

Chapter 5 – Future Development

5.1 Introduction

This chapter presents the potential development options which have been identified to meet projected future water needs of Park City and the remainder of the Snyderville Basin. These projected needs for 2030 and 2050, as described in Chapter 4, are 15,400 acre-feet per year and 20,700 acre-feet per year, respectively. A combination of the options discussed below will be needed to meet these future demands.

5.2 Potential Future Development Options

Nine options have been identified for developing water to meet future needs. The first three, listed below, are in-Basin development options, while the remaining six are importation options that bring water from outside the Snyderville Basin Study Area. Importation options consider opportunities from each of the three adjacent drainage basins; Provo River (Option 4), East Canyon Creek (Option 5), and the Weber River (Options 6, 7, 8 and 9). Each of the Weber River Options (6, 7, 8 and 9) are separate methods/alignments for delivering the same 5,000 acre-feet of Weber Basin water to the Snyderville Basin, and are therefore not additive. Only one of the four can be recommended for development. These nine options, as shown on the map in Figure 5-1, are as follows:

In-Basin Development

1. Additional In-Basin Surface Water Storage
2. Conjunctive Management of Surface and Groundwater
3. Water Reuse

Provo River Importation

4. Provo River - JSSD

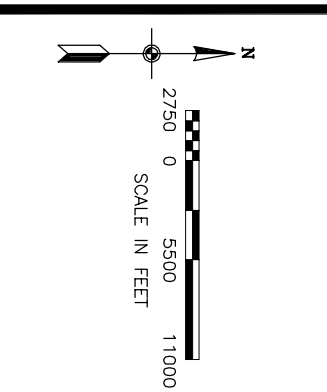
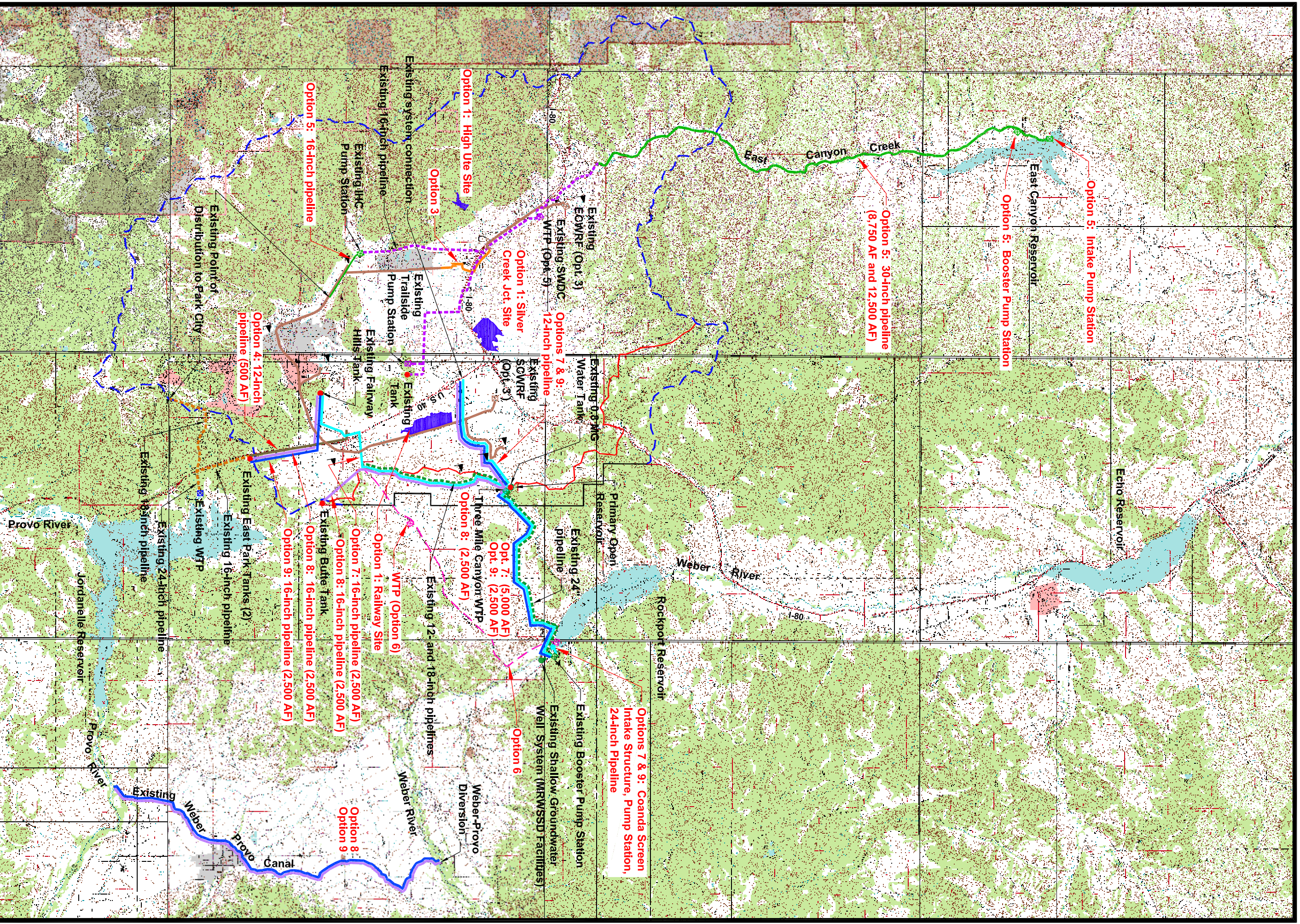
East Canyon Creek Importation

5. East Canyon Pipeline

Weber River Importation

6. Brown's Canyon Pipeline
7. Lost Creek Canyon Pipeline
8. Weber River via Weber-Provo Canal
9. Lost Creek Canyon Pipeline and Weber-Provo Canal

This section describes each of the options, and presents the background and data used by the study team in reaching the study recommendations.



- Legend**
- Snyderville Basin Hydrologic Boundary
 - Moratorium Area Boundary for the Snyderville Basin
 - Mountain Region WSSD District Boundary
 - ▲ Golf Course
 - Existing Water Tank
- Existing Facilities**
- MRWSSD Existing Facilities
 - JSSD Existing Facilities
 - SWDC Existing Facilities
 - ECWRF Facilities Under Construction

- Options**
- Option 1: Additional In-Basin Surface Water Storage
 - Option 3: Water Reuse
 - Option 4: Provo River - JSSD
 - Option 5: East Canyon Reservoir Pipeline
 - Option 6: Rockport Browns Canyon Pipeline (No further action)
 - Option 7: Lost Creek Canyon Pipeline
 - Option 8: Weber River via Weber-Provo Canal
 - Option 9: Lost Creek Canyon and Weber-Provo Canal

Figure 5-1
Options Map
 Park City and Snyderville
 Basin Water Supply
 Study Special Report

5.3 Additional In-Basin Surface Water Storage (Option 1)

The availability of in-Basin surface water is greatest in the high runoff period and would require the development of surface water storage facilities to capture and hold the water for release later in the year when demand for the water is greatest. As noted in Chapter 3, the State Engineer estimates the “safe yield” of the Basin to be approximately 23,700 acre-feet annually, and the currently-developed available supply is about 14,000 acre-feet, leaving a potential storable supply of 9,700 acre-feet per year.

However, most, if not all, of the 9,700 acre-feet per year of potentially storable water in the Basin is currently owned and used by downstream water users. Therefore, exchanges or purchase of downstream rights would need to occur in order to store this water in the Basin. The advantage of capturing the high stream flows from East Canyon Creek or Silver Creek prior to leaving the Basin, is that pumping water from within the Basin would be less costly than pumping a like amount of water from outside the Basin.

5.3.1 Summary of Investigation

An appraisal level survey of potential dam sites was conducted. Several potential sites were located as shown on Figure 5-2. None of the sites identified, however, would accommodate a dam and reservoir large enough to meet any significant portion of the future needs of the area. The investigation was therefore focused on meeting a projected in-stream flow dilution requirement in a range of 1,100 to 1,600 acre-feet per year needed to enable the Snyderville Basin Water Reclamation District to meet their wastewater discharge requirements to East Canyon Creek (See Section 5.5).

To allow other water development options to occur, a minimum of 1,100 acre-feet of reservoir yield would be required to maintain in-stream flows. Based on historic data of stream flows, the in-stream flow requirement would not be required each year. The majority of the reservoir yield would be needed to meet these in-stream flows during the later summer months of moderate to dry years. The following sections describe the sites that were investigated.

5.3.1.1 Hi-Ute Site

The Hi-Ute site is situated in Threemile Canyon, about one mile above the Hi-Ute ranch house, also described as the NW quarter of Section 24, T 1 S, R 3 E, SLBM. The proposed dam would be approximately 80 feet high, and impound a lake of approximately 30 surface acres and 1,200 acre-feet volume. It would have a relatively high cost per acre-foot of storage, and the small drainage basin and low stream inflow would make the available water volume questionable.

A dam at this site would be classified as high hazard due to the ranch and associated structures, roads, utilities, and interstate highway located downstream. A number of local businesses are located within the probable dam break inundation area.

The site is used by the local population as a wildlife “viewing” area, and is situated adjacent to the 2002 Winter Olympics Sports Park. Impounded water would inundate the only road up Threemile Canyon.

Additionally, in the summer of 2004, Utah Open Lands, a land trust advocate, obtained a 200 acre conservation easement on the Hi-Ute ranch. The easement contains jurisdictional wetlands and historic structures. Furthermore, the reservoir site contains densely forested alpine slopes.

Provided the above-mentioned issues could be overcome, in order to consider a reservoir at this location, geotechnical testing of the site would be required to determine the feasibility of the dam.

5.3.1.2 Silver Creek Junction Site

The Silver Creek Junction site is situated on the north (east) fork of Kimball Creek (also called, Silver Creek) about 1,000 feet upstream of the confluence, just north of the Interstate 80 Silver Creek Junction rest area, also described as the SE quarter of Section 17, T 1 S, R 4 E, SLBM. The proposed dam would be approximately 18 feet high and impound a reservoir of approximately 90 surface acres and 1,100 acre-feet volume. It would have a reasonable cost per acre-foot of storage, but would have a low stream inflow, and has a moderately large but highly developed drainage basin down stream. The large surface area and shallow depth would make this lake susceptible to high evaporation losses.

The dam would be classified as high hazard, due to structures, roads, utilities, and an interstate highway located downstream. A number of local businesses, a fire station, a highway rest area, and residences are located within the probable dam break inundation area.

The site is situated adjacent to a number of residential developments and a golf course. The impounded water would inundate a number of existing roads. The reservoir would sit immediately adjacent to Interstate 80 and would be highly visible from the roadway. The impounded water may need an auxiliary dike near the freeway to prevent encroachment on the road fill.

Provided the above-mentioned issues could be resolved, in order to consider a reservoir at this location, geotechnical testing of the site would be required to determine the feasibility of a dam.

5.3.1.3 Railroad Site

The Railroad site is situated on Silver Creek, about 2 miles north of the Keetley Junction interchange of State Highway 40, also described as the NW quarter of Section 26, T 1 S, R 4 E, SLBM. The proposed dam would be approximately 34 feet high and impound a reservoir of approximately 60 surface acres and 1,300 acre-feet volume. It would have a reasonable cost per acre-foot of storage, but would have a low stream inflow and a moderately large and moderately developed drainage basin down stream. The large surface area and relatively shallow depth would make this lake susceptible to high evaporation losses.

The dam would be classified as high hazard due to structures, roads, utilities, and an interstate highway located downstream. A number of local businesses, a sewage treatment plant, an interstate highway, and local residences, are located within the probable dam break inundation area.

The site is situated adjacent to a number of proposed residential developments and golf courses. The impounded water would inundate a portion of the Union Pacific Rail Trail, an existing road,

an existing wastewater treatment collection pipeline, and upland and/or riparian habitat. The upper edge of the reservoir would reach almost to an existing power substation.

The reservoir would sit immediately adjacent to State Highway 40, and would be highly visible from the roadway. It would also sit immediately downstream of the Richardson Flat Mine Tailings Site that is known to have contaminated groundwater present.

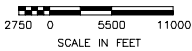
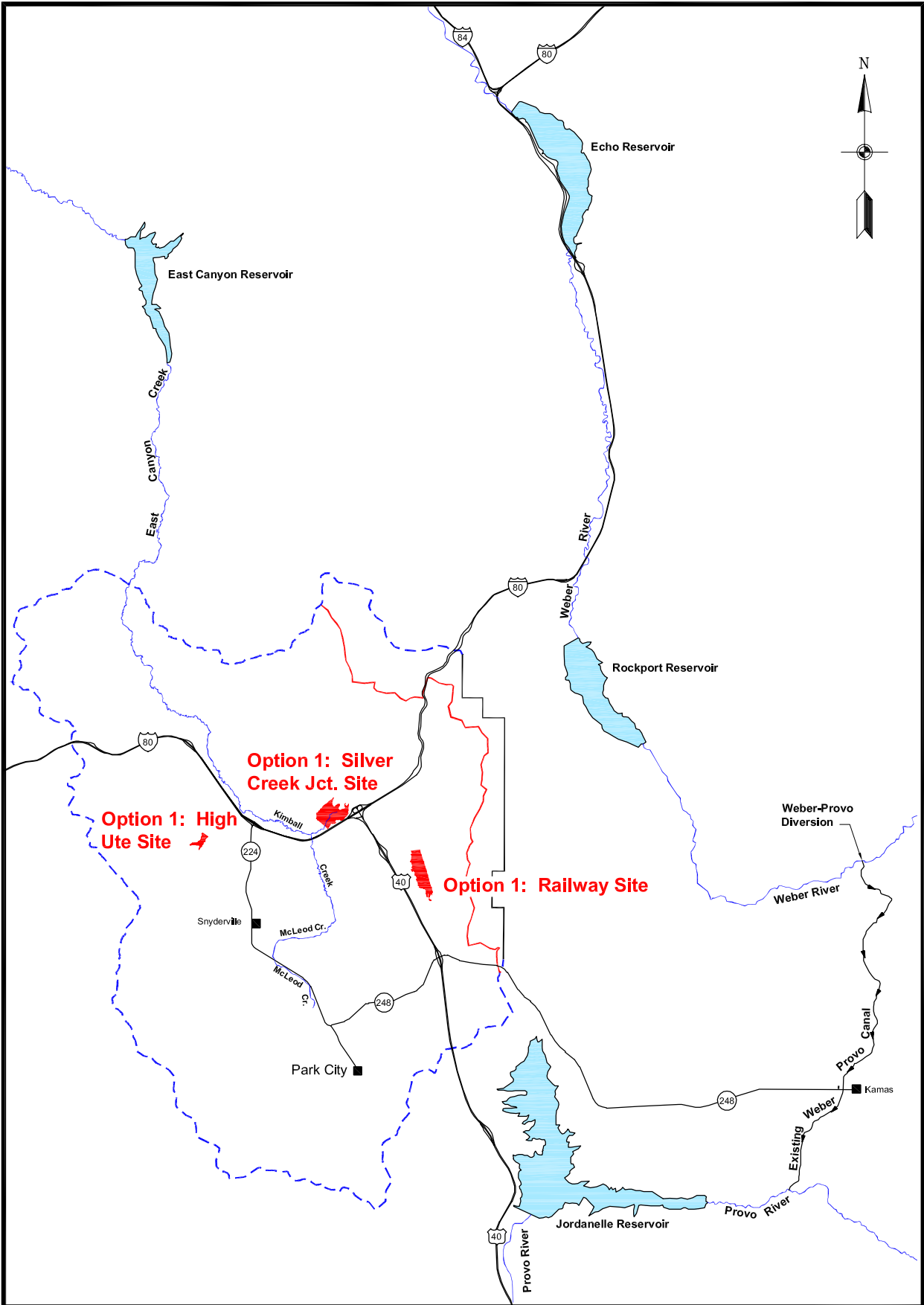
Provided the above-mentioned issues could be resolved, in order to consider a reservoir at this location, geotechnical testing of the site would be required to determine the feasibility of a dam.

5.3.2 Potential Impacts

Siting and construction of a new reservoir would be expected to result in significant impacts (both negative and positive) to the environment for fish and wildlife, land use, recreation, cultural resources, and other resources. Assuming that Federal involvement would be required in construction of new water storage, preparation of an environmental impact statement to fulfill NEPA requirements, and concurrent compliance with the Endangered Species Act, the Fish and Wildlife Coordination Act, and the Clean Water Act, among others, would be expected to take several years and have a relatively high cost.

5.3.3 Recommendations

As noted above, any development of surface water storage within the Basin would require overcoming a number of major obstacles. In addition, any reservoir would be small, with limited water supply and relatively high costs for little storage. These obstacles were considered by the management team to be sufficiently significant to eliminate surface storage as a viable option for water development in the Basin. This option was therefore dropped from further consideration in the study.



Legend

- Snyderville Basin Hydrologic Boundary
- Moratorium Area Boundary for the Snyderville Basin
- Mountain Region WSSD District Boundary

Option

- Option 1: Additional In-Basin Surface Water Storage

Figure 5-2
Option 1 Map
Park City and Snyderville
Basin Water Supply
Study Special Report

5.4 Conjunctive Management of Surface and Groundwater (Option 2)

Conjunctive management of the surface and groundwater resources in the Snyderville Basin and Park City area may help meet some of the projected future water needs. In its broadest definition, conjunctive management is the coordinated and combined use of surface water and groundwater to increase the available water supply of a region and improve the reliability of that supply.

Conjunctive management could be implemented to meet other objectives as well. These include: reducing groundwater overdraft, protecting water quality, and improving environmental conditions. Properly implemented, conjunctive management can change the timing and location of water so it can be used more efficiently. It encompasses full utilization of all water sources in creative ways that are unique to the location where the water is needed (UDWR, 2004).

5.4.1 Option Description

Water suppliers in the study area do not have a coordinated approach to managing surface water and groundwater as one resource. For the most part, they have used surface water and groundwater independently. Groundwater and surface water sources within the study area are closely connected. At some locations or at certain times of the year, water infiltrates the beds of the area's streams and recharges the groundwater. At other times or places, groundwater surfaces in seeps or springs and contributes to the base flow of local streams. Changes in either the surface or groundwater systems of the area affect the other. Therefore, effective management requires consideration of both resources.

There are several components common to most conjunctive management projects (all of which typically require extensive cooperation between water suppliers):

- Use more surface water and less ground water when surface water is available during wet periods. (Wet periods include annual spring snowmelt runoff and consecutive years of above-normal precipitation.)
- Store unused surface water above ground and underground during wet periods.
- Take water out of surface and ground water storage during dry periods. (Dry periods include annual summer months and consecutive years of below-normal precipitation.)
- Use more ground water during dry periods when insufficient water is available in surface water reservoirs.

5.4.2 Constraints/Limitations

Although there may be opportunities for conjunctive management in the Park City and Snyderville Basin area, the volume of water that would become available through this technology is likely limited. In order to determine the exact potential for conjunctive management within the study area, further investigation beyond the scope of this document would be required. If such an investigation is deemed appropriate by local water providers, it should carefully consider the following factors:

- **The Nature of the Local Groundwater System** - The local groundwater system is made up of several compartmentalized and fractured bedrock aquifers covered by a very thin alluvial fill. Because water moves fairly quickly through the fractured bedrock, storing significant volumes of water in any given compartment of the aquifer for any significant period of time may be difficult, unless the given compartment were to be substantially dewatered.
- **Timing and Volume of Available Water Sources** - In order to operate a conjunctive management project, sufficient water must be available at the appropriate times. Many aquifer recharge projects are designed to utilize excess surface water flows. Because downstream storage reservoirs (East Canyon Reservoir, Echo Reservoir and Willard Bay) capture and store most of the excess flows that leave the study area, there is very little unclaimed water available to recharge the aquifers during most years. During wet years when excess water may be available, the aquifers would likely be full and unable to receive any recharge.
- **Ownership and Management of Surface and Groundwater Rights** - In order to implement a conjunctive management project that does not have an aquifer storage component, it is necessary to have control of a significant portion of the surface and groundwater rights within the area of implementation. Without significant control over both resources, it is impossible to fully utilize surface water when it is available and preserve groundwater storage for use only when surface flows decline. Currently, there is no single entity within the study area that appears to have control over a large portion of the area's surface and groundwater rights, thus substantial cooperation between multiple entities would be required.
- **Capacity to Treat Surface Water** - Many conjunctive management projects require the ability to treat surface water to the appropriate level for the desired uses. If injection wells are to be used to recharge target aquifers, the water injected must be treated sufficiently so as to not degrade the groundwater in the receiving aquifer. Full utilization of surface water also requires sufficient capacity to treat available surface water flows. Currently, there are four surface water treatment plants in the study area. One treatment plant is located in Park City, and is designed primarily to treat the water surfacing through an abandoned mine. The second plant is located on East Canyon Creek and is designed to treat both the creek and East Canyon Reservoir water. The third is on Willow Creek. The fourth is the new Signal Hill plant designed to treat the shallow well field water and the diverted Weber River water.
- **Adequate Groundwater Monitoring Wells** - Monitoring the water levels in wells is essential to determine the opportunities for conjunctive management. In order to accurately assess conjunctive management opportunities, a network of monitoring wells within the area would be needed.

5.4.3 Potential Impacts

There are no significant environmental impacts expected if conjunctive management is implemented. There is potential for improving conditions for fish and wildlife. For example, emphasis on groundwater use during low flow summer conditions could help to maintain adequate in-stream flows for fish.

5.4.4 Recommendations

Potential exists for greater coordination of groundwater and surface water resources within the Basin. This coordinated management could result in greater efficiency and better utilization of the Basin's water resources. However, due to the likely limited amount of water that could be developed and the difficulties and uncertainties that exist at this time, the study recommends that if this option is developed, it should be on a local, smaller-scale, basis when more information becomes available and more confidence in the technology is attained. It has therefore been eliminated as a viable option for this study.

5.5 Water Reuse (Option 3)

Reusing treated wastewater effluent may be an attractive option for enhancing available water supplies in the study area. Reclaimed water can be used for a variety of purposes, including irrigation of agricultural crops, irrigation of urban landscapes, and industrial processes. While most wastewater treatment processes treat effluent to a quality that is sufficient to meet state standards for the irrigation of agricultural crops, additional treatment (tertiary filtration and disinfection) is required for urban irrigation and most industrial processes. A comprehensive and coordinated plan to utilize reclaimed water for these purposes within the study area could yield substantial benefits. Figure 5-5, at the end of this section, shows the location of a potential water reuse project within the Basin.

According to the Snyderville Basin Water Reclamation District (SBWRD), over 90 percent of the M&I water users in the Snyderville Basin are connected to their wastewater collection system. While a few septic tanks are still being permitted, most new construction is connecting to the wastewater system (Luers, 2004). Table 5-1 shows estimates of current and projected discharges from the two water reclamation facilities within the study area.

As shown in Table 5-1, in 2004, the average daily wastewater flow into the East Canyon Creek and Silver Creek water reclamation facilities was 2.97 mgd (2,063 gpm) and 0.91 mgd (632 gpm), respectively. This equates to a total wastewater discharge volume of approximately 4,300 acre-feet per year. In order to estimate wastewater volumes for 2030 and 2050, the average from the last five years for gallons per capita per day of wastewater produced was used in conjunction with the population projections from the Governor's Office of Planning and Budget. This projected an increase to approximately 6,500 acre-feet in 2030 and 8,800 acre-feet in 2050 at the East Canyon Creek facility, and 3,500 acre-feet in 2030 and 4,700 acre-feet in 2050 at the Silver Creek facility. (These future projections of wastewater volume assume that additional M&I water will be imported into the Snyderville Basin.)

While the discharge from the East Canyon Creek facility is treated to a sufficient level to accommodate most proposed uses, including urban irrigation, Type I, discharge from the Silver Creek facility could only be used for agricultural irrigation without additional treatment. Even though SBWRD is able to shift flows between the two facilities for operational purposes, it is assumed that the Silver Creek facility would need to be upgraded to meet Type 1 reuse standards. This cost is included in the Appendix. Thus, the total volume of 13,500 acre-feet per year from both plants in 2050 was considered in determining the amount available for reuse in the future.

**TABLE 5-1
Current and Projected Discharges from
Snyderville Basin Water Reclamation District Facilities**

Wastewater Treatment Plant	Treatment Process	Capacity* (mgd)	Current Discharge [‡] 2004		Projected Discharge [†] (Acre-Ft/Year)	
			(mgd)	(Acre-Ft/Year)	2030	2050
East Canyon Creek	Advanced Tertiary	4.00	2.97	3,300	6,500	8,800
Silver Creek	Oxidation Ditch	2.00	0.91	1,000	3,500	4,700
Total		6.00	3.88	4,300	10,000	13,500
Estimated Total Available (35 percent of Total)		--	1.35	1,500	3,500	4,700
Probable Volume of Reuse		--	--	--	2,000	3,600

* Design capacities obtained from Snyderville Basin Water Reclamation District, Sept. 2004.

‡ Current discharges are 12-month averages obtained from Snyderville Basin Water Reclamation District, April 2005.

† Projected discharges are based on population projections from the Governor's Office of Planning and Budget. These discharges also assume additional water will be imported into the Snyderville Basin.

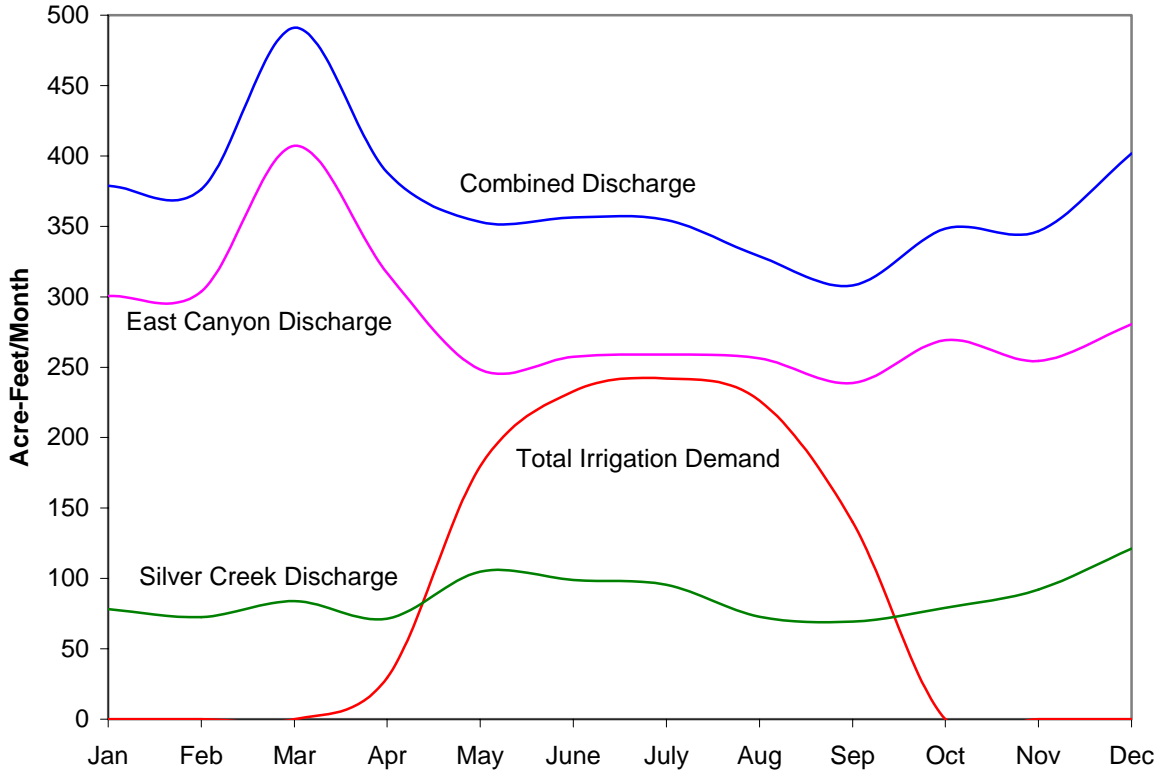
5.5.1 Current Possibilities for Reuse

SBWRD has indicated there could be two scenarios in which reuse water would be developed. The first scenario would be for SBWRD to develop a reuse project in order to comply with regulatory requirements. The second scenario would involve a water provider approaching them with the intent of acquiring reuse water to meet the water provider's needs. In this case, the water provider would likely decide if the development of reuse water is more economical than developing an alternative source (Luers, 2005).

The possibility for reuse to help meet some of the Basin's future water needs is strengthened by the fact that SBWRD is already planning to reuse some of the effluent for the irrigation of golf courses. During the summer of 2005, SBWRD installed a section of pipe to deliver this water in conjunction with other infrastructure to avoid additional installation costs in the future. Three golf courses may be supplied reclaimed water for irrigation purposes, including Jeremy Ranch Golf Course (a course near the East Canyon facility that would require little infrastructure for delivery), Glenwild Golf Course, and a proposed golf course to be built by The Canyons Ski Resort. Other proposed uses in the SBWRD's Phase I proposal include delivery to the Swaner Nature Preserve or for highway beautification. These uses would utilize over 1,000 acre-feet per year of reclaimed water. As shown in Figure 5-3, the current discharge volume from the East Canyon facility could easily meet this demand. This volume represents about 24 percent of the total effluent treated in the study area.

SBWRD is also considering a Phase II implementation of reuse. This would include delivery of about 600 acre-feet per year to Park Meadows Golf Course and Park City Municipal Golf Course. Together with Phase I, this would provide approximately 1,600 acre-feet per year of reclaimed water. SBWRD would likely not be able to implement this phase until either the Silver Creek facility is upgraded to meet Type I standards or until the population grows and the East Canyon facility is able to provide a greater volume of reclaimed water.

FIGURE 5-3
2004 Supply vs. Initial Reuse Demand



5.5.2 Constraints/Limitations

The amount of effluent discharged from these water reclamation facilities that would ultimately be available for reuse could be limited by a number of factors. One of these factors is the nature of the underlying water rights that produced the effluent. According to the State Engineer, a water right that was originally approved for municipal uses can be depleted 100 percent. In other words, the effluent from a municipal water right can be reused and completely consumed. On the other hand, a municipal water right that was originally approved for agricultural irrigation cannot be depleted 100 percent. Because there is typically some return flow associated with an agricultural water right, the State Engineer has determined that a portion of such a right, even if it has been converted to municipal uses, must be returned to the hydrologic system in order to avoid negative impacts on other water users. In the Park City area, only about 50 percent of the agricultural water right that has been converted to municipal uses can be depleted. This is calculated by dividing the local consumptive use of alfalfa (1.54 acre-feet/acre per year) by the water right duty (3.0 acre-feet/acre per year). In other words, only about 50 percent of the original agriculture water right can be diverted and depleted for M&I use. According to a preliminary water rights depletion evaluation conducted for Summit Water Distribution Company, Mountain Regional Water Special Service District and Park City, the total depletions allowed are over 6,700 acre-feet per year. This number would likely need to be further refined and would ultimately need to be reviewed by the State Engineer, but the initial analysis would suggest that the water rights depletion limits would not be the constraint for reuse in the Snyderville Basin.

The nature of the underlying water rights can also impact the locations where reclaimed water can be used. Water rights have a defined place of use where the water can be applied. According to the State Engineer, both the original use and the reuse of water must occur within the water right's place of use boundary. For example, SBWRD cannot reuse the effluent generated by Park City's water rights outside Park City's municipal boundaries. One way to overcome this limitation is to file change applications with the State Engineer's office to modify the reused water rights so that their place-of-use boundaries include the locations where the reclaimed water would be used.

Two other factors that may limit the amount of effluent that can be used are the nature of the proposed uses and the physical location of the uses in relation to the water reclamation facilities. While some industrial processes may have a water demand that is relatively constant year-round, most reuse applications (which are for outdoor irrigation) only have a seasonal demand. In the study area, the demand for irrigation exists in less than six months of the year, part of April through September. Therefore, seasonal uses are limited by the peak demand during July and would not be able to utilize the entire effluent, unless of course the off-season effluent could be stored for use during the peak times. The location of the use may also limit the amount of reuse due to the economics involved with pipelines and pumping stations.

Another factor that may limit the total volume of reclaimed water available for reuse includes potential downstream impacts to the environment. Environmental considerations that could limit the use of effluent include impacts to wildlife and other ecosystem values in the downstream environment if proper stream flows are not maintained. Due to drought and other conditions, East Canyon Creek has completely dried up during brief periods. In the future, SBWRD would likely discharge effluent to help maintain necessary stream flows before it would divert effluent for reuse applications providing that water quality regulations could be met. The need for additional water in the stream is greatest in August and September. Without an alternative delivery schedule with on-site storage, the peak irrigation demands that could be met would be significantly reduced due to the corresponding peak demands for the stream and for irrigation.

Lastly, it should also be noted that a 2005 Utah Legislative Task Force, studying water issues, drafted a wastewater reuse bill that could impact the use of reclaimed water within Utah. Both the final language of the bill and whether or not it becomes law won't be known until after Utah's 2006 Legislative Session. In addition to the proposed bill, there are also two active court cases involving water rights and reuse that may set important legal precedents on wastewater reuse.

5.5.3 Future Potential

After a preliminary analysis taking all the limiting factors into account as discussed above, UDWR roughly estimates that no more than 35 percent of the discharges shown in Table 5-1 will be able to be reused (3,500 acre-feet in 2030 and 4,700 acre-feet in 2050). The seasonal demand appears to be the limiting factor based on the peak of the irrigation demand curve. Thus, the 35 percent could potentially be higher if the primary use of effluent were to be an industrial process with a year-round demand or if the non-irrigation season effluent could be stored to help meet the peak demands.

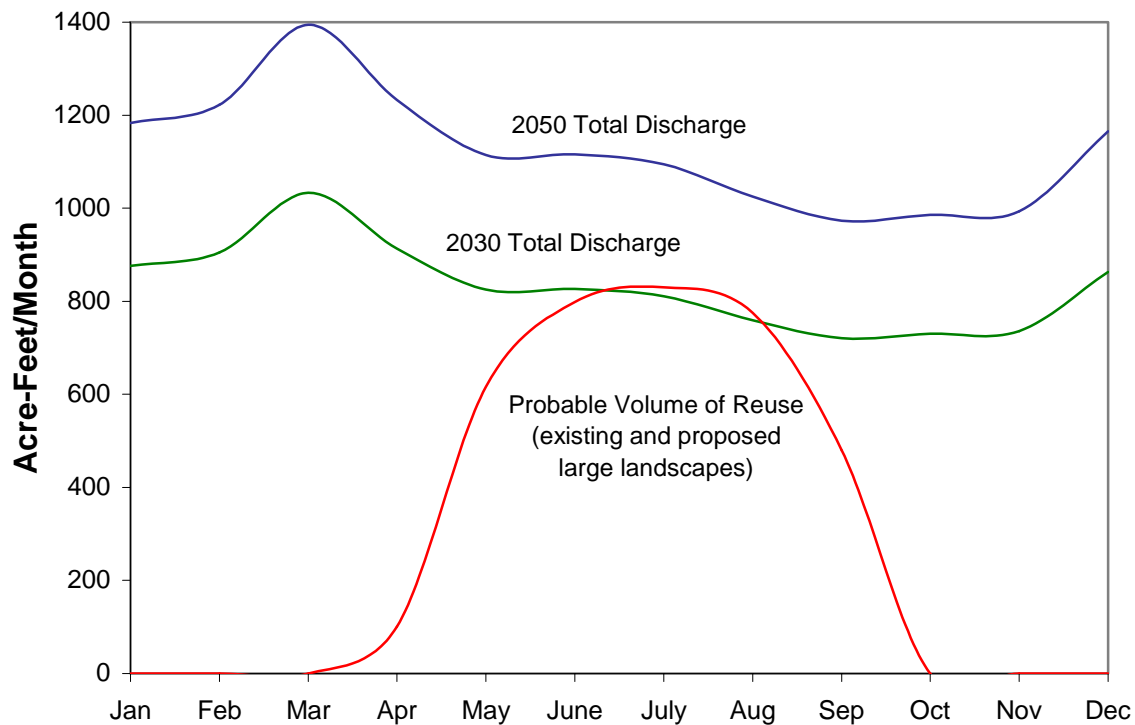
For particular years of low instream flows, an alternative delivery schedule may be necessary in conjunction with on-site storage to allow SBWRD to discharge effluent to help meet instream flow requirements. Based on 2003, the worst year on record, a total of 588 acre-feet would have been needed during July (41 acre-feet), August (318 acre-feet) and September (229 acre-feet). An alternative delivery schedule with on-site storage that supplied the extra water throughout the earlier months would reduce the volume needed during the low stream flow months. This would help to protect important environmental needs, while still allowing the maximum amount of reclaimed water to be available for reuse.

5.5.4 Probable Future Volume of Reuse

Although roughly 4,700 acre-feet per year of reclaimed water could be utilized by 2050, the probable volume of reuse that will be implemented is likely slightly lower. UDWR has identified large landscapes throughout the study area that could potentially be irrigated by reclaimed water including ten existing or proposed golf courses, the Swaner Nature Preserve, a proposed city sports park and other miscellaneous public landscape irrigation such as highway beautification. Using these large landscapes as the determining factor, the total probable volume of reclaimed water that could be implemented by 2050 is approximately 3,600 acre-feet per year.

As shown in Figure 5-4, this volume could nearly be supplied by 2030 without any storage, and could easily be supplied by 2050. One factor that may be important to note is that in 2050 this volume could be supplied during the worst dry-year on record for the area, as discussed earlier, and still provide the necessary water to meet instream flow requirements except for approximately 70 acre-feet in August. Thus, with very little storage or interruption in the supply, these demands could be met with significant reliability while still protecting the stream's needs.

FIGURE 5-4
Probable Future Reuse Volume (2050)



5.5.5 Possible Reuse Delivery Pipeline

Two possible reuse pipelines have been analyzed for delivery of reclaimed water to the various locations discussed in the previous text (see Figure 5-5). One pipeline would extend from the East Canyon facility southeast along I-80 to Kimball Junction. In this area it would cross I-80 and extend south to the area near St. Mary’s Church. It would then continue southeast along State Route 224. This main delivery line would have spurs to supply reclaimed water to Glenwild Golf Course, a future Canyons Golf Course, Park Meadows Golf Course and Park City Municipal Golf Course. It could also supply reclaimed water for irrigation of various public landscapes such as parks and cemeteries in the Park City Area. It ranges in size from 8-12 inches, and would be able to supply around 2,000 acre-feet per year. Much of the preliminary design of a section of this pipe has already been completed by SBWRD.

The second pipeline would extend south from the Silver Creek facility to the Quinn’s Junction area. A large segment would branch off shortly after leaving the treatment facility running east up to multiple golf courses at Promontory Development. This pipeline ranges in size from eight to sixteen inches and is designed to initially deliver around 1,600 acre-feet per year. As part of the design of this pipeline, a pipeline system to connect the two lines has also been analyzed to allow continued flexibility in treatment by one facility or the other. This would allow either pipeline to deliver reclaimed water to a point on either side of the area in the case of interruption in the opposite pipeline. The designed redundancy in capacity could also be utilized in the future as additional landscapes are developed that could be supplied with reclaimed water along the pipeline, which could potentially eliminate the need for later expansion of the pipeline capacity.

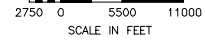
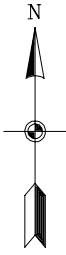
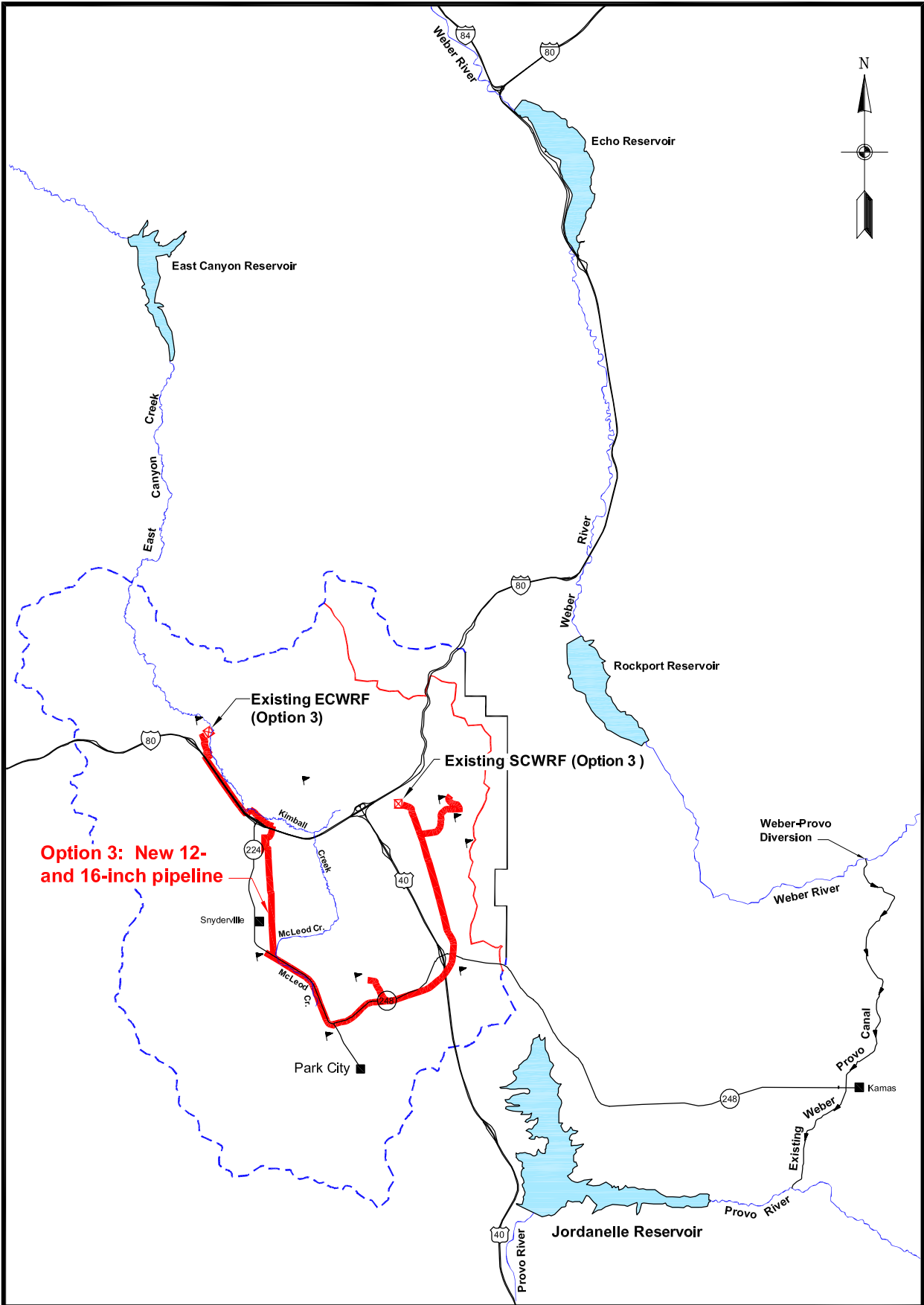
The system from the East Canyon facility was estimated to cost \$6,600,000 and to have a present value life cycle cost of \$10,500,000. The system from the Silver Creek facility was estimated to cost \$10,700,000 and to have a present value life cycle cost of \$19,600,000. A combined system with the ability to shift capacity between the two sides was estimated to cost \$19,100,000 and to have a present value life cycle cost of \$32,200,000. More detailed cost estimates are available in the Appendix.

5.5.6 Potential Impacts

A July 8, 2005, field survey by Reclamation staff looked at several locations where pipelines might be sited to develop water reuse potential. This review noted the potential for impacts to cultural resources, wildlife habitat, spotted frog habitat, and wetlands. Such impacts could possibly be mitigated or avoided by project design.

5.5.7 Recommendations

The study concludes that water reuse is a viable option and should be further considered in the evaluation and ranking process of the study. Volumes of reuse water are estimated at 2,000 acre-feet per year for 2030 and 3,600 acre-feet per year by 2050.



- Legend**
- Snyderville Basin Hydrologic Boundary
 - Moratorium Area Boundary for the Snyderville Basin
 - Mountain Region WSSD District Boundary
 - ▲ Golf Course

- Option**
- Option 3: Water Reuse

Figure 5-5
Option 3 Map
Park City and Snyderville
Basin Water Supply
Study Special Report

5.6 Provo River - JSSD (Option 4)

This option considers importation into the Snyderville Basin from the Provo River drainage. Importation could be made using JSSD's existing facilities or construction of new facilities.

5.6.1 Hydrology

Three sources of water from the Provo River drainage were considered: water developed by JSSD, non-natural (imported) flows of the Provo River, and natural flows of the Provo River. After evaluating the three sources, as explained below, the only viable additional supply from the Provo River drainage is an additional 500 acre-feet per year from JSSD.

Jordanelle Special Service District - As stated in Section 4.4.2 of this report, Park City currently receives 1,000 acre-feet per year of water from JSSD under a 20 year lease agreement that expires in 2022. This water comes from the Ontario Drain Tunnel. The facilities for this delivery have already been constructed and are in operation. They consist of a filtration water treatment plant located at the mouth of the Ontario Drain Tunnel on the northwest side of Jordanelle Reservoir and approximately 15,400 linear feet of 12-inch treated water transmission pipeline. Even though the existing 1,000 acre-feet per year delivery contract expires in 2022, both Park City and JSSD expect deliveries will continue in perpetuity. Park City currently pays \$811 per acre-foot annually for this water supply, with an escalation factor of 4 percent per year. Additionally, they are anticipating increasing the deliveries by 500 acre-feet per year, for a total importation of 1,500 acre-feet per year.

Non-Natural Provo River Flows - Flows not naturally tributary to the Provo River were also considered as potential import sources to the Snyderville Basin. These consist, primarily, of mine tunnel flows in the Park City area. Park City currently uses the entire flows of the Judge and Spiro Tunnels. Based on water-year 2004, JSSD currently utilizes about 55 percent (5,433 acre-feet per year) of the flows of the Ontario Drain Tunnel No. 2. About 28 percent (2,694 acre-feet per year) is used by the Metropolitan Water District of Salt Lake and Sandy, and the remaining 17 percent (1,635 acre-feet per year) by the Midway Irrigation Company for a total yield of 9,762 acre-feet per year. JSSD also has approximately 523 acre-feet per year of surface water, 1,451 acre-feet per year of groundwater, 1,500 acre-feet per year of CUP M&I water, and 2,500 acre-feet per year of CUP irrigation water. Since these rights are all above Jordanelle Dam and the use of the non-JSSD water in the tunnel is downstream from the dam, JSSD plans to exchange these rights into the tunnel, thus essentially utilizing the entire remaining yield (4,329 acre-feet per year) of the tunnel.

Natural Provo River Flows - The only natural flow water within the Provo River drainage that is not fully utilized occurs only in extreme wet years when storage reservoirs are full and other means for recovering and exporting the surplus flows are already fully utilized. Also, any exportation out of the Basin would create considerable political and institutional problems, due to the impacts created on a fully utilized water supply system and the in-stream flow needs of sport fishery and the endangered June Sucker.

5.6.2 Option Description

The JSSD system can currently provide the 500 acre-feet per year to the East Park Tanks located along US-40. To provide water delivery to Park City, a new 12-inch diameter pipeline,

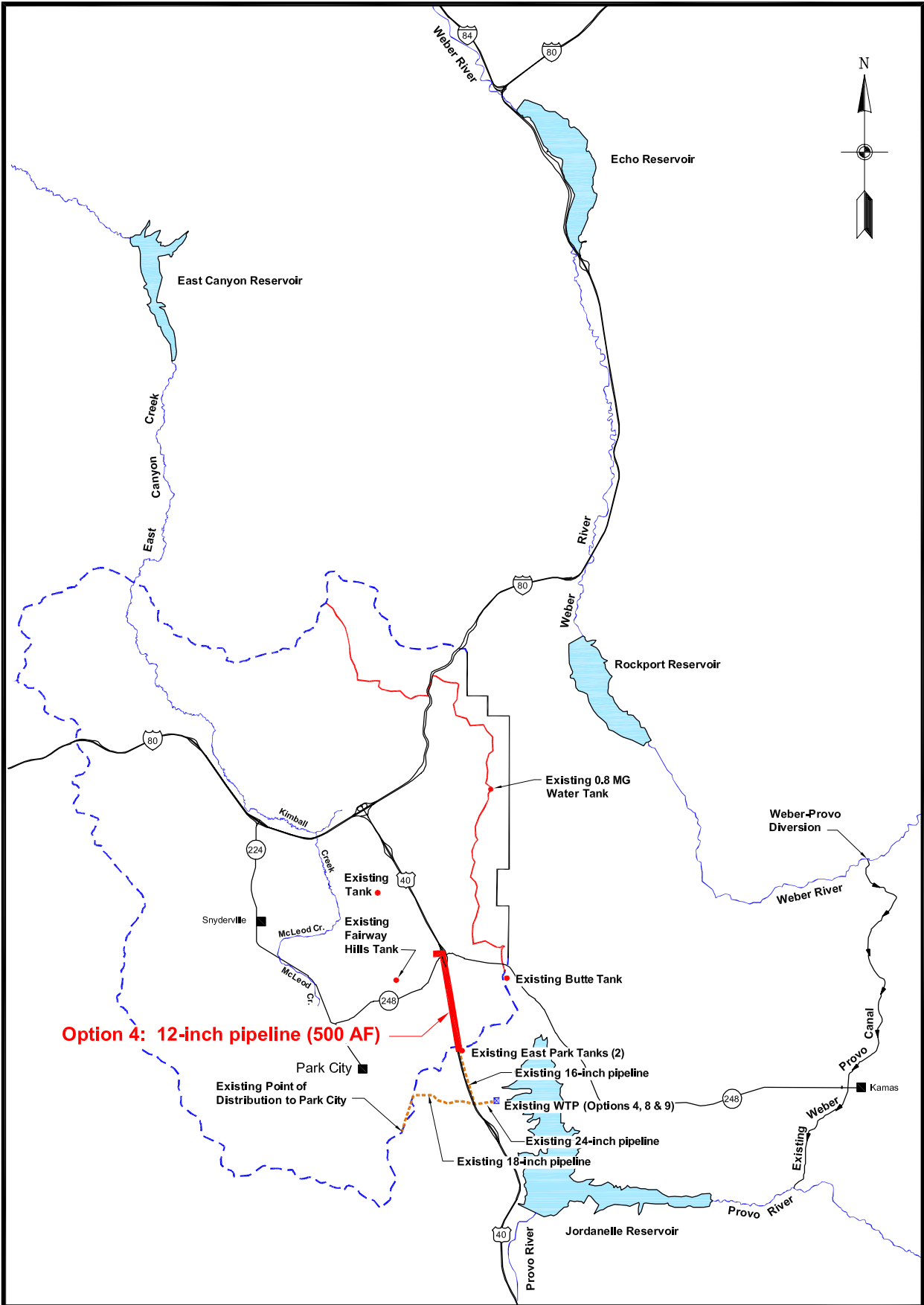
approximately 18,000-feet in length, would need to be built along the existing state and county road right-of-ways as shown on Figure 5-6. The pipeline would connect to existing Park City waterlines at the Quinn's Junction Sports Complex. This pipeline was estimated to cost \$2,700,000. The life cycle cost for this option, including all charges from JSSD, was estimated to be \$18,600,000. More detailed cost estimates are available in the Appendix.

5.6.3 Potential Impacts

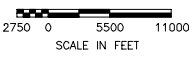
Any impacts associated with construction of existing facilities have already occurred. No significant impacts would be expected based on current information, but any future use of water from the Provo River drainage would need to consider the effects to operation of the Provo River Project and in particular, any potential consequences for the endangered June sucker and the state sensitive species Columbia spotted frog. Also, any effects to the Wasatch County Water Efficiency Project, particularly the environmental commitments for that project as related primarily to return flows, would need to be reviewed.

5.6.4 Recommendations

The study concludes that Option 4 in the amount of 500 acre-feet per year is a viable option and should be further considered in the evaluation and ranking process of the study.



Option 4: 12-inch pipeline (500 AF)



- Legend**
- Snyderville Basin Hydrologic Boundary
 - Moratorium Area Boundary for the Snyderville Basin
 - Mountain Region WSSD District Boundary
 - Existing Water Tank

- Option**
- Option 4: Provo River - JSSD

- Existing Facilities**
- JSSD Existing Facilities

Figure 5-6
Option 4 Map
 Park City and Snyderville
 Basin Water Supply
 Study Special Report

5.7 East Canyon Pipeline (Option 5)

This option considers importation into the Snyderville Basin from water stored in East Canyon Reservoir. The principal facilities include a new pipeline from East Canyon Reservoir to the north Jeremy Ranch boundary and from the south Jeremy Ranch boundary to the existing Summit Water Distribution Company Water Treatment Plant, as shown on Figure 5-7.

5.7.1 Option Description

This option has been studied for importation capacities of 5,000, 8,750, and 12,500 acre-feet per year. Design of the original East Canyon Pipeline Option was completed in September 1999 for SWDC (Michael L. Aldrich & Associates, 1999). The project consists of conveying water from East Canyon Reservoir south to a new water treatment facility located near Interstate 80 near Jeremy Ranch. Initially, SWDC received approvals for a 24-inch diameter pipeline to convey raw water from East Canyon Reservoir to the new treatment plant. After review of the projected demands within the Basin, the decision was made to increase the pipe diameter to 30-inches in order to accommodate future demands. By July 2002, approximately 7,000 linear feet of 30-inch pipeline along Rasmussen and Jeremy Roads had been installed. A water treatment facility with a capacity of 5.5 mgd (3,820 gpm), expandable to 22 mgd (15,500 gpm), has also been constructed. The original project was designed for an ultimate build-out capacity of 15,000 acre-feet, and a presumed peaking factor of 1.67.

A number of additional facilities would be required to deliver the volumes chosen for investigation in this study. A raw water intake and pump station and a raw water booster pump station would be required to pump water from East Canyon Reservoir to the water treatment plant. Approximately 63,000 linear feet of 30-inch pipeline would be required to convey the water between the two locations. A 3.5 mgd (2,430 gpm) expansion of the existing water treatment facility would be needed to meet the daily flow of 6,200 gpm, and a 16.5 mgd (11,500 gpm) expansion for a maximum daily flow of 22 mgd (15,500 gpm). Upgrades to two pump stations within the SWDC system, Trailside and IHC, and an additional 5,680 feet of 16-inch pipeline would be required to deliver finished water to Park City. Also, a 12-inch diameter, 16,500 foot pipeline and additional pump capacity would be required, if it was desired to deliver treated water to the Promontory Development. This pipeline would not be necessary if the Lost Creek Canyon Pipeline (Option 7) were also to be constructed. SWDC currently has 6.0 million gallons (MG) of finished water storage within their system; therefore, additional finished water storage was not considered necessary for this option.

With the existing water distribution infrastructure within the SWDC system, Park City could connect to this additional water supply at two different locations: Section 27 storage tank and near the White Barn just off State Road 224, halfway between Park City and the Canyons Ski Resort. The delivery pressure at the Section 27 storage tank may require the addition of a booster pump station within Park City's system, and the pressure at the White Barn would require a pressure reducing valve (only the White Barn connection was estimated). SWDC has interconnections with Community Water, Gorgoza, High Valley, and MRWSSD through which water could be distributed Basin-wide

Of the three capacities considered, the cost for the 5,000 acre-feet capacity is the highest cost per acre foot of capacity. This is due to the high capital costs associated with the relatively long

pipeline. As the capacity increases, the cost per unit of capacity drops. The estimated costs are shown in Table 5-2. The first phase of this project that would allow initial delivery of water could be constructed for an estimated contract cost of \$37,900,000. The components of phase one are listed in the Appendix. More detailed cost estimates are available in the Appendix.

**TABLE 5-2
East Canyon Pipeline Cost Summary**

Capacity	Capital Cost (New Facilities)	Capital Cost* (Existing & New)	Life Cycle Cost*
5,000	\$35,200,000	\$50,800,000	\$124,700,000
8,750	\$53,700,000	\$69,300,000	\$153,600,000
12,500	\$67,300,000	\$82,900,000	\$181,200,000

* Method 3 costs (see Table 6-3).

There would need to be agreements developed between SWDC and Park City and/or MRWSSD to identify reservation of system capacity, buy-in costs of use of present facilities, as well as “wheeling fees” and rates and fees.

5.7.2 Hydrology

The water rights listed in Table 5-3 represent East Canyon Reservoir Storage rights that are available for importation through the East Canyon Pipeline. These storage rights fall into two main categories which includes: leased water from D&WCCC and water shares in D&WCCC stock. SWDC has indicated that they have sufficient additional water rights not listed in Table 5-3 to cover the current diversions from their water system. Therefore, Reclamation assumes that the water rights in Table 5-3 can be moved to the East Canyon Pipeline without reducing SWDC ability to divert water from their existing water system.

The first category of water rights SWDC has to store water in East Canyon Reservoir is based on an October 13, 1999, water lease contract between SWCD and D&WCCC. This lease annually provides up to 5,000 acre-feet of East Canyon Reservoir water. This water “will be comprised of rental pool water, water covered by treasury shares, water retired from historical irrigation or by reduction in the amount of stored water in East Canyon being available to all share holders or D&WCCC and other water as the Board of D&WCCC may decide.” The contract states that if D&WCCC cannot provide the excess water, SWDC will dedicate shares of D&WCCC stock to cover the water diverted on a basis of 7 acre-feet per share. In the memorandum decision allowing this leased water to be used in Snyderville Basin, the State Engineer required 714.3 shares of D&WCCC stock be dedicated to this project and 1,250 acres of irrigated land be retired. Although it is uncertain how D&WCCC will dedicate shares to the lease water, D&WCCC has indicated that in the event of water shortages they would decrease the yield of their shares to cover this lease.

Reclamation recognizes that a hydrology analysis completed in the mid-1990’s shows a minimum holdover volume in East Canyon Reservoir of over 7,000 acre-feet for each year of the prior 23 year period. However, in the future as the demand for water increases and the existing D&WCCC shares are being more fully utilized, this excess holdover water will likely decrease. Therefore Reclamation estimates that the volume of water available to the East Canyon Pipeline from water lease, to be between 2,500 and 5,000 acre-feet per year.

The second category of water right available for importation in the East Canyon Pipeline is based on shares of D&WCCC stock. In the past, SWDC has filed a variety of change applications to move these shares into their water system. Change Application Nos. a12859, a13561, a13565, and a13566, list the East Canyon Reservoir as a hereafter point of diversion and could likely be used in the East Canyon Pipeline. However, Change Application Nos. a13561, a13565, and a13566 are awaiting final approval and should they be rejected, a new change application would have to be filed to move affected D&WCCC shares to the East Canyon Pipeline. Change Application Nos. a18524 and a16374 will have to be withdrawn and a new change application filed. Change Application No. a16384, appears to be based on the same shares as other change applications in Table 5-3 and will likely be withdrawn. Reclamation notes that the State Engineer has typically quantified change applications based on D&WCCC stock at 7.0 acre-feet per share and D&WCCC has recently determined their stock yields 6.0 acre-feet per share. Future change applications based on D&WCCC stock could yield anywhere between 6.0 and 7.0 acre-feet per share.

In addition to the D&WCCC shares owned by SWDC, representatives from the Corporation of the Presiding Bishop of the LDS Church and Property Reserve Incorporated have indicated that they own shares of D&WCCC stock that could be dedicated to the East Canyon Pipeline project. Both these corporations are share holders in SWDC and are interested in the successful development of this project. These corporations have told Reclamation that, if necessary, they could move at least 400 shares of D&WCCC stock to the East Canyon Pipeline. Reclamation assumes that a change application will need to be filed on these shares.

Reclamation estimates that the volume of water available for the East Canyon Pipeline from D&WCCC shares, to be between 6,882 and 8,029 acre-feet per year. The lower range assumes shares of D&WCCC stock would yield 6.0 acre-feet each. The upper range assumes that shares of D&WCCC stock would yield 7.0 acre-feet each.

Looking at the two categories of water rights, the aggregate estimate of the volume of water available to the East Canyon Pipeline is roughly between 9,400 and 13,000 acre-feet per year. The lower range is the sum of the lower water volume estimates for each category of water and the upper range is the sum of the upper water volume estimates.

A reservoir operation model study, which is beyond the scope of this study, would more accurately determine the reliable yield from these rights, and identify any need for additional acquisitions to reach a firm 12,500 acre-feet supply. Reclamation recommends this reservoir operation model study be done as part of a feasibility study of this Option prior to final design and construction.

**TABLE 5-3
Summary of Water Rights available for Importation
Summit Water Distribution Company**

Water Right No.	Underlying Storage Right	No. of D&WCCC Shares	Quantity (Acre-Feet)
a21859 (35-10539)	Water Lease Agreement 1999		5,000.00
a12859 (35-5360) ¹	D&WCCC Certificates #13927, 13940, 13949	112.0	784.0
a18524 (35-7452) ² (35-5470)	D&WCCC Certificate # 13568	311.0	2,177.0
a16374 (35-5742) ²	D&WCCC Certificate # 13395	11.0	77.0
a13561 (35-9031) ³ a13565 (35-9032) ³ a13566 (35-9033) ³	D&WCCC Certificates # 13569, 13959, 12777, 12063	313.0	2,191.0
a16384 (35-5741) ⁴	D&WCCC Certificate #13569	0	0
LDS Church ⁵	D&WCCC Shares	400	2,800
Total		1,147	13,029.0

¹ The December 21, 1984 Memorandum Decision approving Change Application No. a12859 allows a diversion rate of 1,400 acre-feet/year (which is greater than 7.0 acre-feet/share). If a future change application was filed on these shares the diversion rate could be significantly reduced. This study assumes these 112.0 shares will eventually be quantified between 6.0 and 7.0 acre-feet/share.

² This change application would have to be withdrawn and a new change application filed on the underlying storage shares. It is assumed that the new change application would be quantified between 6.0 and 7.0 acre-feet/share.

³ The March 19, 1993 Memorandum Decision approving Change Application Nos. a13561, a13565, and a13566 allows a diversion rate of 2,190 acre-feet/year. In January 1996, the State Engineer issued a special order reopening the application for review. In March 1996, a second amended special order was issued stating that the stay on the prior approvals would remain in affect until a final agency decision could be made. No final decision has ever been issued.

⁴ The underlying storage shares for the unapproved Change Application No. a16374 appear to have already been used in Change Application Nos. a13561, a13565, and a13566.

⁵ The Corporation of the Presiding Bishop LDS Church and Property Reserve Incorporated have indicated that, if needed, they could dedicate at least 400 shares to the East Canyon Pipeline Project. It is assumed that these shares would be quantified between 6.0 and 7.0 acre-feet/share.

5.7.3 Potential Impacts

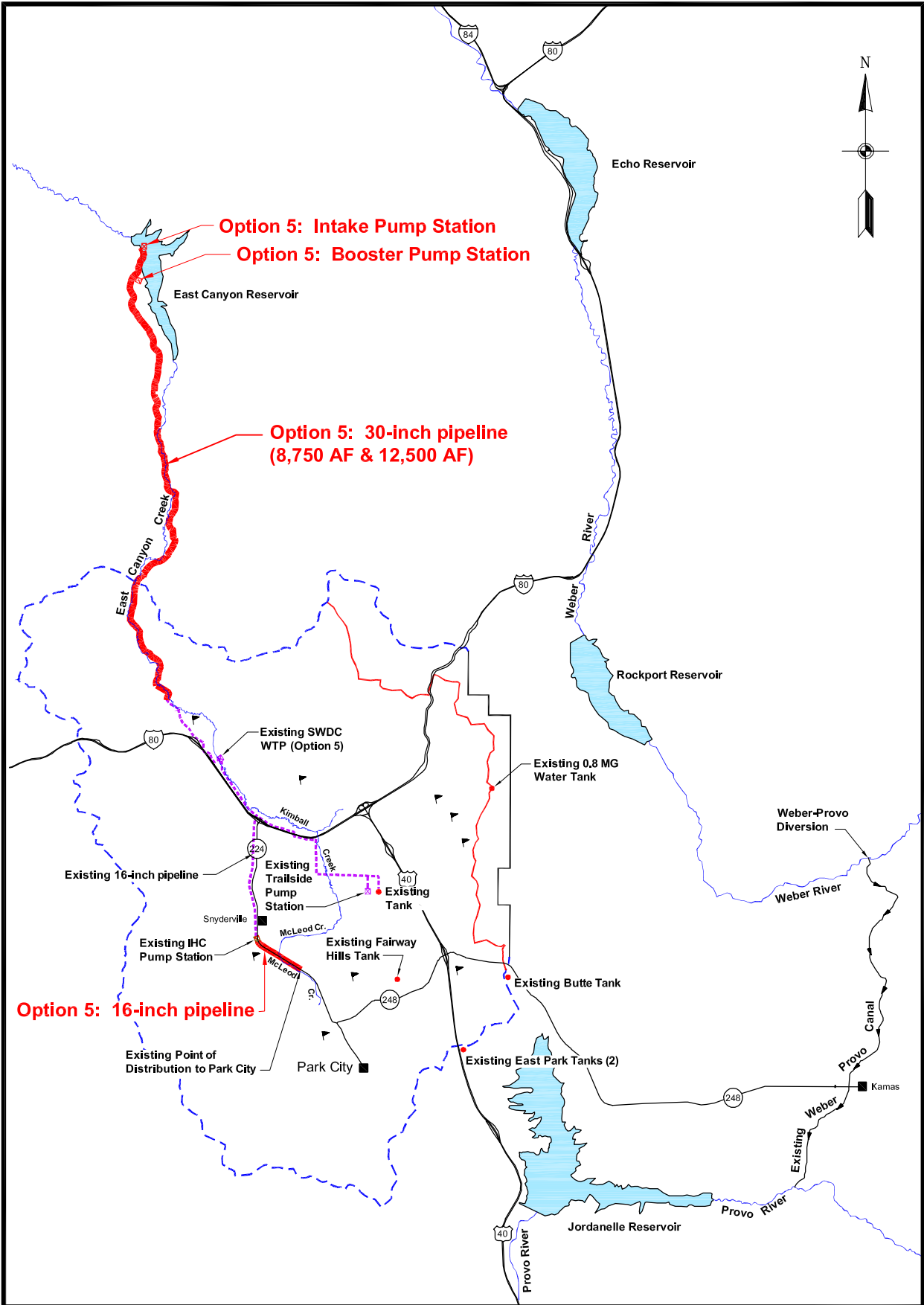
An environmental analysis sponsored by Summit Water Distribution Company and the Davis and Weber Counties Canal Company was completed in 1999, to facilitate permitting of the project. Permits identified in that document for the East Canyon Pipeline option include the following: Nationwide Permit Nos. 12 and 26, from the COE in accordance with Section 404 of the CWA; Endangered Species Act (ESA) consultation with the US Fish and Wildlife Service (FWS); consultation and determination of “no historic properties affected” by the Utah SHPO; water rights approvals and a stream alteration permit from the Utah State Engineer; a general storm water discharge permit (Utah Pollutant Discharge Elimination System – UPDES) and Section 401 water quality certification from the Utah Division of Water Quality (UDWQ); plan approval from the Division of Drinking Water; approval to construct within the state road right-of-way (ROW) from the Utah Department of Transportation (UDOT); coordination with the Utah Division of Wildlife Resources (UDWLR) for the Bonneville cutthroat trout; permits from

Summit County (essentially these have been obtained); and, permits from Morgan County, including a Conditional Use Permit and an excavation permit, and others as needed. In addition, rights-of-way and easements across private lands would need to be obtained. SWDC obtained a professional appraisal for right-of-way and easements in 1998, and Reclamation has reviewed and updated the estimate. Recently a 7,200 acre Ranch (Clayton Macfarlane Company) sold a conservation easement that covers a portion of the county road along East Canyon Creek in Summit and Morgan counties. Right of Way across this conservation easement would also have to be negotiated. The State Division of Forestry, Fire and State Lands (owner of the easement) has indicated this could probably be accomplished, but would likely take additional time for negotiation and legal work. If these facilities were to become part of a Federally-sponsored project, additional permits would be required, including NEPA compliance and use agreements with SWDC to use existing infrastructure.

A June 22, 2005, field review by Reclamation staff noted a potential for impacts to fish and wildlife and potential for impacts to spotted frog habitat. Such impacts could be mitigated or avoided by project design including the location of the pipeline corridor. The potential for effects to cultural resources, principally historic trails, can be avoided by installing the pipeline in the existing roadway.

5.7.4 Recommendations

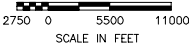
The study concludes that the East Canyon Pipeline Option is a viable option and should be further considered in the evaluation and ranking process of the study.



Option 5: Intake Pump Station
Option 5: Booster Pump Station

**Option 5: 30-inch pipeline
 (8,750 AF & 12,500 AF)**

Option 5: 16-inch pipeline



Legend

- Snyderville Basin Hydrologic Boundary
- Moratorium Area Boundary for the Snyderville Basin
- Mountain Region WSSD District Boundary
- ▲ Golf Course
- Existing Water Tank

Option

- Option 5: East Canyon Pipeline

Existing Facilities

- SWDC Existing Facilities

Figure 5-7
Option 5 Map
 Park City and Snyderville
 Basin Water Supply
 Study Special Report

5.8 Brown's Canyon Pipeline (Option 6)

The Brown's Canyon Pipeline Option, would import water from Rockport Reservoir to the Snyderville Basin through a pipeline to be constructed through Browns Canyon. The Rockport Water Supply Infrastructure Project Phase I Pipeline Alignment Evaluation was completed in April, 2003 (MWH and BC&A, 2003). A subsequent technical memorandum, dated June 17, 2003, recommended the Brown's Canyon Option as the preferred alignment from the evaluation (MWH, 2003). This preferred alignment was used in the analysis for importing water into Snyderville Basin.

Weber Basin Water Conservancy District along with Park City and Summit County which includes Mountain Regional Water Special Service District (then known as Atkinson Special Service District), entered into a certain Memorandum of Understanding and Agreement (MOU), dated November 18, 1996, which set forth a framework for the development of a water project to deliver water, made available from WBWCD's sources, for distribution within the service areas of Park City and MRWSSD. Several studies have been commissioned to examine and recommend feasible pipeline corridors along with water treatment plant and reservoir sites in order to transport and treat water coming from Rockport Reservoir to the Snyderville Basin.

Within the last few years WBWCD, Park City, and MRWSSD, have determined not to pursue the project described in the MOU. The Parties have decided instead to participate in the Snyderville Basin Water Supply Study, currently being conducted by the Bureau of Reclamation to develop a plan for providing additional water to the Snyderville Basin.

5.8.1 Option Description

Two different versions of the Brown's Canyon Pipeline were investigated. Version A considered an intake below Wanship Dam. Version B located the intake just upstream of the Rockport Reservoir.

Version A would require modification to the intake structure below Wanship Dam in addition to a new raw water pump station and approximately 50,000 linear feet of 30-inch raw water pipeline to convey water to a new 9.0 mgd (6,200 gpm) / 22.0 mgd (15,500 gpm) water treatment facility. Three million gallons in raw water storage would be required at the water treatment plant. The finished water would be pumped through approximately 18,000 linear feet of 30-inch pipeline via a new pump station and terminate at a 4.5 MG storage reservoir located at the point of distribution in Round Valley. This option does not have a specific site designated for the location of the new water treatment facility. Property acquisition would be required to locate the water treatment facility and raw water storage.

Under Version B, water would be conveyed from near the upstream end of Rockport Reservoir through approximately 29,000 linear feet of 30-inch raw water pipeline to a 9.0 mgd (6,200 gpm) / 22.0 mgd (15,500 gpm) water treatment facility. Approximately 18,000 linear feet of 30-inch pipeline would be used to convey the finished water to a 4.5 MG terminal reservoir located at the point of distribution in Round Valley. A new raw water intake, similar to the diversion dam and Coanda screen discussed in Option 7, and a raw water pump station would both be required to pump the water from the reservoir to the water treatment plant. A finished water pump station

would pump the treated water from the water treatment plant to the 4.5 MG terminal reservoir. Three million gallons in raw water storage would be required at the water treatment plant location. The general location of the treatment plant would be the same as proposed in Version A. Therefore, property acquisition would be required to locate the water treatment facility and raw water storage reservoir.

5.8.2 Hydrology

The 5,000 acre-feet per year of water to be imported by this Option consists of existing unsubscribed WBWCD water that has not yet been put to beneficial use. One-half of this supply (2,500 acre-feet per year) would come from Weber Basin Project supplies (a Bureau of Reclamation project) and the other half from Smith Morehouse Reservoir supplies (a WBWCD project). This water is available in the Weber River drainage. See Section 5.9.2 for a more detailed description of this water, and the need for a reservoir operation study.

5.8.3 Potential Impacts

An environmental evaluation of the Brown's Canyon Option was completed on December 12, 2002, by MWH. The segment of pipeline from Wanship Dam to Rockport State Park, if contained within the Highway 32 right-of-way, and the segment parallel to the Weber River, if placed in the existing power line corridor, would not create any significant impacts to the environment. The segment along Brown's Canyon Road could have some environmental impacts at three locations, two of which are crossings of unnamed drainages and the third where the road passes above a small reservoir. Where the pipeline leaves Brown's Canyon Road, it would cross the Mountain Meadows area, which contains ephemeral drainages. This area would require wetland surveying. Also, since the water treatment plant does not have a specific site, a wetland survey and environmental analysis would be required once the final site location has been selected.

Implementation of this option would require permits and approvals from Summit County, UDOT for construction within the ROW, UDDW for plan and process approvals, UDWQ for storm water discharge permitting and water quality certification, and the Utah State Engineer for water rights and stream alternation, if necessary. In addition, an assessment of cultural resources would need to be conducted for the SHPO. Coordination with UDWLR and the US Fish and Wildlife Service would be required to ensure that ESA compliance occurs and fish and wildlife issues are addressed for the river diversion. Permitting by the COE would be required should any jurisdictional wetlands be impacted by the construction. Finally, Reclamation involvement in the project would require NEPA and Fish and Wildlife Coordination Act (FWCA) compliance. Approval from West Wanship Irrigation Company would be required for the intake modification.

5.8.4 Recommendations

This option is eliminated from further consideration, primarily because Mountain Regional Water Special Service District has already constructed the Lost Creek Canyon Pipeline, which currently is delivering 1,600 acre-feet per year, with the anticipation that it also be used to deliver the additional 5,000 acre-feet of WBWCD water. It was decided by the study team that constructing another pipeline to deliver water that could be delivered through the existing Lost Creek Canyon Pipeline could not be either environmentally or economically justified.

5.9 Lost Creek Canyon Pipeline (Option 7)

The Lost Creek Canyon Pipeline Option considers importation of water into the Snyderville Basin from the Weber River at the inlet to Rockport Reservoir. This option would utilize the existing Lost Creek Canyon Pipeline discussed in Chapter 4, adding a pump station and pipelines to deliver up to an additional 5,000 acre-feet per year from the Weber River, as well as additional new facilities required to convey water to the point of distribution to Park City and other water providers in the Basin. A detailed discussion of this concept follows. See Figure 5-8.

5.9.1 Option Description

This Option consists of intake and booster stations on the Weber River at the inlet to Rockport Reservoir, the existing pipeline through Lost Creek Canyon to the existing MRWSSD Signal Hill Water Treatment Plant site, an expanded or new water treatment plant, a 16-inch diameter, 13,000 feet pipeline and facilities necessary to convey water to Park City, and a 12-inch diameter, 16,500 feet pipeline to deliver water to other providers in the Basin. This option was analyzed for capacity increases to the existing 1,600 acre-feet per year of 2,500 acre-feet per year and 5,000 acre-feet per year.

Reclamation performed a study for a pump station that would pump water from the base of Wanship Dam or from the Weber River above Rockport Reservoir to the existing booster pump station that is part of the Lost Creek Canyon Pipeline Option discussed in Chapter 4 (Reclamation, 2004). WBWCD proposes to sell 2,500 acre-feet of water per year to both Park City and MRWSSD for a total of 5,000 acre-feet. In order to receive the full benefits of this sale, a pump station would need to be constructed either at the base of Wanship Dam or above Rockport Reservoir. The pump station would be designed for a maximum capacity of 9.0 mgd (6,200 gpm). Four intake options were evaluated in the Reclamation study. Due to costs, environmental impacts, and operation and maintenance considerations, Reclamation's Option 3 – River Large Option, was chosen as the best intake option to be incorporated into this analysis. This Option consists of a diversion dam with a Coanda screen inlet that would be constructed on the Weber River approximately 1,000 feet upstream of the reservoir inlet. Approximately 830 linear feet of 24-inch pipeline would divert water into the existing Lost Creek Canyon booster pump station on the south end of the reservoir. The maximum pumping head to convey the raw water from the river to the existing pump station is approximately 35 feet.

After the raw water is conveyed from the Weber River to the raw water booster pump station, the water would be pumped through the existing 24-inch Lost Creek Canyon raw water pipeline to the Signal Hill Water Treatment Plant, as discussed in Chapter 4. To provide the desired capacity of 9.0 mgd (6,200 gpm, 5,000 acre-feet annually), an upgrade to the existing booster pump station, the addition of 3 MG in raw water storage, a 3 mgd (2,080 gpm) expansion to the build-out capacity of 6 mgd of the existing water treatment plant, and a new 1.5 mgd (1,040 gpm) water treatment plant are incorporated into the alternative.

To provide water delivery to the points of distribution, a new 16-inch diameter, 13,000 feet pipeline would be required for delivery to Park City, and a 12-inch diameter, 16,500 feet pipeline for delivery to MRWSSD's existing 20-inch distribution main located in the Silver Creek Industrial Park. MRWSSD has interconnections with several water systems within the Basin through which water could be distributed basin wide.

The estimated costs per acre-foot for Option 7 increase as the capacity increases due to the relatively low capital cost, and operation and pumping costs being a higher proportion of total costs. The estimated costs for the various capacities are shown in Table 5-4. The first phase of this project that would allow initial delivery of water could be constructed for an estimated contract cost of \$4,300,000. The components of phase one are listed in the Appendix. More detailed cost estimates are available in the Appendix.

**TABLE 5-4
Lost Creek Canyon Pipeline Cost Summary**

Capacity	Capital Cost (New Facilities)	Capital Cost (Existing & New)	Life Cycle Cost
2,500	\$10,200,000	\$20,100,000	\$47,100,000
5,000	\$25,500,000	\$37,800,000	\$84,400,000

5.9.2 Hydrology

The 5,000 acre-feet per year of water to be imported by this Option consists of existing unsubscribed WBWCD water that has not yet been put to beneficial use. One-half of this supply (2,500 acre-feet per year) would come from Weber Basin Project supplies (a Bureau of Reclamation project) and the other half from Smith Morehouse Reservoir supplies (a WBWCD project). This water is available in the Weber River drainage.

The Weber Basin Project supply would come from certificated Water Right No. 35-828(A27609). This right was approved for diversions of up to 60,000 acre-feet per year at Wanship Dam to be used for municipal purposes within the WBWCD service area. Of this total, 2,500 acre feet per year has been reserved and dedicated to this Option. This water would be available nearly every year because municipal water users are guaranteed a full supply of project water even when agricultural water users experience water shortages. In order to use this water for the Lost Creek Canyon Pipeline Option, a change application would need to be filed and approved by the State Engineer to add a new point of diversion at the proposed intake structure upstream from Rockport Reservoir.

The Smith Morehouse Reservoir storage rights include certificated Water Right Nos. 35-8733 (1,040 acre-feet), 35-832 (5,000 acre-feet), 35-5407 (1,860 acre-feet), and 35-5529 (450 acre feet) for a total storage right of 8,350 acre feet. WBWCD has title to all these water rights except Water Right No. 35-8733, which is owned by Smith Morehouse Reservoir Company. Therefore, WBWCD has a right to 7,310 acre-feet of storage water in the Smith Morehouse Reservoir. WBWCD has indicated that only about 300 acre-feet of this storage has been subscribed and that 2,500 acre-feet of the remaining unsubscribed water has been reserved for use in the Snyderville Basin. A change application would need to be filed and approved by the State Engineer to add a new point of diversion on the Weber River above Rockport Reservoir for this Smith Morehouse water.

A reservoir operation study, which is beyond the scope of this study, would more accurately determine the reliable yield from the two sources mentioned above. However, Reclamation believes that the proposed 5,000 acre-feet per year water supply is available for importation to the Snyderville Basin. Reclamation recommends, however, that a reservoir operation model

study be completed prior to final design and construction, just as is recommended for Option 5 (see Section 5.7). See Table 5-5.

**TABLE 5-5
Summary of Water Rights available for Importation
Into the Lost Creek Canyon Pipeline**

Water Right No.	Underlying Storage Right	Total Water Right (Acre-Feet)	Quantity Dedicated to Project (Acre-Feet)
35-828 (A27609)	Rockport Reservoir	60,000	2,500
35-832 (A27614)	Smith Morehouse Reservoir	5,000	
35-5407 (A35794a)	Smith Morehouse Reservoir	1,860	2,500
35-5529 (A35794b)	Smith Morehouse Reservoir	450	
Total			5,000

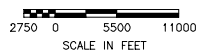
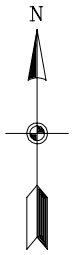
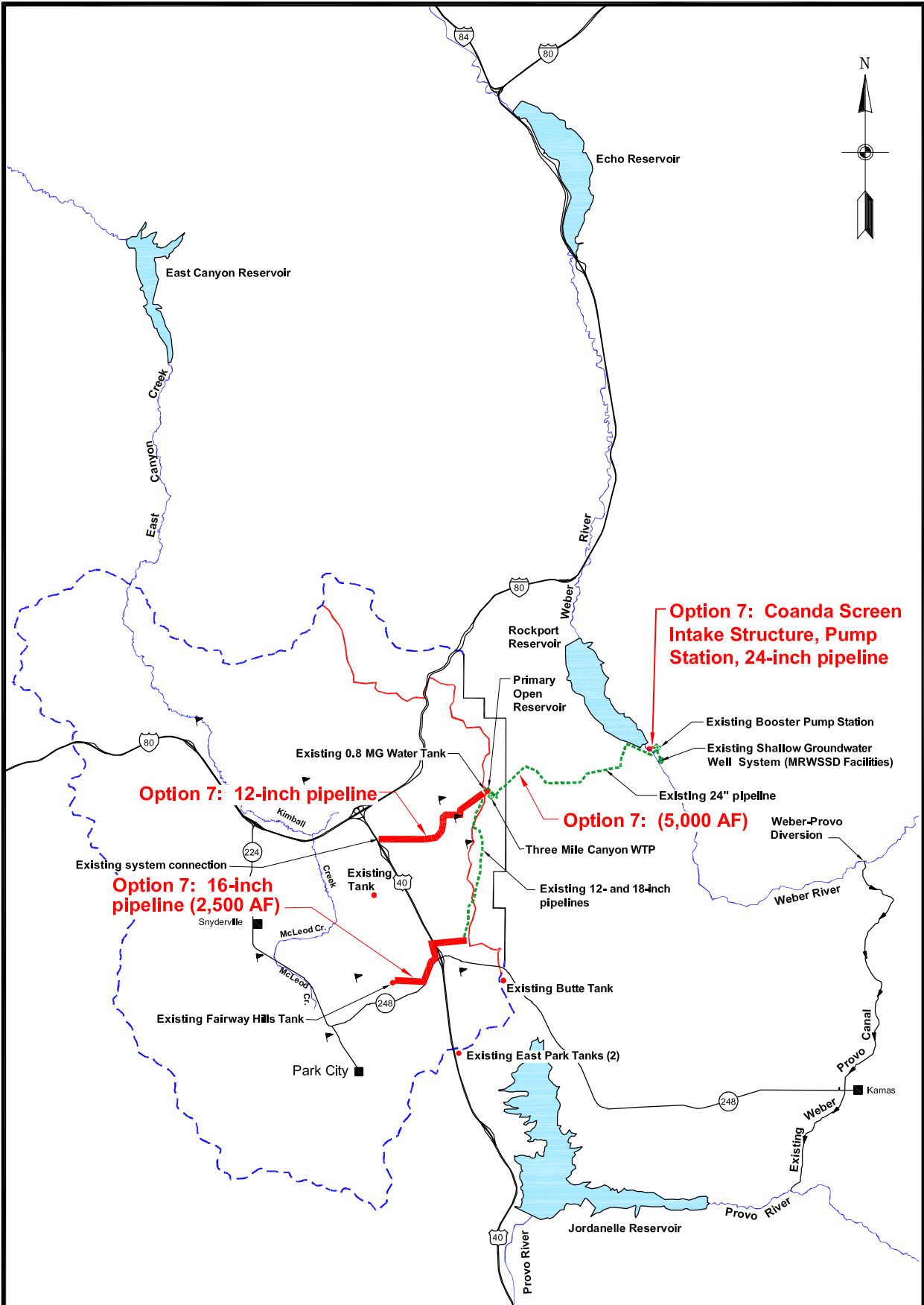
5.9.3 Potential Impacts

Each pumping option presented in the Wanship Pump Station and Pipeline Preliminary Design Project was reviewed for its environmental impact and the potential need for compliance with NEPA, the CWA, the ESA, the FWCA, NHPA, and other laws and regulations. If construction of the diversion structure and installation of the pipelines proposed in this alternative have Federal involvement, NEPA compliance would be required. In addition, construction activities that pose impacts to jurisdictional rivers and associated wetlands, such as the proposed diversion dam and Coanda screen, would require a Section 404, “Dredge and Fill Permit” from the COE, in accordance with the CWA. A diversion dam on the Weber River could adversely affect aquatic resources unless measures are taken to ensure fish passage and adequate water releases. Design of the diversion structure to include a fish passage could reduce or eliminate potential effects to fish and meet the requirements of the FWCA. The preliminary analysis of this option conducted by Reclamation for the ESA, concluded that Federally endangered or threatened species would not likely be affected by the proposed diversion. It was also concluded that no further need of cultural resource fieldwork would be required to meet the requirements of the SHPO for “No Effect to Historic Properties”. It should be noted that the finished water facilities may require SHPO consultation as that was not conducted as part of the Reclamation study.

In addition to the permitting requirements on a Federal level, state and Summit County permits and approvals would be required for this alternative, UDOT for construction within the ROW, UDDW for plan and process approvals, UDWQ for storm water discharge permitting and water quality certification, and the Utah State Engineer for water rights and stream alternation, if necessary.

5.9.4 Recommendations

The study concludes that the Lost Creek Canyon Pipeline Option is a viable option and should be further considered in the evaluation and ranking process of the study.



- Legend**
- Snyderville Basin Hydrologic Boundary
 - Moratorium Area Boundary for the Snyderville Basin
 - Mountain Region WSSD District Boundary
 - Golf Course
 - Existing Water Tank

- Option**
- Option 7: Lost Creek Canyon Pipeline
- Existing Facilities**
- MRWSSD Existing Facilities

Figure 5-8
Option 7 Map
Park City and Snyderville
Basin Water Supply
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5.10 Weber River via Weber-Provo Canal (Option 8)

This option involves diverting 5,000 acre-feet per year of water from the Weber River through the Weber-Provo Canal to the Provo River, then through Jordanelle Reservoir, and JSSD facilities to Snyderville Basin.

5.10.1 Option Description

Under this concept, the imported water would be diverted through the Weber-Provo Canal on a space available basis, as determined by the Provo River Water User's Association (PRWUA) and the Bureau of Reclamation. The water would be withdrawn from Jordanelle Reservoir through JSSD facilities on an acre-foot per acre-foot basis as it enters the reservoir, ensuring that no storage takes place. Adequate real-time measurement would be required at the Weber-Provo Canal and at the JSSD intake structure to ensure accurate accounting of the imported water through the system. Flow measurement data and all equipment and facilities associated with this option would be made assessable to PRWUA, the Central Utah Water Conservancy District, and Reclamation for monitoring and inspection. New 16-inch pipelines would need to be constructed to deliver the 5,000 acre-feet per year to Park City and MRWSSD. A total of 28,000-feet of 16-inch pipeline would be required. Booster pumping of the delivered water would also be required. See Figure 5-9 for the approximate pipeline alignments.

The capital cost for the pipelines is estimated to be \$7,200,000. The estimated life cycle cost including JSSD charges is \$105,200,000. More detailed cost estimates are available in the Appendix.

5.10.2 Hydrology

The 5,000 acre-feet per year of water to be imported by this Option consists of existing unsubscribed WBWCD water that has not yet been put to beneficial use. One-half of this supply (2,500 acre-feet per year) would come from Weber Basin Project supplies (a Bureau of Reclamation project), and the other half from Smith Morehouse Reservoir supplies (a WBWCD project). This water is available in the Weber River drainage. See Section 5.9.2 for a more detailed description of this water, and the need for a reservoir operation study.

5.10.3 Potential Impacts

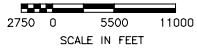
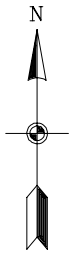
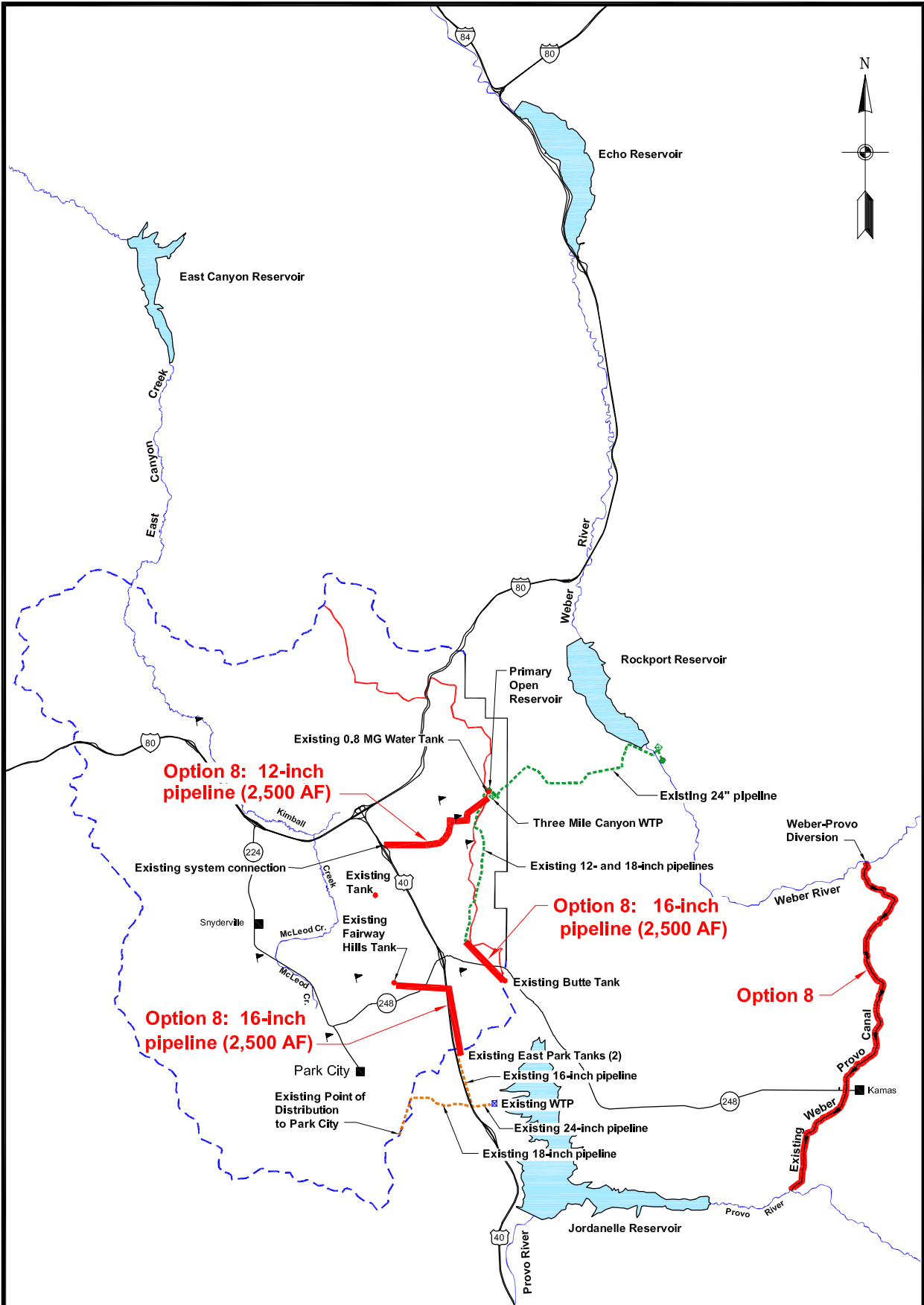
Since the facilities proposed in this option have not been studied in detail, permitting requirements and environmental impacts associated with it have not been defined. It is anticipated that the permitting and impacts associated with this alternative would be similar to, but more complex than, those identified in Option 7. Specifically, state and county permits and approvals would be required from Summit and Wasatch Counties, UDOT for construction within the ROW, UDDW for plan approval, and UDWQ for storm water discharge permitting and water quality certification, and the Utah State Engineer for water rights and stream alternation, if necessary. An assessment of cultural resources would need to be conducted for the SHPO. Coordination with UDWLR and the U.S. Fish and Wildlife Service, would be required to ensure that the ESA and fish and wildlife needs are satisfied. Permitting by the COE would be required should any jurisdictional wetlands be impacted by the alternative. Approval from the Provo River Water Users Association and Reclamation would be required to use the Weber-Provo Canal, as well as approval from Central Utah Water Conservancy District and Reclamation to

utilize Jordanelle Reservoir. Finally, Federal involvement in the option and the reservoir intake would require NEPA compliance.

As with Option 4 above, any future use of water from the Provo River drainage would need to consider the effects to operation of the Provo River Project and in particular, any potential consequences for the endangered June sucker and the state sensitive species Columbia spotted frog. Also, any effects to the Wasatch County Water Efficiency Project, particularly the environmental commitments for that project as related primarily to return flows, would need to be reviewed.

5.10.4 Recommendations

The study concludes that Option 8 is a viable option and should be further considered in the evaluation and ranking process of the study.



- Legend**
- Snyderville Basin Hydrologic Boundary
 - Moratorium Area Boundary for the Snyderville Basin
 - Mountain Region WSSD District Boundary
 - Golf Course
 - Existing Water Tank

- Option**
- Option 8: Weber River via Weber-Provo Canal

- Existing Facilities**
- - - MRWSSD Existing Facilities
 - - - JSSD Existing Facilities

Figure 5-9
Option 8 Map
 Park City and Snyderville
 Basin Water Supply
 Study Special Report

5.11 Lost Creek Canyon and Weber-Provo Canal (Option 9)

This Option is a combination of Options 7 and 8, wherein 2,500 acre-feet per year of the WBWCD water supply would be delivered through the Lost Creek Canyon Pipeline to the Promontory Development and 2,500 acre-feet per year would be delivered through the Weber-Provo Canal/Jordanelle Reservoir/JSSD to Park City (see Figure 5-10).

5.11.1 Option Description

Of the total 5,000 acre-feet per year developed by this Option, 2,500 acre-feet per year would be delivered to Park City. To make this delivery, a new 16-inch pipeline, 18,000 feet in length, would need to be constructed between the East Park Tank and Park City's existing water system. The pipeline would be constructed along the state and county right-of-ways.

Of the remaining 2,500 acre-feet per year, 1,200 acre-feet per year would be delivered to the Promontory Development and the remaining 1,300 acre-feet per year retained by MRWSSD for future growth. To provide the water delivery to Promontory Development, a new 12-inch pipeline would be required for connection to MRWSSD's existing 20-inch distribution main located in the Silver Creek Industrial Park. The water intake costs for the diversion and intake on the Weber River covered in Option 7 are also included in Option 9.

The capital costs for Option 9 are estimated to be \$4,200,000 for the pipeline between JSSD and Park City, and \$10,200,000 to improve the Lost Creek Canyon facilities (see Option 7 and 9 Capital Costs table in the Appendix). This is a total new capital cost of \$14,400,000. The estimated life cycle cost including JSSD charges is \$98,600,000 (\$53,400,000 for the JSSD to Park City pipeline and \$45,200,000 for the Lost Creek Canyon pipeline improvement). More detailed cost estimates are available in the Appendix.

5.11.2 Hydrology

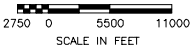
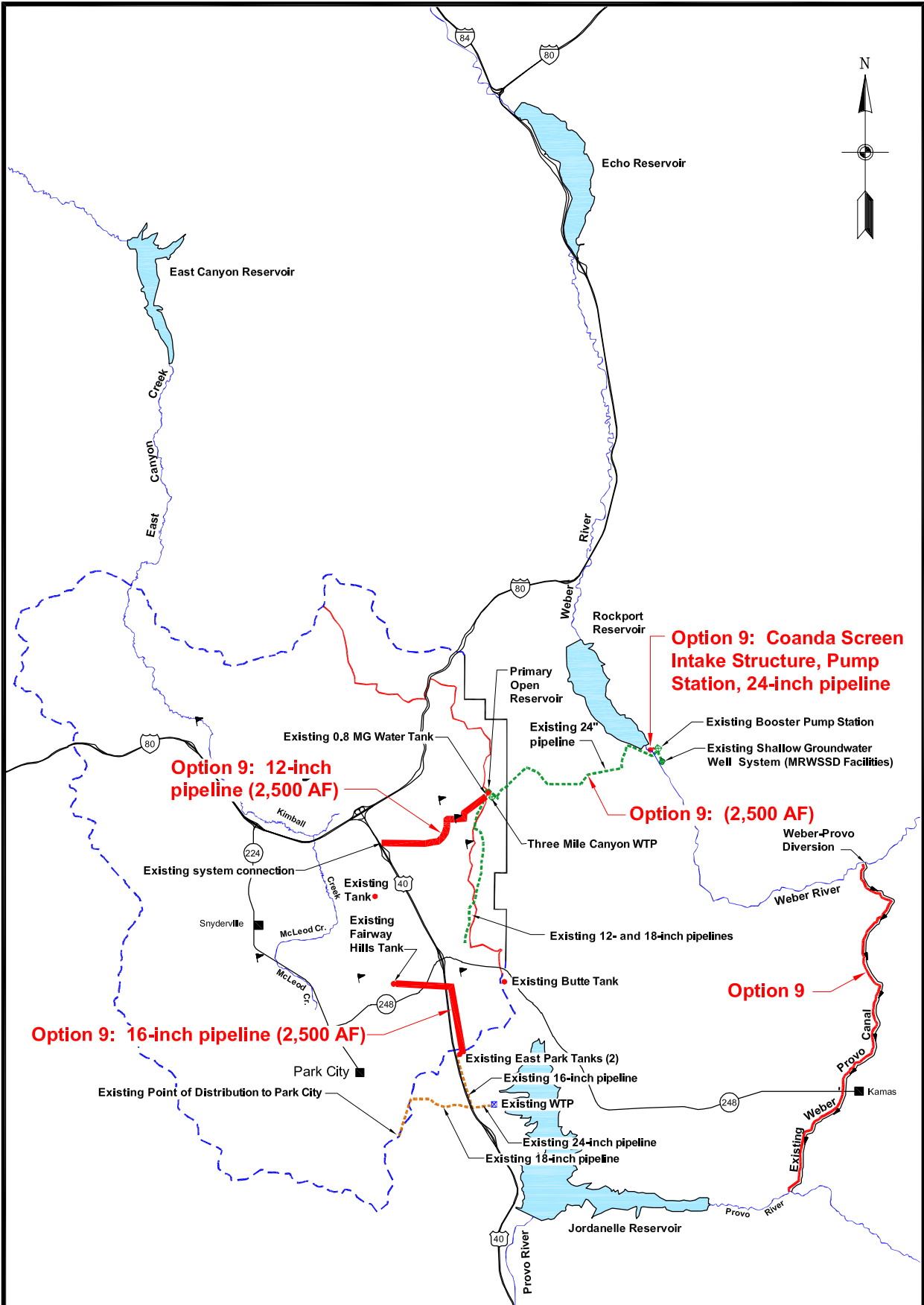
The 5,000 acre-feet per year of water to be imported by this Option consists of existing unsubscribed WBWCD water that has not yet been put to beneficial use. One-half of this supply (2,500 acre-feet per year) would come from Weber Basin Project supplies (a Bureau of Reclamation project) and the other half from Smith Morehouse Reservoir supplies (a WBWCD project). This water is available in the Weber River drainage. See Section 5.9.2 for a more detailed description of this water, and the need for a reservoir operation study.

5.11.3 Potential Impacts

The potential effects for Options 7 and 8, as described above in Sections 5.9.3 and 5.10.3, would apply to this alternative.

5.11.4 Recommendations

The study concludes that Option 9 is a viable option and should be further considered in the evaluation and ranking process of the study.



Legend

- Snyderville Basin Hydrologic Boundary
- Moratorium Area Boundary for the Snyderville Basin
- Mountain Region WSSD District Boundary
- Golf Course
- Existing Water Tank

Option

- Option 9: Lost Creek Canyon and Weber-Provo Canal

Existing Facilities

- - - MRWSSD Existing Facilities
- - - JSSD Existing Facilities

Figure 5-10
Option 9 Map
Park City and Snyderville
Basin Water Supply
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5.12 Future Development Options Summary

The six Options considered viable for development are shown in Table 5-6. These six include: Option 3 - **Water Reuse**, Option 4 - **Provo River - JSSD** (Importation), Option 5 - **East Canyon Pipeline** (Importation), Option 7 - **Lost Creek Canyon Pipeline** (Weber River Importation), Option 8 - **Weber River via Weber-Provo Canal** (Importation), and Option 9 - **Lost Creek Canyon and Weber-Provo Canal** (Importation).

Table 5-6
Summary of Needs and Development Options
Units: Acre-Feet per Year

Existing and Projected Needs	2001	2030	2050
Population	23,900	64,300	86,300
Calculated M&I Demand	9,800	25,300	32,000
Water conservation	0	(2,300)	(5,000)
Adjusted M&I Demand	9,800	23,000	27,000
Minimum in-stream flow and wastewater dilution req.	0	1,100	1,600
Mine tunnel concerns – mine collapse, water quality	0	2,000	2,000
Projected M&I Demand	9,800	26,100	30,600
Estimated Current Production Capacity	14,000	14,000	14,000
Lost Creek Canyon Project	na	1,600	1,600
Jordanelle Special Service District imports	na	1,000	1,000
Increased groundwater development	na	200	300
Future agricultural conversions (Status report: 450-900)	na	400	500
Surplus/Redundancy	(4,200)	(6,500)	(7,500)
Projected Reliable Supply	9,800	10,700	9,900
Projected M&I Needs (Future Development)	0	15,400	20,700
Development Options			
1 – Additional In-Basin Surface Water Storage	0	0	0
2 – Conjunctive Management of Surface & Groundwater	0	0	0
3 – Water Reuse	0	2,000	3,600
4 – Provo River – JSSD	0	500	500
5 – East Canyon Pipeline	0	*12,500	*12,500
6 – Brown’s Canyon Pipeline			
7 – Lost Creek Canyon Pipeline	0	**5,000	**5,000
8 – Weber River via Weber-Provo Canal	0	**5,000	**5,000
9 – Lost Creek Canyon and Weber-Provo Canal	0	**5,000	**5,000

* Additional approvals and potential acquisitions may be needed to yield the full 12,500 acre-feet supply.

** These options are dependent upon the same 5,000 acre-feet water supply – hence only one of the three can be developed.