Issues and Implementation". McElmo Canyon water users are concerned about reductions in stream [sic] flows resulting from decreases in return flows. Reclamation should point out that a monitoring system will be in place to help assure that flows in McElmo Creek are not significantly reduced. Reclamation should also state in the report what, if any, agreements or options may exist to deliver project water so that the flows in McElmo Creek are not materially depleted to the detriment of McElmo Canyon water rights by implementing the salinity program.

**Response:**

The monitoring program is discussed on pages 23-24, and the effects of lining on McElmo Canyon irrigation of approximately 500 acres are discussed on pages 79-80. To reiterate, Reclamation believes the MVIC's use of a call system would make water available late in the irrigation season for these irrigators. Therefore, no agreements or other options have been explored.

36. **Comment:**

9. The cumulative impacts of the USBR and SCS projects should be included in the summary.

**Response:**

Please see the response to comment 27.

37. **Comment:**

10. Mitigation measures for USBR and SCS salinity activities have remained separate and apart from each other. This must continue to be the practice, both here and in future salinity projects.

**Response:**

The comment is appreciated.

Comments From the Colorado Division of Wildlife, Denver, Colorado, letter dated May 3, 1988

38. **Comment:**

1. Management of Totten Reservoir

If the primary use and management of Totten will be as a fishery, the CDOW should have a hand in its management. Pages S-11 and S-14 imply that MVIC would have sole management authority. If the reservoir will be managed as a fishery, what uses will be made by "...local water use entities..." that are consistent with fisheries management?

**Response:**

A contract between the Bureau of Reclamation and the MVIC specifies the MVIC would operate Totten Reservoir exclusively for fish and wildlife purposes and continue to provide public access. Existing minimum pool agreements between the Division of Wildlife and the MVIC would remain in
effect. Also, the MVIC would continue to consult informally with personnel from the Division of Wildlife on managing the reservoir for this single purpose. In the event the MVIC chooses to dispose of the reservoir at some future date, renegotiation of the agreement would be required.

39. Comment:

There is also some question as to the adequacy of 800 acre-feet to stabilize Totten. In the FEIS, it was stated that Totten would be stabilized. If the 800 acre-feet proves to be inadequate, will other water be made available?

Response:

At this time, Reclamation may only commit the necessary water up to 800 acre-feet annually to Totten Reservoir. Additional water would flow into the reservoir as runoff and flushing flow may be sporadically available from McPhee Reservoir during the spring, when excess water would be available. Preliminary analysis of existing and predicted total dissolved solids levels indicates TDS would remain at acceptable levels with the addition of 800 acre-feet of project water.

40. Comment:

Another concern is the reliability of funding for MVIC under salinity control legislation. If this source of funds is not available, will another source be used to replace it?

Response:

Section 202(b)(2) of Public Law 98-369 provides and allows the Secretary of the Interior to reimburse participating non-Federal entities for the costs of operation and maintenance to the extent the costs exceed the expenses that would have been incurred in the thorough and timely operation and maintenance of their canal and lateral systems had the salinity control features not been constructed. If no funding were available from the salinity control legislation, then no other known source would replace it.

41. Comment:

2. Right-of-Way Plantings

The increase in width of the rights-of-way provides an opportunity for greater acreage to be planted as wildlife habitat. Page A-27 of the FEIS indicates that all of the canal banks would be vegetated as wildlife habitat. We would request that all of the rights-of-way not needed for roads and other necessary maintenance structures be planted and managed as wildlife habitat. The CDOW would like to be involved in planning the types of vegetation used and management of the rights-of-way.

Response:

Please see the response to comment 10.

42. Comment:

There is also a need for further consultation with BOR on the locations and types of fences used along the canals. We are concerned that improper fencing could cause unacceptable big game mortality.

Response:

The Division would be contacted for its recommendations on fencing rights-of-way. These recommendations would be considered along with the needs and requests of property owners along the rights-of-way.

43. Comment:

3. Increase in Design Capacity of Power Plant at McPhee and Remote Control Release System

We have been assured by the local BOR office that these changes will not lead to rapid fluctuations in releases from McPhee Dam, and would like to take this opportunity to formally express this concern. Rapid fluctuations could cause mortality to eggs, fry, and adults of fish in the Dolores River below the dam.

Response:

Operation of the power plant will not influence normal release patterns from the dam.

44. Comment:

4. Escape Ramps on the Towaoc Canal

Page 21 states that one wildlife escape structure per mile would be built on the concrete-lined portions of the canals. During our site visit on 11 December 1987, we agreed to the construction of one structure near the middle of Reach 1 and a structure at each end of this reach. Page 21 implies that a safety net or cage would be the only structure at the siphon inlet.

On page 40, the word "or" in the second sentence of the second paragraph should be "and" to reflect the agreement of 11 December. Our understanding is that fencing, escape structures, and crossovers would be used as needed in all combinations.
Response:
Based on the December 11, 1987, agreement, the following has been added to the text on page 21: "Reclamation, the Fish and Wildlife Service, and DOW would evaluate the concrete sections of the canal and take appropriate measures to limit wildlife mortality. The earth- and membrane-lined sections would not require escape structures. Safety nets or cages would be used at the inlet to siphons." The text on page 40 has been changed to read as follows, "This potential loss would be avoided by one or more of the following: Fencing; constructing escape structures; and/or installing crossover ramps along and within the concrete-lined sections of the canal."

45. Comment:
5. Active Bald Eagle Nests

The only active bald eagle nest in the vicinity is outside the affected area. The nest near Totten Reservoir was abandoned about 4 years ago. The golden eagle nest tree on the Hermosa lateral has fallen and is no longer in use.

Response:
The text has been changed on page 42 to read as follows, "Bald eagles occur in the area as wintering residents." The paragraph at the top of page 44 in the environmental consequences section on Threatened and Endangered Species has been deleted.

46. Comment:
6. Ute Mountain Utes - Fish and Wildlife Enhancement

The CDOW would be available for consultation with the tribe in developing its plan for use of the 800 AF of water for wildlife purposes.

Response:
Thank you for the comment.

Comment from Ute Mountain Ute Tribe, Towaoc, Colorado, in a letter dated May 2, 1989

47. Comment:
We have very few comments on the EIS. The main comment is on pages 8-8, 28, 82, and 85 where the report states that the Tribe has agreed to have the Dolores Water Conservancy District administer the entire Towaoc Canal and has agreed to an allocation procedure for operation and maintenance costs. The Tribe may eventually agree to both items, but at the present time the items are still under discussion. It is premature to say that the Tribe has agreed to any details relating to the administration and separation of costs for the Towaoc Canal.

Response:
Reclamation agrees it is premature to state the Dolores Water Conservancy District (DWCD) will administer the entire Towaoc Canal, since negotiations on this issue continue with the Tribe. It is Reclamation's position, however, that the DWCD should be responsible for administering operation and maintenance of the entire canal to provide the necessary continuity of operation with the remainder of the project. Reclamation has already equipped the DWCD to perform this function, resulting in a lesser expense than equipping the Tribe to do so. Reclamation anticipates placing provisions in the Tribe's repayment contract whereby the DWCD would coordinate with the Tribe on any activities to be performed on the reservation.
Regional Environmental Officer  
USDI, Bureau of Reclamation  
123 South State Street  
P.O. Box 11568  
Salt Lake City, Utah 84147

RE: Draft Supplement to the Final Environmental Statement-Dolores Project, Montezuma and Dolores Counties, Colorado.

Dear Sir:

Thank you for the opportunity to review the Draft Supplement to the Final Environmental Statement-Dolores Project, Montezuma and Dolores Counties, Colorado. The Soil Conservation Service has provided comments on earlier drafts of this document. Most of our concerns were addressed at that time.

The following additional comments are provided for your use:

(1) The title page should show that Montezuma and Dolores Counties are in Colorado not Utah.

(2) Page 10. Agricultural Stabilization and Conservation Service.

We suggest replacing this paragraph with:

"The ASCS has, in the past, provided cost-sharing payments to assist farmers and ranchers in implementing conservation measures on their land from limited funding available through the Agricultural Conservation Program. However, should the USDA salinity control plan be implemented the ASCS will provide cost-share..."
April 13, 1988

Regulatory Section

Mr. Clifford L. Barrett, Regional Director
Bureau of Reclamation
Code UC-730, Post Office Box 11568
Salt Lake City, Utah 84147

Dear Mr. Barrett:

We have completed our review of the Draft Supplement to the Final Environmental Statement for the Dolores Project (DS). Most of the aspects of the project appear to be outside "waters of the United States" and exempt from Corps of Engineers (COE) jurisdiction. We feel, however, that the US information requires some additional clarification and expansion in order for us to be comfortable with that position and determine conclusively that no further COE involvement is warranted.

The following comments present issues that require resolution prior to our determination on whether or not a Department of the Army permit will be required for the project:

1. Page 5-11, paragraph 1 - Has it been specifically determined that all of the wetland losses accrue directly to areas that are supported solely by lateral seepage?

2. Page 9, paragraph 1 and 2 - Will any of the recreational commitments require the placement of fill material in non-irrigation induced wetlands or "waters of the United States"?

3. Page 19, figure 3 - A number of the material source areas are adjacent to natural drainages. Will any naturally occurring wetlands or waterways be impacted at the borrow sites or along borrow transportation routes?

4. Page 22, paragraph 2 - Will the creation and enhancement of wetland mitigation areas require the placement of fill material in naturally occurring wetlands or waterways?

5. Page 25, paragraph 2 - See comment 3.
We have reviewed the document referenced above as requested by Bureau of
Reclamation. We are providing these comments for your inclusion in the
official Department of the Interior response.

The Fish and Wildlife Service (Service) has been active in the Dolores project
and the McElmo Creek portion of the Dolores project since their conception.
We have worked closely with the Bureau of Reclamation (Bureau), Colorado
Division of Wildlife and other state and Federal agencies in making
recommendations for avoiding impacts or mitigating for those which were
unavoidable to fish and wildlife. The Bureau has been very cooperative in
following our recommendations to minimize impacts to fish and wildlife
throughout this project. We recognize that this project is still ongoing and
intend to continue to work closely with the Bureau to minimize wildlife impacts
to the project's conclusion.

Specific Comments

5-7 - Right of Way - We note that the canal right of way will be increased from
50 feet to 200 feet. We suggest that all areas within this right of way not
needed for canal or road be enhanced for wildlife by planting shrubs and grass
species beneficial to wildlife. We also request that spraying be kept to a
minimum in this area to enhance the area for nesting birds and small mammals.

5-8 & 9 - Effects of project modifications on salinity - We note here that
there will be a net increase of 18,650 tons of salt annually added in the
Dolores Area, and ultimately the Colorado River System. Of concern is that
additional habitat will be lost as additional salinity control measures are
instituted to offset this overall increase in salinity.
5-10 - Water quantity and quality - Here it sounds as if the project will have a positive effect by reducing the salt at Imperial Dam by 2.9 mg/l. According to the table on page 5-9 this may be misleading.

Page 66 - Table 29 - The estimated angler use days for McPhee, a 4,470 surface acre reservoir, is 52,000. The estimated angler use days for Dawson Draw is 35,000. It appears unlikely that a 290 acre reservoir developed primarily for waterfowl will be used as a cold water fishery by this many anglers. We believe Dawson Draw reservoir is important because of its wetland value but it should not be justified by cold water angler use as stated here.

Thank you for the opportunity to comment. If you have any questions regarding these comments, please contact Rick Krueger of this office at 8-322-0351 or (303) 243-2778.

cc: FSW/FME: SLC
CDOW: Durango
CDOW: Montrose
BFA (EMT), Washington, DC
Official file
Reading file

RKRUlEGER: cjharris
Dolores

MEMORANDUM

To: Regional Environmental Officer, Bureau of Reclamation, Salt Lake City, Utah
From: Associate Regional Director, Planning and Resource Preservation, Rocky Mountain Region
Subject: Review of Draft Supplement to the Final Environmental Impact Statement, Dolores Project, Montezuma and Dolores Counties, Colorado (DES 83/11)

Following are our comments on the subject draft.

A primary concern is that several significant archeological sites are not indicated on the maps of the proposed project. These include Yucca House National Monument, the Goodman Point and Cutthroat units of Hovenweep National Monument, and the Lowry Ruins (administered by the Bureau of Land Management). These archeological sites are not addressed under either Project Setting or under Cultural Resources. The Rocky Ford Laterals may impact the area around Yucca House and development west of Pleasant View may impact the Goodman Point and Lowry Ruins.

Under threatened and Endangered Species, no mention is made of the peregrine falcon, which nests on the escarpment of Mesa Verde National Park and hunt over the Montezuma Valley. No is there mention of threatened prairie falcon, which is also found in the area. Prairie dogs are quite common throughout the Montezuma Valley; mention of the possibility of the presence of the black-footed ferret seems appropriate.

In the section on Project Setting, no mention is made of Mesa Verde National Park, Hovenweep and Yucca House National Monuments, or the Lowry Ruins. The project, during construction and when completed, will be visible from overlooks in Mesa Verde National Park.

The section on Air Noise Quality (page 55) mentions that Mesa Verde National Park is a Class I area under the Clean Air Act. There should be provisions incorporated into the final project design that will ensure that Class I increment levels will not be exceeded during construction and project implementation.

We appreciated the opportunity to review this document.

Michael Egan

Richard A. Strait
Dear Mr. Barrett:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Region VIII Office of the Environmental Protection Agency has reviewed the Draft Supplement to the Final Environmental Impact Statement for the Dolores Project. EPA appreciates the efforts made by the Bureau to address our comments on the advanced draft of the subject project. While the presentation of the local area cumulative impacts is brief, we recognize the difficulties you encountered with utilizing the planning level of detail information the Soil Conservation Service (SCS) was able to provide. We expect these difficulties will be avoided in the future as better coordination between the Bureau and SCS is developed in the salinity control program.

Our remaining concern is with the level of wetland mitigation portrayed in the Draft Supplement. We met with Bureau staff in September, 1987 and presented our concerns about the mitigation plan which was available at that time. The September plan indicated the Bureau would be mitigating the habitat losses associated with 67.155 acres of lost wetlands with the creation of 24 acres of wetlands. EPA disagreed with this approach because it did not address all wetlands values. As a result of the September meeting, the Bureau agreed to re-evaluate the project impact area to assess whether the project would result in wetland creation which had not been claimed as credit in the wetland analysis. EPA agreed that wetlands created as a result of project operations should be included in the wetland credit analysis. EPA also agreed that the Bureau could mitigate the 155 acres anywhere within the Dolores Project area, not just within the salinity control portion of the project. We also understood that 155 acres was not an extremely large number of wetlands to mitigate for considering the opportunities available within the project area.

The Draft Supplement documents the results of that analysis and indicates there would be 66 acres of wetlands created as a result of project operation. EPA requests that maps which indicates the location and size of these areas be supplied to this office as well as included in the Final EIS for public review. At this time, EPA agrees that the prediction of 66 acres of wetlands being created by project operations is reasonable.

Our remaining concern is with the level of mitigation proposed for the remaining 89 acres of lost wetlands. The Bureau has reanalyzed the initial mitigation site proposed in 1987 and determined that 21 acres could be created through rehabilitation of an existing irrigation ditch and thereby better managing an existing water supply (page 41 of the Draft Supplement). The discussion also indicates the new water management would allow the preservation and enhancement of 54 acres of existing wetlands. EPA does not normally give mitigation credit for preservation and enhancement of existing wetlands. One circumstance under which this is considered is when the wetlands are under a very high risk of elimination and not protected under the authority of the CWA or other wetland protection authorities such as the wetland protection Executive Order (E.O. 11990). We do not believe that to be the case in this situation.

The Draft Supplement indicates the wetlands in the mitigation area would be lost, or reduced in value, under the no Federal action alternative. We request further explanation of why the wetlands would be lost under the no action alternative. The Bureau should document what created the wetlands in the first place (i.e. natural ground water supply, alluvial flow, irrigation ditches, etc.) and what would cause this source to be eliminated under the no-action alternative. Given the present information, and discussions with Bureau staff, EPA must conclude there are between 14 and 68 acres of wetlands remaining to be mitigated to meet the 155 acre goal.

Based on the procedures EPA uses to evaluate the adequacy of the information presented in the Draft EIS and the environmental acceptability of the impacts portrayed for the various alternatives, EPA has rated the Draft Supplement for the Dolores Project EC-2 (Environmental Concerns - Insufficient Information). The EPA is concerned with the potential for the un-mitigated loss of up to 68 acres of wetlands in an area where wetlands are naturally rare and therefore of high value to the environmental system. We have documented above the necessary information which needs to be prepared for the Final Supplement. EPA would appreciate the opportunity to discuss these comments.
with the Bureau and assist in working toward an adequate mitigation plan. Please contact Dave Ruiter of my staff at FTS 564-1830 (commercial (303) 283 1830) should you need further explanation of our comments.

Sincerely,

Robert R. DeSpain, Chief Environmental Policy Branch Office of Policy and Management

Dear Mr. Barrett:

We have reviewed the Draft Supplement to the Final Environmental Statement - Dolores Project, Colorado and offer the following comments.

Page S-3, first paragraph, fourth sentence: The USBR report "1987 Joint Evaluation of Salinity Control Programs in the Colorado River Basin" November 1987, reports the current level of salt removal to be 140,000 tons per year. This discrepancy should be cleared up.

Page S-3, last sentence and S-4 continuation: The report should make reference to P.L. 98-559 which authorized USDA's Colorado River Salinity Control (CRSC) Program.

Page S-4, second sentence: The SCS plan is the recommended plan.

Page S-8, last paragraph, fifth line: The 1987 Evaluation Report shows a cost effectiveness of $827/ton. This difference in the two USBR reports should be resolved.

Page S-8, Table A: Cost effectiveness, same as above.

Page 12, last paragraph: This paragraph should be rewritten as follows:

"In response to the Federal Water Pollution Control Act and its 1972 amendments, P.L. 92-500, the seven Colorado River Basin States, acting through the Colorado River Basin Salinity Control Forum, developed numeric criteria and plan of implementation for salinity control. The individual states adopted, in 1975, water quality standards for salinity. The Environmental Protection Agency approved the state adopted standards. Pursuant to Section 303(c)(3) of the Clean Water Act, the Basin states reviewed the standards in 1978, 1981, 1984, and 1987. The 1987 review is in progress. EPA has approved the three earlier reviews. The numeric criteria...

Page 13, third line: The 126,000 tons currently being removed should be 140,800 tons, as per the 1987 joint evaluation report.

Sincerely yours,

Dennis B. Underwood
Executive Director
May 31, 1988

Mr. Clifford I. Barrett, Regional Director
U.S. Department of the Interior
Bureau of Reclamation
Upper Colorado Regional Office
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Cliff:

We have reviewed the "Draft Supplement to the Final Environmental Statement for the Dolores Project". Enclosed herein are our comments on that report. Most of the comments are editorial in nature. However, I would call your attention specifically to points 2, 3 and 8.

The Colorado Water Conservation Board is very appreciative of the help and cooperation Reclamation has provided on the Dolores Project. With the inclusion of the attached comments, we feel that the Draft Supplement to the Final Environmental Statement for the Dolores Project fairly presents the project modifications, impacts, and concerns and would urge its approval.

Thank you for your consideration of these comments.

Sincerely,

J. William McDonald
Director

Enclosure

cc: Ken Beck
John Porter, Dolores Water Conservancy District
Les Nunn, Montezuma Valley Irrigation Company

Comments of the Colorado Water Conservation Board on the Dolores Project
Draft Supplement to the Final Environmental Statement
May, 1988

1. Page S-5, paragraph 4. The report implies that the minimum releases are 25 cfs in a dry year, 50 cfs in a normal year, and 75 cfs in a wet year. This paragraph needs to be clarified so that the turbine design capacities do not imply that the minimum bypass requirements are the same. The minimum bypasses are 20 cfs in a dry, 50 cfs in a normal, and 78 cfs in a wet year.

2. Page S-7, "Project Modifications". The report notes that 215 acres of land were acquired as mitigation for riparian and wetland losses resulting from the project. Of this 215 acres, the U.S. Fish and Wildlife Service recommended that 24 acres be developed as wetland habitat to compensate for wetland habitat losses. However, Reclamation, through coordination with EPA, USF&W, and the CDOW, developed a 75 acre plan to offset the losses. This plan is explained in further detail on pages 38 to 41 of the supplement.

We feel that the addition of more of the narrative from pages 38 through 41 to the summary on page S-7 would clarify that 215 acres of heavily grazed riparian habitat were purchased to offset the loss of 155 acres of wetlands under a worst case scenario. Furthermore, out of the 215
acres purchased. 75 acre were included in a management plan that develops 21 acres of new wetlands and enhances 54 acres of riparian habitat into quality wetlands.

This is a significant improvement over the 24 acres of wetlands required by the USFWS using the HEF procedure to off set the 155 acre loss. Thus, while one does not get the acre for acre replacement EPA requested, one does get a significant improvement in the quality of wetlands and the further ability to manage those wetlands acquired through mitigation. We feel that these positive aspects need recognition.

3. Page S-8, "Administration". The Dolores Water Conservancy District (DWCD) will administer the entire Towaoc Canal. However, it is our understanding that there will be subcontracting agreements between DWCD and the Montezuma Valley Irrigation Company (MVIC) and between DWCD and the Ute Mountain Utes (Utes), although those are not yet finalized. We would suggest that you update this point in the "Administration" on S-8 and in the "Issues and Implementation" section on S-15.

4. Page S-11, "Fish and Wildlife". In the last paragraph the report states that 4.6 miles of the Towaoc Canal will be lined and will present dangers to elk and deer. We suggest that wording be added to clarify that the 4.6 miles are concrete lined and that this mileage is in two segments, rather than one continuous segment.

5. Page S-11, "Floodplains and Wetlands". The comments made under point 2 herein are appropriate here as well.

6. Page S-11, "Fish". The report states that Totten Reservoir will serve no irrigation purpose to MVIC (upon completion of the project it should be added), but that 800 acre feet of project water will be available to maintain water quality and sustain the fishery. We feel a comment would be appropriate here as to whether or not all 800 acre feet of project water must go to Totten Reservoir annually or whether part might be available for the same purpose at other sites if Totten doesn't require all of it.

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8. Page S-14, "Issue and Implementation". McElmo Canyon water users are concerned about reductions in stream flows resulting from decreases in return flows. Reclamation should point out that a monitoring system will be in place to help assure that flows in McElmo Creek are not
The cumulative impacts of the USBR and SCS projects should be included in the summary.

10. Mitigation measures for USBR and SCS salinity activities have remained separate and apart from each other. This must continue to be the practice, both here and in future salinity projects.

If the primary use and management of Totten will be as a fishery, the CDOW should have a hand in its management. Pages S-11 and S-14 imply that MVIC would have sole management authority. If the reservoir will be managed as a fishery, what uses will be made by "...local water use entities..." that are consistent with fisheries management?

There is also some question as to the adequacy of 800 acre-feet to stabilize Totten. In the FEIS, it was stated that Totten would be stabilized. If the 800 acre-feet proves to be inadequate, will other water be made available?

Another concern is the reliability of funding for MVIC under salinity control legislation. If this source of funds is not available, will another source be used to replace it?

We are also concerned that the proposed heavy metal studies, which will include Totten, may show a need for more than 800 AF of relatively uncontaminated water. More water should be held for use in Totten in the event that it becomes necessary.

2. Right-of-Way Plantings

The increase in width of the rights-of-way provides an opportunity for greater acreage to be planted as wildlife habitat. Page A-27 of the FEIS indicates that all of the canal banks would be vegetated as wildlife habitat. We would request that all of the rights-of-way not needed for roads and other necessary maintenance structures be planted and managed as wildlife habitat. The CDOW would like to be involved in planning the types of vegetation used and management of the rights-of-way.

There is also a need for further consultation with BOR on the locations and types of fences used along the canals. We are concerned that improper fencing could cause unacceptable big game mortality.
3. Increase in Design Capacity of Powerplant at McPhee Dam and Remote Control Release System

We have been assured by the local BOR office that these changes will not lead to rapid fluctuations in releases from McPhee Dam, and would like to take this opportunity to formally express this concern. Rapid fluctuations could cause mortality to eggs, fry, and adults of fish in the Dolores River below the dam.

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Page 21 states that one wildlife escape structure per mile would be built on the concrete-lined portions of the canals. During our site visit on 11 December 1987, we agreed to the construction of one structure near the middle of Reach I and a structure at each end of this reach. Page 21 implies that a safety net or cage would be the only structure at the siphon inlet.

On page 40, the word "or" in the second sentence of the second paragraph should be "and" to reflect the agreement of 11 December. Our understanding is that fencing, escape structures, and crossovers would be used as needed in all combinations.

5. Active Bald Eagle Nests

The only active bald eagle nest in the vicinity is outside the affected area. The nest near Totten Reservoir was abandoned about 4 years ago. The golden eagle nest tree on the Hermana lateral has fallen and is no longer in use.

6. Ute Mountain Utes - Fish and Wildlife Enhancement

The CDOW would be available for consultation with the tribe in developing its plan for use of the 800 AF of water for wildlife purposes.

Thank you for the opportunity to comment on this document. The CDOW hopes that the cooperative spirit in which issues have been resolved in the past can continue.

Sincerely,
Gary V. Skiba
Habitat Biologist

xc: Bob Clark
Mike Zgainer
Mike Reid

---

Mr. Clifford I. Barrett
Regional Director
Upper Colorado Regional Office
Bureau of Reclamation
P.O. Box 11568
Salt Lake City, Utah 84147

Re: Comments on Dolores Project Supplemental EIS

Dear Mr. Barrett:

On behalf of the Ute Mountain Ute Tribe I would like to thank you for the effort that you and your staff have expended in preparing this supplemental EIS to describe the Towaoc Canal. The canal is the major facility to deliver water to the Ute Mountain Reservation and is of great interest to the Tribe. The completion of the EIS is one more step in the process of constructing the canal so that the Tribe can develop an agricultural economy on the reservation.

We have very few comments on the EIS. The main comment is on pages 5-8, 28, 82, and 85 where the report states that the Tribe has agreed to have the Dolores Water Conservancy District administer the entire Towaoc Canal and has agreed to an allocation procedure for operation and maintenance costs. The Tribe may eventually agree to both items, but at the present time the items are still under discussion. It is premature to say that the Tribe has agreed to any details relating to the administration and separation of costs for the Towaoc Canal.

Once again, we appreciate the effort that the Bureau of Reclamation is expending to deliver water to the Ute Mountain Reservation.

Sincerely,

Ernest House, Sr.
Tribal Chairman

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Chief Jack House, Last Traditional Chief 1886-1972

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MEMORANDUM FOR: David Cottingham
Ecology and Environmental Conservation Office
Office of the Chief Scientist

FROM: Rear Admiral Wesley V. Hull, NOAA
Director, Charting and Geodetic Services

SUBJECT: Control Number 802391 - Draft Supplement Final Environmental Statement, Dolores Project, Colorado

The subject statement has been reviewed within the areas of Charting and Geodetic Services' (C&GS) responsibility and expertise and in terms of the impact of the proposed actions on C&GS activities and projects.

Geodetic control survey monuments are located in the proposed project area. Specifically, four first order horizontal control stations, DOLORES (Quad 371083), YELLOW JACKET, SPARGO, and Baird (Quad 371084) are located in the project area. In addition, there is a monumented level line, COLORADO #31, extending from Dolores, Colorado, to Monticello, Utah.

If there are any planned activities which will disturb or destroy these monuments, C&GS requires not less than 90 days' notification in advance of such activities in order to plan for their relocation. C&GS recommends that funding for this project include the cost of any relocation required for C&GS monuments.

For further information about these monuments, please contact the National Geodetic Information Branch, N/CN17, Rockwall Bldg., Room 20, National Geodetic Survey, NOAA, Rockville, Maryland 20852, telephone (301) 443-8631.

Attachments
Geodetic Control Station Descriptions

cc: ES - Gooding
N/CN17 - Spencer

Mr. Wayne O. Deason (ref: Number 735)
Director, Office of Environmental Affairs
Bureau of Reclamation
United States Department of Interior
Washington, D. C. 20240

Mr. Richard S. Cohen (Information Only)
NOAA, RC
325 Broadway
Boulder, Colorado 80303
2. U. S. DEPARTMENT OF COMMERCE

MAST AND GEODETIC SURVEY

Second-order leveling

COLORADO, COLORADO, TO MONTICELLO, UTAH

Standard (adjusted) elevations based on the Sea-level Datum of 1929.

This line follows Colorado State Highway 147 from Delores to the junction of U.S. Highway 160 near Lewis, Colorado; U.S. Highway 160, from Lewis through Gunnison and Dove Creek to Delores, Colorado, to the Colorado-Utah state line at 9.5 miles southwest of Dove Creek. This line is 115 miles long. The mile markers are of the concrete pole type, set in the top of a concrete post.

As of the ancient time, it was reported in February 1940 that the bridge over Delores River is approximately 100 feet south of where the bridge at another time was.

150 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "150," 1930, is set in the top of the concrete post.

151 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "151," 1930, is set in the top of the concrete post.

152 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "152," 1930, is set in the top of the concrete post.

153 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "153," 1930, is set in the top of the concrete post.

154 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "154," 1930, is set in the top of the concrete post.

155 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "155," 1930, is set in the top of the concrete post.

156 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "156," 1930, is set in the top of the concrete post.

157 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "157," 1930, is set in the top of the concrete post.

158 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "158," 1930, is set in the top of the concrete post.

159 -- 1 mile west along State Highway 147 from the high school at Delores, Colorado, to the junction of State Highway 147, at the old bridge over Delores River, in the center of the town, 0.5 miles west of the intersection of Delores Road, 120 feet east of the summit of the high school, 1.5 miles north of the centerline of the highway, 1.6 feet southwest of a telephone pole, and 1 foot east of the centerline of the highway, 1.6 feet south of a fence. A standard disk, stamped "159," 1930, is set in the top of the concrete post.
HORIZONTAL CONTROL DATA

by the
Coast and Geodetic Survey
ROCHESTER N.Y.

DOLORES (Montezuma County, Colo., 1936)—Station is located 1 mile NNW of Dolores, 10 1/2 miles NNW of Cortez (air line) in T 15 N, R 37 W. On a flat-topped mesa 50 yards N of the 3 mile and 1/4 mile W of the E edge of the mesa, which is about 1000 feet higher than the town of Dolores.

All marks are standard tablets set in concrete in 4-inch soil pits.

Asimuth is 120 yards WW of town and end of small ridge.

Reached from the post office in Dolores as follows: Go E on east Highways 145 and 147 for 0.7 mile and take left fork, High-
y 147, go 1.2 miles to a gate on left side of road and turn left through gate, go 0.25 mile and take left fork, go 0.05 mile d take right fork, go 0.2 mile and take left fork which runs 5 d parallel wire fence, go 0.3 mile to a fence corner and turn right through fence, go 0.4 mile to top of knoll, turn left again and go 0.25 mile to foot of road and end of truck area. From here climb uphill 350 about 1/4 mile to top of mesa station as described above.

OBJECT DISTANCE DIRECTION
MEMORIE 13.500 0°00'000'
R.M.Ro.1 (*) 13.500 138 54 48
R.M.Ro.2 (*) 14.967 241 13 47

Montezuma County Colo., (C.F. 1936) J. Harris, Western Goe. Co. 1936

recovered in good condition.

RECOVERY NOTE TRIANGULATION STATION

DOLORES

USGS 1936 State COLORADO bench mark plan

AND DIRECTION FROM NEAREST CORNER 1 mile NNW of Dolores

1. A copy of the original description, including marks listed, has been returned and other pertinent data recovered. Revised description: Post Office in Dolores, 0.4 mile ey 145 thence 1.7 mi. north along the Dolores-Worwood Road #526 road west. Turn left (west) thru gate and follow main traveled road to fence. Continue 0.8 mi SW on road to point in saddle between lls. Pack from this point 3E up hill and station at previously Station mark is also about 150 feet NW of a wire fence that e top of the hill. It is on land owned by Mr. W. H. Veasey in lorado.

RECOVERY NOTE TRIANGULATION STATION

DOL.033 1936 State COLORADO bench mark plan

USGS 1965 County Montezuma

AND DIRECTION FROM NEAREST CORNER 1 mile NNW of Dolores

1. A copy of the original description, including marks listed, has been returned and other pertinent data recovered. Revised description: Post Office in Dolores, 0.4 mile ey 145 thence 1.7 mi. north along the Dolores-Worwood Road #526 road west. Turn left (west) thru gate and follow main traveled road to fence. Continue 0.8 mi SW on road to point in saddle between lls. Pack from this point 3E up hill and station at previously Station mark is also about 150 feet NW of a wire fence that e top of the hill. It is on land owned by Mr. W. H. Veasey in lorado.

ADJUSTED HORIZONTAL CONTROL DATA

STATE Colorado LOCALITY South Ute Indian Reservation

First order Triangulation SOURCE 0-0521

COORDINATES (Fund) PLAN COORDINATE (Fund) STATE MARK

STATE COLORADO COLO-3

LONGITUDE 109°30' TO 109°00'

DIAGRAM RJ 12-9 CORTEZ
HORIZONTAL CONTROL DATA
by the
Coast and Geodetic Survey
WASHINGTON D.C.

BAIRD (Dolores County, Colo., C.P., 1936)--Station is located
line between Secs. 8 & 9, T 46 N, R 17 W, about 34 mile N of
Dolores National Forest Boundary Line, and about 1 mile S
and 3/4 mile E of Dove Creek post office, and about 6 miles E
and 1 mile S of the Baird water reservoir. On a low oak brush
dotted ridge just W of the Dolores River. There is a higher and
dense-covered ridge to the N, but station is located 1/2 mile S
of low ridge at the edge of the tall pine timber.
Station, reference and azimuth marks are standard bronze
embedded in drill holes in outcropping basalt.
Azimuth mark is 0.4 mile N and 10 yards W of road near a
spruce tree.
Reached from Dove Creek on U.S. Highway 160 as follows: from
Binton garage in Dove Creek go E on U.S. Highway 160 for 0.8 mile
to a fork and a large gravel pile on the N side of the highway; leave U.S.
Highway 160 here and take left fork and follow graded
dirt road for 2.3 miles to a fork, take left fork and follow
graded dirt road N6° and easterly for 4.3 miles to Forest Boundary
Line and Baird reservoir, continue on unimproved road around reser-
voir, and for 0.13 mile to three road fork, continue straight
ahead on middle fork (main-traveled road) E and S through timber
for 2.1 miles to station.

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<th>OBJECT</th>
<th>DISTANCE</th>
<th>DIRECTION</th>
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<tr>
<td>YJ96.01</td>
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<td>121 58 16</td>
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<td>YJ98.02</td>
<td>4.306</td>
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(1) (Dolores County, Colo., C.P., 1936; J. Harris, Western Geol. Co. 1954)

STATE Colorado LOCALITY South Ute Indian Reservation

<table>
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<th>COORDINATE</th>
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<th>ELEVATION</th>
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<tr>
<td>COO 1</td>
<td>1,061,081.19</td>
<td>170° 21' 05&quot;</td>
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<td>COO 0503</td>
<td>408,326.07</td>
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ADJUSTED HORIZONTAL CONTROL DATA

STATE: Colorado
LOCALITY: South Ute Indian Reservation

First-order triangulation
SOURCE: 0-6581

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<td>TARO</td>
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<td>PARK POINT 2 USGS</td>
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AZIMUTH MARK

STATE Colorado LOCALITY South Ute Indian Reservation

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<tr>
<td>COO 1</td>
<td>168 21 32.8</td>
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FILE COPY

BEST COPY AVAILABLE
### Horizontal Control Data

**Location**: Mantezuma County, G.C., C.P., 100.01 - Station is about 1 mile, N of the settlement of Mantezuma, about 3 miles E of the settlement of Mancos, and about 1 mile N of the town of Mancos. Station is located on the top of a low flat-topped hill. In the field, 30 ft. 4 in. N, 145° 35' 19" W, and 18 ft. 11 in. above road level.

**Notes**: South, groundwater, and reference marks are standard concrete or concrete as described in notes in. To and line. A bench mark is located about 1 mile E of station, along road. A. 10 ft. on left side (E) of road and about 15 ft. N from center of road.

**Object** | **Distance** | **Direction** |
--- | --- | --- |
**Point** | meters | |
Steel Church (AZ, O.M.) | 1 | 151.90 |
Break (CE) | 275.30 | 198.15 |
Az. N. (SE) | 5503.89.7 |
| R. 79.0 S. (NB) | 26.10 | |

All objects observed from a 10-foot tower.

---

**Altitude Mark**

<table>
<thead>
<tr>
<th>Land</th>
<th>Reference Point or District</th>
</tr>
</thead>
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</table>

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**Best Copy Available**
### Horizontal Control Data

#### By the
Coast and Geodetic Survey
WASHINGTON D.C.

**Yellow Jacket** (Montezuma County, Colo., C.P., 1936)—Station is located 2 miles E of Yellow Jacket post office, 2 1/2 miles SSE of Acumen post office, and 15 1/2 miles NNW of Cortez (air-line distance) near the SW corner of Sec. 20, T. 35 N., R. 17 W., on top of a rise near the SE corner of sagebrush covered field which is fenced in, 100.0 meters E of the center line of a N and S county road, 17.4 meters E of the W right-of-way fence, 2.4 meters N of the E right-of-way fence of same road, 66 meters E of the center line of a W and N county road, and 56 meters N of the E right-of-way fence of this road.

Surface, reference and azimuth marks are standard disks set in concrete in 4-inch cast iron soil pipe.

Underground marks are standard disk set in concrete. Azimuth is 970 faces S, 50 feet E of center line of road, 5 feet E of W right-of-way fence of same road.

Reached from Cortez as follows: go N on U.S. Highway 160 for 17.6 miles to Yellow Jacket post office and leave by going straight ahead where highway turns N, go 2.0 miles on graded dirt road to cross roads and turn right N on fenced right-of-way for county road, go 0.05 mile to top of rise and station 2.4 meters E of right-of-way fence on right.

<table>
<thead>
<tr>
<th>OBJECT</th>
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<th>DIRECTION</th>
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</thead>
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<tr>
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<td>A.W.</td>
<td>44 22 04</td>
<td></td>
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<tr>
<td>B.W. No. 1 (W)</td>
<td>17.132</td>
<td>136 46 21</td>
</tr>
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#### Azimuth Mark

- **NR, 65**

#### Best Copy Available

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### Adjusted Horizontal Control Data

**Name of Station**: YELLOWJACKET

**State**: Colorado

**Locality**: South Ute Indian Reservation

**First Order Triangulation Source**: G-521

**Field Work**: Col., 3.4.1

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<tr>
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<th>Plate Sources</th>
<th>W.A.C.</th>
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<td>S</td>
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<td>33° 92.60</td>
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**Mark**: AZ MK

**State**: L

**Zone**: S

**Code**: 359.3

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<th>STATE</th>
<th>COLO</th>
<th>ZONE</th>
<th>CODE</th>
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</thead>
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<td>359.3</td>
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<tr>
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<td>FIRST-ORDER</td>
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<td>Raine</td>
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<td>4.347 6934</td>
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<td>Colores</td>
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<td>Park Point</td>
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<td>4.580 2666</td>
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**Azimuth Mark**: N R, 65
March 28, 1988

Mr. Wayne Deason
Director, Office of Environmental Affairs
U.S. Department of the Interior
Bureau of Reclamation
Washington, D.C. 20240

Dear Mr. Deason:

This is in response to your letter of March 2, 1988, requesting comments on the Draft Supplement to the Final Environmental Statement (DSFES) on the Dolores Project, Colorado.

Your DSFES has been reviewed with consideration for the areas of responsibility assigned to the Department of Housing and Urban Development (HUD). This review considered the project's impacts on housing and community development.

The DSFES indicates that the project area has a surplus of housing and an adequate capacity for urban services to absorb the short term impacts from employment activity generated by this project. Water quality (salinity control) and water conservation are positive benefits from the project. We also note the additional benefit of the availability of 800 acre feet of water annually to the Ute Mountain Ute Tribe for fish and wildlife enhancement and irrigation laterals on the reservation. Based on this assessment, we find this document adequate for our purposes.

If we may be of further assistance, please contact Mr. Howard Kutzer, Regional Environmental Officer, at FTS 564-3102.

Very sincerely yours,

Robert J. Matuschek
Director
Office of Community Planning and Development

April 14, 1988

Memorandum

To: Director, Office of Environmental Affairs, Bureau of Reclamation
From: Director, Bureau of Mines
Subject: Draft Supplement to the Final Environmental Statement, Dolores Project, Colorado

The Bureau of Mines has reviewed the draft supplement to the final environmental statement to determine whether mineral resources are adequately considered. The document describes impacts that would result from proposed salinity control modifications and from changing the alignment of the Towaoc Canal. As expressed in the document, the only known mineral resources impacted by the modified project would be those used as construction materials, such as gravels used for road base and canal lining protection and lean clays required for earth-lined sections of the Towaoc Canal. Mineral resources appear to be adequately considered, and we have no objection to the modified proposed project or to the document as written.

Director

bcc: File:Assoc Dir., I&A
Director's RF (2)
Chief, IFOC
REO, Utah
H. Enzer
B. Pavlovich
M. Gloster (2)
WBM:JGerscisan 4-19-88

174
United States Department of the Interior
GEOLOGICAL SURVEY

Water Resources Division
P. O. Box 2027
Grand Junction, CO 81502

March 17, 1988

MEMORANDUM

To: Regional Director, Bureau of Reclamation, Code UC-730,
P. O. Box 11568, Salt Lake City, Utah 84147

From: Subdistrict Chief, U.S. Geological Survey, Water Resources Division
Colorado District, West Slope Subdistrict, Grand Junction, CO

Subject: Review of Draft Supplement to the Final Environmental Statement, Dolores Project, Colorado.

Dave Butler and I have reviewed the parts of the subject report dealing with surface-water quantity and quality and the short section on hydrology and have no comment. We have no hydrologic data available at your selected locations to verify quantity and quality figures used in this draft.

Dannie L. Collins
Subdistrict Chief

Enclosure
Mr. Clifford I. Barrett
Regional Director
Bureau of Reclamation
Code UC-730
P. O. Box 11568
Salt Lake City, Utah 84147

SUBJECT: Dolores Project, Colorado
Draft Supplement to Final Environmental Statement

Dear Mr. Barrett:

The Colorado State Clearinghouse has received the above-referenced Draft Supplement Environmental Statement and has notified interested state agencies. No comments have been received as of this date. However, should there be any late comments, we'll forward them to you for your information.

Thank you for the opportunity to review this matter.

Sincerely,

Val Tungseth, Staff Assistant
Colorado State Clearinghouse