SUMMARY

Preface

The project plan was completed at the request of the Mancos Conservation District.

All United States Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS) programs are available on a strictly voluntary basis. Each landowner or individual water user group will decide whether to participate in this program. The intention of this plan is to evaluate the cost effectiveness and potential environmental impacts this project will have if Colorado River salinity control funds are made available to the landowners in the Mancos Valley. It was anticipated for planning and evaluation purposes that approximately 60 percent of the water users in the Mancos Valley would take advantage of this program if funds are made available. The 26 ditches that were used to evaluate the project supply approximately 92 percent of all the available water diverted in the Mancos Valley. This evaluation was done to determine the cost effectiveness and overall salinity benefits. No site-specific designs or environmental evaluations were completed for the individual irrigation delivery systems at this time. Designs and evaluations will be done on a case-by-case basis and will only be completed for the water user groups that are interested in participating.

Each individual project will have a site-specific environmental evaluation done to assess effects on soil, water, air, plants, animals, cultural resources, other aspects of the human environment, and wildlife habitat. All practices will be designed and installed to minimize negative impacts to cultural resources, known or uncovered, and to plan appropriate wildlife habitat replacement to offset any anticipated losses. All policies and procedures described in the Advisory Council on Historic Preservation, 36 CFR Part 800, Protection of Historic Properties, Final Rule; the Endangered Species Act; the Federal Water Pollution Control Act, also known as the Clean Water Act; and the federal guidelines on no net loss of wetlands will be followed. Wildlife habitat monitoring will be done throughout the life of the project, and reported to the Salinity Forum and the U.S. Fish and Wildlife Service.

Background

The Mancos Valley unit was not identified by name in Title II of the Colorado River Basin Salinity Control Act, but was identified by USDA as an area which should be studied for possible salinity control. The salinity entering the Mancos River as a tributary to the Colorado River contributes to the overall salinity concerns. Salinity in the Colorado River causes approximately $330 million in damages annually to downstream water users based on current estimates. The existing program for funding Colorado River

salinity control projects is the USDA Environmental Quality Incentives Program (EQIP) which is covered by a nationwide programmatic environmental assessment. The conservation practices planned for this project are included in that programmatic assessment to address water quality improvement and water conservation. General EQIP cost sharing is currently available in the Mancos Valley for these types of practices. The designation as eligible for EQIP salinity control funds would make more money available to help additional agricultural producers. This combined plan and environmental assessment (EA) is intended to supplement the programmatic EA and to evaluate effects more specific to this type of salinity control project in the Mancos Valley.

The combined plan and environmental assessment has three major components: (1) to determine the contribution of salt loading to the Mancos River from the irrigated farmland; (2) to determine the opportunity for USDA to reduce salt loading through improvements in irrigation delivery and application systems; and (3) to determine environmental effects of the proposed action.

Approximately 11,700 acres can be irrigated in the Mancos Valley by 47 irrigation ditches. A map showing the location of the Mancos Valley Project is found in Appendix E. The investigation was directed towards inventorying and analyzing current irrigation systems and management practices. Data was analyzed on 26 of the 47 irrigation ditch systems. These 26 systems supply irrigation water to 10,800 acres, or 92 % of the irrigated acres through approximately 100 miles of earthen ditches. Each of the 26 systems was analyzed to determine what types of improvements are needed. The remaining ditches were not studied because they are small or no longer in use.

Mancos shale, a marine formation with a very high salt content, underlies much of the valley and is the principal source of salt contributed by the Mancos River to the Colorado River. Lenses of crystalline salt often are exposed during excavation into shale. Because of the arid climate, salts have not been leached naturally, and applying excess irrigation water to the soil greatly accelerates the leaching process.

The Mancos River contributes an average of approximately 42,300 to 43,000 tons of salt annually to the Colorado River based on the 30-year USGS record of volume and concentration of outflow, minus volume and concentration of inflow.[1/] The 30-year record spans a good representation of dry and wet years. Approximately 26,000 tons come from irrigation practices. This number is in the middle of the range of values used for the other 6 salinity project areas; Grand Valley, Uintah Basin, Big Sandy, Lower Gunnison, and McElmo Creek. The remaining 16,300 tons represents salt produced from natural and other sources. Salt loading estimates include approximately 14,500 tons from ditch seepage and approximately 11,500 tons from on-farm deep percolation of irrigation water.

The following is from the Mancos Valley Salinity; Hydrologic Study Report, Steven E. Yochum, PE, Hydrologist, NRCS Northern Plains Engineering Team, 2004 for the 2001 field season:

> "Approximately 400 field measurements and water sample analyses were performed at this site [the Mancos Valley]. Using this data, total dissolved solid load was computed using a seven-parameter regression model for thirty years of record and an average load of 42,300 tons/year was estimated. This value agrees remarkably well with the previous estimate of 43,000 tons/year (SCS 1984). A baseflow separation was also performed and an average load of 26,200 tons/year was estimated. These load estimates may not account for all sources, specifically the first flush of salts from stream channels and any salts not yet dissolved in suspended sediment and bed load passing the gaging station. Additionally, it should be noted that this average baseflow load changed slightly from the previous estimate of 26,800 tons/year due to the use of a water year average instead of an irrigation year average. This change was necessary to provide confidence limits and standard errors of prediction for the estimates. Considering the uncertainty involved in such analyses, these two numbers should be considered identical." [2/]

Based on the hydrology report, the 26,200 tons/year value is rounded to 26,000 tons/year.

The proposed plan contains structural and management improvements in the irrigation systems to improve water conservation and to reduce salt loading to the Colorado River. Salinity data on irrigation inflows, seeps, and other irrigation outflows indicates that each acre foot of deep percolation and seepage that returns to the river carries approximately 2.9 tons of salt per acre foot. Refer to Appendix D, Explanation of Salt Loading Factor and Deep Percolation Reduction from the On-Farm Irrigation Improvements. This salt loading factor is consistent with the other salinity project areas.

1/ Agriculture Water Quality Management for Colorado. History, strategies and critical area assessments prepared by the State of Colorado, Department of Natural Resources, Soil Conservation Board for State of Colorado, Department of Health, 208 Executive Committee, 1982 at 43,000 tons annually, and supported by the Mancos Valley Salinity Control Study, USDA- Soil Conservation Service, 1984

2/ Mancos Valley Salinity; Hydrologic Study Report, Steven E. Yochum, PE, Hydrologist, NRCS Northern Plains Engineering Team, 2004 at 42,300 tons annually.

Table 1: Mancos Valley Treatment Costs

MANCOS VALLEY TREATMENT ALTERNATIVES

Practice	Systems Ac, Ditches Ft.	Total Cost	Tech. Asst.	Fed. Cost @ 75% Cost Share	Total Federal Cost	Salt Reduct. Tons	Project Cost per Ton
FUTURE WITHOUT							
Sprinklers	500	$250,000	$100,000	$187,500	$287,500	400	
Surface Systems	705	$106,015	$42,406	$79,511	$121,917	400	
Total Construction Cost		**$356,015**			**$409,417**		
Total Project Cost		**$498,421**					
PROPOSED ACTION							
Sprinklers	4,070	$2,035,000	$814,000	$1,526,250	$2,340,250	3,500	
Surface Systems	1,330	$200,000	$80,000	$150,000	$230,000	1,000	
On-farm Total	**5,400**	**$2,235,000**	**$894,000**	**$1,676,250**	**$2,570,250**	**4,500**	**$43.10**
Off-Farm for 26 Ditches							
Pipeline [1/]	381,566	$6,679,756	$2,671,902	$5,009,817	$7,681,719	9,500	**$61.02**
Polyacrylamide	119,263	$15,907	$6,363	$11,930	$18,293	2,900	
Off-farm Total	500,829	**$6,695,663**	**$2,678,265**	**$5,021,747**	**$7,700,012**	**12,400**	**$46.86**
Off-Farm At 60% Participation							
Pipeline [1/]	228,940	$4,007,854	$1,603,141	$3,005,890	$4,609,031	5,700	**$61.02**
Polyacrylamide	71,558	$9,544	$3,818	$7,158	$10,976	1,740	
Off-farm Total	**300,497**	**$4,017,398**	**$1,606,959**	**$3,013,048**	**$4,620,007**	**7,440**	**$46.86**
Total Construction Cost @ 60% Participation		**$6,252,398**					
Grand Total Fed. Cost @ 60% Participation w/ Polyacrylamide					**$7,190,257**	**11,940**	**$45.44**
Grand Total Fed. Cost @ 60% Participation w/o Polyacrylamide					**$7,179,281**	**10,200**	**$53.11**
Total Project Cost w/ Polyacrylamide			**$8,753,357**				
Total Project Cost w/o Polyacrylamide			**$8,739,995**				
*** Costs Amortized at 5.625% for 25 years**							

* Price Base: 2004

1/ In a few cases concrete ditch or other canal lining practices may be necessary or requested. If used, these practices will need to be engineered for the Mancos Valley conditions.

Proposed Action

The proposed action will result in reducing seepage from approximately 60 percent of the 26 ditches and increasing the irrigation efficiency to reduce deep percolation on 5,400 acres.

This action will consist of converting approximately 228,940 linear feet of earthen irrigation ditches to underground pipelines. Another 71,558 feet of irrigation ditch will be treated with polyacrylamide to reduce seepage. On-farm irrigation improvements will consist of improved surface application systems and sprinkler irrigation. Concrete or other types of ditch lining while depicted in the table, is not expected to be used very much due to the nature of the underlying soils and frost heave potential. Ditch lining would only be used where site conditions preclude installation of pipeline or where the client requests it.

The estimated total construction cost for the pipeline and sprinkler systems is $6,252,398. The total estimated project cost is $8,753,357. It is recommended that the federal cost-share used to implement the plan not be greater than 75 percent. A cost effectiveness analysis was used to determine the annual cost per ton of salt reduction. Table 1 displays the project costs and anticipated salt reduction.

Table 2: Salt Loading Reduction

Mancos Valley Salinity
Basin Total Salt Load 42,300 to 43,000 Tons/Year *

Salt Load Source	Tons/Year	Tons/Year from Irrigation	% Reduction Planned	Tons/Year Reduced	Tons/Year After
Natural and Other Sources	**16,300**				**16,300**
Irrigation Salt Load	**26,000**				
Off Farm Ditch Seepage		**14,500**			**7,060**
16 Systems @ 60% Participation			** 90%	**7,440**	
On Farm Irrigation Systems		**11,500**			**5,500**
Existing Improvements, 1,800 Acres			76%	1,500	
Proposed Improvements, 5,400 Acres			*** 76%	**4,500**	
Totals	**42,300**	**26,000**		**11,990**	**28,860**

* Based on analysis of a 30-year (1969 through 1998) USGS record of water quantity and water quality to determine salt loading in average tons/year. The record includes a representative mix of wet and dry years.

** Anticipate a 90% net reduction in seepage losses from the estimated 16 ditches to be treated.

*** Deep percolation reduction of 58% for conversion from unimproved flood to improved flood on 25% of the treated acres; and a deep percolation reduction of 82% for conversion from un-improved flood to side roll sprinkler on 75% of the treated acres for a 76% net reduction in salt loading for each acre treated. Refer to Appendix D, Explanation of Salt Loading Factor and Deep Percolation Reduction from the On-Farm Irrigation Improvements.