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Review of Proposals for Improving Methow and Twisp Rivers for Anadromous Fish Interim Report

A Report to the Northwest Power Planning Council
by the Independent Economic Analysis Board
June 2002
Interim Report

Council document IEAB 2002-2

Executive Summary

The Independent Economic Analysis Board (IEAB) has been asked to review a proposed project to increase in-stream flows and improve fish passage in the Twisp and Methow Rivers. The focus of the review is cost-effectiveness of the project, which requires that we compare the project costs to costs of alternative approaches to increasing in-stream flows. The proposed Methow Valley Irrigation District (MVID) project was developed by MVID, the Yakama Nation, and others over the last ten years. There are several variations of the project, but all are similar. All options would exclude about 1,110 acres from the MVID surface water service area. Owners of the excluded lands would be compensated. The remaining lands would receive water from a rehabilitated surface water delivery system. During low flows, diversions from the Twisp River would cease and more water would be diverted from the Methow instead. There is still uncertainty about how and when this exchange would be accomplished.

The IEAB has reviewed published information, and initiated discussions with project advocates, researchers, and others. Based on the information available at this time, the IEAB cannot determine if the current project option, or the other similar options, are cost-effective.

Some of the reasons for being inconclusive involve the MVID project itself. Some costs are still being determined. Instream flow amounts and triggers (i.e., when diversions would cease) are still being negotiated. There is insufficient information regarding potential hydrologic effects of the proposed project. An ongoing USGS study of groundwater hydrology, including assessment of canal seepage and return flow to the Twisp River, and the study of in-stream flow needs established by the current proposal, may help to resolve these issues.

In addition, any cost-effectiveness determination requires a clear definition of the set of alternatives under consideration. The potential cost-effectiveness of the MVID proposal cannot be judged in a vacuum. In other words, against what alternatives are we considering the MVID project? At the very least, cost-effectiveness of the MVID project can be considered relative to 1) other alternatives involving MVID, 2) alternatives to improve instream flow that acquire water outside of MVID, and 3) alternatives that include other types of improvements in a larger geographic area.

The IEAB has considered one option involving MVID: water acquisition (leasing or sales) from landowners in MVID. Water acquisition could be accomplished by surface water transfers, or by paying landowners to replace surface water with groundwater pumping. A comparison of the proposed project costs to the likely costs of a water acquisition approach suggests that water acquisition might be cost-effective. However, any water acquisition involving MVID poses legal and political concerns. In the short run, water transfers from MVID are believed to be politically infeasible, at least because water rights are uncertain. The existing MVID board of directors, or the Washington Department of Ecology (WDOE), would not approve a transfer. Recent attempts to complete water transfers involving MVID have not been successful. The current MVID proposal includes what is probably the maximum feasible amount of replacement of surface water with groundwater.

Water transfers might be a cost-effective part of the project in the future. However, approval by MVID's Board of Directors will still be required. Since there is no upstream storage, it may not be possible to change the time of use to the low-flow period. MVID has an unusually high density of landowners and residences, which may increase water acquisition costs. Feasibility of water marketing may also be limited by the inefficient conveyance system. The improved conveyance system might facilitate transfers by minimizing canal leakage, improving measurement capabilities, and allowing more exchanges.

The Twisp River is subject to more adverse low flow conditions than the Methow, and much of the remaining controversy in the proposed project involves Twisp River flows. The IEAB has briefly considered the potential for Twisp River flow restoration by water acquisition from water users other than MVID. The amount of water diversion by all other water users combined is about equal to the MVID Twisp River diversion, and some of the other diversions are junior in priority, so the amount of available water may be insufficient to accomplish the biological objectives.

Finally, we cannot determine whether the MVID project is cost-effective relative to alternative projects that would help the same species within the larger Methow River basin, or the ecological province (Columbia Cascade). We have not reviewed or considered the feasibility or cost-effectiveness of such other, broader approaches. These approaches might include new upstream water storage, other types of habitat improvements, supplementation, and/or some other cooperative venture. With uncertainty involving MVID, water rights, and continued delays in implementation of major improvements, there is value in considering other options that might achieve comparable biological benefits.

In summary,

- No determination of cost-effectiveness is possible at this time for a number of reasons;
- Political, legal and structural changes would be needed before water acquisition within MVID would be feasible;
- Some water acquisition may be a cost-effective part of a long-run solution.

The IEAB proposes to update the Council on these matters within one year.

Introduction

The IEAB has been asked to investigate the cost-effectiveness of several proposed options for improving anadromous fish habitat conditions in the Methow River. Cost-effectiveness requires two measures: 1) economic costs, and 2) a measure of how well the costs will accomplish some pre-defined goal(s).

One measure of effectiveness for a stream flow enhancement project is the degree to which it is expected to increase stream flows at the appropriate times and places. Although important, the hydrologic effects are only precursors to the analysis of biological effects – the increase in anadromous fish populations. A more fundamental measure of cost-effectiveness would combine project cost information with estimated contributions to the salmon restoration goal.

A third measure of effectiveness might be the extent to which the project represents a local agreement. There are a number of economic and social values associated with a local consensus, but such consensus is not an explicit goal for this effort. Local consensus is a factor that may influence the success of restoration, but it is clearly not a proxy for it. There is economic value in achieving a consensus solution quickly, but this value alone should not be used to justify one of the project options.

Background Information

The Methow River drains about 1.2 million acres and enters the Columbia River just upstream from Wells dam (see Foster). Generally, habitat for anadromous and resident fish in this subbasin has been degraded by logging, road construction, flood control, and other development. Irrigated agriculture has contributed to the decline of salmon by direct mortality in diversions and dewatering of streams, especially in summer and early fall. Most irrigation is from small private diversions. Irrigated land, about two percent of the subbasin or 24,000 acres, is primarily used for pasture, hay production, field crops and orchards.

The Methow Valley Irrigation District (MVID) West Canal diverts water from the Twisp River about 4 miles above its confluence with the Methow. In addition, the MVID's East Canal diverts water from the Methow River about five miles above the confluence. According to a 1997 EIS/FONSI (BPA 1997), the MVID West Canal diverted, on average, about 26 cubic-feet-second (cfs) from the Twisp River. The average September diversion was about half of the mean September flow in the Twisp River at this point of diversion. The East Canal diverted about 41 cfs from the Methow River. The average September diversion from the Methow was about 13 percent of the mean September flow at this point of diversion.

Numerous interests, including the Yakama, the NMFS and WDOE have been working to develop and implement alternatives for improving in-stream flows and passage, address water conservation, and continue irrigation. In 1996, a preferred alternative was identified by WDOE that would reduce the MVID service area by over half, and rely on new wells and a pressurized pipe system to convey water to farmers (see Dunau). In 1998, the MVID Board of Directors passed a resolution authorizing the District to proceed with the pressurized pipe system, the

drilling of wells, and designation of landowners who would receive compensation for voluntarily drilling wells and leaving the MVID.

The Final Environmental Assessment and Finding of No Significant Impact was released in 1997. The total cost of the project was estimated to be about $4.9 million, including the costs to compensate landowners to switch to groundwater. BPA committed $2.8 million in 1999 with the balance to be paid by the State of Washington.

In 1999, the district reorganized so that some water users converted to groundwater wells, leaving about 9 cfs of additional water in the river. Current projections show approximately 1,110 acres of land eventually being excluded from the MVID, and approximately one million dollars will be paid out by BPA to compensate these "excluded" landowners.[1] This leaves about 1,499 assessed acres in the district, of which 873 acres are irrigated from the two diversions. An additional 413 acres is served by MVID through the Barkley ditch through an agreement with that water user. The total amount of land irrigated by surface water is therefore about 1,286 (873 + 413) acres.

An order issued by WDOE in May of 2002, which MVID is expected to appeal, would entitle MVID to withdraw 29 cubic feet per second (cfs) on the west side. The WDOE order entitles MVID to 24 cfs instantaneous flow on the east side. These diversion rates assume that the excluded lands are, in fact, excluded. The allowable diversion on the Twisp is still a large share of flow, but the eastside diversion is about 8 percent of average September flow.

On July 3, 2000, a new Board of Directors voted to reject the "all-well" plan (AP, July 15, 2000). A facilitation group began meeting in January 2001. These meetings resulted in development of several local options. Up to March 2002, there were two options under consideration. In both options, the eastside canal from the Methow River would be rehabilitated with a new upstream diversion, a wing dam instead of the existing check dam, new screens, and canal improvements. In the option proposed by the Yakamas, the MVID would remove its diversions and screens from the Twisp River (for the West Canal) and two new pump stations would be installed on the Methow instead (see Dunau).

Current Project Option

In the option proposed by MVID, the Twisp River diversion for the West Canal would be kept and improved and only one of the new pump stations would be built on the Methow. A water exchange between the Twisp and Methow rivers would be used to address Twisp River low flow needs. Conveyance and pumps would be built to move water from the Methow River to service the water users' needs on the West canal during periods of low flow periods in the Twisp River. For some upstream lands, engineering is needed to determine whether a piping system or wells will most cost effectively assure delivery of water during the low flow period. From the time that the water exchange program is triggered until the end of the irrigation season, MVID would utilize the exchange to meet 100% of their Westside irrigation needs.

[1] About 650 to 700 acres of this land was irrigated (Barwin, 2002)

The Yakamas accepted the MVID option in principle, but the Yakamas and MVID disagreed on how the Twisp River diversion could be operated. Under the current project description, the trigger flow will be determined through Section 7 project consultation. BPA will lead an in-stream flow study of the reach between the MVID Twisp River diversion and the USGS gage near Twisp. Results of the in-stream flow study will be binding only for the purpose of determining when to activate the water exchange program annually. NMFS will notify MVID of its tentative determination of the trigger flow by or before January 1, 2003. MVID may choose not to implement the exchange if they do not accept the tentative determination, if environmental reviews may raise more issues, or if revised cost estimates are unfavorable. MVID must proceed to replace the existing fish screens on the Methow and Twisp with ESA-compliant screens in any case, but the cost of screens could depend on whether or not they agree to implement the exchange. BPA would fund the annual operations and maintenance cost of the pump system for 25 years. At the conclusion of 25 years, MVID may choose to maintain and/or replace the pump station at its discretion.

In the future, if the local option is successful, MVID would transfer into trust an amount equal to the difference between the peak instantaneous diversion amount and a new peak instantaneous quantity determined following rehabilitation, implementation of the exchange, and additional conservation. The exact amount of water to be placed in trust is currently unclear.[2]

Summary of Proposed Costs

Project costs for the current MVID option are shown in Table 1. The components of these costs are shown in the attached table. The evaluation considers two different areas: the excluded lands of 1,110 acres, and the remaining area served by MVID (1,912 acres of which 1,286 acres are irrigated).

Total project costs would be about $5.8 million, including the present value of future O&M costs. About four-fifths of costs are associated with the rehabilitation. Cost per acre for lands served by the rehabilitated system ($2,524) is about three times the cost per excluded acre ($856).

These costs are quite similar to the costs of the other local proposals. The Yakama option would have eliminated the Twisp River diversion, saving capital rehabilitation costs, but annual costs of the water exchange were more (Attachment 1). Earlier variants of the MVID option were slightly less expensive.

[2] The amount of peak instantaneous diversion is provided in WDOE Order No. DE 02WRCR-3950 or as modified by a court of competent jurisdiction if that Order is appealed

Table 1.
Proposed Costs for Irrigation System Rehabilitation and Excluded Lands, 4/15/02

Description	Dollar Cost
Annual Costs (BPA)	$45,000
Net Present Value (NPV) of Annual Costs[1]	$1,157,839
Capital Costs of Irrigation System Improvements	$3,667,250
Total NPV of Costs, MVID Remaining Lands	$4,825,089
NPV Cost/ Irrigated Acre (1,286 acres)[2]	$3,752
NPV Cost/District Acre (1,912 acres)[3]	$2,524
Additional Cost of Excluded Lands (1,110 acres)	$950,000
Total NPV Project Cost	$5,775,089
NPV Cost/Project Acre (3,022)[4]	$1,911

Source: Andy Dunau, 2002. NPV and per acre cost calculations by the IEAB

[1] at 3% over 50 years
[2] 873 acres plus 413 acres irrigated by the Barkley ditch
[3] 1,499 plus 413
[4] 1,912 plus 1,110

With 1,286 acres irrigated recently, the net present value of the MVID option exceeds $3,700 per irrigated acre. With 1,499 acres in the District and 413 acres on the Barkley ditch, the net present value cost per district acre is about $2,500. Actual costs would depend on the operational scheme eventually selected.

Hydrologic Considerations

The IEAB has concerns about hydrologic consequences of the project options. Leakage from the canals provides recharge to local aquifers, which then drain to the river. Because lining the canals will eliminate this leakage, some portion of the increased flows will be offset by reduced accretions to the river. (Accretions are increases in streamflow from diffuse sources.) It is not clear when and where the reduced accretions would occur. This issue has been addressed in past studies, but the existing quantitative analysis is not adequate to support a conclusion.

It is recognized that, at times when flows are limiting for fish, it is unlikely that the reduction in accretions would be more than the increase in in-stream flows from reduced diversion. That is, improvements in conveyance efficiency will increase in-stream flow, and this increase equals the reduction in diversion at the point of diversion. However, the flow improvement will be increasingly less as one moves downstream from the point of diversion.

According to the 1997 EIS/FONSI,

> [t]he approximate amount of the total diversion of 67 cfs that seeps from the canals is about 51 cfs during the peak irrigation period. That water returns to the rivers gradually, during and beyond the irrigation season (normally, the beginning of October). Because soils in the area are permeable, and the canals are close to the rivers, it is assumed that almost all return flows reach the river by the end of December." (page 35)

With the 1,110 acres of irrigated land excluded, the 53 cfs rate from the two canals combined implies a diversion of about 3,150 acre-feet (AF) per month. Over a four month irrigation season this could mean that 12,600 AF is diverted by the project, or about 10 AF per irrigated acre. Crops in this region probably consume about 2 AF per acre. Therefore, the unconsumed 8 AF per acre must go to canal seepage losses, deep percolation to the aquifer, and tailwater runoff, with a small amount lost to surface evaporation and weeds. Some of this unconsumed water may be appropriated by other water users, but much of this excess diversion must end up back in the river.

If the proposals to substantially improve conveyance efficiency are successful, they will reduce or eliminate this recharge. The ability to use wells as substitute water supplies could be jeopardized, and accretions back to the Twisp and lower Methow could be reduced. Another significant factor for fish may be water temperatures. Groundwater accretions from canal leakage may be cooler than the stream water. Therefore, a substitution of stream water for ground water caused by canal lining could have adverse consequences for fish through higher temperatures.

Additional information is being collected by the U.S. Geological Service.

> The USGS has been conducting a detailed investigation of groundwater and surface-water interactions in the lower Twisp River valley. As part of the investigation, the USGS will construct a water budget for the valley to estimate the volume and timing of exchanges between ground water and surface water along the river as well as irrigation canals. The USGS monitored river flow, irrigation diversions, ground-water levels, and weather continuously during the irrigation season in 2001 and will continue to monitor river flow and ground-water levels (see wa.water.usgs.gov/ methow/GW_SW.html).

One hydrologist working on this Twisp River project was contacted.[3] Given the orientation of the canal, water would have to flow parallel to the canal for some distance to reach the Methow. The prevailing gradient drives water to the north back to the Twisp. Also, the lower part of the Twisp Valley is very narrow, so there is not much room for water to flow out that way. Therefore, seepage from the upper two or three miles of the West Canal probably returns to the Twisp.

In addition to questions about the location of return flows, the timing of the flows is still unclear. In the Twisp, the hydrologist suggested that there is a baseline accretion of about 3 cfs from fall

[3] Konrad, 2002. To request the study call 253-428-3600 x2634.

through April. During high flows, the Twisp fluctuates between gaining and losing. In August through September, the river gains about 10 cfs, and accretions return to the 3 cfs baseline level by end of November. Some of the 10 cfs gains may be bank storage and natural accretions. There is also another canal, the Twisp Valley Power and Irrigation ditch, on the north side, that diverts a few miles upstream of the West Canal, that may account for some of the gains.

In sum, the hydrologic benefits of improved conveyance efficiency are not clear. An excerpt from the Methow Subbasin Summary reinforcing our concerns is attached to this report. This uncertainty about hydrologic effects means, in turn, that the biological benefits of the proposed projects are not clear.

Potential for Water Acquisition in the MVID Region

The IEAB continues to support the consideration of lower cost alternatives for environmental restoration. These alternatives can include the use of market institutions to purchase environmental amenities from willing sellers. Water marketing can be an economically efficient and equitable means of increasing in-stream flows. The IEAB realizes that water markets are poorly developed at present, and that market-oriented strategies may raise local political opposition and challenging legal issues. Still, a market-based solution, such as the purchase or lease of water rights facilitated by the development of local or regional water markets, deserves a closer look. In particular, it is possible that a partial year dry-year lease would cost less, perhaps much less, than the options considered above.

The first step is to consider what the costs of water purchases might be. The cost of irrigated land is one measure. Offer prices were obtained from internet sources, but useful sales data were not found because all relevant properties included major improvements. However, the $3,700 per acre of irrigated land to be spent under the options is high relative to commonly accepted values of irrigated land.

The Methow Valley News (January 16, 2002) reported that the town of Twisp recently purchased 32 acre-feet (AF) of water rights for $1,000 per AF. According to the Mayor of Twisp, the City negotiated a deal with MVID to acquire 200 AF for $50 per AF per year, but the deal has been held up by Washington State Department of Ecology (DOE) until water rights issues are resolved.[4] About 3,000 AF could provide 50 cfs of flow for one month. If water could be acquired for $50 per AF, then annual cost would be $150,000, and the NPV of this annual cost is about $3.8 million, less than the $5.9 million cost of the current proposal.[5]

These data suggest that water transfers might be cost-effective, but water markets would be difficult to implement under the current legal, social and hydrologic situation in the region. Two problems substantially limit feasibility in the short run. First, the status of MVID's water rights is very uncertain. Until water rights issues are resolved by DOE and the courts, any water transfer will have uncertain benefits. Second, MVID's approval may be required to transfer water from

[4] Price, 2002. Some of these issues may have been resolved.
[5] 3 percent, 50 years.

landowners to in-stream flow. It seems unlikely that the current MVID Board would approve any water transfers for in-stream use.

In the long run, obtaining water through land or water markets may not be practical options because of other problems. First, costs of negotiation, measurement, contracting and enforcement might be unusually large, because MVID is characterized by a large number of small land parcels with residences. Water transfer prices for small farms and hobby operations may be higher than for large farms.

Second, several hydrologic considerations may make water acquisition difficult. With the existing system, large conveyance losses may be required to provide any water to users on the end of the system. Also, a certain amount of head, flow or water height in the conveyance system may be required to service some landowners. Water acquisition would not be practical if any landowners requiring the high diversion rates refused to participate. The rehabilitated conveyance system might actually facilitate transfers by reducing losses, facilitating measurement, and increasing exchange opportunities.

A water transfer to in-stream flow would require a change in place, time and type of use. Time of use is especially troublesome in this case, because in-stream flow is needed at precisely the time when there is very little flow available for all uses. There is no surface water storage in the system, so water acquired by ceasing irrigation in July and August cannot be saved for in-stream flow in September. When low flows limit diversions, the amount of transferable water for in-stream use might be limited to a share of the natural flow available at that time of the year.

Switching more landowners to groundwater irrigation may be another option. However, this option may have been exhausted for the time being in terms of those willing to participate. A much higher price may be required to induce the remaining landowners to convert to groundwater. The need to maintain surface water diversions for a few holdouts would also be a limiting factor.

Potential for Alternatives that Do Not Involve MVID

It is possible that some alternative that does not involve MVID at all might be more cost-effective. The options under consideration may not be cost-effective because some other option not yet identified may provide more biological benefit at less cost. These options might involve the Methow River basin, but options outside of the Methow basin might prove to be more cost-effective for restoring a given depleted stock.

With the current flow problems on the Twisp River, alternative projects to provide flow past the MVID diversion might be considered. There are two possible options within the Twisp River basin: 1) upstream water storage, and 2) water acquisition. In both cases, water would be placed in the State Water Trust to protect the flow past MVID's diversions. With screening, the existing MVID diversions might then be tolerable.

With new storage, water would be appropriated for diversion and storage during high flows, and water would be released from storage during low-flow periods. Major concerns are environmental impacts, and costs. Off-stream storage locations that would not impair fish passage should be available.

Water acquisition would obtain water from willing sellers upstream for use as in-stream flow. To be most useful, the water right should be senior to the MVID right. Apparently, there are water uses on the Twisp that might qualify. The amount of water diverted by all other diversions is about the same as the amount diverted by the West canal.[6]

Conclusions

At this time, and based on the information available, the effectiveness of the options in terms of hydrology or fisheries is unclear. More information is needed about hydrologic impacts before we can adequately assess effectiveness. Some of the needed information is technical. A hydrology study is expected in July of this year, and in-stream flow studies are forthcoming, but these studies will not dispel all uncertainties. There is additional uncertainty about future MVID operations in low-flow conditions. Absent full information on hydrologic impacts, it is not possible to judge accurately the cost-effectiveness of the project.

The local options were all developed by local stakeholders. Future litigation, development and negotiation costs might be avoided by proceeding with a locally-developed option. Another dimension of accomplishment for a solution to salmon enhancement projects may be simply reaching agreement. We recognize that successes of this sort may be essential to building the "social capital" – the social cohesion and working relationships – needed to address salmon recovery more broadly. It may be the case that the Council will want to consider an investment in "social capital" as part of this project, but we recommend that this investment be approached with caution because it is only loosely connected to fish and wildlife enhancement.

References

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Dunau, Andy, 2001. "Methow Valley Irrigation District Rehabilitation Project," Draft October 2001.

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[6] The Methow Subbasin Summary lists these diversions from the Twisp and their estimated flow in cfs: Aspen Meadows (1.3), Buttermilk (7.0), Culbertson (1.0), Hottell (1.3), Twisp Power (9.0), and West Canal (20.0)

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Price, Mike. 2002. Mayor of Twisp. Personal Communications.

Excerpt from Draft Methow Subbasin Summary (pp. 120-121)

• Water resources are important to the residents and ecosystems of the Methow Subbasin. People depend on reliable, high-quality water supplies for their domestic and agricultural uses, and aquatic organisms depend on streamflow from snowmelt and groundwater discharge to survive in an otherwise arid environment. To improve the understanding of the quantity and quality of water resources of the Methow Subbasin both spatially and temporally, it is important that hydrologic data are collected throughout the basin over periods spanning a range of climatic conditions. Long-term hydrologic data have been collected at some points in the basin, but generally, the information is limited. Hydrologic data of interest include long-term records of streamflow discharge, temperature, and sediment loading, irrigation diversions and application rates, and groundwater levels in the unconsolidated sediments of the basin. Currently, an extensive network of 27 streamflow gages is operated in the Methow River Basin. Except for seven USGS gages that have been in operation for more than a decade, most of these gages have been in operation for about one year. Once continuous records of hydrologic conditions have been measured throughout the basin over a period spanning wet and dry years, the records can be evaluated to determine whether some stations indicate broader conditions and thus provide the core physical information for a water-resources management system.
• The "natural-flow" watershed model in the Methow Subbasin needs to be updated by including the effects of diversions. Currently no watershed-management tool exists for the Methow River Subbasin to estimate the cumulative effects of natural variability in streamflow and irrigation diversions and returns. The USGS recently completed a watershed model that can be used to estimate natural streamflows, but it needs to be improved by incorporating newly collected data and by simulating irrigation diversions and returns.
• Leaking irrigation canals are expected to return some of the diverted river water to the groundwater system. The valley-fill groundwater system is connected to streams and contributes groundwater discharge to streamflow along selected stream reaches. Increased groundwater levels that may result from leaking irrigation canals may increase groundwater contributions to streamflow. To date, the timing and amount of the possible increase in groundwater contributions to streamflow are not known. In a current study, the USGS has instrumented part of the Twisp subwatershed to investigate the groundwater/surface-water interactions. Data have been collected since the beginning of the 2001 irrigation season and will be analyzed later in 2001 and 2002. Continued data collection in the existing study area and, potentially, other areas of the basin would improve estimates of irrigation canal leakage and groundwater discharge to streams, particularly during non-drought years.
• Forest management, including tree harvesting, road building, and fires, alter the density and type of vegetation in parts of the Methow River Basin. Cumulative effects of these land-use changes may affect the accumulation and melting of the snowpack, snowmelt and rainfall runoff patterns, and soil erosion. If it were known what the effects of different forest management practices were on the timing and amounts of water and sediment yields in streams prior to their implementation, forest practices could be planned to minimize potential adverse impacts and increase potential benefits to salmonid habitat in the basin.
• Changing land use may affect streamflow temperatures by changing the quantity and timing of streamflow and by changing the degree of shading from vegetation. If streamflow temperatures are changed significantly from natural conditions, habitat may be less favorable for salmonids.

Currently, no management tools exist for the Methow River Basin to predict the effect of land-use practices on streamflow temperatures. Bank protection and flood-control projects in the Methow River Basin have modified the development and maintenance of floodplain and off-channel habitat for salmonids. Determining the extent of structural changes to stream channels and floodplains in the Methow Subbasin and assessing the effect of these changes on geomorphic processes (channel migration) and aquatic habitats would be very useful in future restoration and planning activities.

• Prior to converting the Methow Subbasin open ditch irrigation systems to closed systems it would be useful to design and implement a test case to determine if conversion to a closed irrigation system would provide the benefits linked with such a system e.g. increasing in-stream flows without deleterious effects at another time of year.

• There is a great deal of conflicting information about actual water use in the Methow Subbasin. An assessment of agricultural use including all water rights, claim and certificates and actual acreage of irrigated land is needed. In addition an assessment of municipal, industrial and domestic water use is needed.

Attachment 1.
Cost Estimates Used in IEAB Evaluation of Methow Costs

Capital Costs			
DESCRIPTION	**Yakama Alternative**	**MVID Alternative**	**Preliminary Revised MVID 4/15/02**
Project Development: Facilitation, Conceptual Plan Development, and Legal Consulting	$183,000	$183,000	$210,000
Engineering	$396,000	$357,750	$362,250
Regulatory Compliance (EA, NEPA, etc.)	$100,000	$150,000	$175,000
Miscellaneous Items: Gages and Monitoring	$100,000	$100,000	$112,000
Downstream Pump Station for West Canal			
2X150 HP LOW LIFT, SCREENS, PUMP HOUSE, VARIABLE SPEED DRIVE, FLOW METERS300' - 24 INCH STEEL	$340,000	$340,000	$430,000
Upstream Pump Station for West Canal			
HIGH LIFT PUMP, SCREENSPUMP HOUSE, VARIABLE SPEED DRIVE, FLOW METERS24 INCH STEEL & PVC PIPE	$255,000	$0	$0
West Canal Rehabilitation - 8.3 Miles			
CLEAN & RESHAPE CANAL, REBUILD AND SEAL CONCRETE CANAL, INSTALL TURN-OUTS, FLOW MEASUREMENT & CONTROL STRUCTURE	$421,600	$506,600	$821,250
West Canal Intake Rehabilitation			
REPLACE PUSH UP DAM WITH DIVERSION DAM & 1000'-30" PIPE	$0	$140,000	$140,000
NEW WEDGE WIRE FISH SCREENS WITH AUTO AIR PURGE SYSTEM	$0	$130,000	$130,000
East Canal Intake Rehabilitation			
CONSTRUCT NEW DIVERSION DAM&2000' OF 30" STEEL PIPE	$199,750	$199,750	$199,750
NEW WEDGE WIRE FISH SCREENS WITH AUTO AIR PURGE SYSTEM	$123,250	$123,250	$123,250
East Canal Rehabilitation: 9.4 Miles			
CLEAN&RESHAPE CANAL, REPLACE CANAL WITH PIPELINE REBUILD&SEAL CONCRETE CANAL, INSTALL TURN-OUTS, INSTALL FLOW MEASUREMENT AND CONTROL STRUCTURE	$570,400	$570,400	$403,750
Lateral Replacement			
REPLACE OVER 6 MILES OF LATERALS IN THE DISTRICT. REPLACE 15 LATERAL ON EAST CANAL & 16 LATERALS ON WEST CANAL	$391,000	$391,000	$520,000

Attachment 1.
Cost Estimates Used in IEAB Evaluation of Methow Costs (Continued)

	Yakama Alternative	MVID Alternative	Preliminary Revised Estimate 4/15/02
On-Farm Conservation			
SOIL MOISTURE MEASUREMENT, ON-FARM AUDITS, EFFICIENT. SPRINKLER REPLACEMENT, PUMP TIMER, EDUCATIONAL WORKSHOP	$40,000	$40,000	$40,000
Total Project One Time Cost	**$3,120,000**	**$3,231,750**	**$3,667,250**
Annual Costs			
O & M for pump stations	$36,800	$18,750	
Power Costs for pumping	$35,000	$8,750	
Monitoring	$0	$20,000	
Total Annual Costs	$71,800	$47,500	$45,000
IEAB Extensions			
NPV of Annual Costs (50 yrs, 4%)	**$1,847,397**	**$1,222,164**	**$1,157,839**
Total One-time cost equivalent	**$4,967,397**	**$4,453,914**	**$4,825,089**
Cost per Irrigated Acre (1286 acres)	**$3,863**	**$3,463**	**$3,752**