10.0 Alternatives Evaluation – Reconnaissance Level Analyses

The following table summarizes all the alternatives identified during the planning process.

Table 10-1

Alternatives Considered				
Alternative	**Watershed**	**Supply or Drought Contingecy Alternative?**	**Water Developed or Conserved**	**Reduces Consumption ?**
w/ Engineering Evaluation				
Additional Storage in NM	Animas	Both	1000 AF	N
Develop Shallow Groundwater	Animas	Drought	none	N
Crop Leasing	All Watersheds	Drought	Not limited	Y
Enlarge Farmington Lake	Animas	Both	1000 AF	N
Small Reservoir Storage	La Plata	Both	2700 AF	N
Conservation				
Conservation Education	All Watersheds	Both	na	Y
Limit Mesa Water Use	All Watersheds	Supply	180 gpcd	Y
Xeriscaping	All Watersheds	Supply	70 gpcd	Y
Indoor Conservation	All Watersheds	Supply	NA	N
Canal Improvements	Animas, La Plata, San Juan	Supply	NA	Minor
On-Farm Improvements	Animas, La Plata, San Juan	Supply	NA	Minor
Navajo-Farmington Pipeline	Upper SJ, Animas, La Plata	Neither	unknown	N
w/o Engineering Evaluation				
Remove Non-Native Species	Animas	Supply		Y
Cloud Seeding	Animas	Supply		N
Increase ALP Storage	Animas	Both		N
Store Stormwater	All Watersheds	Supply		N
Gallegos Wash Storage	Animas, SJ	Supply		N
Treat Saline Water	Animas	Both		N
Challenge ESA	All Watersheds	Neither		N
La Plata Pipeline	Animas, SJ	Both		N
Encourage Navajo Settlement	All	Supply		N
Groundwater Exchange to NIIP	Upper SJ, Animas	Both		N
Additional Funding for Office of State Engineer	All			
Navajo Nation Recommendations				
Refer to Volume I, Section 10.14				

10.1 General Legal Issues

Almost all of the alternatives identified must be pursued within the following legal framework. Please note that the issues generally identified here do not represent legal impediments that would block the use of any particular alternative (unless otherwise noted below in the analysis of the alternative). Rather, these issues reflect the types of water-related and other regulations at the federal, state and local level that must be considered.

- Federal laws: Endangered Species Act (the San Juan River Basin Recovery Implementation Plan, Section 7 consultations, NEPA); Clean Water Act (NPDES permits); obligations under federal compacts (Colorado River Compact, Upper Colorado River Basin Compact, Colorado River Compact, Animas-La Plata Compact, La Plata River Compact); Reclamation Law (Bureau of Reclamation contracts and authorizing legislation for the Animas-La Plata Project, the San Juan-Chama Project, the Hammond Irrigation Project and the Navajo Indian Irrigation Project); and Jicarilla Apache Nation Partial Final Decree.
- State laws: Water Quality Act (water quality standards and TMDLs); Echo Ditch Decree; San Juan River Adjudication; any settlement of Navajo Nation's reserved water rights; Water Code (*e.g.*, appropriation, transfer, forfeiture and abandonment issues); State Engineer rules and regulations; state water permits.
- Local regulations: County regulations, subdivision regulations, access issues (easements, ROW issues), boundaries of some water users associations and franchises.

More specific considerations are noted below with regard to each alternative. A detailed legal analysis of each alternative is neither possible nor appropriate at this time. In-depth legal analysis of any particular alternative will be appropriate, and necessary, when any particular alternative actually is pursued.

10.2 Additional Storage in New Mexico (Cox Canyon Reservoir) Evaluation

10.2.1 Legal Issues

- Federal and state permits for both the reservoir and the storage of water
- ESA/NEPA compliance
- Access and ROW issues for both reservoir and infrastructure used to transport stored water to users

10.2.2. Technical Feasibility

Because the reservoir is relatively small, 1,300 acre-feet, and is close to the source and delivery point, this alternative is technically feasible. The site had previously been identified by Reclamation as a potential dam site and available topographic data would support construction of this small reservoir.

10.2.3 Political Feasibility

Following are political issues identified for this alternative:

- It is not known whether the owners of the site would be willing sellers.
- Water rights to store existing direct flow rights would need to be acquired. New appropriation of water would likely be rejected by the State of New Mexico

10.2.4. Social and Cultural Impacts

There are no identified social or cultural impacts associated with this alternative.

10.2.5. Financial Feasibility

This reconnaissance level cost estimates is accurate to plus or minus 50 percent of the estimate. At an annual cost of $1,600 per acre-foot[1], this is expensive in relation to cost for acquiring water rights from irrigators. Irrigation water can be purchased in the San Juan Hydrologic Basin for approximately $1,800 per acre-foot (one-time cost)[2]. Consequently, the cost for this alternative is not currently financially feasible. However, a more thorough investigation or change in alternative water sources may change this evaluation.

Additional costs associated with NEPA and ESA compliance is not included in this reconnaissance level estimate.

10.2.6 Implementation Schedule

Not recommended for implementation unless other less expensive alternatives become non-viable.

10.2.7. Physical, Hydrological and Environmental Impacts

Inundation of Cox Canyon, construction of a new river diversion and potential channel erosion between the reservoir and the Animas River could have impacts to the environment. Reduction of flows during the spring below the river diversion could impact riparian habitat. There are no identified endangered species that would be impacted.

10.3. Development of Shallow Groundwater Evaluation

10.3.1. Legal Issues

- State Engineer permits for alternative points of diversion for surface water supplies
- Federal permits for working in or very near the riverbed.
- ESA/NEPA compliance.

10.3.2. Technical Feasibility

The technical feasibility of this alternative is not certain because this alternative depends heavily on the shallow geological conditions that would allow well development. Before this alternative is implemented, a detailed geotechnical study, including test drilling, would be required to ensure that wells could be constructed and to identify specific siting requirements. In lieu of implementing the entire alternative, a single well site could be investigated and constructed as a pilot project to evaluate the feasibility of constructing additional facilities.

[1] Section 9.4.1.3
[2] Based on author's recent experience with water rights sales transactions.

10.3.3. **Political Feasibility**

Identifying well sites on properties of willing sellers is an issue that would need to be considered. Furthermore, impacts to surface water flows may result in protests by other surface water users. Water rights changes in points of diversion would be required.

10.3.4. **Social and Cultural Impacts**

There are no identified social or cultural impacts associated with this alternative.

10.3.5. **Financial Feasibility**

As a drought contingency alternative, the cost of between $1,000 and $4,000 per acre-foot[3] is acceptable. However, this alternative does not develop a new water supply. It only improves the capability to divert water when surface water is minimal.

Additional costs associated with NEPA and ESA compliance is not included in this reconnaissance level estimate.

10.3.6. **Implementation Schedule**

It is recommended that a single pilot well be investigated and constructed within the next two years.

10.3.7. **Physical, Hydrological and Environmental Impacts**

This alternative will impact the flows in the Animas River during drought conditions by increasing the gradient from the surface water to the groundwater. This may impact the riparian habitat during drought periods.

10.4. Crop Leasing Evaluation

10.4.1. **Legal Issues**

- To use water, must have a permit from the State Engineer (probably for lease of water); however, no statute specifically addresses this concept. Emergency permit provisions do not anticipate this type of request. Administrative process could take a long time.
- Possibility of creating a "water bank" for this purpose, which might be similar to water banks in other communities intended to facilitate the short-term use of water.

10.4.2. **Technical Feasibility**

Transfer of water from agricultural uses to municipal has no technical feasibility issues. However, during extreme drought, agricultural water supplies will likely be less than the water right associated with agriculture irrigation. Therefore, contracts must consider the availability of water supply as well as the water right. Furthermore, the value of crops without sufficient water supply has not been considered in the costs for this option. This should be considered in contracting. Also, the type of crop leased would need to be a component of crop leasing. Leasing a wheat crop (one-year crop) should cost less than a multi-year crop such as alfalfa. The age of the stand of alfalfa should also be considered during contract negotiations.

[3]Table 9.2

10.4.3. **Political Feasibility**

It is accepted by most municipalities, the State of New Mexico and irrigators that transfer of agricultural water to municipal uses is a natural evolution of water use. However, finding willing irrigators to contract may be difficult because the concept of crop leasing and optioning water purchases has not occurred in the Basin.

Temporary water rights change applications for drought periods would need to be approved prior to contracting for crop leasing. This may require water rights approval subject to drought conditions.

10.4.4. **Social and Cultural Impacts**

The only identified social or cultural impact is the loss of farming labor.

10.4.5. **Financial Feasibility**

Purchasing options to lease crops is a very cost effective means of providing water for drought conditions. Conservatively estimated at $1,470 per acre-foot[4], this is one of the best alternatives for drought contingency. Negotiations should result in costs less than this amount. This non-structural alternative requires no capital investment and only minimal option payments.

104.6. **Implementation Schedule**

It is recommended that a contract to purchase an option to crop lease be implemented as soon as possible by those municipalities who have experience shortages. Other entities should implement contracts prior to experiencing shortages.

10.4.7. **Physical, Hydrological and Environmental Impacts**

Depending on the locations of the irrigation diversion and the municipal diversion, there may be either, 1) less water, 2) more water, or 3) no change in the water left in a reach of the river. Many of the municipal diversions are shared by agricultural irrigators. These diversions would see no impacts.

10.5. Enlargement of Farmington Lake Evaluation

10.5.1 **Legal Issues**

- Amend/enlarge State Engineer storage permit
- Possible federal NEPA/ESA compliance

10.5.2. **Technical Feasibility**

The technical feasibility of this option is very subject to acquisition of geotechnical data and detailed topography. Since all storage would be developed by excavation of the reservoir basin, spoil of excess material would be significant; at a minimum 1.6 million cubic yards. Locating a spoil site will be problematic. Finally, seepage in the excavated area may be significant and require lining. Lining costs have not been included in the cost estimate.

[4] Table 9.2

10.5.3. **Political Feasibility**

This alternative may receive strong opposition from Farmington City, particularly if the storage benefit is intended for a different municipality. A water right to store existing direct flow rights would be required to increase the storage capacity of the reservoir.

10.5.4. **Social and Cultural Impacts**

There are no identified social or cultural impacts associated with this alternative.

10.5.5. **Financial Feasibility**

At a cost of $6.5 million, this is one of the more costly alternatives. At $5400 per acre-foot[5], this is an expensive drought contingency plan.

Additional costs associated with NEPA and ESA compliance is not included in this reconnaissance level estimate.

10.5.6. **Implementation Schedule**

It is recommended that this alternative not be implemented unless other more cost effective alternative have been determined to be non-viable.

10.5.7. **Physical, Hydrological and Environmental Impacts**

This alternative would withdraw additional water from the Animas River during extreme drought periods and could impact downstream riparian habitat. Creation of a spoils pile containing 1.6 million cubic yards could result in damage to upland habitat and would require revegetation and erosion control.

10.6. Small Reservoir Storage Evaluation

10.6.1. **Legal Issues**

- See Section 10.2.1

10.6.2. **Technical Feasibility**

Implementing a program to establish 27 small reservoirs in the La Plata Watershed would be technically difficult. Typically, small reservoir construction requires both special topography and geology. Without these special conditions, costs escalate beyond that acceptable for agricultural purposes. However, it is anticipated that as shortages continue on the La Plata, irrigators are going to find storage a more viable alternative to losing crops, particularly if pasture land is replaced with feed crops.

10.6.3. **Political Feasibility**

Multiple, individual storage water rights would need to be acquired. Funding opportunities for small on-farm projects through governmental agencies is limited and funding may not be commercially viable.

[5] Section 9.4.4

10.6.4. **Social and Cultural Impacts**

Numerous small excavation projects have a great potential of disturbing archaeological sites. Because these excavation projects would likely be constructed independently, archaeological preservation would be less likely than single site alternatives.

10.6.5. **Financial Feasibility**

The current cost benefit ratio for this alternative is less than 1:1. This means that this alternative is currently not financially feasible. Unless crop values increase more quickly than construction costs, this alternative may not become feasible.

However, the Natural Resource Conservation Service (NRCS), formerly Soil Conservation Service has a cost sharing program (EQIP) which cost shares 75 percent of the cost of constructing on-farm reservoirs. This level of funding would make this alternative financially feasible.

Additional costs associated with NEPA and ESA compliance is not included in this reconnaissance level estimate.

10.6.6. **Implementation Schedule**

It is recommended that no implementation schedule be developed. As agricultural interest in developing storage grows as a result of economic considerations and NRCS cost sharing availability, this alternative may be viable for specific farming operations, if not the entire watershed. If farm economics and funding availability never warrant implementation, this alternative will not occur.

10.6.7. **Physical, Hydrological and Environmental Impacts**

This alternative would withdraw additional water from the La Plata River during extreme drought periods and could impact downstream riparian habitat. Creation of numerous small reservoirs may improve habitat for water fowl.

10.7. Urban Conservation Measures (Indoor and Xeriscape) Evaluation

10.7.1. **Legal Issues**

- Conservation of municipal and industrial water supply would not have significant legal implications, unless the plan is so successful or optimistic that the water rights holder/supplier cannot justify (or protect) its projections for future needs or requests for additional supplies. Cities, counties, other political subdivisions and some community-based water suppliers can protect supplies for a 40-year period under the planning statute, NMSA 1978 § 72-1-9 (1985, as amended through 2000).

10.7.2. **Technical Feasibility**

All three urban conservation measures are technically feasibly. However, the benefits associated with each vary significantly.

Indoor conservation will occur as a result of adoption of the International Plumbing Code. Benefits do not include reduction in consumption but does include reduction in diversion and treatment requirements.

Limiting water use on mesas will occur only through implementation of zoning restrictions by municipalities. These restrictions include limiting non-xeriscape landscaping and prohibiting septic systems. Both restrictions are technically feasible for most properties; however there may be properties that, because of topography, cannot be have gravity sewer systems and would require sewer lift stations. This may result in a loss of financial feasibility.

Xeriscaping of existing conventional landscaping is technically feasible but more costly and more difficult to provide incentives than for new developments.

10.7.3. **Political Feasibility**

Land developers and mesa property owners will likely oppose development restrictions. Municipalities will need to provide clear explanation to justify water use restrictions and wastewater collection requirements. Development incentives, such as higher densities credits, may help mitigate opposition.

10.7.4. **Social and Cultural Impacts**

A social and cultural shift from lawns and large tree landscape to more desert landscapes would be required. A hallmark, upscale development could mitigate the social and cultural impacts of xeriscape requirements.

10.7.5. **Financial Feasibility**

Xeriscaping of new development is a very cost effective method of conservation. Benefits are immediate and long-term. Indoor conservation is less beneficial because it does not include a measurable reduction in consumption. Conversion of existing conventional landscaping includes the additional cost of demolition and is less cost effective than new landscaping.

10.7.6. **Implementation Schedule**

It is recommended that municipalities develop and enact landscape ordinances and wastewater collection ordinances for mesa area developments as soon as possible. Ordinances for xeriscaping of non-mesa areas should not be implemented until the value of the river green corridor has been considered.

10.7.7. **Physical, Hydrological and Environmental Impacts**

Water use limitations for mesa development will reduce environmental impacts to the mesa environment and mitigate growth impacts associated with increased surface and groundwater diversions. Return flows from indoor mesa area uses will be maintained by requiring wastewater collection and treatment. Indoor conservation measures will reduce diversion requirements. Conversion of existing conventional landscape and xeriscaping new developments in the non-mesa areas may result in loss of the green river corridor. This might result in loss of urban forestry and reduction of groundwater recharge.

10.8. Agricultural Irrigation Conservation Measures (Canal Improvements and On-Farm Improvements) Evaluation

10.8.1. Legal Issues

- Conservation of agricultural water is problematic if, with conservation, the farmer would divert or consume less than his permitted or decreed water right. Under current New Mexico law, there is no provision for a farmer (or industry in the same position) to conserve water and still protect the "unused" part of the water right. Under forfeiture statutes, nonuse can jeopardize the water right. Also, the law does not allow for a water rights owner to easily "sell" the conserved part of his water right; sale of "excess" water rights is possible, but it is cumbersome, time-consuming and has high transaction costs. On the other hand, a farmer or business can protect water rights by leasing them to entities that fall under the planning statute. Other communities have created water banks to facilitate the movement of water among users, and that might merit further consideration here as a way to recognize and capture some value from conserved water.
- If farmers or industrial users are over-diverting, conservation is imperative to comply with the limits of State Engineer permits.

10.8.2. Technical Feasibility

The technical feasibility of both canal improvements and on-farm irrigation practices improvements are site specific and not evaluated by this regional plan. However, canal lining is usually technically feasible unless there are geotechnical or groundwater pressure issues that prohibit implementation. On-farm improvements can be technically feasible with pumping of either surface or groundwater.

10.8.3. Political Feasibility

Based on Planning Committee input, support for both canal improvements and on-farm practices is high in the study area. However, there are currently no low-cost funding programs for such projects and farm economics do not support the cost of large projects. Typically, water savings from improved agricultural irrigation practices have not accrued to the farming entity. This is a disincentive to agricultural producers to improve practices for conservation purposes only.

10.8.4. Social and Cultural Impacts

There are no identified social or cultural impacts associated with this alternative.

10.8.5. Financial Feasibility

Without grants or low-interest loans, agricultural improvements are typically not financially viable. However, the Planning Committee strongly supports these conservation efforts and encourages irrigation districts to seek funding opportunities.

The U.S. Corps of Engineers and the New Mexico Interstate Streams Commission, in cooperation with the State Engineer and the Natural Resources Conservation Service, provide programs for financial and technical assistance for water conservation measures on irrigation ditches that qualify as community ditches under State statutes.

10.8.6. **Implementation Schedule**

It is recommended that irrigation districts implement both canal improvements and on-farm improvements as funding opportunities are available. No schedule is recommended.

10.8.7. **Physical, Hydrological and Environmental Impacts**

Agricultural irrigation improvements will necessarily reduce seepage and on-farm tail water runoff. This water has historically resulted in groundwater recharge, support of incidental vegetation and delayed return flows to rivers. Consequently, implementation of agricultural irrigation improvements will likely result in impacts to riparian and upland habitat near canals and farms. Reduction in diversion requirements will result in additional flows instream and potentially improve river riparian habitat and water quality. Actual impacts would have to be evaluated on a case-by-case basis.

10.9. Navajo-Farmington Pipeline Evaluation

10.9.1. **Legal Issues**

- Navajo Reservoir was developed primarily to serve NIIP, and until the Navajo Nation's water rights are settled, the United States cannot contract to allow any additional long-term uses of the reservoir. The Jicarilla Apache Nation also has rights in Navajo Reservoir that must be protected.
- Changing flow patterns could adversely affect the RIP and efforts to recover endangered species.
- State Engineer permits would be needed for storage, which would be difficult, at best, because of the Navajo issues.
- NEPA/ESA compliance would be required for storage at places of use.
- State Engineer permits would be needed for additional storage at places of use.
- Access and ROW issues
- If existing flow permits are used, the State Engineer must amend the permits to allow storage, which could subject the permits to examination for validity.

10.9.2. **Technical Feasibility**

Construction of a long-distance pipeline with multiple pressure reduction facilities is technically feasible. Most of the alignment would follow existing roadways and there are no identified factors prohibiting pipeline construction.

10.9.3. **Political Feasibility**

Storage in Navajo Reservoir by non-contract entities is not allowed by current Reclamation law. Consequently, storing existing direct flow water rights would require Congressional approval.

Storage rules would have to be negotiated with Reclamation, the Navajo Nation, and other contract entities.

This alternative would necessarily shift Animas Watershed demands from the Animas River to the San Juan River. This would require water rights change applications to either exchange water or to appropriate new water on the San Juan River.

10.9.4. **Social and Cultural Impacts**

There are no identified social or cultural impacts associated with this alternative.

10.9.5. **Financial Feasibility**

This large-scale project would cost approximately $31 million. This does not include any Reclamation repayment costs associate with Navajo Dam and Reservoir. Without a detailed storage/reservoir operations study, it is not possible to determine whether this alternative would develop any new supply for the basin or what the real benefits of the project might be.

Additional costs associated with NEPA and ESA compliance is not included in this reconnaissance level estimate.

10.9.6. **Implementation Schedule**

No implementation schedule is recommended. Additional feasibility study is required and a sponsoring agency identified.

10.9.7. **Physical, Hydrological and Environmental Impacts**

This alternative would reduce the volume of water in the San Juan River between Navajo Dam and Farmington from that historically experienced. Depending on the timing of storage, releases, return flows, and Animas River flows, critical endangered species habitat below Farmington could be negatively impacted.

10.10. Additional Funding for the Office of the State Engineer

The New Mexico Constitution declares that all surface and ground water belongs to the public. On the other hand, administering and protecting water rights, and overseeing adjudications are the responsibility of the Office of the State Engineer. Historically, the Office of the State Engineer has lacked the resources to adequately administer and protect [New Mexico] water rights, and general stream adjudications in the San Juan Basin Hydrologic Unit and throughout the State, have languished for decades. Today, insufficient resources continue to frustrate the operation of the Office of the State Engineer and the Office of the State Engineer can not operate efficiently and is unable to address protests and requests for water transfers, in a timely manner. New Mexicans can no longer tolerate this situation and action must be taken to provide the Office of the State Engineer with copious resources to efficiently and effectively fulfill all the responsibilities of the Office. The efforts of the Office of the State Engineer in the San Juan Basin Hydrologic Unit are in desperate need of support and it is recommended that the current State Engineer's office in Aztec be upgraded to a District Office, with a Water Master, and a commensurate increase in manpower and funding, to provide the Office of the State Engineer with adequate resources to [fully] fulfill the fiduciary responsibilities of the Office.

10.10.1. **Legal Issues**

No legal impediments identified.

10.10.2. **Technical Feasibility**

Upgrading the Office of the State Engineer is technically feasible.

10.10.3. **Political Feasibility**

Increasing the funding is politically feasible if water management and administration is made a priority on a statewide basis.

10.10.4. **Social and Cultural Impacts**

There are no identified social or cultural impacts associated with this alternative.

10.10.5. **Financial Feasibility**

It is feasible to increase the funding for the Office of the State Engineer if water management and administration become a priority on a statewide basis. The State will need to determine the funding level required to provide adequate resources for the Office of the State Engineer. The State will need to identify [traditional] revenue sources and [the State] may need to consider additional revenue sources to improve water management statewide. However, inadequate water management is many, many times more costly and is a risk that New Mexicans can not afford to take.

10.10.6. **Implementation Schedule**

It is recommended that the State determine the funding level necessary and make sufficient resources available to the Office of the State Engineer, as soon as possible. The Office of the State Engineer should take immediate action to use all available resources to fulfill the fiduciary responsibilities of the Office, i.e., upgrade the current State Engineer's office in Aztec to a District Office, with a Water Master, and a commensurate increase in manpower and funding.

10.11 Other Alternatives Evaluation

10.11.1 **Legal Issues**

- Removal of Non-native Species:
    - ROW/access issues

- Increased ALP Storage:
    - Purchase of storage is possible under existing legislation.
    - Depending on water stored, State Engineer permits may be needed.
    - Congressional approval will be needed to enlarge Ridges Basin, along with ESA/NEPA compliance.

- Stormwater Storage:
    - State Engineer storage permit required
    - Storage facility needed (see section 10.2.1)
    - Decreasing storm flow into streams could adversely affect the ability to meet water quality standards and TMDLs in the future.

- Saline Water Treatment:

  - Permit for new appropriation of saline water required (unless water is more than 2,500 feet deep and meets other requirements of NMSA 1978 § 72-12-25 (1967)).
  - Permit required to dispose of brine
  - Must comply with applicable water quality standards

- Blending Saline Water:
  - Permit for new appropriation of saline water required (unless water is more than 2,500 feet deep and meets other requirements of NMSA 1978 § 72-12-25 (1967)).
  - Must comply with applicable water quality standards

- Challenge to ESA:
  - Amending legislation is always risky. Numerous attempts in the past have not been successful.

- La Plata Pipeline:
  - Possible under existing ALP permit. If other water is used, a State Engineer permit would be needed to the transport water (and perhaps to use it in a different place).
  - Access and ROW issues
  - NEPA/ESA compliance

- Settlement of Navajo Water Rights:
  - Settlement should be encouraged because it would resolve major legal issues.
  - Depending on its terms, settlement may require Congressional approval.

- Groundwater Exchange for NIIP or Navajo-Gallup Pipeline:
  - State Engineer permits would be required for the exchange. "Exchanges" in New Mexico are unusual and not explicitly addressed by statute. Most "exchanges" take the form of retirement of surface water rights in stream-connected aquifers to reduce the draft of surface water caused by new wells. Generally, the well and stream must be hydrologically related. The ALP diversion permits allow the exchange of Animas River water for San Juan River water, but the authority for the exchange is a permit condition.
  - New groundwater development probably would be regarded as a new appropriation, requiring a State Engineer permit.
  - Ownership issues about who must own the "exchange" wells and water rights to be able to take the San Juan River water. The user, proposed here as Bloomfield or Farmington, probably would need to own the water rights being developed in order to benefit from any exchange. It might be more efficient for a larger political subdivision, such as the SJWC, to facilitate the exchange.
  - Potentially need federal permits depending on location of wells.

- Access and ROW issues for wells and infrastructure to connect wells and NIIP or the Navajo-Gallup Pipeline.

10.11.2 **Technical Feasibility**

Removal of non-native species to reduce consumption is technically feasible but requires continuous and long-term control program to prevent re-establishment. Cloud-seeding is technically feasible in Colorado; however, realization of the benefits in New Mexico is problematic. Increasing ALP storage can be accomplished with enlargement of the reservoir or by acquisition of storage of other contracting entities. Enlargement of the reservoir at this time would be difficult. Storage of stormwater is not technically feasible because it requires considerable capital for very minor benefits. Storage in Gallegos Wash is similar in concept to storage in Cox Canyon, however, this alternative was not selected for engineering evaluation and no reservoir site was identified. Treating saline water is technically feasible but disposal of brine would be very difficult. Blending will degrade water quality of potable water supply but is feasible. Challenging the Endangered Species Act would not necessarily result in any additional water supply for the San Juan Hydrologic Unit since instream flows recommendations meet Colorado River Compact obligations. The La Plata Pipeline is being studied for feasibility. Encouraging the Navajo Nation water rights settlement is not a technical issue but is important to final quantification of available water resources. Groundwater exchange to NIIP/Navajo Gallup Pipeline would require detailed geotechnical investigations (test drilling) to determine technical feasibility.

10.11.3 **Political Feasibility**

Removing vegetation on private property will receive significant opposition. Increasing ALP storage would require amending the San Juan Water Commission ALP contract. Challenging ESA would require U.S. Congressional action and would be strongly opposed by most environmental groups. The La Plata Pipeline requires negotiation and cooperation with Colorado municipal water users. Encouraging the completion of the Navajo water rights settlement is accomplished by local adoption of the Regional Water Plan.

10.11.4. **Social and Cultural Impacts**

These alternatives were not selected by the Planning Committee for evaluation of social and cultural impacts.

10.11.5. **Financial Feasibility**

These alternatives were not selected by the Planning Committee for cost analyses.

10.11.6. **Implementation Schedule**

These alternatives were not selected by the Planning Committee for evaluation of implementation schedules.

10.11.7. **Physical, Hydrological and Environmental Impacts**

These alternatives were not selected by the Planning Committee for evaluation of physical, hydrological and environmental impacts.

10.12. Risk of Implementation of Alternatives

Each alternative carries a component of risk associated with efforts to implement the alternatives. For this evaluation, "*risk*" is defined as:

> *The cost, time, and effort to study and obtain necessary approvals before the alternative can be successfully implemented.*

This risk evaluation does not include the cost, time, and effort for construction or operation of the facilities, only the risk to develop the alternative prior to successful implementation.

This evaluation is a subjective assessment of the relative implementation risks using high, moderate, and low classifications. Following is an example of the assigned risk.

Additional Storage in New Mexico – High Risk

This alternative is assigned high risk because prior to implementation the following tasks would need to be successful.

- Geotechnical investigation of site to confirm site selection and borrow area(s)
- Acquisition of property for site
- Mitigation plan for impacts to river and site.
- Environmental approvals…possibly NEPA compliance
- Water rights approval
- Dam safety approvals

The number and cost of obtain these approvals and completing studies is significant and warrants a high risk classification.

All of these implementation risk factors are identified in the legal, political, technical and environmental feasibility evaluations for each alternative as described in this section. Following is a table listing each alternative, the water development goal, the implementation and the relative risk.

Table 10.2

Watershed/Alternative	Water Development Goal (AF)	Implementation	Relative Implementation Risk *	Implementation Schedule
Animas	1000 drought contingency only			
Additional Storage in NM		Reservoir	high	None
Develop Shallow Groundwater		Wells/Distribution	moderate	2 years
Crop Leasing		200 acres alfalfa	low	1 year
Enlarge Farmington Lake		Reservoir	moderate	None
Conservation				
Limit mesa water use		approx.2000 residential indoor connections	low	Immediate
Xeriscaping		675.2 acres	low	Following evaluation
Indoor conservation		50000 toilets or 208,000 showers	low	None
Canal improvements		canal dependent	moderate	As funding available
On-farm improvements		1,333 acres flood/sprinker conversion	moderate	As funding available
Navajo-Farmington Pipeline		36"pipeline	high	None
Blanco	groundwater development only			
Chaco	groundwater development only			
La Plata	5600 supply shortage			
Small Reservoir Storage		storage (only 2,900 af)	high	As funding available
Canal improvements		canal dependent	moderate	As funding available
On-farm improvements		7,466 acres flood/sprinker conversion (only 2781 available)	moderate	As funding available
Middle San Juan	none			
Upper San Juan	3,000 single worst month			
On-farm improvements		4000 acres flood/sprinker conversion	moderate	As funding available
Navajo-Farmington Pipeline		36"pipeline	high	None
Groundwater exchange to NIIP		15-1500 gpm wells	moderate	None
Upper San Juan above Navajo	none			
Other Alternatives				
Remove non-native species			moderate	
Cloud seeding			low	
Increase ALP storage			moderate	
Store stormwater			high	
Gallegos Wash Storage			high	
Treat saline water			high	
Challenge ESA			high	
La Plata Pipeline			low	
Encourage Navajo Settlement			low	
Addional Funding for the Office of the State Engineer			low	

* Risk is associated with the cost , time and effort to study and obtain permitting. It does not include the cost, time and effort to construct facilities.

10.13. Drought Contingency Plans

Drought is a recurring phenomenon. It is not a question of 'if a drought will occur' but rather, 'when a drought will occur'. Mitigation and protection are far more preferable to emergency response and recovery. The term 'drought' is often inaccurately used to characterize all water shortage situations. Drought is commonly defined as a persistent and extended period of below normal precipitation causing abnormal moisture deficiency having adverse effects on people, animals, and crops (Hawaii, 2000). The San Juan Hydrologic Unit is arid. Periods of little or no rainfall frequently occur and do not necessarily constitute a drought. The drought response needs to distinguish between chronic water shortage and drought.

Most of the alternatives developed by the Planning Committee are drought contingency alternatives. This is because, with the 90 percentile water supply, 2044 water demands are met in all the watersheds but the La Plata Watershed. Community based drought contingency plans are outside the scope of work for this study (Scope of Work for Regional Water Plan for SJHU, Subtask 4.2.2). They would include tasks to be accomplished during drought to manage available supplies. Specific events for a community might include:

1. Groundwater levels
2. Reservoir contents
3. Streamflow/runoff predictions

These events or triggers would be specific for each community or water user and would require planning at a local water level as opposed to a regional water planning level.

However, recommendations of alternatives for inclusion in community based plans were developed by this regional water plan. Many of the drought related plans that require long-term implementation (i.e., xeriscaping or storage) also improve the available water supply during non-drought years. Table 10.3 lists the drought contingency alternatives identified by this regional water plan.

Table 10.3

Watershed/Alternative		
Animas		
Additional storage	Development of shallow groundwater	Crop leasing
Enlarge Farmington Lake	Limit mesa water use	Xeriscaping
Indoor conservation	Canal improvements	On-farm improvements
Increase ALP storage	Treat saline water	Conservation Education
Blanco		
Crop leasing	Conservation Education	
Xeriscaping	Indoor Conservation	
Chaco		
Crop leasing	Conservation Education	
Xeriscaping	Indoor Conservation	
La Plata		
Conservation Education	Limit mesa water use	Crop leasing
Indoor conservation	Canal improvements	Xeriscaping
On-farm improvements		
Middle San Juan		
Conservation Education	Limit mesa water use	Crop leasing
Indoor conservation	Canal improvements	Xeriscaping
On-farm improvements	Increase ALP storage	Groundwater Exchange with NIIP or Navajo Gallup Pipeline
Upper San Juan		
Conservation Education	Limit mesa water use	Crop leasing
Indoor conservation	Canal improvements	Xeriscaping
On-farm improvements	Increase ALP storage	Groundwater Exchange with NIIP or Navajo Gallup Pipeline
Upper San Juan above Navajo Dam		
Conservation Education	Indoor conservation	Xeriscaping

Descriptions of the alternatives are included in Section 9.0 and above in Section 10.0

10.13.1 **Navajo Nation Drought Contingency Planning**

The Navajo Nation Department of Water Resources provided the information for Section 10.13.1

Due to the arid climate, drought has always been a major concern to the Navajo people. Navajo Nation residents, ranchers, farmers, and businessmen are subjected to frequent water

shortages. The Navajo Nation, with the assistance of the U.S. Bureau of Reclamation, U.S. Bureau of Indian Affairs, Navajo Nation Division of Natural Resources and the Navajo Nation Department of Emergency Management completed the *Navajo Nation Drought Contingency Report, 2002*. This report was used to prepare the *Navajo Nation Drought Contingency Plan 2003* (Contingency Plan). A copy of the *Navajo Nation Drought Contingency Plan 2003* is located in **Volume II, Appendix A-8**. The Contingency Plan follows the National Drought Mitigation Center (NDMC) *Methodology for Drought Planning*. The NDMC methodology describes a ten-step process:

1. Appoint a drought task force
2. State the objectives of the drought plan
3. Seek stakeholder participation
4. Inventory resources and identify groups at risk
5. Prepare the drought plan
6. Identify research needs and institutional gaps
7. Integrate science and policy
8. Publicize the drought plan to build public awareness
9. Develop education programs
10. Evaluate and revise the drought plan

Droughts are a result of a number of interacting factors. The impacts of a drought vary depending on the water use sector. Droughts can be defined by meteorological, agricultural, hydrologic or socioeconomic variables. Any one of these variables can be quantified using different indices. Furthermore, the beginning and end of drought events are not distinct. The Navajo Nation Contingency Plan is based on the six-month Standard Precipitation Index (SPI) as reported by the National Drought Mitigation Center. The six-month SPI is used to justify the Navajo Nation drought alerts, warnings and emergency declarations, and to trigger drought responses. This response is very similar to the response developed by the State of New Mexico, which is based on a combination of the SPI and the Palmer Drought Index. The use of similar indices helps to insure that the drought declarations and responses are based on similar criteria.

Mitigation and protection are more cost effective than response and recovery. One objective of the Navajo Nation's drought mitigation is to reduce the expense of responding to drought emergencies. Emergency drought response is difficult to sustain over a long period of time. The Navajo Nation Contingency Plan combines long term and short term mitigation strategies, and it will assist all of the Navajo stakeholders to be proactive before a drought begins. The Navajo Nation assessed the drought impacts on: 1) domestic water haulers, 2) public drinking water systems, 3) irrigators and dryland farmers, 4) ranchers, and 5) recreation, wildlife and forestry.

This Contingency Plan provides guidance to the Chapters and the federal agencies to take appropriate action to minimize drought impacts. It is intended to be updated annually. This Contingency Plan provides the Navajo Nation with a simpler, more streamlined tool to determine in a timely manner, which Chapters need assistance. Using the NDMC

methodology as a guide, the broad objectives of the *Navajo Nation Drought Contingency Plan 2003* (**Volume II, Appendix A-8**) are to:

- Provide an effective and systematic means of assessing drought conditions
- Develop mitigation actions and programs to reduce risk in advance of drought
- Develop response options that minimize hardships during drought

Specific objectives of the *Navajo Nation Drought Contingency Plan 2003* (Volume II, Appendix A-8) are to:

- Collect, analyze and disseminate drought related information in a timely manner
- Establish criteria for declaring drought and triggering mitigation and response activities
- Describe the organization structure and the responsibilities of programs with respect to drought
- Prepare and inventory of state and federal programs and provide action recommendations
- Identify drought prone areas and vulnerable sectors
- Identify mitigation actions
- Provide a mechanism to ensure a timely and accurate assessment of drought impacts

10.14. Navajo Nation Alternatives Evaluation

The Navajo Nation Department of Water Resources provided the information for Section 10.14

10.14.1. General Legal Issues

The fact that the Navajo Nation's water rights in the San Juan Basin are not yet quantified creates one of the major obstacles to a secure water future for all of the water users in the Basin. In 1998, the Navajo Nation and the State of New Mexico entered into discussions to determine if a negotiated settlement of the Navajo Nation's unquantified water rights was possible. After determining that a negotiated settlement was possible, formal negotiations ensued in 2001 and a federal negotiating team was appointed in 2002.

All of the alternatives identified must be pursued within the following legal framework. The issues identified in this framework do not necessarily represent legal impediments, nor fatal flaws. However, compliance with federal, state and tribal statutes must be addressed.

- Federal laws: Endangered Species Act, National Environmental Policy Act; Clean Water Act (NPDES permits); Colorado River Compact, Upper Colorado River Basin Compact, Animas-La Plata Compact, La Plata River Compact; Reclamation contracts and authorizing legislation for the Animas-La Plata Project, the San Juan-Chama Project, the Hammond Irrigation Project, and the Navajo Indian Irrigation Project; and the Jicarilla Apache Nation Partial Final Decree.
- Navajo Nation laws: Navajo Nation Water Code and Water Quality Standards (water quality standards and TMDLs).

- State laws: Although not recognizing State jurisdiction over tribal land various alternatives may require addressing issues related to: Water Quality Act (water quality standards and TMDLs); Echo Ditch Decree; San Juan River General Stream Adjudication; State regulations and State water permits.

Specific legal issues are noted for each alternative. A detailed legal analysis of each alternative is beyond the scope of this document. A more detailed legal analysis of each alternative will be completed as each alternative is implemented.

10.14.2. Establishing a Water Resource Development Task Force, Which Will Coordinate Technical and Fiscal Resources of the Navajo Nation and Federal Agencies

10.14.2.1. Legal Issues

- The Task Force has been approved by the Navajo Nation's oversight committees
- The participating agencies have the necessary authorization to participate.

10.14.2.2. Technical Feasibility

The Navajo Nation Water Resource Development Task Force is technically feasible.

10.14.2.3. Political Feasibility

The Navajo Nation Water Resource Development Task Force is politically feasible

10.14.2.4. Social and Cultural Impacts

No detrimental social or cultural consequences of the Navajo Nation Water Resource Development Task Force have been identified.

10.14.2.5. Financial Feasibility

The Navajo Nation Water Resources Development Task Force is funded by the participating agencies.

10.14.2.6. Implementation Schedule

The Navajo Nation Water Resources Development Task Force was initiated in July 2000.

10.14.2.7. Physical, Hydrological and Environmental Impacts

No detrimental hydrological or environmental impacts of the Navajo Nation Water Resource Development Task Force have been identified.

10.14.3. Reservation-wide Water Resource Needs Assessment and Prioritizing Water Projects

10.14.3.1. Legal Issues

There are no legal impediments.

10.14.3.2. Technical Feasibility

The Navajo Nation Water Resource Reservation-wide Needs Assessment is technically feasible.

10.14.3.3. Political Feasibility

The Navajo Nation Water Resource Reservation-wide Needs Assessment is politically feasible.

10.14.3.4. Social and Cultural Impacts

No detrimental social or cultural consequences of the Navajo Nation Water Resources Reservation-wide Needs Assessment have been identified.

10.14.3.5. Financial Feasibility

The Navajo Nation Water Resources Reservation-wide Needs Assessment is being funded by the participating agencies.

10.14.3.6. Implementation Schedule

The Navajo Nation Water Resources Reservation-wide Needs Assessment was initiated in July 2000.

10.14.3.7. Physical, Hydrological and Environmental Impacts

No detrimental hydrological or environmental impacts of the Navajo Nation Water Resource Development Task Force have been identified.

10.14.4 Developing Regional Water Supply Projects Farmington to Shiprock Pipeline

10.14.4.1. Legal Issues

- As required by the ESA, Reclamation has consulted with the USFWS regarding the project depletions.
- This alternative was authorized for construction by the Colorado Ute Settlement Act of 2000.
- As required by NEPA, this project was addressed in the Supplemental Environmental Impact Statement and the Record of Decision. Additional NEPA may be required if the alignment is altered.

10.14.4.2. Technical Feasibility

This alternative is technically feasible.

10.14.4.3. Political Feasibility

This alternative is politically feasible. Discussions are ongoing with local residents regarding rights-of-way and the alignment.

10.14.4.4. Social and Cultural Impacts

The Farmington to Shiprock Pipeline will be constructed along the NTUA existing water line. The proposed alignment may be shifted so a gravity line system can be constructed. During construction phase, some farmlands may be disturbed during the farming season. As a result, some irrigable lands that are well suited to cultivation of corn, squash, beans, alfalfa, potatoes, grains, and sorghums may be affected. Reclamation, Navajo Tribal Utility

Authority, and the Navajo Department of Water Resources are working with the community on the project status.

10.14.4.5. **Financial Feasibility**

For the 1999 Supplemental EIS, the Bureau of Reclamation estimated that the Farmington to Shiprock Pipeline will cost $24 million. This project is financially feasible.

10.14.4.6. **Implementation Schedule**

Construction of the pipeline is estimated to begin in fiscal year 2005 and it will be completed by fiscal year 2007.

10.14.4.7. **Physical, Hydrological and Environmental Impacts**

The depletions associated with this project are in the San Juan River environmental baseline and the impacts are described in the 1999 EIS.

10.14.5 Developing Regional Water Supply Projects Navajo Gallup Water Supply Project

10.14.5.1. **Legal Issues**

- Endangered Species Act

Reclamation and the BIA are in informal consultation with the USFWS.

- National Environmental Policy Act

Public scoping meetings were conducted in Farmington, Shiprock, Crownpoint and Gallup in 2001. After considering 12 alternatives, a preferred alternative was selected in early 2003. The Environmental Impact Statement (EIS) is being drafted by the U.S. Bureau of Reclamation. According to Reclamation, a Record of Decision is anticipated in early 2005.

- Colorado River Compact and the Upper Colorado River Compact

The U.S. Bureau of Reclamation has been working with the Navajo Nation, Jicarilla Apache Nation, City of Gallup, the New Mexico State Engineers Office, and the Interstate Stream Commission to ensure that this Project complies with the "Law of the River" including the Colorado River Compact and the Upper Colorado River Compact. Window Rock, the City of Gallup and some of the Navajo chapters surrounding Gallup are located in the Lower Colorado River Basin. The Project participants and the NM Interstate Stream Commission are working with the Upper Basin Commission to address the compact concerns. The Navajo Nation is working with the Arizona Department of Water Resources to identify a water supply for Window Rock.

- Water Rights

The Navajo Nation and the City of Gallup have requested Secretarial water contracts for this project. Reclamation has identified several legal, environmental and administrative issues that need to be addressed before these contracts can be initiated. Congressional authorization for this project will require the resolution of several environmental, technical and financial obstacles. The State Engineer has suggested that project authorization will be contingent on a Navajo Nation water rights settlement.

10.14.5.2. **Technical Feasibility**

The U.S. Bureau of Reclamation completed an *Appraisal Level Designs and Cost Estimates* report for the Navajo-Gallup Water Supply Project in April 2002 (**Volume II, Appendix A-7**). The report analyzed six basic Project configurations with each configuration having two different water demands for a total of twelve different alternatives. The preferred alternative was the San Juan PNM Alternative. The San Juan PNM Alternative is composed of the San Juan Lateral and Cutter Lateral. The Navajo Nation Resources Committee approved the preferred San Juan PNM Alternative for the Navajo-Gallup Water Supply Project. The conjunctive groundwater components proposed by the NDWR are being further investigated by Reclamation. This Project, with all of its components, is feasible.

10.14.5.3. **Political Feasibility**

The Project participants include the Navajo Nation, the Jicarilla Apache Nation, and the City of Gallup. The recent addition of the Jicarilla Apache Nation provides additional support for the Cutter Lateral Component. The Navajo Nation people have waited for the Navajo-Gallup Water Supply Project to make water available for growing communities and economic development. Political obstacles in the past have been largely reconciled. Senator Pete Dominici, Senator Jeff Bingaman, and Representative Udall have gone on record supporting the Project.

10.14.5.4. **Social and Cultural Impacts**

The lack of domestic and municipal water is the greatest water resource problem facing the Navajo Nation. The current demand for municipal water is not met by public water supply systems. Access to adequate water is critical for economic growth and the survival of the Navajo culture. The cornerstones of the Navajo water development strategy are several large, regional water supply projects, including this Project that will provide new and reliable water for domestic and municipal use.

10.14.5.5. **Financial Feasibility**

The U.S. Bureau of Reclamation's *Appraisal Level Designs and Cost Estimates* report for the Navajo-Gallup Water Supply Project (**Volume II, Appendix A-7**) estimated the preferred alternative to be $441 million. The Navajo Nation's estimated portion of the surface water component is approximately $344 million. The groundwater components are an additional $70 million. The Project participants will need to secure funding to pay for the Project. The City of Gallup has proposed raising its water rates to help pay for this project. The Navajo project reimbursement may be waived as part of a water rights settlement.

10.14.5.6. **Implementation Schedule**

The Environmental Impact Statement and a Record of Decision may be completed in early 2004. Congress could authorize construction in 2004 with construction beginning in 2005. At $40 million per year, the construction would take eleven years, or until 2016, to complete. The Gallup Regional System has already received State Water Trust Board funding to extend the Gallup Regional System to Manuelito and Tsyatoh. The groundwater component can be implemented as soon as funding is available.

10.14.5.7. **Physical, Hydrological and Environmental Impacts**

The Project will meet the requirements of the Endangered Species Act, the National Environmental Protection Act and the Colorado River and Upper Basin Compacts. During construction, the laws of the Navajo Nation, State of New Mexico, and State of Arizona, local municipalities will be addressed. Concerns of Chapters and landowners will also be addressed.

10.14.6 Developing and Rehabilitating Local Public Water Systems

10.14.6.1. **Legal Issues**

- ESA/NEPA compliance
- Navajo Nation Water Rights settlements

10.14.6.2. **Technical Feasibility**

As part of the regional needs assessments, the small public water systems will be assessed. These assessments will evaluate those projects that have the best chance hydrologically, institutionally, and agronomically sustaining themselves. Improving the performance of these smaller systems is technically feasible.

10.14.6.3 **Political Feasibility**

Improving the performance of these smaller systems is politically feasible.

10.14.6.4 **Social and Cultural Impacts**

Improving the performance of these smaller public water systems is socially and culturally acceptable.

10.14.6.5 **Financial Feasibility**

These systems are located in remote areas with limited access. They require long distances between the water source and places of use. These factors result in very expensive infrastructure. In some instances, the IHS has determined that many of the Navajo homes cannot be feasibly served and that NTUA cannot under its current rate structure afford to operate and maintain systems to some of the Navajo homes. The IHS's sanitation deficiency system identifies the homes that are the most financially feasible to serve.

10.14.6.6 **Implementation Schedule**

The IHS sanitation deficiency list identifies hundreds of millions of dollars of current deficiencies on the Navajo Reservation. At current funding levels, it may take ten to twenty years to address the current deficiencies.

10.14.6.7 **Physical, Hydrological and Environmental Impacts**

Environmental compliance work will be conducted on all public water projects before construction begins.

10.14.7 Completing Navajo Indian Irrigation Project Evaluation

10.14.7.1. **Legal Issues**

- NIIP was authorized by Congress in 1962, yet 40 years later, it remains uncompleted.

- The BIA has consulted with the USFWS as required by the ESA. As a result of that consultation, the depletions required to complete the project are in the environmental baseline.

10.14.7.2 **Technical Feasibility**

NIIP is technically feasible.

10.14.7.3 **Political Feasibility**

NIIP has had the support of the New Mexico delegation and the State of New Mexico. Continued support may be contingent on the performance of the farming enterprise.

10.14.7.4 **Social and Cultural Impacts**

The Navajo Nation repeatedly expresses that the NIIP is important for social and cultural reasons.

10.14.7.5 **Financial Feasibility**

The financial feasibility of NIIP depends in part on the performance of the farming enterprise, and future agronomic decisions.

10.14.7.6 **Implementation Schedule**

NIIP was authorized in 1962, but forty years later, it is still not complete. If recent funding levels of $26 million per year are restored, it may take 12 to 15 years to complete NIIP. At last years funding level (2002), it may take more than 30 years to complete.

10.14.7.7 **Physical, Hydrological and Environmental Impacts**

The depletions required for the completion of NIIP are in the environmental baseline.

10.14.8 Small Agricultural Irrigation Projects Evaluation

10.14.8.1 **Legal Issues**

- ESA/NEPA compliance
- Navajo Nation Water Rights settlements

10.14.8.2 **Technical Feasibility**

As part of the regional needs assessments, the small irrigation projects in Region 2 will be assessed. These assessments will evaluate those projects that have the best chance hydrologically, institutionally, and agronomically sustaining themselves. The Navajo Nation Department of Water Resources has oversight for the operation and maintenance of the Shiprock Irrigation Projects, which include Hogback, Fruitland and Cudei. These projects divert water directly from the San Juan River to 12,000 acres of permitted land. The Navajo Nation will continue to obtain resources to help make these Navajo farms feasible. The proposed rehabilitation projects on these irrigation projects will conserve water, and reduce saline discharges to the San Juan River. Rehabilitation of these projects is technically feasible.

10.14.8.3 **Political Feasibility**

Traditionally, agriculture has been of major importance in the culture of the Navajo People and in a number of treaties the United States Government has pledged to assist the Navajo Nation in its agricultural undertaking, with money and tools. The Navajo Nation politically supports the continued irrigation of Navajo farmlands.

10.14.8.4 **Social and Cultural Impacts**

The Navajo (Diné) people irrigated fields along the San Juan River and its tributaries long before non-Indian farmers moved into the region. The Hogback, Fruitland, and Gadiiahi irrigation projects divert water directly from the San Juan River in New Mexico. Federal participation began in the early 1900's when the United States Indian Irrigation Services expanded the Navajo Irrigation projects along the San Juan River and its tributaries. Over subsequent decades, the U.S. Bureau of Indian Affairs (BIA) attempted to improve, extend and operate these projects. As a result Public Law 86-636 (74 Stat. 470) effective October 1, 1962, the BIA explicitly transferred the Shiprock Irrigation Projects and the responsibility for operation and maintenance to the Navajo Nation. The Navajo Nation representatives have repeatedly stated that it is vital to keep the irrigation projects operating for the preservation of Navajo social and cultural practices.

10.14.8.5 **Financial Feasibility**

The formation of local agricultural water user groups will enable the farmlands to have an administrative oversight to address the needs and concerns of the water users. Once the Navajo Nation and local water user groups have identified projects to upgrade the existing irrigation systems to make them technically sound, the projects will cost less to operate and maintain. Rehabilitating the irrigation projects is financially feasible.

10.14.8.6 **Implementation Schedule**

Navajos were irrigating along the San Juan River and its tributaries. The implementation of rehabilitation depends on the future needs assessment, technical analysis, and, most of all, funding. Significant rehabilitation, such as the Hogback Diversion Structure, has already happened.

10.14.8.7 **Physical, Hydrological and Environmental Impacts**

The proposed rehabilitation projects should not jeopardize the endangered species. And many recent efforts, including the new Hogback Diversion Structure, have benefited the San Juan River Basin Recovery Implementation Program. In addition, several proposed activities will improve efficiency, conserve water, and reduce saline discharges to the Colorado River Basin.

10.14.9 Water Conservation and Water Reuse Evaluation

10.14.9.1 **Legal Issues**

- ESA/NEPA compliance
- Navajo Nation Water Code

10.14.9.2 Technical Feasibility

Navajo per capita water use rates are already very low. Water conservation is already practiced. However, there is very little irrigated landscaping that could take advantage of reclaimed water. Even so, improvements can still be proposed. Several water reuse projects have been initiated on the Navajo Nation, such as in Pinon and Ganado, and others are proposed.

10.14.9.3 Political Feasibility

This alternative is politically feasible.

10.14.9.4 Social and Cultural Impacts

In many, but not all, circumstances this alternative is socially and culturally feasible.

10.14.9.5 Financial Feasibility

Due to the already low per capita water use rates and currently high NTUA fee structures, few opportunities may exist for significant, inexpensive water conservation. In addition, the ability to pay may not be present.

10.14.9.6 Implementation Schedule

These efforts are ongoing.

10.14.9.7 Physical, Hydrological and Environmental Impacts

Water conservation has few detrimental impacts on the environment.

10.14.10 Power Generation Evaluation

10.14.10.1 Legal Issues

- Any new large water use will require ESA and NEPA compliance
- Navajo Nation Water Code

10.14.10.2 Technical Feasibility

Power generation is technically feasible.

10.14.10.3 Political Feasibility

Any coal fired power plant and mine will be politically controversial. The proposed power plant will need to be made as "green" as possible. Perhaps it can carry some of the burden for cleaning up the older power plants in the local area. Dry stacks may reduce the impacts on politically sensitive water supplies.

10.14.10.4 Social and Cultural Impacts

The large generating stations have all had major social and cultural impacts. Mining makes up about 75 percent (75%) of the Navajo Nation's general revenue. These revenues have been used to fund needed social programs and to provide lively hood for many Navajo residents. However, residents in the effected areas often oppose them.

10.14.10.5 Financial Feasibility

The financial feasibility of a power generating station is under investigation.

10.14.10.6 **Implementation Schedule**

These efforts are ongoing.

10.14.10.7 **Physical, Hydrological and Environmental Impacts**

Conventional generating stations with wet stacks will require significant quantities of water. Dry stacks, which are expensive and reduce efficiency, reduce water demand 70 to 90 percent. However, these additional costs may be reflected in the reduced value of Navajo coal. If the proposed water supply is not in the environmental baseline, then the supply will have to be addressed.