COTTONWOOD LAKE ENLARGEMENT PROJECT

2009 LEVEL II STUDY

EXECUTIVE SUMMARY

for

WYOMING WATER DEVELOPMENT COMMISSION

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1.0 INTRODUCTION

1.1 GENERAL STUDY LOCATION

The general study area is near Smoot, Lincoln County, Wyoming located on the western edge of Wyoming near the south end of Star Valley. The area of this study includes the Cottonwood Creek drainage and, in particular, Cottonwood Lake located five miles east of Smoot in Cottonwood Canyon.

![Figure 1.1 – Location Map](image)

1.2 PREVIOUS STUDIES

The Cottonwood Irrigation District sponsored a Level II Study in 2006 through the Wyoming Water Development Commission of the enlargement potential of the existing site or constructing a dam at one of several new sites located in the drainage. This 2006 study contains much of the history and information used in this study. Of particular note was the review and elimination of several alternate reservoir sites in the previous studies leaving the current Cottonwood Lake site as the preferred reservoir site and focus of this study.

1.3 EXISTING AGREEMENTS

As outlined in the 2006 study, the Snake River Compact established the allocation of Snake River Water at 96% for Idaho and 4% to Wyoming. The first half of Wyoming’s allocation (2%) can be diverted or stored with few compact requirements. The second half of the allocation however can only be diverted or stored if there is provision made for reimbursement of Idaho users replacement
storage. Provision for this storage has been made in the current Palisades Reservoir in the amount of 33,000 acre feet (Snake/Salt River Basin Plan, 2002).

Currently Wyoming uses less than the first 2% of its Snake River water. Therefore any storage constructed on Cottonwood will enter into the accounting under the Compact, but should not be difficult to justify.

1.4 STUDY OBJECTIVES

The current Level II Study is intended to build on the information from the 2006 study. Primary tasks of the study include:

1) Scoping and Project Meetings
2) Review of Background Information
3) Access
4) Identify Construction Funding Sources
5) Technical Evaluation of Storage Site
6) Permitting and Mitigation
   6a) Geotechnical permitting and investigation,
   6b) Geotechnical permitting,
7) Conceptual Designs and Cost Estimates
8) Financing and Economic Evaluation
9) Discretionary Task
10) Draft final and Executive Summary Reports
11) Project Presentation

This contract identified two separate possible paths. Tasks 1 through 4 were common to both paths. At Task 5 the study paths diverged with one path developing a geotechnical drilling program and the other path developing and implementing the drilling program as budget allows. Tasks 6a and 6b are also separate paths determined during Task 5. During prosecution of study Task 5, it was determined that the drilling program be developed but not executed. This decision set the final path of the study as completion of Task 6b and Tasks 9-11. There was also a need to complete some of Task 7 to provide necessary information for Task 6.

2.0 BACKGROUND INFORMATION

Much of the following geography and background information was taken from the previous 2006 Level II study. It is provided here to orient the reader with the site and general site conditions. The U.S. Forest Service administers the land at Cottonwood Lake. There are, however, several private citizens leasing land at the upper end of the lake.
3.0 CONSTRUCTION FUNDING SOURCES

The first task to be completed on this project was to identify potential funding sources for the project. The intent was to insure a likely funding source or sources existed before expending additional funds on further engineering study and investigation.

The consultant (Sunrise) has made contact with various leads identified by them, and the WWDO as possible sources. Some of these leads are traditional sources for public works funding such as the USDA while others are relatively new as is the Wyoming Business Council.

The following is a summary of Contacts. Details regarding their responses are contained in the report.

- Wyoming Department of Agriculture
- Wyoming Game and Fish Department
- Wyoming Division of State Parks and Historic Sites
- Wyoming Business Council
- USDA
- H.R. 1770, The Dam Rehabilitation and Repair Act of 2009
- Star Valley Conservation District
- Wyoming Water Development Commission

Summary

The expressly interested funding sources with the structure and mission already in place to fund the project are:

1) The users of the Cottonwood Irrigation District
2) The Wyoming Water Development Commission

The District with its approximate 5,000 acres currently assessed at $12.00/acre/year raises only enough for operations, maintenance and debt service on their current loan. In the previous study the economic analysis identified $3,900 or 0.78 cents/acre as the annual assessment increase that could be justified by increases in crop production alone.

In order to demonstrate commitment to the Water Development Commission or any other funding partner it will be necessary for an increase in the assessment. Assuming a $2.00 per acre increase, the District would raise about $10,000 per year. This amount could fund about $150,000 of the estimated $3,280,000 project cost or 4.5%.

The State of Wyoming through the Water Development Commission would then be approached about funding the remainder of the project at a 95.5% grant; well in excess of the 67% current guidelines. The results of this approach are not certain and become more of a political decision.
4.0 TECHNICAL EVALUATION OF STORAGE SITE

4.1 SITE SURVEY

In anticipation of a geotechnical drilling and testing program, a site specific survey was conducted for the Cottonwood Lake site. Due to vegetative cover and horizon limitations the survey was conducted using conventional survey equipment rather than gps based equipment. A detailed topographic map of the site was prepared using the survey to show contours, water edges, trees, and road edges.

4.2 GEOTECHNICAL EVALUATION

Prior to completing final design for the Cottonwood Lake Dam the following geotechnical investigations are recommended to obtain sufficient data for design analyses and more precise cost estimates.

Field explorations should include detailed geological mapping and drilling and sampling several test borings. There are five additional boreholes proposed at the site. The spacing between the holes will be approximately 150 feet. Three of the holes will be located along the toe of the existing dam and will correspond with the approximate centerline axis of the proposed dam. Two of the holes will be located on the existing landslide on the west side of the parking area but also along the centerline of the proposed dam reconstruction.

The holes will be sampled to evaluate the boundaries and the engineering characteristics of the alluvium, terrace deposits and bedrock. Down-hole water pressure tests should be conducted to evaluate in-situ permeabilities. Standard Penetration Test (SPT) blow counts should be recorded in the alluvium for the purpose of evaluating liquefaction potential of the stream deposits. Core borings should be taken in the bores located at the abutment and spillway channel areas to determine if weak seams are present and will have an adverse effect on slope stability. The Forest Service has also suggested that selected holes be outfitted with a piezometer and an inclinometer for future monitoring.

Selected undisturbed and bulk samples should be tested in the laboratory to determine pertinent engineering characteristics of the foundation and embankment materials. Strength tests should be performed on dam foundation materials and compacted embankment soils and on geologic formations that will be in the walls of the spillway channel (if an excavated channel is used for the spillway). Gradation determinations should be made on the core and shell materials to establish filter and drain criteria. Compaction tests should be completed on potential embankment fill soils.

Potential borrow sources identified in the canyon must be investigated to determine material characteristics and volumes. Including the potential borrow source for low permeability material. These potential borrow sources have been identified on Exhibits B and C of Appendix A. Location 9 is the only potential low permeability material identified in the canyon. Other low permeability material may be found on the west side of Star Valley. It would be advantageous to test this material along with other material sources.
5.0 PERMITTING & MITIGATION

5.1 ISSUES AND CONSIDERATIONS

The initial Level II study identified the following items as potential issues requiring resolution during the permitting process. During this study the permit requirements were identified; and under Alternative B of Task 6, the information required to complete NEPA, USFS, ACOE and any other State and Federal permits for the geotechnical investigations is to be completed. In addition, the permit requirements for the construction project are to be identified.

5.2 PERMITTING

The National Environmental Policy Act of 1969 and its implementing regulations require that all federal projects consider the effects of a proposed action and its alternatives on the environment. Depending on the significance and impacts of a project, an Environmental Impact Statement (EIS) or an Environmental Assessment (EA) could be required. Both documents are used to assist agency decision makers and the public in making informed decisions about the environmental impacts of a project. The EIS is more comprehensive and follows a defined procedure which makes it a lengthier process. Environmental assessments do not require the same procedural steps and vary from brief to comprehensive.

Given the likely environmental impacts associated with the enlarging of the existing dam it is unlikely that any new enlargement of the existing dam could be built without an EIS. However, repair and maintenance work for the existing dam probably would not require a full EIS and likely would be permitted as an EA. The current proposal of restoring the existing dam and bringing it up to current standards is expected to fall under an EA. However raising the level even to historic the historic height may trigger impacts that require a full EIS.

5.3 INITIAL AGENCY COMMENTS/PERMITS

In order to identify required permits and permitting processes for reconstruction at the existing site, a number of agencies were contacted in January 2009. The agencies that were contacted included the following: The Wyoming Game and Fish Department, Wyoming State Historic Preservation Office, the Wyoming Department of Environmental Quality (DEQ), Air, and Water Quality Divisions, the US Fish and Wildlife Service, the US Forest Service, the US Army Corps of Engineers, Homeland Security, Wyoming State Engineers Office and the National Resources Conservation Service (NRCS).

Written responses were received from the Wyoming Game and Fish Department, State Historic Preservation Office, Wyoming DEQ Air Quality, the Wyoming State Engineers Office, the US Fish and Wildlife Service, and the USDA Forest Service, and Corps of Engineers. Copies of the agency letters are contained in Appendix C of the report.
5.4 NEPA PROCESS

The single largest regulatory issue will likely involve compliance with the National Environmental Policy Act (NEPA).

During any project in the Cottonwood Creek basin, the likely trigger for initiating NEPA will be a 404 Permit application with the COE, making them the lead agency for the NEPA process. The need for a US Forest Service special use permit(s) could make them the lead agency. At least, the US Forest Service will be a cooperating agency during the Cottonwood Lake project.

Other major environmental permitting issues that may require agency coordination during the NEPA process include a US Fish and Wildlife Service (USFWS) Section 7 consultation, and possibly Section 106 of the National Historic Preservation Act.

5.5 REQUIRED STEPS FOR NEPA

An EA is often the first phase in NEPA compliance and provides an initial analysis of the environmental resources that might be affected by the proposed action. An EA is used to present a preliminary assessment of environmental impacts and to assess the need for changes in the design, or additions, in response to assess impacts. Based on the conclusions in the EA, the lead federal agency then either prepares a Finding of No Significant Impact (FONSI), or an EIS; if the agency determines that the proposed action may significantly affect the environment. An EIS is a detailed statement to describe the impacts, any unavoidable adverse impacts, and alternatives to the proposed action.

It is possible the 3-foot raise could be permitted under an EA especially if the dam repair was designed to minimize any impacts to the area downstream of the existing dam and it can be demonstrated that the small raise will improve the safety or function of the dam and reservoir. However, significant impacts to the environment, including work in wetland areas below the dam may require a more detailed Environmental Assessment even to repair the dam.

5.6 CRITICAL PATH

The trigger for NEPA for any likely storage project in the Cottonwood Creek River Basin will be the 404 Permit Application. A special use permit application to the US Forest Service will also trigger the NEPA process. Once the decision is made to proceed with the project, a 404 Permit Application should be filed as soon as possible.

A critical aspect in the 404 process is delineating jurisdictional wetlands impacted by the project. Wetlands are a special case of waters of the U.S.; and it is up to the COE to make final determination of the wetlands present, their boundaries and jurisdiction.

The decision to proceed with the project should be made, in part, based on the ability to adequately mitigate wetlands and other aquatic impacts. Given the importance of this issue, the recommended first step in the critical path for the project is investigating the feasibility of developing and implementing a wetland mitigation plan.
5.7 ASSESSMENT/OPINION OF PERMITTING DIFFICULTY

The 3-foot rising of the dam could be permitted using the EA process. This work will be much simpler and less time consuming. The wetland, wildlife, fishery and cultural resources impacts will be much less and the permitting process will be simpler and less time consuming.

5.8 BUDGET COSTS FOR ENVIRONMENTAL AND MITIGATION WORK

The budget for the environmental assessment and permitting for a project to restore the dam will range from approximately $10,000 to $50,000. This relatively wide range in the budget is primarily due to the EA resulting in a FONSI or a mitigated FONSI and how detailed the environmental and cultural resources investigations will need to be.

Construction costs for creation of new wetlands could be in the range of $25,000 to $40,000 per acre. This assumes that there is land that can be agreed upon and is suitable for mitigation work. This figure does not include the EIS, land acquisition, monitoring, or continued operation and maintenance work for the wetlands mitigation areas.

Another potential mitigation cost for the project is fish passage issues that may require a constructed passage be installed at the new Cottonwood Lake dam and spillway. The size and cost of the passage is largely determined by the target species and the required passage velocities. A constructed passage for a height of 12 to 13 feet will be in the $125,000 to $150,000 range.

6.0 CONCEPTUAL DESIGNS & COST ESTIMATES

6.1 INTRODUCTION

In order to obtain information from agencies regarding permitting and mitigation the 2006 Level II drawings were updated using the new topographic survey data obtained during this study. The new topographic survey allowed an accurate determination of the proposed dam centerline and preparation of cross sections. The designs depart from the original Level II Study in that the core seepage issue is more fully addressed rather than only the embankment stability and erosion protection.

The conceptual designs completed at the Cottonwood Lake site include embankments, concrete emergency spillways, service outlet works, and access/exploration roadway alignments. Details of the conceptual designs are presented in Exhibits D through K (Appendix A). Two basic dam or embankment types were considered when reviewing options for Cottonwood Lake. The types included 1) Earth Fill Dam with Clay Core, and 2) Earth Fill Dam with Concrete Core.

6.2 COTTONWOOD LAKE CONCEPTUAL DESIGN – 3 FOOT LEVEL INCREASE

This design will restore the historic high water level at the lake. The project will raise the current lake level by 3 feet and allow drawdown to 7 feet below current levels. Approximately 33 total surface acres will result from the level increase. The active volume provided for irrigation is
approximately 230 acre feet. The project will include reconstruction of the spillway and a new outlet works. Two options have been explored for construction of the dam, they include a clay core and a concrete wall core. Cross sections of these conceptual designs are presented in Exhibit G, Appendix A of the study.

6.3 COST ESTIMATES

The previous 2006 study cost estimates were updated for the two proposed options for construction of the three foot level increase. The estimates were based on the preliminary drawings which were created to investigate the permitting requirements.

These cost estimates were prepared by contacting some materials suppliers and contractors, reviewing past bid tabulations, and the RS Means Heavy Construction Cost Guide. These estimated costs are subject to fluctuations in market values.

The estimated total project costs are shown in Table 6.1. Appendix D contains additional detail related to the costs summarized on Table 6.1.

Table 6.1 – Summary of Opinion of Probable Costs

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<thead>
<tr>
<th>ITEM</th>
<th>ALTERNATIVE</th>
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<tbody>
<tr>
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<td>CLAY CORE</td>
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<td>Geotechnical</td>
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<td>Embankment</td>
<td>$1,178,747</td>
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<td>Spillway</td>
<td>$198,219</td>
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<td>Outlet Works</td>
<td>$11,900</td>
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<tr>
<td>General</td>
<td>$238,900</td>
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<tr>
<td>Component Cost Sub-Total</td>
<td>$1,711,333</td>
</tr>
<tr>
<td>Const. Permits, Bond, Insurance</td>
<td>$348,000</td>
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<tr>
<td>Construction Engineering Cost</td>
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<tr>
<td>Contingency</td>
<td>$339,790</td>
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<tr>
<td>Sub-total</td>
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<td>Total Construction Cost</td>
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<tr>
<td>Preparation of Final Design</td>
<td>$208,404</td>
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<td>Permitting</td>
<td>$78,152</td>
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<td>Legal Fees</td>
<td>$104,202</td>
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<tr>
<td>Environmental Study and Mitigation</td>
<td>$100,186</td>
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<tr>
<td>Total Project Cost</td>
<td>$3,096,000</td>
</tr>
</tbody>
</table>

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7.0 FINANCING & ECONOMIC EVALUATION

The economic evaluation was to be conducted based on the findings under Section 3 of this report. Since no significant alternate funding sources or grants are available, economic findings from the previous study are still valid. The current cost estimates are slightly higher than the 2006 study costs meaning the ability of the only identifiable group (irrigators) to pay is further diminished. The summary under Section 3 contains the following discussion of the two most probable funding sources.

The expressly interested funding sources with the structure and mission already in place to fund the project are:

1) The users of the Cottonwood Irrigation District
2) The Wyoming Water Development Commission

The District with its approximate 5,000 acres currently assessed at $12.00/acre/year rises only enough for operations, maintenance and debt service on their current loan. In the previous Level II Study completed in 2006 the economic analysis identified $3,900 or 0.78 cents/acre as the annual assessment increase that could be justified by increases in crop production alone.

In order to demonstrate commitment to the Water Development Commission or any other funding partner it will be necessary for an increase in the assessment. Assuming a $2.00 per acre increase, the District would raise about $10,000 per year. This amount could fund about $150,000 of the estimated $3,280,000 project cost or 4.5%.

The Water Development Commission would then be approached about funding the remainder of the project at a 95.5% grant well in excess of the 67% current guidelines. The results of this approach are not certain and become more of a political decision.

The final project budget breakdown using the above approach will be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
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<tr>
<td>Cottonwood Irrigation District</td>
<td>$150,000</td>
</tr>
<tr>
<td>State of Wyoming/WWDC</td>
<td>$3,130,000</td>
</tr>
<tr>
<td>Total</td>
<td>$3,280,000</td>
</tr>
</tbody>
</table>

8.0 CONCLUSIONS & RECOMMENDATIONS

The Cottonwood drainage offers a reliable water source sufficient to provide irrigation reliability in excess of 80% while still providing for minimum in-stream flows. In addition to irrigation benefits, the reservoir will provide some flood control, recreational opportunities, and additional future municipal and/or industrial storage.

The site in this study has impacts to fish and wildlife. The Cottonwood Lake site generally impacts Forest Service lands and some private leases. Permitting the site will require detailed study and agency review by a variety of State and Federal agencies. The Army Corps of Engineers in
cooperation with the Wyoming Department of Environmental Quality would likely take the lead in the permitting process. An initial Department of the Army Permit Application, ENG Form 4345, February 1994 would begin the dam enlargement process. A full Environmental Impact Statement should be anticipated and the study and fieldwork is expected to take significant time (years) to assess impacts and mitigation requirements. The project offers the potential of permitting with the possibility of an Environmental Assessment rather than an Environmental Impact Statement.

The geotechnical investigation may be accomplished using a Nationwide Permit Number 33. The geotechnical study and mitigation costs are anticipated to run into the several hundred thousand dollar range.

In terms of traditional financing, this project does not offer sufficient cash flow to meet the debt service. This is apparent because among all the beneficiary groups, only agricultural entities can be readily isolated and cash flow benefits identified for the purpose of seeking project repayment. Further, agriculture would only be able to pay a fraction of the project costs. The Forest Service while supporting the project has limited resources. They can offer assistance in terms of general support for the project and possibly assist in resolution of permitting issues. In order for the dam enlargement to become a reality it will require extensive funding from the State through the Wyoming Water Development Commission. Project funding really appears to be more of a political cause and its implementation will require a groundswell of public support and identification of a strong project proponent.

The geotechnical drilling proposed for the summer of 2010 will result in review of the proposed designs and a re-evaluation of costs based on the findings of the drilling. The findings could mean higher costs that will then cause all involved to re-evaluate the feasibility of the project.

The drilling of the dam is the next logical step in the process that will further the information needed to determine if the project is fully funded and moves to a Level III permitting and design.