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Dolores Project Colorado

FINAL SUPPLEMENT TO THE FINAL ENVIRONMENTAL STATEMENT

FINAL SUPPLEMENT TO THE
FINAL ENVIRONMENTAL STATEMENT

DOLORES PROJECT

MONTEZUMA AND DOLORES COUNTIES, COLORADO

Prepared by

U.S. Department of the Interior
Bureau of Reclamation
Upper Colorado Region
Salt Lake City, Utah

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 11568, Salt Lake City, Utah 84147, 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:



McPhee Reservoir



UNITED STATES DEPARTMENT OF THE INTERIOR



BUREAU OF RECLAMATION

Introduction

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 Towaoc, 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 16,510 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 Towaoc 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 1502.9(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 88-206, Clean Air Act; Public Law 93-205, Endangered Species Act, as amended; Public Law 85-624, Fish and Wildlife Coordination Act; Public Law 89-665, 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.

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 filed 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 MVIC 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 use. 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 607 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 States^{1/} 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).

Summary Table 1
Numeric criteria for the
Lower Colorado River

Station	Annual flow-weighted concentration (mg/L)
Below Hoover Dam	723
Below Parker Dam	747
At Imperial Dam	879

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 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.

In the McElmo Creek area, salt loading primarily results from conveyance seepage in the MWIC 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 MWIC facilities. In recent years, however, a reevaluation of the Towaoc Canal alignment has identified several factors, in addition to achieving salinity control benefits, that favor a rerouting 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 7,500 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 DWCD 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 Monument Creek Dam and Reservoir and 7.2 miles of 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 DWCD has agreed to construct these two features 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, was

much higher than any other land in that block, Reclamation determined that a separate booster pumping plant for that area, the Delivery 23.0 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.

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 990 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 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 would allow monitoring and remote controlling 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.

Alternatives

Reclamation considered one viable alternative and a 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 were needed.
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 electro-dialysis.

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.

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 8.8 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.

Rights-of-Way

Rights-of-way for the Lone Pine and Upper Hermana Laterals, currently 50 feet in width, would be widened to 200 feet. The MVIC would be responsible for acquiring the rights-of-way for these two canal sections and the Rocky Ford Pipe Laterals. Reclamation would acquire a

250-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 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 detailing the responsibilities of the company for the proper operation and maintenance of all salinity control features, except the Towaoc Canal.

Administration

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. The Bureau of Land Management would develop and administer 474 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 MVIC operations.

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, 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 MVIC area. An analysis made since completion of the 1977 Definite Plan Report reveals that 40,570 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 50,650 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 18,650 tons of salt per year, as shown in Summary Table 2.

Summary Table 2
Effects of project modifications on salinity
(Unit--tons of salt)

	Salt loading		Effects of project modifications on proposed plan	Salt loading
	as presented in 1977 FES	Revised salt loading for 1977 FES plan ^{1/}		
Dolores Project area-- project land and canals	+10,080	+43,150	0	+43,150
Towaoc Canal--west alignment	2/0	+ 7,500	-7,500	0
Salinity control features	3/0	3/0	4/-24,500	4/-24,500
Total project effect	+10,080	+50,650	-32,000	+18,650

^{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 McElmo 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 McElmo 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.

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 in 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 Towaoc 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 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

SUMMARY (Continued)

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 Hermosa 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 DWCD, 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.

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 1985, some of the project full service irrigators representing ownership of approximately 15 percent of the land 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. 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. In November 1986, 17 claimants filed a tort claim against the United States; the claim was denied in June 1987. In August 1987, the claimants filed a lawsuit, which is pending in District Court, against the Dolores Water Conservancy District to rescind the petitions and to collect an undisclosed amount of damages.

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-purpose municipal and industrial features--the Monument Creek Reservoir and the pipeline from McPhee Reservoir to Cortez--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, 1986, 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.

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 (Weeminuchi 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.

SUMMARY (Continued)

Summary Table 3
Short- and long-term effects
resulting from project modifications

Resource	Short-term effects	Long-term effects	Relationship of short-term use of environment and long-term productivity
Local economy	Yes	No	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 1994.
Housing	Yes	No	During construction, a reduction would occur in the number of vacancies.
Population	Yes	No	Construction workers and their families would offset an expected decline in population.
Services	No	No	Local services would have sufficient capacity to deal with the effects of construction.
Energy	Yes	No	The energy for vehicles and machinery would be a short-term commitment of resources.
Scenery	Yes	No	Over the short term, construction activities would detract from scenery.
Air and noise	Yes	No	Emissions and dust from construction equipment would have a short-term effect on these qualities.
Water	No	Yes	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.
Vegetation	Yes	Yes	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 offset this loss.
Wildlife	Yes	Yes	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.
Fish	No	Yes	The project modifications would have a stabilizing effect on Narraguinnep and Totten Reservoirs. The water supply for Totten Reservoir would ensure its continuing as a fishery.
Endangered species	No	No	The Fish and Wildlife Service's Biological Opinion states that the project modification would not likely jeopardize the Colorado squawfish or the bald eagle.
Recreation	Yes	Yes	Construction would have a negative impact on the use of laterals and ditches. Stabilizing of Narraguinnep Reservoir and water supply for Totten Reservoir would be positive effects.
Cultural resources	Yes	Yes	Significant cultural resources have been located within potentially disturbed areas. These resources would be mitigated through survey recording, excavation, and avoidance, where possible.

SUMMARY (Continued)

CONTENTS

Summary Table 4
Comparison of alternative plans

	Existing condition	Alternatives	
		No action	Proposed plan
Canal lining (miles)		NC ^{1/}	2/+34.3
Buried pipe laterals (miles)		NC	+7.0
Permanent rights-of-way (acres)			
Private land (Federal acquisition)		NC	+1,410.5
Private land (MVIC acquisition)	161	NC	+297.2
Wildlife habitat (acres)			
Upland	125,534	NC	125,548
Wetland ^{2/}	10,310	NC	10,296
Impact to fisheries	NC	NC	NC
Impact to endangered species	NC	NC	NC
Cultural resources present	129	129	129
Salt loading reduction (tons)		NC ^{4/}	5/24,500
Net effect on salt loading (tons) ^{5/}			+18,650
Seepage reduction (acre-feet)	NC	NC	7,900
Irrigation systems			
Improved system	No	No	Yes
Automated delivery system	No	No	Yes
Sprinkler pressure	No	No	Yes
Employment (direct--person years)	NC	NC	215
Construction costs (1987 prices in millions)			\$23.168
Increase in annual operation, maintenance and replacement costs ^{7/}	NC	NC	91,400
Cost effectiveness per ton of salt removed (\$/ton) ^{8/}			83

1/ NC = No significant change.
 2/ Pluses 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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PURPOSE AND NEED

Purpose and Authority

The purpose of this Draft Supplement to the Final Environmental Statement is to provide additional National Environmental Policy Act (NEPA) compliance by describing the environmental impacts that would occur from the proposed modifications of combining salinity control as a purpose to the Dolores Project, Colorado, and changing the alignment of the Towaoc Canal from the west to the east of Cortez. The Final Environmental Statement (FES) was filed with the Council on Environmental Quality on May 9, 1977 (FES 77-12). A Finding of No Significant Impact (FONSI) on the addition of two hydroelectric powerplants to the project, one at the McPhee Dam and one on the Towaoc Canal, was approved on May 11, 1981.

The salinity control modifications in the present plan would include lining sections of the Lone Pine and Upper Hermosa irrigation laterals in the Montezuma Valley Irrigation Company (MVIC) 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 to the east of Cortez; abandoning the MVIC's Lower Hermosa Lateral and Highline Ditch and also including their flows, along with the Ute Mountain Ute 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 (see Frontispiece Map).

This supplement also serves as a public involvement summary report by providing an account of how public input was obtained since the 1977 Dolores Project FES was filed and how this input was used in arriving at decisions affecting the current project (see Chapter IV, "Consultation and Coordination.")

The Dolores Project was authorized for construction by the Colorado River Basin Act of September 30, 1968 (Public Law 90-537) as a participating project under the Colorado River Storage Project (CRSP) Act of April 11, 1956 (Public Law 84-487). The authorization was based on the feasibility report of the Secretary of the Interior sent to the Congress on March 17, 1966, and printed as House Document 412, 89th Congress, 2nd Session. Original salinity control investigations in the Dolores Project area were conducted from 1977 to 1984 under the McElmo Creek Unit of the Colorado River Water Quality Improvement Program (CRWQIP). These planning studies on the McElmo Creek Unit were conducted in accordance with the Colorado River Basin Salinity Control Act of June 24, 1974 (Public Law 93-320) and the Federal Water Pollution Control Act Amendments of October 1972 (Public Law 92-500), as amended by the Clean Water Act of 1977 (Public Law 95-217). Public Law 93-320 originally authorized the unit for study as part of a basinwide program of works for the

enhancement and protection of the quality of water available from the Colorado River. Public Law 98-569 of October 30, 1984, 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 Upper Colorado Regional Office Federal Building 125 South State Street Salt Lake City, Utah 84147	Bureau of Reclamation Washington Office Office of Environmental Affairs Interior Building 18th and C Streets, NW Washington, DC 20240
Bureau of Reclamation Denver Office - Building 67 Denver Federal Center Denver, Colorado 80225	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 1502.9(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 FONSI, 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 85-624, Fish and Wildlife Coordination Act; Public Law 89-665, 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).

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, Pleasant View, 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 Mountain 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 construction, declining to 18,031 in 1985. The compound average 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. Minimal 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.

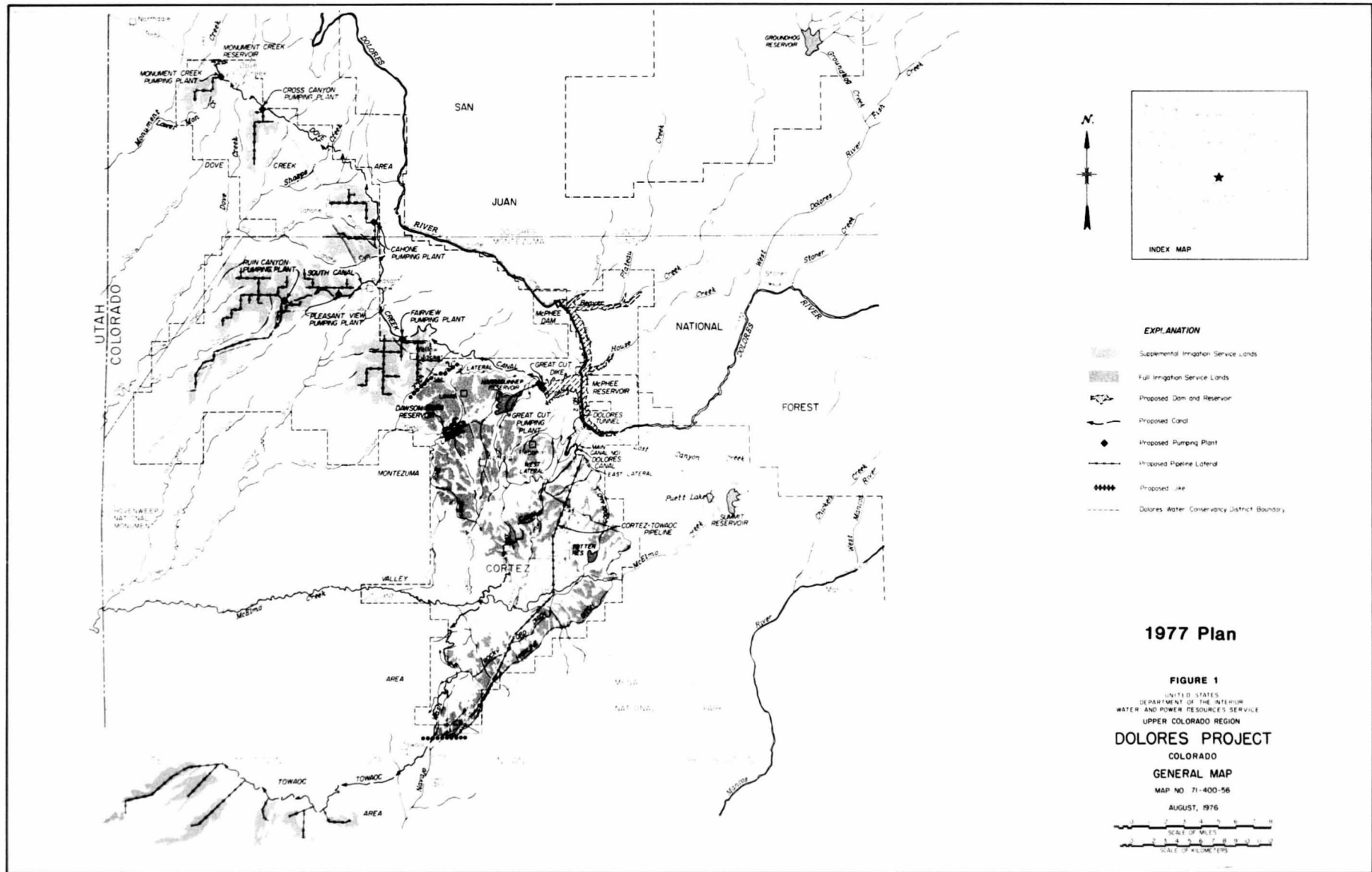
The three areas served by the Dolores Project are Montezuma Valley in the central part of the project area, Dove Creek to the northwest, and Towaoc to the south. Montezuma Valley and Dove Creek are within the boundaries of the Dolores Water Conservancy District (DWCD). The MVIC is the oldest distributor 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.

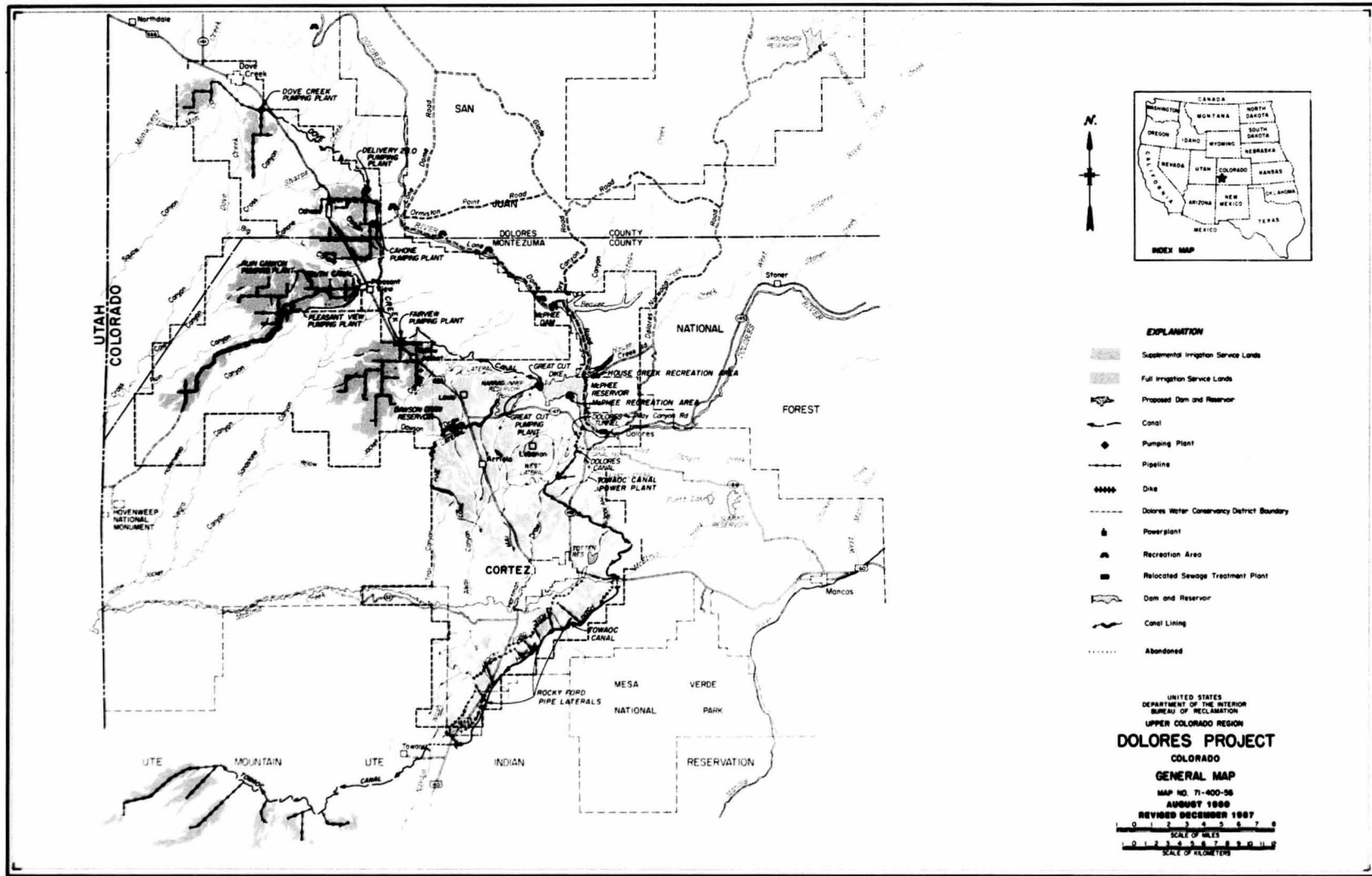
Dolores Project Plan

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, recreational opportunities, 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 FES. 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 "U" 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 Laterals, through the Towaoc Powerplant, 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





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 27,920 acres of full service land in the Dove Creek area and 22,900 acre-feet will be used to irrigate 7,500 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 5,200 acre-feet of M&I water for Cortez, 1,000 acre-feet for Towaoc, 600 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 DWCD will administer project Reclamation and joint-use facilities. 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. 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.

1. In September 1977, the DWCD 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 DWCD 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.

2. 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.
3. 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 23.0 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.

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-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 990 kW to 1,350 kW. 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 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 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

people; Great Cut Dam; Great Cut Pumping Plant, and switchyards; the Dolores sewage treatment plant; the landfill and protective dike 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 Anasazi Heritage Center; McPhee recreation facilities; House Creek, Ormiston, 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 689-acre Bradfield Ranch of which 215 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 1
Proposed schedule for completion of
construction activities

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

^{1/} 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 Canyon 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.

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 25, 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 MVIC off-farm ditches and 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 compatible with local interests. Alternatives proposed by the SCS are described in the USDA report released in January 1983, entitled Onfarm Irrigation Improvements, McElmo Creek Unit Salinity Control Study, Montezuma County, Colorado. The most favorable plan includes on-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 DSCS will provide cost-share assistance to operators for installing salinity control measures using funds available through the USDA's Colorado River Salinity Control Program.

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 MVIC and the DWCD in Cortez, Colorado, and the Ute Mountain Ute Tribe in Towaoc, 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 ActionSalinity controlColorado 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 500 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 Mead in

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-apportioned^{1/} 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 water quality improvement projects, this temporary downward 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

^{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).

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 2
Numeric criteria for the
lower Colorado River

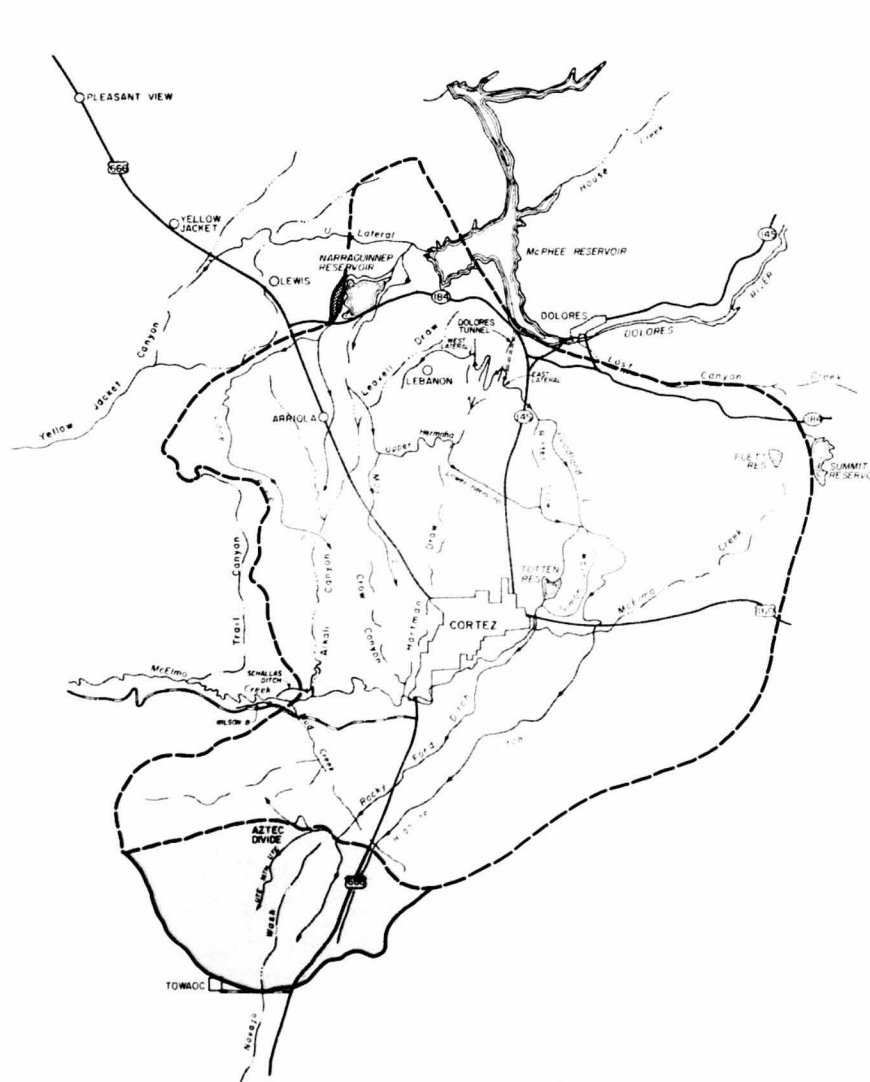
Station	Annual flow-weighted concentration (mg/L)
Below Hoover Dam	723
Below Parker Dam	747
At Imperial Dam	879

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

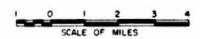
McElmo Creek originates in Montezuma County in southwestern Colorado and flows west into the San Juan River in southeastern Utah. The creek drains a total of 720 square miles. At the Colorado-Utah State line, a gauging station, the last one on McElmo Creek, measures a drainage area of 350 square miles. 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 MVIC that drains into Yellow-jacket Canyon outside the intensive study area, and all of the Navajo Wash area south of Aztec Divide, 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 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. It is estimated that with the Dolores Project in operation, as described in the 1977 FES, 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



EXPLANATION

-  INTENSIVE STUDY AREA BOUNDARY (MCELMO CREEK UNIT)
-  DRAINAGE INTO YELLOW JACKET CANYON
-  DRAINAGE INTO NAVAJO WASH



UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION
 UPPER COLORADO REGION
DOLORES PROJECT
 COLORADO
 SALINITY CONTROL STUDY AREA

MAP NO. 71-406-1863
 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 46.5 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 Hermana 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 Hermana 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 Hermana 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.

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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 1977 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 was 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 MWIC.

A wide range of possible methods for reducing salt loading from the 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. Those plans not passing the four tests are discussed briefly at the end of this chapter.

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 independent of other increments, and each was planned to be a logical and practical part of the delivery system, such as an entire lateral system or a major 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 Hermans Laterals, abandoning the Lower Hermans Lateral and the Highline and Rocky Ford Ditches and combining their flows with the new alignment of the Towaoc Canal, and installing eight buried pipe laterals from the Towaoc 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 Towaoc Canal, and 75 acres of land would be developed as wetland habitat to compensate for wetland habitat losses expected to result from canal lining. Implementing construction 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 Towaoc 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
Irrigation system improvements

Feature	Maximum capacity (cfs)	Length improved (miles)	Tons of salt removed
Open laterals			
Lone Pine Lateral ^{1/}	162	8.8	7,478
Upper Hermana Lateral	110	.5	1,135
Towaoc Canal	420	25.0	3,405
Subtotal		34.3	12,018
Buried pipe laterals			
Rocky Ford Pipe Laterals			
(combined capacity for eight laterals)	93	2/7.0	12,455
Total (rounded)		41.0	24,500

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
Lone Pine Lateral^{1/}

Section number	Maximum Flow (cfs)	Length (miles)
1	162	3.46
2	128-109	2.58
3	71-56	2.77
Total (rounded)		8.80

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.

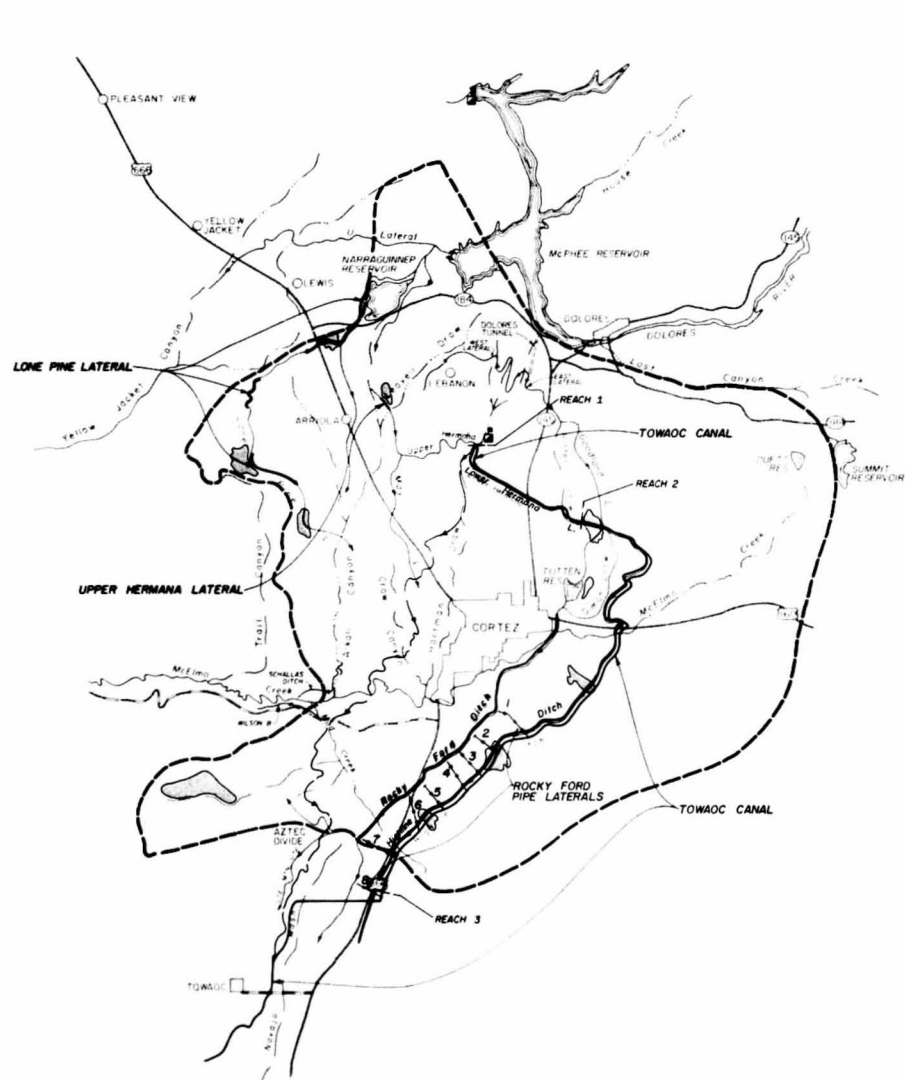
Since the lateral would be earth lined, except for the pipe segment, neither game fencing nor escape ramps would be necessary. Safety nets or cages would be placed over the inlet of the drop structures. No fencing would be installed except to replace existing fences removed during construction or, where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

Upper Hermana Lateral.--Approximately 0.5 mile of the Upper Hermana 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.

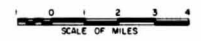
Towaoc Canal.--As noted earlier, a portion of the Towaoc Canal originally proposed in the 1977 FES plan to be located on the west side of Cortez would be replaced by an alternate alignment. The alternate alignment would parallel the existing Lower Hermana Lateral and Highline Ditch in the MVIC system east of Cortez in most cases, 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 Towaoc Powerplant to the end of the existing Lower Hermana Lateral near U.S. Highway 160, and Reach 2, extending from this point to the end of the existing Highline Ditch.^{1/} Flow in the Towaoc Canal would include the supplemental service flows of the Lower Hermana Lateral and Highline Ditch for the MVIC, 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 Towaoc Canal. The Rocky

1/ The 1977 FES referred to four reaches of the Towaoc Canal. Reclamation changed the numbering to three reaches. Reach 3 would extend from near the town of Towaoc at the end of the Highline Ditch to the full service land to the southwest.



EXPLANATION

- INTENSIVE STUDY AREA BOUNDARY (MELMO CREEK UNIT)
- FORMER ALIGNMENT OF TOWAOC CANAL (1977) (Reach 3)
- BEGIN CONSTRUCTION REACHES TOWAOC CANAL
- LINED CANAL AND LATERAL
- PIPELINE
- MATERIAL SOURCE AREAS
- ABANDON LATERAL or DITCH
- POWER PLANT



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
UPPER COLORADO REGION
DOLORES PROJECT
COLORADO
PROJECT MODIFICATIONS

MAP NO. 71-406-1864
MAY 1987

FIGURE 3

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 Hermana Lateral and Highline Ditch, which would be disposed of at individual landowner's discretion. The remainder of the Towaoc Canal below Reach 2 would deliver water as described in the 1977 FES.

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 and distance to 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 CMO turnouts, and 2 pipe chutes. Insufficient data are available to size the individual CMO 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

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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
Rocky Ford pipe laterals

Pipe	Length (miles)	Diameter (inches)	Head- gates served	Initial capacity (cfs)
1	1.40	18	8	9.0
2	.64	15	4	5.0
3	.70	15	4	5.0
4	.91	15	5	6.0
5	.91	18	8	9.0
6	.95	18	7	8.0
7	.84	42	10	29.4
8	.63	33	18	22.0
Total (rounded)	6.98 7.0			

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 all grazing from this acreage by fencing in order to permit natural vegetation to reestablish itself. The entire 689 acres is adjacent to and on both sides of the Dolores River, and grazing on the 474 acres of fish 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.

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.

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. The program, begun in 1987 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 composes 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 Hermans 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 4.6 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 6
Construction materials for canal and lateral lining
(Unit--cubic yards)

	Type of material		
	Earth lining	Gravel	Concrete
Lone Pine Lateral	83,000	14,800	470
Upper Hermans Lateral	5,100	960	70
Towaoc Canal	356,000	205,200	12,190
Total	444,100	220,960	12,730

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 Hermans 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 5.5 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 Hermans 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 Hermans Lateral. The road base material source near McPhee Reservoir could also be considered for aggregate on the Upper Hermans Lateral, reducing haul distances to about 7.5 miles.

For the construction of the Towaoc Canal, Reaches 1 and 2, a shortage 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 align-

ment. 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 Mountain.

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 14.1 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 Hermosa Laterals, currently 50 feet, would be widened to 200 feet and require 146 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 rights-of-way for these two canal 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 1,410 acres of private land for construction rights-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 courses. 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 administration of 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 7
Effects of project modifications on salinity
(Unit--tons of salt)

	Salt loading as presented in 1977 FES	Revised salt loading for 1977 FES plan ^{1/}	Effects of project modifications on plan	Salt loading proposed plan
Dolores Project area--				
project land and canals	+10,080	+43,150	0	+43,150
Towaoc Canal--west alignment	2/0	+7,500	-7,500	0
Salinity control features	3/0	3/0	4/-24,500	4/-24,500
Total project effect	+10,080	+50,650	-32,000	+18,650

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.

The change in alignment of the Towaoc 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 Towaoc Canal, would be an annual reduction of the total project salt loading of approximately 32,000 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 Towaoc Canal, which would be operated and maintained by the DWCD according to Reclamation criteria.

Administration

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. 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 \$460,570,000, 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 \$23,168,000. 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 \$91,400 for the first 10 years. These costs would drop to \$74,000 after 10 years when the monitoring program is complete.

Development Program

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 MVIC operations.

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 Final Environmental Statement 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 would be impacted because no gravity head would be provided by the closed pipe laterals to the Rocky Ford Ditch and the Aztec Divide service areas, but the reduction in tons of salt removed is unquantifiable.

Selection of the Proposed Plan

The proposed plan was selected because (1) it was the only plan that passed all four tests of viability—completeness, effectiveness, efficiency, and acceptability (the plan is acceptable to the public and supported by the MVIC and DWCD), (2) it is compatible with the on-farm plan recommended by the Soil Conservation Service in that it would provide gravity head for sprinkler irrigation service to the Rocky Ford Ditch and Aztec Divide service areas, and (3) it would maximize salinity reduction and is the most cost-effective alternative. Although not impacted by the salinity portion of the proposed modifications, the Ute Mountain Ute Tribe supports the realigning of the Towaoc Canal.

The no action alternative would not result in any salinity reduction. Table 8 on the following page compares the proposed plan of irrigation system improvements with the no action alternative.

Other Plans Considered

During the planning process, a number of other alternatives were developed and studied using January 1982 price levels but were dropped from further consideration by 1984 because they failed to pass one or more of the four tests of viability. These alternatives included using

Table 8
Comparison of alternative plans

	Existing condition	Alternatives	
		No action	Proposed plan
Canal lining (miles)		1/ NC	2/+34.3
Buried pipe laterals (miles)		NC	+7.0
Permanent rights-of-way (acres)			
Private land (Federal acquisition)		NC	+1,410.5
Private land (MVIC acquisition)	161	NC	+297.2
Wildlife habitat (acres)			
Upland	125,534	NC	125,548
Wetland ^{3/}	10,310	NC	10,296
Impact to fisheries	NC	NC	NC
Impact on endangered species	NC	NC	NC
Cultural resource sites present	129	129	129
Salt loading reduction (tons)		4/ NC	5/24,500
Net effect on salt loading (tons) ^{5/}			+18,650
Seepage reduction (acre-feet)	NC	NC	7,900
Irrigation systems			
Improved system	No	No	Yes
Automated delivery system	No	No	Yes
Sprinkler pressure	No	No	Yes
Employment (direct--person years)	NC	NC	215
Construction costs (1987 prices--millions)			\$23.168
Increase in annual operation, maintenance, and replacement costs ^{7/}	NC	NC	91,400
Cost effectiveness per ton of salt removed (\$/ton) ^{8/}			83

1/ NC = No significant change.

2/ Pluses 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 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.

saline water to transport coal in a slurry pipeline, withdrawing the use of highly saline lands, collecting saline water and using it for industrial cooling, collecting and evaporating saline water, and constructing desalting plants. These alternatives and the reason they were dropped from consideration are briefly discussed in the following paragraphs. Table 9 on page 32 shows the amount of salt each alternative would remove and its cost effectiveness.

Coal slurry pipeline

Under this alternative, saline water from McElmo Creek would be used to transport coal in a coal slurry pipeline to areas of future coal development in southwestern Colorado. A diversion dam and pumping plant would be located on McElmo Creek to divert water and pump it to the potential Mud Creek Reservoir. Water would be available to the coal slurry company at the reservoir; its ultimate disposal would be the responsibility of the coal slurry company or the company receiving power.

The coal slurry pipeline alternative does not pass the test of completeness because no potential users could be found.

Land withdrawal

With the land withdrawal alternative, the Federal Government would purchase either the land or water rights to about 12,800 acres located mostly south and east of Cortez. This land consists of gray soils of Mancos Shale origin having a higher salt content per unit volume than any other soils in the area. About 1,500 acres of land of intermixed soils north of Cortez are included in this alternative.

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.

Industrial cooling

Under this alternative, water from McElmo Creek would be made available for powerplant cooling in the Four Corners area of New Mexico. The alternative would involve diverting 40 cfs of saline water from McElmo Creek at its confluence with Mud Creek and transporting it 5 miles through a pipeline to Navajo Wash, where it would flow 19 miles to a regulation reservoir near the Mancos River. The water would then be pumped through a pipeline to Morgan Lake, an existing generating station-cooling reservoir. McElmo Creek water would replace the less saline San Juan River water now being used so that additional depletions in the Colorado River system would not occur.

This alternative failed the test of completeness because no firm commitments were obtained from power companies, although some interest was shown. The plan may be a viable alternative in the future if additional salinity reduction were needed.

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 electro dialysis.

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

Alternative	Potential salt removed annually (tons)	Cost effectiveness ^{1/} (\$ per ton)
Coal slurry pipeline	40,000	79
Land withdrawal	42,000	95
Industrial cooling	60,000	100
Evaporation of selected highly saline flows	42,000	141
Evaporation of total McElmo Creek flows	115,000	214
Evaporation of small creek and draw flows	51,000	329
Desalting plants	90,000	629

^{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 systems improvement plan^{1/}

Canal/lateral segment ^{2/}	Length to be lined (feet)	Salt removed annually (tons)	Cost effectiveness (\$/ton)
Lone Pine 8	928	68	109
Lone Pine 9	5,449	377	137
Upper Hermana 4	13,218	784	144
Upper Hermana 3	2,200	131	155
Lone Pine 3	9,236	471	159
Lone Pine 7	5,896	303	169
Lone Pine 13	8,451	300	253
Lone Pine 15	9,900	245	271
Upper Hermana 6	6,181	189	301
Upper Hermana 2	10,260	333	386
Lone Pine 7	4,992	157	407
Upper Hermana 5	4,032	43	800

^{1/} January 1986 price level.

^{2/} Segment refers to small portions of the laterals studied as separate or contiguous increments during plan formulation.

Introduction

The only viable alternative to constructing the plan described in Chapter II is no action on the irrigation system improvements 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 Hermana Laterals, currently 50 feet, would be widened by an additional 150 feet by acquiring approximately 146 and 8.9 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 owners.

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

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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

Over the short term, heavy equipment, increased human activity, and construction scars would detract from scenery in construction areas. Once construction is completed and reseeded 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 a Class I area, meaning 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.

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 with the proposed plan			
	Water volume (acre-feet per year)		Salt load (tons)	
	1977 FES plan	Propo- sed plan	1977 FES plan	Propo- sed plan
Within McElmo Creek basin				
Inflow to basin				
Canal inflow	139,000	139,000	29,500	29,500
Precipitation	173,500	173,500		
total (or average)	312,500	312,500	29,500	29,500
Consumptive use				
Crops	57,700	57,700		
Other	174,900	172,100		
Canal evaporation	800	800		
Total	233,400	230,600		
Outflow ^{1/}	79,100	81,900	173,700	147,400
Salt pickup			144,200	117,900
Outside McElmo Creek basin				
Lone Pine Lateral ^{2/}				1,950
Navajo Wash ^{3/}				3,750
Subtotal				5,700
Total salt load reduction				12,000

^{1/} Measured at McElmo Creek below Mud Creek.

^{2/} Canal seepage from this portion of the Lone Pine Lateral drains down Yellow Jacket Canyon, which joins McElmo Creek downstream of the gauging station.

^{3/} Seepage from this wash does not drain into McElmo Creek.

Environmental consequences

With or without project modifications, as shown in Table 11, annual canal inflow would average 139,000 acre-feet. Crops would consumptively use 57,700 acre-feet annually. The remainder would return to McElmo 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 147,400 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 117,900 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 McElmo 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 enter the system as a result of abandoning the Towaoc 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 2.9 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 expected to reduce salt loading by 38,000 tons annually. This program would be less effective because the closed pipe laterals 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 Towaoc 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 MVIC 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 MVIC, but Reclamation would require operation and maintenance agreements with the MVIC and DWCD 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 MVIC 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, meadow hay, and pasture. Native vegetation in the area varies

with elevation and soils. Pinyon 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 McElmo 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 MVIC 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 McElmo Creek drainage (Burdick, 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 McElmo 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 may be found in moist 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 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 in other habitat for other 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, 155 acres were estimated to be lost by the project

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, greasewood, 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 since some wildlife species benefit from the conversion. 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 (USDOJ, 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 Towaoc 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 entrapment will now exist within the concrete-lined sections of the Towaoc Canal. The Colorado Division of Wildlife estimated that 524 and 275 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 to a variety of wildlife species and, particularly, to the federally endangered bald eagle.

The Colorado Division of Wildlife assessed the impacts of the Towaoc Canal on large animal populations and on existing cottonwood trees located along the canal alignment. Because of its smooth, hard surface, the two concrete-lined sections of the Towaoc Canal totaling 4.6 miles 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 Towaoc Canal because of the unknown construction needs and the vagaries of local surface and subsurface water conditions which contribute to 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 would, 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 HEP 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 EPA asked Reclamation to review 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.

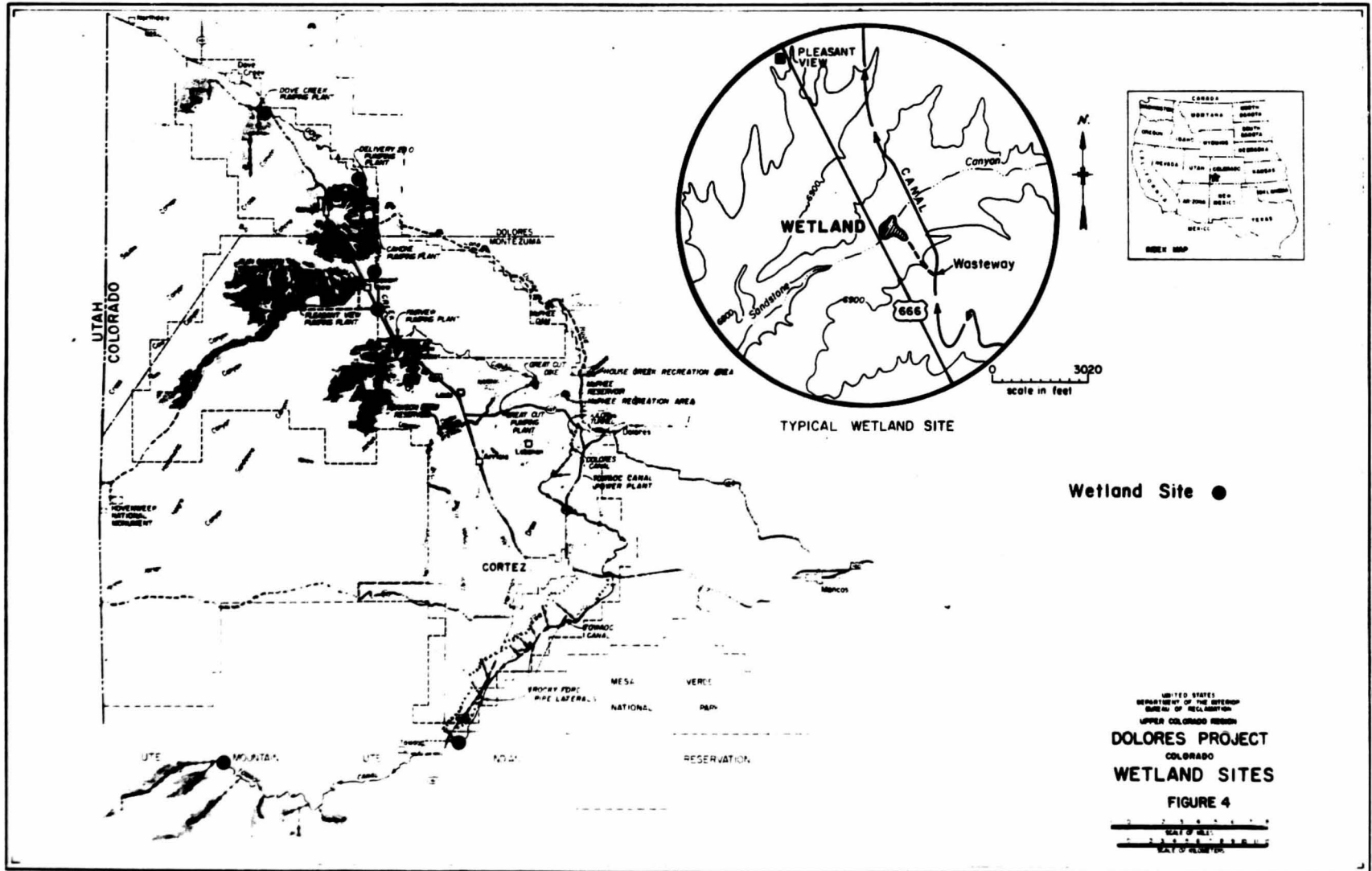
McElmo Creek

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.



Environmental consequences

McElmo Creek

According to the Colorado Division of Wildlife (Smith, 1979), 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 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, bonytail chub, humpback chub, and the bald eagle. The bonytail 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, bonytail 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.

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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 diminished greatly. Onstream 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 taken 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 84 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 30, 1984, in concurrence with Reclamation's assessment stating that 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 Narraguinnep, 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 Narraguinnep Reservoir would have a positive effect on the visual and recreational aspects of the reservoir. Through MWIC'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 Towaoc Canal, Reaches 1 and 2; Rocky Ford Laterals; three Lone Pine Lateral sections; Upper Bermana 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 block villages, although most habitation sites are small in size. The historic sites range from artifact fresh scatters to homesteads with outbuildings and dugouts. A Class III survey has been conducted on the Ute 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 800.5e. 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 Towaoc 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 Towaoc 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 (SEDAP) for Computer Utilization; the Colorado State Demographers Office; the Colorado State

Job Service; and information derived from field observations and informal discussions.

Population, employment, income, housing, and services

Affected Environment

The population of Montezuma County, according to the Bureau of the Census, grew from 12,952 in 1970 to 16,510 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 18,806 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 1.8 percent. During that period, the State of Colorado grew at an annual rate of 2.3 percent.

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).

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 28.6. 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), 6,826 in 1980 (Colorado State Job Service, 1986), and 8,883 in 1986 (Colorado Division of Employment). Unemployment rates for the county were 7.5 percent in 1970 (U.S. Census), 7.7 percent in 1980, and 13.6 percent in 1986 (Colorado Division of Employment). Table 12 below reflects the employment trends in Montezuma County from 1980 through December 1986.

Table 12
Annual average Montezuma County employment trends from 1980-86^{1/}

Year	Total labor force	Total employment	Unemployment	Unemployment rate (percent)
1980	6,826	6,301	525	7.7
1981	7,328	6,780	548	7.5
1982	7,664	6,791	873	11.4
1983	10,285	9,401	884	8.6
1984	10,305	9,262	1,043	10.1
1985	9,660	8,650	1,010	10.5
1986	8,883	7,671	1,212	13.6

^{1/} Compiled by the Job Service of the Colorado Department of Labor and Employment, 1986.

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 \$2,449 (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 \$10,650 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 in 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 houses (Goldwell-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 917:1. The sheriff's department, police in three cities, and the State Highway Patrol provide law enforcement in

Table 13
Income analysis for 1979^{1/}

Area	Median income		Percent of persons below poverty level
	Household	Personal	
City of Cortez	\$15,085	\$6,778	9
Montezuma County	13,971	5,724	15
State of Colorado	18,057	7,840	10
^{1/} 1980 Census.			

Table 14
Income by sector in Montezuma County (1984)^{1/}

Sector	Total wages	Percent of total
Agriculture	\$4,273,000	4
Mining	17,015,000	14
Construction	23,812,000	20
Manufacturing	4,714,000	4
Transportation, communication and public utilities	8,768,000	7
Trade	18,958,000	16
Finance, insurance, and real estate	3,185,000	3
Services	11,537,000	10
Government ^{2/}	25,239,000	21
Other	999,000	1
Total	118,500,000	100
^{1/} Bureau of Economic Analysis, April 1986.		
^{2/} All levels.		

the county, with 15, 25, 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 295. The Cortez Volunteer Fire Protection District has 26 volunteers providing fire protection and rescue service to Cortez and the adjacent area. In 1986, fire and rescue calls totalled 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, SEDAP). 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.

Nonproject 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
Population projections for Montezuma
County and the City of Cortez^{1/}

Year	Area	No action		Proposed plan		Difference between no action and proposed plan
		Popula- tion	Change from previous year	Popula- tion	Change from previous year	
1986	County	18,199	168			
	City	7,807	40			
1987	County	18,351	152			
	City	7,873	66			
1988	County	18,500	149			
	City	7,936	63			
1989	County	18,645	145	18,673	173	28
	City	7,999	63	8,011	75	12
1990	County	18,787	142	18,844	171	57
	City	8,060	61	8,084	73	24
1991	County	18,925	138	19,015	171	90
	City	8,119	59	8,157	73	38
1992	County	19,058	133	19,244	229	186
	City	8,176	57	8,256	99	80
1993	County	19,187	129	19,321	77	134
	City	8,231	55	8,289	33	58
1994	County	19,313	126	19,318	-3	5
	City	8,285	54	8,287	-2	2

^{1/} Colorado State Demographers Office, Bureau of Reclamation Dolores Monitoring Study and SEDAP, and Construction Worker Survey.

Table 16
Direct employment jobs added by sector with
construction of the project modifications

Sector	Fiscal year					
	1989	1990	1991	1992	1993	1994
Construction	16	35	55	114	81	4
Government	2	4	7	13	10	0
Total	18	39	62	127	91	4

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 projection is based on January 1987 construction costs.

Table 17
Projected income added by sector with
construction of project modifications^{1/}

Year ^{2/}	Sector	Estimated annual wages
1989	Construction	\$286,000
	Government	54,000
1990	Construction	614,000
	Government	115,000
1991	Construction	966,000
	Government	181,000
1992	Construction	1,991,000
	Government	374,000
1993	Construction	1,408,000
	Government	264,000
1994	Construction	62,000
	Government	12,000

^{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 increases 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 Hermans 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.

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 Frypan-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

Table 18
Short- and long-term effects
resulting from project modifications

Resource	Short-term effects	Long-term effects	Relationship of short-term use of environment and long-term productivity
Local economy	Yes	No	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 1994.
Housing	Yes	No	During construction, a reduction would occur in the number of vacancies.
Population	Yes	No	Construction workers and their families would offset an expected decline in population.
Services	No	No	Local services would have sufficient capacity to deal with the effects of construction.
Energy	Yes	No	The energy for vehicles and machinery would be a short-term commitment of resources.
Scenery	Yes	No	Over the short term, construction activities would detract from scenery.
Air and noise	Yes	No	Emissions and dust from construction equipment would have a short-term effect on these qualities.
Water	No	Yes	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.
Vegetation	Yes	Yes	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 offset this loss.
Wildlife	Yes	Yes	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.
Fish	No	Yes	The project modifications would have a stabilizing effect on Narraguinnep and Totten Reservoirs. The water supply for Totten Reservoir would ensure its continuing as a fishery.
Endangered species	No	No	The Fish and Wildlife Service's Biological Opinion states that the project modification would not likely jeopardize the Colorado squawfish or the bald eagle.
Recreation	Yes	Yes	Construction would have a negative impact on the use of laterals and ditches. Stabilizing of Narraguinnep Reservoir and water supply for Totten Reservoir would be positive effects.
Cultural resources	Yes	Yes	Significant cultural resources have been located within potentially disturbed areas. These resources would be mitigated through survey recording, excavation, and avoidance, where possible.



FIGURE 4
UPPER COLORADO STREAM SYSTEM

Table 19
Developments included in cumulative impact analysis

Development and location (State)	Actual or estimated completion date
<u>Developments constructed or under construction</u>	
CRSP storage units	
Wayne N. Aspinall Unit, Colorado	1977
Flaming Gorge Unit, Wyoming and Utah	1963
Glen Canyon Unit, Utah and Arizona	1965
Navajo Unit, Colorado and New Mexico	1963
CRSP participating projects	
Florida Project, Colorado	1963
Paonia Project, Colorado	1962
Silt Project, Colorado	1966
Smith Fork Project, Colorado	1963
Hammond Project, New Mexico	1975
Central Utah Project, Utah	
Bonneville Unit	1995
Jensen Unit	1989
Vernal Unit	1961
Upalco Unit	1/
Emery County Project, Utah	1965
Lyman Project, Wyoming	1980
Seedskaadee Project, Wyoming	2/
Navajo Indian Irrigation Project, New Mexico	1991
San Juan-Chama Project, New Mexico	1976
Bostwick Park Project, Colorado	1971
Dallas Creek Project, Colorado	1989
Dolores Project, Colorado	1996
Fryingpan-Arkansas Project, Colorado	1977
<u>Developments considered for construction after 1976</u>	
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.	

Colorado and Wyoming are not included as they were determined to be economically infeasible and construction funds have not been appropriated.

The Bonneville Unit of the Central Utah Project, Utah; the San Juan-Chama Project, New Mexico; and the Fryingpan-Arkansas Project, Colorado, are evaluated only where they would create impacts in the Colorado River Basin. Most water from the Bonneville Unit would be used in the Bonneville Basin of Utah. Essentially all of the San Juan-Chama Project water would be delivered to the Rio Grande River Basin in New Mexico. Most water from the Fryingpan-Arkansas Project would be used in the Arkansas River Basin in Colorado.

The base for most of the following discussions--referred to as the 1976 modified base--is a hypothetical situation which includes actual conditions in 1976 in addition to modifying effects of developments which are or were under construction. The base includes many Federal and private developments, although the effects of CRSP and the Fryingpan-Arkansas Project are tabulated separately. The cumulative effects of the seven developments considered for construction after 1976 are analyzed as increments to the base condition. Although imprecise, these comparisons are based on the best available data from numerous Reclamation reports and information provided by Federal, State, and local agencies and private entities. Salinity projections presented later under "Water Availability and Salinity" are updated to reflect the most recent and accurate estimates of average flows and salinity.

Social and economic conditions

Crop Production

Developments constructed or under construction.--An estimated annual crop production value of about \$46 million is attributed to developments constructed or under construction. This value represents about 37 percent of the total crop production value in the Colorado River Basin. A project-by-project comparison of crop production is shown in Table 20. The value of water for irrigated pasture and the value of livestock and livestock products have not been included in project evaluations because comparable data are not available. Generally, in the Upper Basin, the value of crop production is only about a third of the gross agricultural production. The value of livestock and livestock products accounts for the remaining two-thirds. The total annual value of agricultural production in the Upper Basin from developments constructed or under construction is estimated at roughly \$138 million.

Developments considered for construction after 1976.--The seven developments considered for construction after 1976 would contribute approximately \$14 million in additional crop production as summarized in Table 21. The value of gross agricultural production from these seven developments is estimated at more than \$41 million.

Table 20
Summary of annual gross crop values from
developments constructed or under construction

Development	Irrigable acreage			Gross crop value ^{1/}
	Full service	Supple- mental service	Irrigation supply (acre-feet)	
1975 production in Upper Colorado River Basin ^{2/}				\$79,941,000
1975 CRSP production ^{3/}				
Florida Project	5,730	13,720	25,700	1,057,000
Paonia Project	2,370	12,930	20,100	1,352,000
Silt Project	2,120	4,480	12,800	548,000
Smith Fork Project	1,420	8,060	10,300	251,000
Hammond Project	3,930		18,500	733,000
Central Utah Project				
Jensen Unit ^{4/}	440	3,640	4,600	167,000
Vernal Unit		14,780	18,000	602,000
Upalco Unit ^{4/}		42,610	17,900	7,056,000
Emergy County Project	770	17,210	25,200	473,000
Lyman Project		36,000	49,000	486,000
Navajo Indian Irrigation Project ^{4/}	105,000		357,000	19,256,000
Bostwick Park Project	1,320	4,290	11,400	305,000
Dallas Creek Project ^{4/}		20,850	11,200	622,000
Dolores Project ^{4/}	35,360	26,300	90,900	13,200,000
Subtotal	158,460	204,870	672,600	46,108,000
Fryingpan-Arkansas Project production	0	0	0	0
Total production in basin with CRSP and Fryingpan-Arkansas Project (1976 modified base)	158,460	204,870	672,600	126,049,000
Percent attributable to CRSP and Fryingpan-Arkansas Project				37

^{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.

Table 21
Summary of annual gross crop values from developments
considered for construction after 1976

Development	Irrigable acreage			Gross crop value ^{1/}
	Full service	Supplemental service	Irrigation supply (acre-feet)	
1976 modified base	158,460	204,870	672,600	\$126,049,000
Developments considered for construction after 1976				
Grand Valley Unit				2/
Paradox Valley Unit				Not applicable
Animas-La Plata Project	61,470	8,630	118,100	13,732,000
Ruedi Reservoir Round 2 Water Sale				Not applicable
Lower Gunnison Basin Unit				2/
Uinta Basin Unit				2/
Dolores Project modifications				modi-
Subtotal	61,470	8,630	118,100	13,732,000
Total crop production	219,930	213,500	790,700	139,781,000
Percent increase	39	4	18	11

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.

Power

Developments constructed or under construction.--Power produced by developments constructed or under construction is estimated at more than 6 million megawatthours (MWh) annually. This is equivalent to nearly 10 percent of the 1975 power consumption in the CRSP power marketing area, which includes the entire States of Arizona, Colorado, New Mexico, Wyoming, and Utah, as well as three southwestern counties of Nevada and a small portion of California. A comparison of project capability and consumption in the market area is shown in Table 22. On the basis of an average annual use of 2,600 kilowatthours per capita, the generation from developments constructed or under construction is sufficient to meet the annual residential needs of about 2.3 million people, or the annual estimated residential needs of the States of Utah and Nevada.

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 Animas-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 (M&I) 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 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 Animas-La Plata Project and the Ruedi Reservoir Round 2 Water Sale would provide water for M&I use. The Animas-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 46,400 acre-feet for industrial use.

Recreation

Developments constructed or under construction.--Developments constructed or under construction are expected to provide nearly 6 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 22
Power capability of developments constructed or under construction compared with 1975 consumption in market area

Development	Name plate capacity ^{1/} (MW)	Generation ^{2/} (MWh)
Wayne N. Aspinall Unit		
Blue Mesa Dam	60	269,000
Harrow Point Dam	120	386,000
Crystal Dam	28	173,000
Flaming Gorge Unit	108	605,000
Glen Canyon Unit	1,021	4,234,000
Central Utah Project		
Bonneville Unit	134	319,000
Seedskadee Project	10	70,000
Dolores Project	11	37,000
Dallas Creek Project	4	19,000
Total	1,496	6,092,000
Power market area consumption ^{2/}		
Arizona		20,468,000
California		N/A
Colorado		15,792,000
Nevada		7,672,000
New Mexico		6,748,000
Utah		7,444,000
Wyoming		4,452,000
Total		82,776,000

^{1/} Based on 19th Annual Report, Colorado River Storage Project and Participating Projects for Fiscal Year 1975 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 pumping requirements of 8 MW of capacity at peak loads and 20,400 MWh of energy for the Bonneville Unit and 16,800 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 D. Kolstad, Los Alamos Scientific Laboratory of the University of California.

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

CRSP	
Glen Canyon Unit	142,000
Navajo Unit	64,000
Central Utah Project	
Jensen Unit	18,000
Vernal Unit	2,000
Upalco Unit	3,000
Emery County Project	6,000
Lyman Project	1,500
Seedskadee Project	150,000
Dallas Creek Project	28,000
Dolores Project	8,700
Subtotal	423,200
Fryingpan-Arkansas Project	7,900
Total	431,100

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 esthetics 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 2,870 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 14,215 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
(Unit--annual recreation-days)

Development	Sightseeing	Picnicking	Camping	Boating	Fishing ^{1/}	Hunting ^{2/}	Other ^{3/}	Total
Upper Colorado River Basin recreational use (1976) ^{2/}	8,720,430	5,625,610	8,807,030	1,815,320	3,221,400	1,403,640	9,311,940	38,905,370
CRSP recreational use								
Wayne N. Aspinall Unit	480,730	16,400	102,800	51,800	103,000	110	5,070	759,910
Flaming Gorge Unit	98,000	24,000	132,300	133,600	151,800	7,900	119,300	666,900
Glen Canyon Unit	84,140	18,900	798,300	166,700	217,000	530	91,980	1,377,550
Navajo Unit	60,020	40,400	38,600	56,200	88,500	3,910	87,660	375,290
Florida Project	31,500	11,500	4,100	2,500	25,000		3,000	77,600
Paonia Project	4,700	3,500	4,100	1,200	2,600	10	650	16,760
Silt Project	17,000	3,000	16,500	6,600	28,700	150	4,070	76,020
Smith Fork Project	23,180	10,000	16,600	11,100	36,700		1,520	99,100
Hammond Project ^{3/}								
Central Utah Project								
Bonneville Unit Collection System	76,250	24,400	91,500	79,300	541,800	9,150	24,400	846,800
Jensen Unit	10,000	3,200	12,000	10,400	9,500	1,200	3,200	49,500
Vernal Unit	10,600	9,200	8,100	17,600	7,400	50	7,910	60,860
Upalco Unit	9,910	4,960	18,170	14,310	58,700		7,700	113,750
Emery County Project	13,800	14,200	57,800	19,700	48,200	3,900	16,400	174,000
Lyman Project	3,670	12,840	11,000	1,830	49,000	1,830	5,500	85,670
Seedskaadee Project	9,500	1,000	12,000	7,500	55,000	600	1,650	87,250
Navajo Indian Irrigation Project ^{5/}								
San Juan-Chama Project ^{3/}								
Bostwick Park Project	26,000	500			7,900	100	200	34,700
Dallas Creek Project	147,620	26,050	130,250	43,420	30,400			377,740
Dolores Project	26,550	96,560	48,600	60,350	155,500	31,800	57,940	477,300
Subtotal	1,133,170	320,610	1,502,720	684,110	1,616,700	61,240	438,150	5,756,700
Fryingpan-Arkansas Project recreation use		1,800	27,400	7,700	5,000		3,700	45,600
Total recreational use in basin with CRSP and Fryingpan-Arkansas Project (1976 modified base)	9,853,600	5,948,020	10,337,150	2,507,130	4,843,100	1,464,880	9,753,790	44,707,670
Percent attributable to CRSP and Fryingpan-Arkansas Project	12	5	15	27	33	4	4	13

^{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/} Hypothetical value--derived from State Comprehensive Outdoor Recreation Plans for the portions of Arizona, Colorado, New Mexico, Utah, and Wyoming updated to estimated 1976 conditions, less 1976 recreation use for CRSP developments constructed and 1981 use for Fryingpan-Arkansas Project.

^{5/} No recreational facilities or uses in the Upper Colorado River Basin.

Table 25
Recreational use at developments considered for construction after 1976
(Unit--annual recreation-days)

Development	Sightseeing	Picnicking	Camping	Boating	Fishing ^{1/}	Hunting ^{2/}	Other ^{3/}	Total
1976 modified base	9,853,600	5,948,020	10,337,150	2,507,130	4,843,100	1,464,880	9,753,790	44,707,670
Developments considered for construction after 1976								
Grand Valley Unit ^{4/}								
Paradox Valley Unit ^{4/}								
Animas-La Plata ^{2/}	68,800	38,100	42,100	69,200	55,000		88,100	361,300
Ruedi Reservoir Round 2 Water Sale								
Lower Gunnison Basin Unit ^{4/}								
Uinta Basin Unit ^{4/}								
Dolores Project modifications ^{4/}								
Subtotal	68,800	38,100	42,100	69,200	55,000		88,100	361,300
Total recreational use	9,922,400	5,986,120	10,379,250	2,576,330	4,898,100	1,464,880	9,841,890	45,068,970
Percent increase	0.7	0.6	0.4	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)

	Agriculture			Operation and main- tenance	Other	Total
	Direct	Indirect	Total			
Employment in Upper Colorado River Basin ^{1/}	12,000	3,000	15,000		151,000	166,000
CRSP employment						
Storage units and Seed- skadee Project				230		230
Florida Project	120	30	150	6		156
Faonia Project	300	70	370	6		376
Silt Project	70	20	90	6		96
Smith Fork Project	70	20	90	2		92
Hammond Project	50	10	60	5		65
Central Utah Project						
Bonneville Unit Collec- tion System	80	20	100	10		110
Jensen Unit	20	10	30	5		35
Vernal Unit	140	30	170	7		177
Upalco Unit	65	35	100	10		110
Emery County Project	150	40	190	3		193
Lyman Project	140	30	170	3		173
Navajo Indian Irrigation Project	750	180	930	102		1,032
Bostwick Park Project	30	10	40	2		42
Dallas Creek Project	30	10	40	2		42
Dolores Project	270	70	340	30		370
Subtotal	2,285	585	2,870	429		3,299
Fryingpan-Arkansas Project employment				2		2
Total employment in basin with CRSP and Fryingpan- Arkansas Project (1976 modified base)	14,285	3,585	17,870	431	151,000	169,301
Percent attributable to CRSP and Fryingpan-Arkansas Project	16	16	16	100	0	2

^{1/} Exclusive of CRSP and Fryingpan-Arkansas Project.

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Table 27
Employment opportunities at developments
considered for construction after 1976

	Average annual permanent employment opportunities (number of jobs)				Total temporary employment opportunities (person- years)
	Agriculture			Operation and main- tenance	
	Direct	Indirect	Subtotal		
1976 modified base	14,285	3,585	17,870	431	18,301
Developments considered for construction after 1976					
Grand Valley Unit				10	4,840
Paradox Valley Unit				4	700
Animas-La Plata Project	300	80	380	21	6,760
Ruedi Reservoir Round 2 Water Sale					1,520
Lower Gunnison Basin Unit					180
Uinta Basin Unit					215
Dolores Project modifi- cations					215
Subtotal	300	80	380	35	14,215
Total projected employment	14,585	3,665	18,250	466	18,716
Percent increase	2.1	2.2	2.1	8.2	2.1

Table 28
Changes in stream fisheries in Upper Colorado River Basin
from developments constructed or under construction

Type of fishery	Stream miles				
	Without CRSP and Fryingpan- Arkansas Project ^{1/}	Inun- dated	Changed from warm to cold water ^{2/}	1976 modified base	Changes (per- cent)
Cold water	7,715	-140	+253	7,828	+1
Warm water	1,811	-421	-253	1,137	-37
Total	9,526	-561		8,965	-6

^{1/} Based on Upper Colorado Region Comprehensive Framework Study, Appendix XIII, Fish and Wildlife, June 1971.

^{2/} Changed as a result of storage regulation.

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 flat 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 Green River below Flaming Gorge are rated good to excellent. The Wayne N. 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, Gunnison, and San Juan Rivers) are of particular concern in evaluating impacts of the developments constructed or under construction. These species are the Colorado squawfish, bonytail chub, and humpback 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 depletions 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

CRSP	Streams inundated			Streams degraded			Stream sport fishery improved			Flat water fishery created or improved	
	Length (miles), quality, and type of fishery ^{1/}		Loss of use (angler-days)	Length (miles), quality, and type of fishery ^{1/}	Reason for change	Loss of use (angler-days)	Length (miles), quality, and type of fishery ^{1/}	Reason for change	Use (angler-days)	Acres and type of fishery ^{2/}	Estimated use (angler-days)
	Main stem	Tributaries									
Wayne N. Aspinall Unit											
Blue Mesa Reservoir	23 (E) CW	24 (G) CW				29 (E) CW	Improved water quality,				
Morrow Point Reservoir	11 (E) CW	0	38,000			8 (G) CW	lower temperature,	20,300	9,180 CW	82,700	
Crystal Reservoir	6 (E) CW	0				8 (F-P) CW	and less turbidity				
Flaming Gorge Unit	72 (P) WW	22 (P) WW	Not available			26 (E-G) CW	Same as above	25,000	42,000 CW	126,800	
Glen Canyon Unit	186 (F-P) WW	71 (P) WW	2,500			20 (F-P) CW					
						15 (E) CW	Same as above	10,000	163,000 CW and WW	207,000	
						45 (G) CW		Not available			
						170 (F) WW		Not available			
Navajo Unit	35 (F) WW	18 (P) CW	Not available			18 (E-G) CW	Same as above plus	40,000	15,600 CW and WW	48,500	
						20 (F) WW	Improved flows	Not available			
Florida Project (Lemon)	3 (F) CW		100			10 (E-G) CW	Improved flows	5,000	600 CW	20,000	
Paonia Project (Paonia)	4 (P) CW	1 (O)	Not available			None	None	None	300 CW	2,600	
Silt Project (Rifle Gap)	2 (O)		None			None	None	None	350 CW	28,700	
Smith Fork Project (Crawford)	2 (O)		None			None	None	None	400 CW and WW	36,700	
Hammond Project (no reservoir)											
Central Utah Project ^{3/}											
Bonneville Unit Collection System ^{4/}	7 (E-G) CW		4/11,000	113 (E-G) CW	Reduced flows	104,900	5 (G) CW	Improved flows	2,000	13,500 CW	5/539,800
Jensen Unit (Red Fleet)	13 (F-P) CW			76 (F-P) CW	Reduced flows	10,800					
Vernal Unit (Steinaker)	3 (G) CW		1,700	25 (F-P) WW	Reduced flows	2,500	None	None	800 CW	7,400	
Upalco Unit	0		None				None	None			
Taskeech	4 (G) CW		2,000				None	None	1,210 CW	38,700	
							10 (G) CW	Habitat structures and improved flows	1,600	800 CW	14,100
Moon Lake ^{5/}									190 CW	1,100	
Twin Pots ^{7/8/}									610 CW	3,200	
Fourteen high country lakes ^{7/}											
Big Sand Wash ^{8/}											
Emery County Project											
Joos Valley	2 (G) CW	1 (G) CW	100				None	None	1,200 CW	40,000	
Huntington	0		None				None	None	200 CW	8,200	
Lyman Project											
Meeks Cabin	2 (G) CW		3,000				9 (G) CW	Improved flows, access, and stream improvement structures	1,000	500 CW	30,000
Stateline	2 (G) CW		1,000				11 (G) CW	Improved flows, temperatures, and turbidity	1,000	300 CW	17,000
Seedskaadee Project (Fontenelle)	17 (P) WW	2 (F) WW	190				73 (E) CW	Improved flows, temperatures, and turbidity	33,000	8,750 CW and WW	22,000
Bostwick Park Project (Silver Jack)	2 (G) CW		500				19 (G) CW	Improved minimum flows and improved water quality	4,300	300 CW	3,600
Dallas Creek Project (Ridgway)	5 (P) CW		450				12 (G) CW	Same as above	6,000	1,000 CW	24,400
Dolores Project											
McPhee	10 (P) WW	6 (P) WW	Insignificant				56 (G-F) CW	Improved flows and access, first 11 miles good, fair for remaining 45	38,000	4,470 CW	52,000
Totten Reservoir			None						204 WW	6,000	
Narragunnep Reservoir			None						535 WW	7,500	
Dawson Draw	2 (P) CW		None						290 CW	35,000	
Groundhog			Insignificant						400 CW	17,000	
Fryingpan-Arkansas Project		8 (E) CW	1,000	2 (E) CW	Temperature changes	Not available			1,000 CW	5,000	
				10 (F-P) CW	Reduced flows and scout						
Total											
No fishery	4	1									
Warm water fishery	320	101		25		2,500	190				
Cold water fishery	89	51		201		115,700	374				
Total	413	153	61,540	226		118,200	564	187,200	267,689	1,434,500	

^{1/} Quality factors given as E = excellent; G = good; F = fair; P = poor; and O = no sport fishery; CW denotes a cold water fishery and WW a warm water fishery.

^{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/} Consists of the following: enlargement of Strawberry Reservoir; construction of Bottle Hollow, Starvation, Currant Creek, and Lower and Upper Stillwater Reservoirs; and stabilization of Midview Reservoir.

^{4/} Does not reflect a recently negotiated instream flow agreement which would provide 50 percent of the historical habitat and thus reduce the losses shown by 50 percent.

^{5/} Combination of Fish and Wildlife Service 1955 estimates and Bureau of Reclamation 1976 estimates.

^{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 Upalco Unit would degrade a 400-acre cold water fishery at Big Sand Wash Reservoir and result in a loss of 3,500 angler-days.

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Table 30
 Fishery impacts from developments considered for construction after 1976

	Stream sport fishery improved			Stream sport fishery degraded			Flat water fishery created or improved	
	Length (miles), quality, and type of fishery ^{1/}	Type of improvement	Increase in use (angler-days)	Length (miles), quality, and type of fishery ^{1/}	Type of degradation	Loss of use (angler-days)	Acres and type of fishery ^{1/}	Estimated use (angler-days)
Grand Valley Unit ^{2/}								
Paradox Valley Unit ^{3/}	7 (F) WW	Improved water quality	No estimate available					
Animas-La Plata Project								
Ridges Basin Reservoir							2,270 CW	39,600
Southern Ute Reservoir							1,386 CW	15,400
Ruedi Reservoir Round 2								
Water Sale				27 (E) CW	Reduced flows	Slight	<u>4/</u>	<u>4/</u>
Lower Gunnison Basin Unit								
Uinta Basin Unit								
Dolores Project modifications ^{2/}								
Total	7						3,656	55,000
Summary								
Warm water fishery	7							
Cold water fishery				27			3,656	55,000
Total	7			27			3,656	55,000

^{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 esthetics and, ultimately, fisherman use.

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 1,350 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)

Project and river	Eliminated by inun- dation	Loss due to water quality change	Total
Wayne N. Aspinall Unit			
Gunnison River		50	50
Flaming Gorge Unit			
Green River	72	65	137
Glen Canyon Unit			
Colorado River	186	<u>1/280</u>	466
San Juan River	71		71
Navajo Unit			
San Juan River	35	40	75
Total	364	435	799

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 23 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.

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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 life stage 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

Major features of developments considered for construction after 1976 in relation to endangered fish species habitat

Development	Feature	Known endangered fish habitat	
		Location	Miles from project
Grand Valley Unit	Irrigation system improvements	Colorado River at Grand Junction, Colorado	0
Paradox Valley Unit	Brine well field	Colorado River at mouth of Dolores River, Utah	75
Animas-La Plata Project	Ridges Basin and Southern Ute Reservoirs	San Juan River near Shiprock, New Mexico	75
Ruedi Reservoir Round 2 Water	Sale of reservoir water	Colorado River at Grand Junction, Colorado	120
Lower Gunnison Basin Unit	Irrigation system improvements	Gunnison River downstream from Delta, Colorado	15
Uinta Basin Unit	Irrigation system improvements	Green River above and below mouth of Duchesne River, Utah	25
Dolores Project modifications	Irrigation system improvements	San Juan River confluence with McElmo Creek	40

Although tolerances of the endangered fishes for temperature, turbidity, salinity, and flow changes have not been fully determined,

Reclamation does not believe the species or habitat would be significantly affected by the small changes predicted to occur.

The Ruedi Reservoir Round 2 Water Sale and the Paradox Valley, Grand Valley, Lower Gunnison Basin, and Uinta Basin Units are not expected to affect stream turbidity. During construction, the Animas-La Plata Project would result in slight turbidity increases in the Animas and La Plata Rivers.

The salinity changes in the Colorado River Basin that would result from the seven developments are not expected to affect any of the endangered species, all of which have been found living in areas with extensive variations in salinity levels. At the Colorado-Utah border in 1974, salinity levels in the Colorado River ranged from 339 to 1,300 mg/L with no apparent adverse effects on the endangered species in that area. With the seven developments, salinity levels are expected to remain within this range. The Colorado squawfish has also been successfully reared from eggs to lengths of 10 to 12 inches at Willow Beach National Fish Hatchery, Arizona, in water with salinity levels greater than 800 mg/L.

The Animas-La Plata Project would reduce historic peak flows and slightly increase historic low flows in known historic habitat areas of endangered fish species. During average years, flows during the July to September spawning and rearing season would be increased; late fall, winter, and spring flows would be reduced. Because postproject flows would be within the range of historic flow fluctuations in these areas, however, flow changes are not expected to have adverse effects. Changes in streamflows resulting from the Ruedi Reservoir Round 2 Water Sale; the Paradox Valley, Grand Valley, Lower Gunnison Basin, and Uinta Basin Units; and the Dolores Project modifications would not be significant. Exact numerical values for the flow changes caused by the seven developments are not given because the probability of error in measuring the flow is substantially greater than the changes themselves would be. An unknown amount of endangered species habitat may have been restored in the Green River below Flaming Gorge Dam as a result of penstock modifications completed in 1978. The modification increased the temperature of water released from the dam, thereby warming water sooner for endemic fish species downstream.

Endangered Fishes Consultation

Because of potential cumulative impacts of Reclamation water developments on the endangered Colorado River fishes, the Fish and Wildlife Service on February 7, 1980, requested Section 7 Consultation on virtually all developments constructed, under construction, or in advance planning stages by Reclamation. Consultation on these developments was contingent on completing fishery studies funded by Reclamation. The goal of the study effort was to refine the recommendations to ensure the continued existence of the fishes in concert with the orderly development of the water resources of the various States.

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 initiation should occur 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-pasture--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 42 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 man-caused 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
Major terrestrial wildlife habitat changes from
developments constructed or under construction
(Unit--acres)

Key habitat in Upper Colorado	Riparian ^{1/}	Aspen- conifer	Desert shrub, brushland, pinyon- juniper ^{2/}	Grassland	Cropland- pasture ^{3/}	Specific wildlife develop- ments
						Not determined
River Basin ^{4/}	200,000	5,648,900	29,987,300	1,064,700	3,720,700	
CRSP changes ^{5/}						
Wayne N. Aspinall Unit	-430	-1,010	-6,000	-270	-2,070	7,620
Flaming Gorge Unit	-1,730	-800	-34,970		-940	7,530
Glen Canyon Unit ^{6/}	-90		-2,930			
Navajo Unit	-150		-12,190		-4,000	3,060
Florida Project	-10	-100	-5,930	-300		5,730
Paonia Project	-5		-2,430	-100		2,230
Silt Project	-10	-15	-2,320			1,920
Smith Fork Project	-10		-1,590			1,290
Hammond Project			-3,030			3,900
Central Utah Project						
Bonneville Unit Collec- tion System	-105	-412	-4,590	-4,213		23,260
Jensen Unit	-40		-680	-230	380	500
Vernal Unit			-580		-300	600
Upalco Unit	-450	-100	-700	-50	-50	160
Emery County Project	-10		-2,160		770	2,030
Lyman Project	-260		-1,190	-260		1,880
Seedskadee Project	-2,860		-3,660		-2,310	22,000
Navajo Indian Irrigation Project			-100,000			100,000
Bostwick Park Project		-20	-1,400	-190		1,320
Dallas Creek Project	-100		-920		-600	1,160
Dolores Project	-870		-2,500	-8,800		4,900
Subtotal	-7,130	-2,547	-189,770	-14,413	112,170	78,850
Fryingpan-Arkansas Project changes		-200	-100			-840
Subtotal	-7,330	-2,557	-189,770	-14,413	111,330	78,850
Total ^{7/}	192,670	6,646,343	29,797,530	1,050,287	3,832,030	78,850

1/ Data on quantity of riparian habitat are scarce. Habitat losses were estimated on the basis of sites of streams inundated, with the exception of Flaming Gorge, Wayne N. Aspinall, and Glen Canyon Units where habitat figures were available from preimpoundment studies.

2/ Includes pinyon-juniper woodland, mountain brush, salt desert shrub, and northern and southern desert shrub types.

3/ Net change.

4/ Derived from the 1971 Upper Colorado Region Comprehensive Framework Study (1965 data) adjusted to reflect habitat changes due to CRSP units constructed prior to 1965.

5/ Figures shown are estimates for land either inundated or placed under full service irrigation.

6/ A total of 153,290 primarily barren acres was inundated at Glen Canyon; of these, only 3,020 were considered key habitat.

7/ Total remaining habitat in basin with CRSP and Fryingpan-Arkansas Project (1976 modified base).

Losses 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 furbearers, 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 impacts are tied to the loss of approximately 189,770 acres of brushlands and pinyon-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 weeds, fence rows, and waste areas provide 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 and particularly benefits the 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 Seedskaadee National Wildlife Refuge in Wyoming; the Brown's Park, Desert Lake, and Stewart Lake Waterfowl Management Areas in eastern Utah; and the Miller Mesa Waterfowl Management Area at Navajo 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 pinyon-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 34
Major wildlife habitat changes from
developments considered for construction after 1976
(Unit--acres)

	Riparian	Aspen-conifer	Desert shrub, brushland, and pinyon- juniper	Grassland/	Cropland- pasture	Specific wildlife developments
1976 modified base	193,040	6,646,343	29,787,530	1,050,287	1,832,030	78,040
Developments considered for construction after 1976						
Grand Valley Unit	-709		-1,177		1,000	2,090
Paradox Valley Unit	2/50		-3,800	200		3,700
Aniwas-La Plata Project	-550	-420	-5,953	-3,246	18,310	3,500
Ruedt Reservoir Round 2						
Water Sale						
Lower Gunnison Basin Unit	-2,547					2,100
Uinta Basin Unit	-609		384		200	610
Dolores Project modifi- cations	-304					770
Subtotal	-4,669	-420	-10,546	-3,046	19,510	12,770
Total remaining habitat in basin	188,371	6,645,923	29,776,984	1,047,241	1,851,540	90,850
Percent change	-2.4	-0.01	-0.04	-0.3	+0.5	+16.4

1/ Net change.

2/ Approximately 50 acres of riparian habitat would be improved because of salt reduction in 7 miles of the Dolores River.

Water availability and salinity

Water Availability

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 205,500 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 Uinta 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 CRSS 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 from the level expected from developments constructed or under construction. This reduction would be due to a combination of development and salinity control expected in the Colorado River Basin. The proposed Dolores Project modifications would further reduce the average salinity by about 2.9 mg/L.

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 No. 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 34.3 miles of MWIC's existing canals and install 7 miles of buried pipe laterals and the SCS would install 235 miles of buried pipe laterals to provide gravity and pumped

Table 35
Stream depletions and salinity impacts

Project or Unit	Depletions (acre-feet/ year)	Change in salt loading (cons/year)	Range of individual project salinity impacts for 1941-2040 ^{1/}	
			Minimum (mg/L)	Maximum
Developments constructed or under construction				
Wayne N. Aspinall Unit	9,000	0	0.4	1.7
Flaming Gorge Unit	65,000	0	2.6	12.1
Glen Canyon Unit	525,000	0	20.8	91.2
Navajo Unit	26,000	0	1.1	4.9
Florida Project	14,000	11,500	1.1	4.1
Paonia Project	10,000	4,700	.6	2.5
Silt Project	6,000	13,200	.8	2.8
Smith Fork Project	6,000	2,800	.4	1.5
Hammond Project	10,000	7,900	.7	2.9
Central Utah Project				
Bonneville Unit	166,000	-21,600	5.8	27.7
Jensen Unit	15,000	33,200	2.0	7.1
Vernal Unit	12,000	27,700	1.7	5.9
Upalco Unit	12,000	6,200	.8	3.1
Emery County Project	8,000	0	.3	1.5
Lyman Project	10,000	0	.4	1.9
Seedskaade Project	281,000	0	11.3	50.6
Navajo Indian Irrigation Project	267,000	220,000	20.0	75.7
San Juan-Chama Project	110,000	-16,000	3.8	18.3
Bostwick Park Project	4,000	11,200	0.6	2.2
Dallas Creek Project	17,000	9,800	1.1	4.5
Dolores Project	81,000	50,650	5.4	21.5
Fryingpan-Arkansas Project	69,000	-3,500	2.7	12.4
Subtotal	1,723,000	357,760	1/	1/
Developments considered for construction after 1976				
Paradox Valley Unit ^{2/}	1,500	-180,000	-7.7	-23.2
Aniwas-La Plata Project	155,000	8,470	6.0	27.6
Ruedi Reservoir Round 2 Water Sale	49,000	-15,000	1.3	7.3
Lower Gunnison Basin Unit ^{3/}	-2,000	-141,000	-6.1	-18.7
Grand Valley Unit ^{3/}	0	-166,600	-7.2	-21.7
Uinta Basin Unit ^{3/}		2/25,500	-1.1	-3.3
Subtotal	203,500	-534,570	1/	1/
Proposed development				
Dolores Project modifications		-32,000	-1.4	-4.2
Total	1,926,500	-208,810	4/	4/

^{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/} Mean of 21,000 to 30,000 tons of reduction expected from unit.

^{3/} Salinity Control Units.

^{4/} Salinity impacts of the individual developments cannot be added directly because of synergistic 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 14 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.

Table 36
Cumulative effects of Reclamation and SCS plans

	Existing condition	Reclamation proposed plan	SCS 1/Plan 5	Cumulative effects
Canal lining (miles)		2/+34.3	NA ^{2/}	+34.3
Buried pipe laterals (miles)		+7.0	+235.0	+242.0
Permanent rights-of-way (acres)				
Private land (Federal acquisition)		+1,410.5	NC ^{2/}	+1,410.5
Private land (MVIC acquisition)	161	+297.2	NC	+297.2
Wildlife habitat (acres)				
Upland	125,534	125,548	127,284	+1,764
Wetlands ^{4/}	10,310	10,296	8,560	-1,764
Impact to fisheries	NC	NC	NC	NC
Impact to endangered species	NC	NC	NC	NC
Cultural resources present	129	129	5/	129
Salt loading reduction (tons)		-24,500	-38,000	-62,500
Net effect on salt loading (tons) ^{5/}		+18,650	NA	+18,650
Seepage reduction (acre-feet)	NC	-7,900	7/-9,000	-16,900
Irrigation systems				
Improved system	No	Yes	Yes	Yes
Automated delivery system	No	Yes	No	No
Sprinkler pressure	No	Yes	Yes	Yes
Employment (direct—person years)	NC	215	98	313
Construction costs (millions) ^{3/}		\$23.168	\$23.32	9/
Increase in annual operation, maintenance, and replacement costs	NC	\$91,400	\$184,300	\$275,700
Cost effectiveness per ton of salt removed (\$/ton)		\$83	10/\$64	

1/ Information on the impacts of the Soil Conservation Services's recommended plan, referred to as Plan 5, for on-farm improvements solely in the McElmo Creek drainage comes from the agency's Environmental Assessment for On-Farm Irrigation Improvements, McElmo Creek Unit Salinity Control Study, Colorado River Basin Salinity Control Program, Denver, Colorado, December 1986.

2/ Pluses indicate increases—minuses indicate decreases.

3/ NA = data not available. NC = No significant change.

4/ The effect of Reclamation's salinity control program reflects the development of 75 acres of wetlands habitat. Mitigation under the SCS-USDA program, and in accordance with the Colorado River Basin Salinity Control Act (Public Law 93-320, as amended by Public Law 98-569), would be accomplished on a voluntary basis by landowners, with a maximum percent Federal cost-share for necessary measures.

5/ Should cultural resources sites be discovered during construction, work would be stopped to give the State Historic Preservation Officer time to assess the value of the site and salvage valuable artifacts.

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 Towaco Canal on the east side of Cortez.

7/ The seepage reduction for the SCS-USDA program includes laterals, ditches, and deep percolation.

8/ The construction cost for Reclamation is based on 1987 prices. The SCS-USDA construction cost is based on July 1981 prices.

9/ Since the construction costs are based on different prices, as noted in footnote 8, a cumulative total would be inaccurate.

10/ Because the SCS-USDA report does not use dollars per ton, the following formula was used to obtain it in a value: \$624,000 per mg/L times 3.9 mg/L divided by 38,000 tons equals \$64 per ton of salt removed.

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

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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 call 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.

Alternatives 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 Hermana 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 DWCD, 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 Hermana 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, Reach 1, the reservoir 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.

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 undisclosed 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.

1984

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

1977

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.

1982

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 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, 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 (Weeminuchi 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.

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.

Environment

Coordination activities

1979

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.

1985

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 160. 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."

1987

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 recordkeeping 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 MVIC 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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 KVFC Radio Station, Cortez, Colorado
 Western Wrapup, Washington, DC

Local Agencies and Private Organizations

American Canoe Association, Denver, Colorado
 Club 20, Grand Junction, Colorado
 Colorado Field Ornithologists, Boulder, Colorado
 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, Colo-
 rado
 Colorado University Wilderness, Boulder, Colorado
 Colorado Water Congress, Denver, Colorado
 Colorado White Water Association, Boulder and Lakewood, Colorado
 Colorado Wildlife Federation, Boulder, Colorado
 Colorado Wildlife Federation, Boulder, Colorado
 Defenders of Wildlife, Rock Springs, Wyoming
 Dolores Water Conservancy District
 W.T. Butler, Dolores, Colorado
 Larry Deremo, Dove Creek, Colorado
 Adrian Fisher, Yellow Jacket, Colorado
 David Herrick, Cortez, Colorado
 Bruce McAfee, Cortez, Colorado

Local Agencies and Private Organizations (Continued)

Dolores Water Conservancy District (Continued)
 Dudley Millard, Cortez, Colorado
 John Porter, Cortez, Colorado
 Environmental Defense Fund, Denver, Colorado
 Friends of the Earth, Moab, Utah
 Four Corners Expeditions, Mancos, Colorado
 Four Corners Regional Commission, Farmington, New Mexico
 Four Corners Research 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
 Montelores 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
 Native American Rights Fund, Boulder, Colorado
 New Mexico Conservation Council, Albuquerque, New Mexico
 New Mexico Wildlife Federation, Albuquerque, New Mexico
 Region 9 Community Services Agency, Durango, Colorado
 Rocky Mountain Center on Environment, Denver, Colorado
 Sierra Club, Golden, Colorado
 Sierra Club, Rocky Mountain Chapter, Steamboat Springs, Colorado
 Sierra Club, Rocky Mountain Chapter, Denver, Colorado
 President, Southwestern Water Conservation District, Durango, Colorado
 The Nature Conservancy, Colorado Chapter, Denver, Colorado
 The Wilderness Society, Western Regional Office, Denver, Colorado
 Trout Unlimited, Albuquerque, New Mexico and Denver and Durango, Colorado
 Upper Colorado River Commission, Salt Lake City, Utah
 Civil Engineer, Branch of Roads, Ute Mountain Ute Agency, Towaoc, Colorado
 Chairman, Ute Mountain Ute Tribe, Towaoc, Colorado
 Vice Chairman, Ute Mountain Ute Tribe, Towaoc, Colorado
 Planning Department, Ute Mountain Ute Tribe, Towaoc, Colorado
 Chairman, Ute Mountain Water Resources Task Force, Towaoc, Colorado
 Western River Guides Association, Salt Lake City, Utah

Interested Individuals

Walter Ertel, Cortez, Colorado
 Daniel Israel, Denver, Colorado
 Sam Maynes, Durango, Colorado
 Larry McDaniel, Durango, Colorado
 Christine Mulick, Denver, Colorado
 Michael Preston, Cortez, Colorado
 Don Schwindt, Cortez, Colorado

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ATTACHMENTS

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.

Name: Ken Beck
Position: Agricultural Economist
Education: M.S., Agricultural Economics
Experience: 5 years
Participation: Team leader and economic analysis

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Position: Sociologist
Education: M.A., Sociology
Experience: 6 years
Participation: Social analysis

Name: Mark A. Chiarito
Position: Landscape Architect
Education: B. Landscape Architecture
Experience: 7 years
Participation: Recreation analysis

Name: Don W. Fazzan
Position: Civil Engineer
Education: B.S. Civil Engineering
Experience: 10 years
Participation: Designs and estimates

Name: Errol G. Jensen
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ATTACHMENT A

LIST OF PREPARERS

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 Participation: Environmental analysis and mitigation

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 Education: B.S. Civil Engineering
 Experience: 13 years
 Participation: Operation, maintenance, and replacement analysis

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 Education: B.S., Civil Engineering
 Experience: 12 years
 Participation: Hydrosalinity analysis

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 Experience: 11 years
 Participation: Economic analysis

Name: Christopher Vogl
 Position: Technical Publications Writer
 Education: M.A., English
 Experience: 12 years
 Participation: Lead writer

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.



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

IN REPLY REFER TO

(ES)

December 13, 1985

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 reduction of seepage from the lined canal or complete removal of the canal (Rocky Ford); and 3) Totten Reservoir fishery.

In November of 1984 FWS contracted with the Colorado Division of Wildlife (CDOW) to assess potential impacts the Dolores Project Towaoc-Highline Canal would have on big game and cottonwoods. The CDOW 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 would pose its greatest potential for drowning deer and elk, the CDOW estimates the resident deer population at 4.7 deer/sq. mi. In addition, the CDOW 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 6 mile section of the Grand Valley Canal was lined in 1981. Since that time 26 deer and 2 elk have been trapped in the canal. Ten of the deer were dead (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 CDOW 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 powerplant 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 Stream 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 should then 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 concerning deer or 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 5280 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 reregulation 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 angler days/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 deer escape structures along the 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 CDOW and FWS as well as BR. 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 160. 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 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.
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 Canal.
6. 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

Colorado Division of Wildlife. 1985. Assessment of Potential for Big Game Losses in the Towaoc Canal and Cottonwood Tree. Inventory Dolores Project Final Report. Unpublished Colorado Division of Wildlife Report, Northwest Region, Terrestrial Wildlife Section. 19pp.

R.W. Nelson et. al. 1978. Western Reservoir and Stream Handbook.
U.S. Fish and Wildlife Service (FWS/OBS-78-56) Unpublished
Handbook.



Field Supervisor
Ecological Services

cc: CDOW, Montrose, Durango,
Denver (Attn: Walt Burkhart)
FWS/HR, Denver, CO
FWS/ES, Grand Junction, Golden, CO
BR, Durango

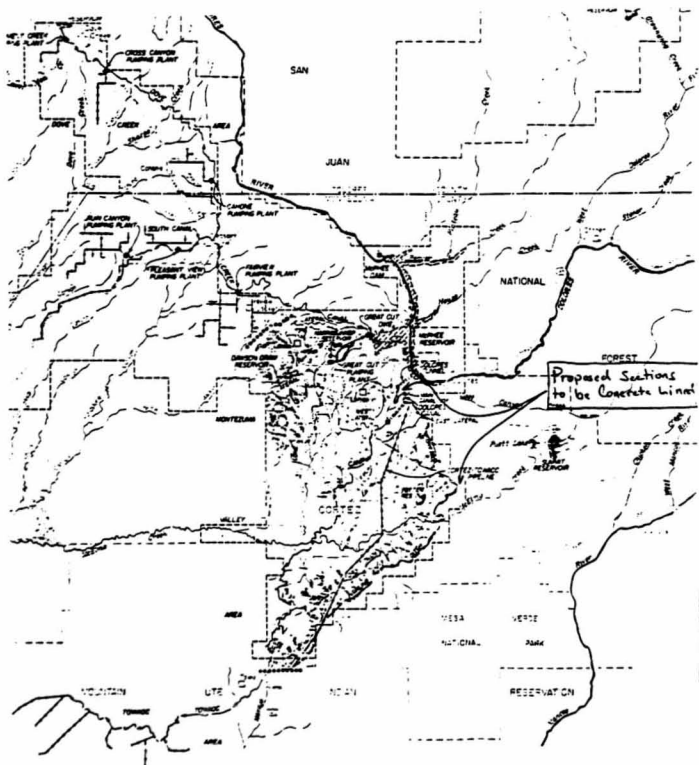
Escape Ramps P5.4

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.



Public Hearing Comments and Responses

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 DWCD, 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

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

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

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

U.S. Department of the Interior, Fish and Wildlife Service, Fish and Wildlife Enhancement, Colorado State Office, Grand Junction, Colorado
U.S. Department of the Interior, National Park Service, Rocky Mountain Regional Office, Denver, Colorado
U.S. Environmental Protection Agency, Region VIII, Denver, Colorado

Responses to letters from State agencies

State of California, Colorado River Board of California, Los Angeles, California
State of Colorado, Department of Natural Resources, Colorado Water Conservation Board, Denver, Colorado
State of Colorado, Department of Natural Resources, Division of Wildlife, Denver, Colorado

Response to letter from group

Ute Mountain Ute Tribe, Towaoc, Colorado

Comments requiring no response

U.S. Department of the Army, Corps of Engineers, Sacramento District, Sacramento, California
U.S. Department of Commerce, National Ocean and Atmospheric Administration, Rockville, Maryland
U.S. Department of Housing and Urban Development, Office of Community Planning and Development, Denver Regional/Area Office, Region VIII, Denver, Colorado
U.S. Department of the Interior, Bureau of Mines, Washington, D.C.
U.S. Department of the Interior, Geological Survey, Grand Junction, Colorado
U.S. Department of Transportation, Office of the Secretary of Transportation, Washington, D.C.
State of Colorado, Department of Local Affairs, Division of Local Government, Denver, Colorado

Comments from the U.S. Department of Agriculture, Soil Conservation Service, State Conservationist, Denver, Colorado, letter dated April 19, 1988

1. Comment:

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

Response: The correction has been made.

2. Comment:

(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 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 S-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.

6. Comment:

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?

Response:

The wetland mitigation plan involves rebuilding an existing irrigation system. To do this, a new head gate 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.

7. Comment:

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

Response:

Please see response to comment 3.

8. 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.

9. Comment:

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

Response:

Please see response to comment 4.

Comments from the Fish and Wildlife Service, Grand Junction, Colorado, memorandum of April 29, 1988

10. 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.

11. 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.

12. 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 S-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.

13. Comment:

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 days as stated here.

Response:

Dawson Draw Reservoir has a single-purpose objective, fish and wildlife enhancement. The fisherman day use number in the document is the number used in the Dolores Project Final Environmental Statement dated May 9, 1977. The Fish and Wildlife Service furnished this number in a planning aid memorandum dated March 19, 1976. This memorandum also contains estimated use for waterfowl hunting, upland game hunting, and wildlife-oriented activities. Based on the total of all of these numbers, Reclamation still endorses the reservoir as a fish and wildlife enhancement feature.

Comments from National Park Service, Rocky Mountain Regional Office, Denver, Colorado, in a memorandum dated April 29, 1988

14. Comment:

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 the 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.

Response:

This document supplements the PES 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.

18. Comment:

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 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 [sic] 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.

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 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."

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.

Comments from the Colorado River Board of California, Los Angeles, California, letter dated April 18, 1988

20. Comment:

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.

Response:

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

21. Comment:

Page S-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 S-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."

22. Comment:

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

Response:

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

23. Comment:

Page S-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.

24. Comment:

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

Response:

Please see the response to comment 23.

25. Comment:

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 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)(1) 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 ..."

Response:

The text has been changed to read 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 a basinwide plan of implementation for salinity control. In 1975, the states adopted these water quality standards for salinity. The EPA approved the state-adopted standards. 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 on the following page."

26. Comment:

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

Response:

The text has been changed to read 140,800 tons.

27. Comment:

Page 76, Table 35: Identify Paradox Valley, Grand Valley, Uinta Basin, and Lower Gunnison Basin as salinity control units. Further, it is unclear why the analysis included only four of the salinity control units rather than the full complement of units set forth in the recommended salinity control plan as presented in the 1987 Joint Evaluation of Salinity Control Programs in the Colorado River

Basin. It would be appropriate to include all of the salinity control units included in the plan.

Response:

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.

Comments from the Colorado Water Conservation Board, Denver, Colorado, letter dated May 31, 1988

28. Comment:

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.

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, USF&WS 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 [sic] 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 USF&WS using the HEP procedure to offset 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.

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-15.

Response:

Added to the text on pages S-8 and 28 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-15, 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 instream [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 98-569 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 Hermana 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, 1988

47. Comment:

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.

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.

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United States
Department of
Agriculture

Soil
Conservation
Service

Bldg A, 3rd Floor, DHOC
2490 West 26th Avenue
Denver, Colorado 80211

April 19, 1988

Regional Environmental Officer
USDI, Bureau of Reclamation
125 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.

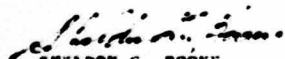
We suggest replacing this paragraph with:

"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

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assistance to operators for installing salinity control
structures using funds available through the USBR's
Colorado River Salinity Control Program."

Sincerely,


SHELDON G. BOONE
State Conservationist

cc: James B. Newman, Director, Ecological Sciences Division, SCS
Washington, D.C.
Kenneth A. Pitney, Basin Coordinator, SCS, Denver



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ORIGINAL

DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO CALIFORNIA 95814 4794

REPLY TO
ATTENTION OF

April 13, 1988

Regulatory Section

Mr. Clifford I. Barrett, Regional Director
Bureau of Reclamation
Code UC-730, Post Office Box 11588
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 DS 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:

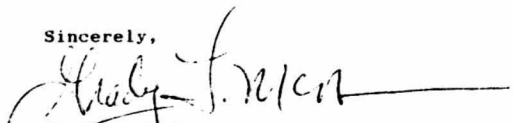
1. Page S-11, paragraph 1 - Has it been specifically determined that all of the wetland losses accrue directly to areas that are supported solely by lateral seepage?
2. Page 9, paragraph 1 and 2 - Will any of the recreational commitments require the placement of fill material in non-irrigation induced 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.

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?

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

Thank you for the opportunity to comment on the DS. If you have any questions, please contact Ken Jacobson at telephone (303) 243-1199.

Sincerely,


Grady L. McNure
Chief, Regulatory Unit 4
764 Horizon Drive, Room 211
Grand Junction, Colorado 81506-8719



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United States Department of the Interior

FISH AND WILDLIFE SERVICE
FISH AND WILDLIFE ENHANCEMENT
COLORADO STATE OFFICE
529 25 1/2 Road, Suite B-113
GRAND JUNCTION, COLORADO 81505
(303) 243-2778


IN REPLY REFER TO:

(FWE)

April 29, 1988

MEMORANDUM

TO: Regional Environmental Officer, Bureau of Reclamation,
Upper CO Region, Salt Lake City, UT

FROM: State Supervisor, Fish and Wildlife Enhancement,
Fish and Wildlife Service, Grand Junction, Colorado 

SUBJECT: Review of Draft Supplements to the Final Environmental Statement,
Dolores Project, CO

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

S7 - 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.

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.

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 S-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 days 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/FWE: SLC
CDOW: Durango
CDOW: Montrose
BFA (ERT), Washington, DC
Official file
Reading file

RKRUEGER:cjharris
Dolores



88009558
United States Department of the Interior

NATIONAL PARK SERVICE
ROCKY MOUNTAIN REGIONAL OFFICE
12795 W. Alameda Parkway
P.O. Box 25287
Denver, Colorado 80225-0287

IN REPLY REFER TO:

L7619 (RMR-PP)

APR 28 1988

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 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.

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 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.

We appreciated the opportunity to review this document.

Richard A. Strait

for Richard A. Strait



000000

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII
900 18th STREET—SUITE 500
DENVER, COLORADO 80202-2405

APR 07 1990

Ref: 8PM-EP

Cliff Barrett
Regional Director
Upper Colorado Regional Office
U.S. Department Of Interior
Bureau of Reclamation
125 South State Street
P.O. Box 11568
Salt Lake City, Utah 84147

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

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 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.

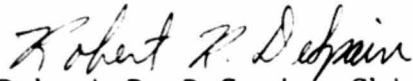
Our remaining concern is with the level of mitigation proposed for the remaining 89 acres of lost wetlands. The Bureau has reanalyzed the initial mitigation site proposed in 1987 and determined that 21 acres could be created through rehabilitation of an existing irrigation ditch and thereby better managing 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, 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 Ruitter 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

cc: Ken Pitney, SCS
Harold Sersland, BOR
Al Jonez, BOR
Gene Jencsok, Colorado DNR
Ernie Weber, CRBSCF Work Group
Jack Barnett, CRBSCF

ORIGINAL

COLORADO RIVER BOARD OF CALIFORNIA

107 SOUTH BROADWAY, ROOM 8103
LOS ANGELES, CALIFORNIA 90012
(213) 620-4480

88001516

April 18, 1988

Clifford I. Barrett
Regional Director
Upper Colorado Region
Bureau of Reclamation
P.O. Box 11568, Code UE-730
Salt Lake City, Utah 84147

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. 98-569 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 \$82/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)(1) 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 140,000 tons, as per the 1987 joint evaluation report.

Clifford I. Barrett

April 18, 1988

Page 2

Page 76, Table 35: Identify Paradox Valley, Grand Valley, Uinta Basin and Lower Gunnison Basin as salinity control units. Further, it is unclear why the analysis included only four of the salinity control units rather than the full complement of units set forth in the recommended salinity control plan as presented in the 1987 Joint Evaluation of Salinity Control Programs in the Colorado River Basin. It would be appropriate to include all of the salinity control units included in the plan.

We appreciate the opportunity to review and comment on the draft supplement to the final environmental statement.

Sincerely yours,

Dennis B. Underwood
Executive Director

STATE OF COLORADO

COLORADO WATER CONSERVATION BOARD
Department of Natural Resources
721 State Centennial Building
1111 Sherman Street
Denver, Colorado 80204
Phone: (303) 866-1441



Roy Rumer
Governor
J. William McDonald
Director
David W. Walker
Deputy 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 Environment 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

JWM/bj

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&WS, 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 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 USF&WS using the HEP procedure to offset 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.
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.
8. Page S-14, "Issue and Implementation". McElmo Canyon water users are concerned about reductions instream 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.

9. 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.

g1

STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES

88002561

ORIGINAL

DIVISION OF WILDLIFE

James B. Ruch, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

REFER TO



151 E. 16th Street
Durango, CO 81301
May 3, 1988

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

Sir:

The Colorado Division of Wildlife (CDOW) has reviewed the Draft Supplement to the Final Environmental Statement, Dolores Project, Colorado (DSFES 88-11). We would like to offer the following comments.

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?

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.

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.

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 T. Skiba
Habitat Biologist

xc: Bob Clark
Mike Zgainer
Mike Reid



UTAH
UTE MOUNTAIN UTE TRIBE

Towaoc, Colorado 81334
(303) 565-3751

May 2, 1988

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

Ernest House
Chairman

Judy M. Knight
Vice Chairman

Rudy Hammond
Treasurer

White Mesa Representative
Eddie Dutchie, Jr.

Councilman

Eva Wall
Councilwoman

Nelson Elkriver
Councilman

Scott Jacket
Councilman

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



DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

May 10, 1988

Colorado/Great Basin Branch

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

Dear Mr. Barrett:

We have reviewed the Dolores Project, Colorado, Draft Supplement to the Final Environmental Statement and have no comments at this time.

Sincerely,

Walter Yep
for Walter Yep
Chief, Planning Division



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF CHARTING AND GEODETIC SERVICES
ROCKVILLE, MARYLAND 20852

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

FROM: *J. G. Yeason*
for 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/CG17, Rockwall Bldg., Room 20, National Geodetic Survey, NOAA, Rockville, Maryland 20852, telephone (301) 443-8631.

Attachments
Geodetic Control Station Descriptions

cc:
ES - Gooding
N/CG17 - 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



File copy

31 Colo.
20 Utah

Reprinted May 27, 1963
Revised October 4, 1957
May 31, 1954

U. S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
Second-order leveling

Dolores, Colorado, to Monticello, Utah

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

This line follows Colorado State Highway 147 from Dolores to the junction of U.S. Highway 160 near Lewis, Colorado; U.S. Highway 160 from Lewis through Axman and Dove Creek, Colorado, to the Colorado-Utah State line 8.6 miles northwest of Dove Creek; and U.S. Highway 450 (in 1954) from the Colorado-Utah State line to Monticello, Utah. The field work was done in September 1954 by a party under the supervision of A. S. Thorsen.

For additional bench marks in the vicinity of Dolores, see "Antonio, Colo., to Bluff, Utah (7 Colo.)", "Dolores to Placerville, Colorado" (32 Colo.), and "Norwood to Dolores, Colorado (39 Colo.)."

W 150.-- 1.9 miles west along State Highway 147 from the high school at Dolores, Montezuma County, 0.5 mile northeast of the junction of State Highway 145, at the old bridge over Dolores River, in the top of the southeast concrete wing wall of the south-west concrete abutment, 110 feet northeast of pole 291, and 8 feet southeast of the centerline of the highway. A standard disk, stamped "W 150 1954" (2,101.103 meters or 6,894.025 feet.)

NOTE-- It was reported in February 1954 that the new bridge over Dolores River is approximately 150 feet south of what remains of the old bridge.

I 150.-- 3.7 miles west along state Highway 147 from the high school at Dolores, Montezuma County, 1.5 miles northwest of the junction of State Highway 145 leading south, 0.2 mile west of the junction of the road leading north to McPhee, on an abandoned highway, 480 feet west of a culvert, on the outside of a curve, 75 feet southwest of the centerline of the highway, and 1 foot north of the northwest corner of a fence. A standard disk, stamped "I 150 1954" and set in the top of a concrete post. (2,157.103 meters or 7,077.095 feet.)

NOTE-- It was reported in February 1954 that the abandoned highway is approximately 100 yards west of the new highway.

T 150.-- Destroyed prior to February 1954.

Z 150.-- Destroyed prior to February 1954.

A 164.-- 1.6 miles southeast along U.S. Highway 160 from the public school at Legala, Montezuma County, 0.5 mile northwest of the intersection of Cortez Road, 120 feet east of the summit over a ridge, 2 1/2 feet northwest of a wagon gate, 22 feet north of the centerline of the highway, 4.5 feet northwest of a telephone pole, and 1.9 feet south of a fence. A standard disk, stamped "A 164 1954" and set in the top of a concrete post. (2,009.468 meters or 6,592.730 feet.)

NOTE-- It was reported in February 1954 that this mark is not now on the highway, but about 1/2 mile west of the gravel road on the section line between sections 5 and 6, on a dirt section-line road about 1 1/4 mile north of State Highway 147, between sections 6 and 7, T 37 N, R 16 W, 100 yards west of a gate, 50 yards west of an abandoned house on the north side of a dirt lane, 15 feet north of the centerline of the lane, and 1 foot south of a fence.

B 166.-- At Legala, Montezuma County, on U.S. Highway 160, at the public school, 4 1/2 feet southwest of the southwest corner of the school, 75 feet northeast of the centerline of the highway, 27 feet east of the centerline of a north-and-south dirt road, 25 feet north of the school flagpole, and 1.9 feet east of the schoolyard fence. A standard disk, stamped "B 166 1954" and set in the top of a concrete post. (2,040.950 meters or 6,696.148 feet.)

C 166.-- 1.8 miles northeast along U.S. Highway 160 from the public school at Legala, Montezuma County, on the outside of a curve, 25 feet northeast of the east end of a wooden irrigation culvert, 2 1/2 feet east of the centerline of the highway, 15 feet north of the center of a wagon gate, 3.4 feet north of a telephone pole, and 1.5 feet west of a fence. A standard disk, stamped "C 166 1954" and set in the top of a concrete post. (2,082.206 meters or 6,831.371 feet.)

D 166.-- 1.7 miles northeast along U.S. Highway 160 from the public school at Legala, Montezuma County, 0.7 mile east of the post office at Yellow Jacket, 300 feet east of a two-room log cabin, 400 feet southeast of the south end of a small wooden bridge, 115 feet southwest of the south end of a culvert, 50 feet south of the centerline of the highway, in the top of an outcrop of sandstone, 3.5 feet south of a rock cairn 1 foot at the base and 3 feet high, and 3.2 feet north of a fence. A standard disk, stamped "D 166 1954" (2,080.065 meters or 6,826.315 feet.)

E 166.-- 3.5 miles southeast along U.S. Highway 160 from the public school at Acron, Montezuma County, 1.4 miles north of the post office at Yellow Jacket, 270 feet northeast of the northeast corner of a shed of the State Highway Department, 180 feet north of the junction of a dirt road leading to the shed, 25 feet east of the centerline of the highway, 2.8 feet north of a telephone pole, and 2.2 feet west of a fence. A standard disk, stamped "E 166 1954" and set in the top of a concrete post. (2,112.410 meters or 6,930.465 feet.)

F 166.-- 1.6 miles southeast along U.S. Highway 160 from the public school at Acron, Montezuma County, 1000 feet south of a small frame house on the side of a hill, 24.4 feet northwest of the north end of a culvert, 24 feet east of the middle of a wagon

gate, 27 feet north of the centerline of the highway, 5.1 feet west of a telephone pole, at the east end of a winding road, and 1.8 feet south of a fence. A standard disk, stamped "F 166 1954" and set in the top of a concrete post. (2,048.460 meters or 6,754.077 feet.)

NOTE-- It was reported in October 1949 that this mark is now below the level of the ground, but marked by a large sandstone rock.

G 166.-- At Acron, Montezuma County, on U.S. Highway 160, at the public school, 120 feet northeast of the northeast corner of the school, 20.4 feet northwest of the school pump, 300 feet southwest of the centerline of the highway, 300 feet southwest of a wooden bridge over a draw, in the top of a sandstone ledge, and 1.8 feet west of the top edge of the ledge. A standard disk, stamped "G 166 1954" (2,068.697 meters or 6,787.050 feet.)

H 166.-- 1.7 miles north along U.S. Highway 160 from the public school at Acron, Montezuma County, 150 feet north of a summit, 21 feet south of the centerline of an east-and-west dirt road, 40 feet west of the centerline of the highway, 7.2 feet west of a northeast fence corner, 3.4 feet west of a telephone pole, and 1.9 feet north of a fence. A standard disk, stamped "H 166 1954" and set in the top of a concrete post. (2,105.694 meters or 6,908.431 feet.)

I 166.-- 3.6 miles north along U.S. Highway 160 from the public school at Acron, Montezuma County, 1.1 miles south of the Montezuma-Dolores county line, at the Pleasant View School, 100 feet northwest of the northwest corner of the building, 33 feet east of the centerline of the highway, 9 feet north of the middle of a wagon gate, 2.8 feet northeast of the northwest fence corner of the schoolyard, and at a summit. A standard disk, stamped "I 166 1954" and set in the top of a concrete post. (2,083.596 meters or 6,852.335 feet.)

NOTE-- It was reported in February 1954 that this mark is not now on the highway, but is 1.1 miles south of the Dolores-Montezuma county line, in the northwest quarter of Section 30, T 37 N, R 17 W, 300 feet south of the cross road and section corner, 20 feet east of the centerline of a north-and-south road, and 9 feet north of the middle of a gate into a field. It was also reported that there is now nothing left of the school.

K 166.-- 3.3 miles east along U.S. Highway 160 from the public school at Cahone, Dolores County, about 1 mile northwest of the Dolores-Montezuma county line and a highway intersection, 0.25 mile south of Little Grove School, 42 feet south of the centerline of an east-and-west dirt road, 30 feet east of the centerline of the highway, 10 feet south of a northwest fence corner, 2.4 feet south of a telephone pole, and 1.8 feet west of a fence. A standard disk, stamped "K 166 1954" and set in the top of a concrete post. (2,079.489 meters or 6,824.077 feet.)

NOTE-- It was reported in February 1954 that this mark is 2 miles east and 1 mile south of Cahone and in the northeast quarter of section 18, T 37 N, R 17 W. Highway 160 is 2 miles west.

L 166.-- 1.4 miles east along U.S. Highway 160 from the public school at Cahone, Dolores County, 1.8 miles northwest of the Little Grove public school, 400 feet west of a small log cabin, 400 feet east of the centerline of a north-and-south crossroad, at a summit, 2 1/2 feet north of the centerline of the highway, 0.3 feet west of a telephone pole, and 1.5 feet south of a fence. A standard disk, stamped "L 166 1954" and set in the top of a concrete post. (2,066.756 meters or 6,780.688 feet.)

M 166.-- 1.8 miles northwest along U.S. Highway 160 from the public school at Cahone, Dolores County, 0.8 mile northwest of a wooden bridge over a draw, 0.2 mile south of a wooden bridge over a draw, 40 feet northeast of the farmhouse of Berry Sabo in 1954, in the outside of a curve, 27 feet southwest of the centerline of the highway, 9 feet northwest of a telephone pole, and 1.8 feet northeast of a fence. A standard disk, stamped "M 166 1954" and set in the top of a concrete post. (2,024.363 meters or 6,658.002 feet.)

P 166.-- Destroyed prior to February 1954.

Q 166.-- 4.8 miles southeast along U.S. Highway 160 from the public school at Dove Creek, Dolores County, 750 feet southeast of the southeast end of a curve in the highway, 120 feet northeast of the west end of a frame barn, 5 1/2 feet northeast of the centerline of the highway, 11.3 feet northeast of a fence, in the southwest point of a sandstone outcrop, and 3.4 feet northeast of the northeast point of a sandstone outcrop. A standard disk, stamped "Q 166 1954" (2,053.330 meters or 6,736.633 feet.)

R 166.-- 2.8 miles southeast along U.S. Highway 160 from the public school at Dove Creek, Dolores County, 420 feet west of a wooden culvert, 120 feet southwest of the centerline of the highway, 42 feet east of the centerline of a dirt road, on the outside of a curve, 11.8 feet north of a northwest fence corner, and 3 feet north of a telephone pole. A standard disk, stamped "R 166 1954" and set in the top of a concrete post. (2,040.400 meters or 6,695.254 feet.)

S 166.-- 0.9 mile southeast along U.S. Highway 160 from the public school at Dove Creek, Dolores County, 0.5 mile east of the Sifton garage in 1954, 70 feet west of the middle of a wagon gate, 70 feet west of a northwest fence corner, on the outside of a curve, 36 feet north of the centerline of the highway, and 2.4 feet north of a fence. A standard disk, stamped "S 166 1954" and set in the top of a concrete post. (2,101.082 meters or 6,891.300 feet.)

NOTE-- This bench mark was searched for but not recovered in 1950.

T 166.-- At Dove Creek, Dolores County, at the public school, 40 feet north of the centerline of U.S. Highway 160, 200 feet west of the centerline of a north-and-south dirt road, 130 feet south-west of the southwest corner of the schoolhouse, 3.3 feet north of a southeast fence corner, and 0.4 feet west of a fence. A standard disk, stamped "T 166 1954" and set in the top of a concrete post. (2,085.748 meters or 6,842.11 feet.)

NOTE-- It was reported in September 1950 that U.S. Highway 160 has been relocated.

NOVEMBER 1963
 PUBLISHED AND PRINTED BY:
 U.S. DEPARTMENT OF COMMERCE
 NAUTICAL AND GEODETIC SURVEY
 WASHINGTON D.C.

HORIZONTAL CONTROL DATA

by the
 Coast and Geodetic Survey
 NORTH AMERICAN 1927 DATUM

QUAD 371083 STATION 1002
 COLORADO
 LATITUDE 37°00' TO 37°30'
 LONGITUDE 108°30' TO 109°00'
 DIAGRAM NJ 12-9 CORTEZ

DOLOROS (Montezuma County, Colo., C.P., 1936)--Station is located 1 mile NNW of Dolores, 1 1/2 miles NNE of Cortez (air line distances) in T 15 W, R 37 N. On a flat-topped mesa 50 yards N of the S rim and 1/4 mile W of the E edge of the mesa, which is approximately 1000 feet higher than the town of Dolores.

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

Azimuth is 120 yards NNW on S end of small ridge. Reached from the post office in Dolores as follows: Go E on State Highways 145 and 147 for 0.7 mile and take left fork, Highway 147, go 1.6 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 and take right fork, go 0.2 mile and take left fork which runs S and parallels wire fence, go 0.3 mile to a fence corner and turn right SW through fences, go 0.4 mile to top of knoll, turn left along road and go 0.25 mile to foot of mesa and end of truck level. From here climb uphill SSW about 1/4 mile to top of mesa station as described above.

OBJECT	DISTANCE	DIRECTION
WENEPEE	meters	0°00'00"0
R.M.No.1 (W)	13.309	138 54 48
Az.M. (see desc.)		181 08 09.5
R.M.No.2 (N)	14.967	241 13 47

(Montezuma County Colo.; C.P. 1936; J. Harris, Western Geod. Co. 1954) recovered in good condition.

RECOVERY NOTE, TRIANGULATION STATION

DOLOROS
 USC&GS YEAR 1936 STATE COLORADO BENCH MARK(1) ALSO []
 USGS YEAR 1965 COUNTY Montezuma
 AND DIRECTION FROM NEAREST TOWN 1 mile NNW of Dolores

Due to the loss of the original description, including marks found, stampings, changes made, and other pertinent facts recovered. Revised description: Post Office in Dolores, 0.4 mile W of 145 thence 1.7 mi. north along the Dolores-Norwood Road #2526 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 hills. Pack from this point SE up hill and station as previously described. Station mark is also about 150 feet NW of a wire fence that is on top of the hill. It is on land owned by Mr. W. R. Vesch in Colorado.

RECOVERY NOTE TRIANGULATION STATION

DOLOROS
 C. P. YEAR 1936 STATE Colorado BENCH MARK(1) ALSO []
 E. Purcell, Jr. YEAR 1967 COUNTY Montezuma
 AND DIRECTION FROM NEAREST TOWN 0.5 mile north of Dolores

Due to the loss of the original description, including marks found, stampings, changes made, and other pertinent facts recovered. Station mark and reference marks recovered in good condition as shown. The description is adequate for the area concerned.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION DOLOROS YEAR 1936
 STATE Colorado LOCALITY South Ute Indian Reservation
 First-ORDER Triangulation SOURCE: 0-6521 FIELD SHEET NO. COLO-3

GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH BY STATION ANGLE	MARK
STATE Colorado ZONE S CODE 0503	X 1,129,309.96 Y 310,745.87	110°29'02" - 1 50 27	AZ MK
STATE: ZONE: CODE:			

GEODETIC DATA	POSITION		SECONDS IN METERS	ELEVATION
	LATITUDE	LONGITUDE	NORTH WEST	METERS FEET
	37°28'54".081	108°30'03".841		

TO STATION	GEODETIC AZIMUTH (Feet south)	DISTANCE	
		LOGARITHM (Meters)	METERS
UTE YELLOWJACKET RUSH MADDEN WENEPEE PARK POINT 2 USGS	FIRST-ORDER		
	48°17'01".82	4.517 2203	32,901.85
	103 35 59.75	4.363 8072	23,110.39
	270 07 59.56	4.125 5946	13,353.48
	287 20 17.77	4.565 0109	36,729.15
	307 30 25.45	4.451 1233	28,256.82
	350 54 50.15	4.353 9527	22,591.90
AZIMUTH MARK	THIRD-ORDER		
	108 38 34.7		

R'8a

T 11)
 170

170

HORIZONTAL CONTROL DATA

by the
 Coast and Geodetic Survey
 NORTH AMERICAN 1927 DATUM

QUAD 371084 STATION 1001
 COLORADO
 LATITUDE 37°30' TO 38°00'
 LONGITUDE 108°30' TO 109°00'
 DIAGRAM NJ 12-9 CORTEZ

FILE COPY

BAIRD (Dolores County, Colo., C.P., 1936)--Station is located
 line between Secs. 8 & 9, T 40 N, R 17 W, about 3/4 mile N of
 Montezuma National Forest Boundary line, and about 1 mile S
 1/2 miles E of Dove Creek post office, and about 4 miles E
 1/4 miles N of Canoncito post office, and about 1 mile S and
 1/2 miles E of the Baird water reservoir. On a low oak brush cov-
 ered ridge just W of the Dolores River. There is a higher and
 more-covered ridge to the N, but station is located 1/2 mile S
 this ridge at the edge of the tall pine timber.

Station, reference and azimuth marks are standard bronze
 on wedged in drill holes in outcropping bedrock.
 Azimuth mark is 0.4 mile N and 50 yards W of road near a
 sad tree.

Reached from Dove Creek on U.S. Highway 160 as follows: from
 Sitton 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 NE and easterly for 4.3 miles to Forest Boundary
 line and Baird reservoir, continue on unimproved road around res-
 ervoir, and E for 0.25 mile to three road fork, continue straight
 ahead on middle fork (main-traveled road) E and S through timber
 for 2.3 miles to station.

OBJECT	DISTANCE	DIRECTION
YELLOW JACKET	meters	0°00'00"0
R.M.No.1 (NW)	3.855	121 58 16
Ar.M. (N)	0.4 mile	166 45 47.6
R.M.No.2 (NNE)	4.326	212 40 59

D (Dolores County, Colo., C.P. 1936, J. Harris, Western Geod. Co. 1954)
 ion recovered in good condition.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION BAIRD YEAR 1936
 STATE Colorado LOCALITY South Ute Indian Reservation
 First-ORDER Triangulation SOURCE G-6521 FIELD SHEET COLO 3,4-1

GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH BY ORIGIN AND ANGLE	MARK
STATE Colo ZONE S CODE 0503	1,061,081.19 408,326.07	170°21'05" - 1 59 32	AZ MK
STATE ZONE CODE			

GEODETTIC DATA	POSITION		SECONDS IN METERS	ELEVATION
	LATITUDE	NORTH WEST		METERS FEET
	37°44'35".765			
	108 44 51.875			

TO STATION	GEODETTIC AZIMUTH (From mark)	DISTANCE	
		LOGARITHM (Meters)	METERS
YELLOWJACKET UTE SPARGO PARK POINT 2 USGS	FIRST-ORDER 1°35'44".89	4.373 5934	23,637.05
	3 00 53.16	4.707 8450	51,032.28
	33 52 42.30	4.356 3396	22,716.40
	333 37 11.11	4.757 8927	57,265.45
AZIMUTH MARK	THIRD-ORDER 168 21 32.8		

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171 (5010)

OCTOBER 1954
 100-111-100
 U.S. GEOLOGICAL SURVEY
 WATER RESOURCES DIVISION
 WASHINGTON, D.C.

HORIZONTAL CONTROL DATA

By name
 and located by field survey
 REPORT OF INVESTIGATION

SPARGO (Montezuma County, Colo., C.P., 1900) - Station is about 1/2 mile S, W of the settlement of Ackmen, 1/2 mile from post office and about 0.4 mile air line, S and W of the Spargo Church and located on the top of a low flat-topped hill, in the SW 1/4 of Sec. 21, T. 41 N., R. 19 W., and just E of the R. 19 E. 1/2-1/4.

Markings, underground and reference marks are standard bronze disks set in concrete as described in notes in 7a and 11a. A bench mark is located about 1/2 mile E from station, along road 1/2 mile on left side (S) of road and about 10 ft E from center of road.

Spargo Church Cupola (azimuth object) is located about 0.3 mile N from station. Building is painted white with small cupola on top of roof. Peak of cupola was observed.

Reached from Cortez by going E on U.S. Highway 160 for about 28 miles to Ackmen post office, thence continue W and N on U.S. Highway 160 for 0.6 mile to a side road W left; turn left, off U.S. Highway 160, and go W on a graded dirt section line road for 2.7 miles to a left fork, keep straight ahead for 1.9 miles to a crossroads, keep straight ahead for 1.0 mile to another cross road, keep straight ahead for 0.35 mile to top of hill and station on the left. One and one half hours drive from Cortez.

OBJECT	DISTANCE	DIRECTION
LAIRD	meters	0°00'00.0
Spargo Church (Az. Obj.)		1 51 00.1
N.W. 1/4 (NE)	27.720	9 48 25
Az. Obj. (E)		55 03 49.7
N.W. 1/4 (NW)	26.740	284 59 40

All objects observed from a 12-foot tower.

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION
 STATE
 COUNTY
 TOWNSHIP
 RANGE
 SECTION

GRID DATA	COORDINATES (FEET)	ELEVATION (FEET)	MARK
STATE ZONE CODE	N 1,207,911.00 W 1,207,911.00	7,000.00	BR. DISK
STATE ZONE CODE			

GEOLOGIC DATA	POSITION		ELEVATION (FEET)	MARK
	LATITUDE	LONGITUDE		
	37 41 25.1	108 51 27.7		

MARK	MARK TYPE - ELEVATION (Feet above ground)	DISTANCE (Meters)	
		MARK	MARK
LAIRD	0.00	0.00	0.00
MADDER	0.00	0.00	0.00
PARK POINT & USGS	0.00	0.00	0.00
UTE	0.00	0.00	0.00

AZIMUTH MARK	MARK TYPE - ELEVATION (Feet above ground)	DISTANCE (Meters)	
		MARK	MARK

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FOIA

HORIZONTAL CONTROL DATA

by the
 Coast and Geodetic Survey
 NORTH AMERICAN 1927 DATUM

QUAD 371084 STATION 1005
 COLORADO
 LATITUDE 37°30' TO 38°00'
 LONGITUDE 108°30' TO 109°00'
 DIAGRAM NJ 12-9 CORTEZ

YELLOW JACKET (Montezuma County, Colo., C.P., 1936)--Station is located 2 miles W of Yellow Jacket post office, 2 1/2 miles SSE of Ackmen post office, and 15 1/2 miles NW of Cortez (air line distances) near the SW corner of Sec. 20, T 38 N, R 17 W, on top of a rise near the SW corner of sagebrush covered field which is fenced in, 10.0 meters E of the center line of a N and S county road, 17.6 meters E of the W right-of-way fence, 2.4 meters E of the E right-of-way fence of same road, 62 meters E of the center line of an E and W county road, and 54 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 mark is a standard disk set in concrete.

Azimuth is 970 paces S, 20 feet W of center line of road, 5 feet E of W right-of-way fence of same road.

Resched from Cortez as follows: go N on U.S. Highway 160 for 2.8 miles to Yellow Jacket post office and leave by going straight ahead where highway turns E, go 2.0 miles on graded dirt road to crossroads and turn right E 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.

OBJECT	DISTANCE	DIRECTION
PARK POINT 2 (U.S.G.S.)	meters	0°00'00.0
R.W.No.2 (S)	14.515	44 22 04
Ac.V.		44 25 47.4
R.W.No.1 (W)	17.132	156 46 21
R.W.No.1 to R.W.No.2	22.909	

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION **YELLOWJACKET** YEAR **1936**
 STATE **Colorado** LOCALITY **South Ute Indian Reservation**
 First-Order Triangulation SOURCE **G-6221** FIELD SKETCH **COLO 3,4-1**

GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH & BORDON ANGLE	MARK
STATE Colo ZONE S CODE 0593	x 1,056,228.34 y 330,932.60	3°05'45" - 1 59 48	AZ MK
STATE ZONE CODE			

GEODETIC DATA	POSITION		SECONDS IN METERS	ELEVATION
	LATITUDE	LONGITUDE	NORTH WEST	METERS FEET
	37°31'49"366	108 45 18.685		

TO STATION	GEODETIC AZIMUTH (From mark)	DISTANCE	
		LOGARITHM (Metric)	METERS
UTE	FIRST-ORDER 4°14'01"93	4.437 8889	27,408.73
BAIRD	181 35 28.52	4.373 5934	23,637.05
DOLORES	283 26 42.75	4.363 8072	23,110.39
PARK POINT & USGS	316 40 10.50	4.580 2666	38,042.29
AZIMUTH MARK	THIRD-ORDER 1 05 57.3		

NR. 65 ↓

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U.S. Department of Housing and Urban Development
 Denver Regional Area Office, Region VIII
 Executive Tower Building
 1405 Curtis Street
 Denver, Colorado 80202

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



OFFICE OF THE DIRECTOR

88001745

United States Department of the Interior

BUREAU OF MINES
 2401 E STREET, NW.
 WASHINGTON, D.C. 20241

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
 IREO, Utah
 H. Enzer
 B. Pavlovich
 M. Gloster (2)
 WBM:JGersic:sn 4-14-88



CONFIDENTIAL
United States Department of the Interior

GEOLOGICAL SURVEY

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

85000120

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 Resource 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



U.S. Department of
Transportation

Office of the Secretary
of Transportation

400 Seventh St. S.W.
Washington, D.C. 20590

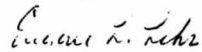
MAR 8 1988

Mr. Wayne O. Deason
Director
Office of Environmental Affairs
Bureau of Reclamation
Washington, D.C. 20240

Dear Mr. Deason:

Thank you for sending Secretary of Transportation Burnley a copy of the draft supplement to the final environmental impact statement on the Dolores Project in Colorado. We will provide coordinated DOT comments, if any, by the May 2, 1988 deadline.

Sincerely,


Eugene L. Lehr, Chief
Environmental Division

STATE OF COLORADO

Department of Local Affairs

DIVISION OF LOCAL GOVERNMENT

Pat Ratliff, Director

May 4, 1988



Roy Romer
Governor

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 will forward them to you for your information.

Thank you for the opportunity to review this matter.

Sincerely,

Val Tungseth, Staff Assistant
Colorado State Clearinghouse

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