



SOUTH TAHOE PUBLIC UTILITY DISTRICT

Recycled Water Strategic Plan

December 2024



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Acknowledgments

The South Tahoe Public Utility District Recycled Water Strategic Plan was developed in collaboration with Carollo Engineers and supported by Ascent Environmental and ESI.

The following organizations provided strategic guidance throughout all phases of the project:

- Alpine Watershed Group
- California Tahoe Conservancy
- Carson Water Subconservancy District
- City of South Lake Tahoe
- Douglas County Lake Tahoe Sewer Authority
- El Dorado County
- Incline Village General Improvement District
- Lahontan Regional Water Quality Control Board
- League to Save Lake Tahoe
- Lukins Brothers (also representing Tahoe Keys Water)
- Nevada Division of Environmental Protection
- Nevada Division of Water Resources
- Sierra-at-Tahoe
- Sierra Nevada Alliance
- Tahoe Environmental Research Center
- Tahoe Regional Planning Agency
- Tahoe Resource Conservation District
- Tahoe Water Suppliers Association
- United States Forest Service
- Washoe Tribe of Nevada and California

The District and its partners express our gratitude to the advisors above for the time and expertise they contributed during development of the plan.

The Purpose

The objective of the South Tahoe Public Utility District (District or STPUD) Recycled Water Strategic Plan (Plan) is to develop a 50-year strategy for the District’s recycled water. The District began exporting recycled water to Alpine County in 1967 to comply with state and federal laws such as the [Porter-Cologne Act and Public Law 96-551](#). This requirement is unique to the Tahoe region and requires an enormous amount of energy to pump recycled water over mountain passes. Since export began, the District has continually improved the treatment plant and export infrastructure. However, the overall intent and function of the system—providing recycled water for irrigation in Alpine County—has not changed in the past 50+ years.

There have been significant advances in and acceptances of water reuse over the last 50 years. As such, the purpose of the Plan is to re-evaluate current operations and practices to identify the best ways to process and use recycled water in the future. The evaluation includes both existing recycled water practices and potential alternative recycled water practices and points of use that may be implemented in the future. These alternatives would be triggered for implementation by existing or future drivers, constraints, or opportunities.

Benefits of the Existing System

Decades of planning and improvements have resulted in a system that:



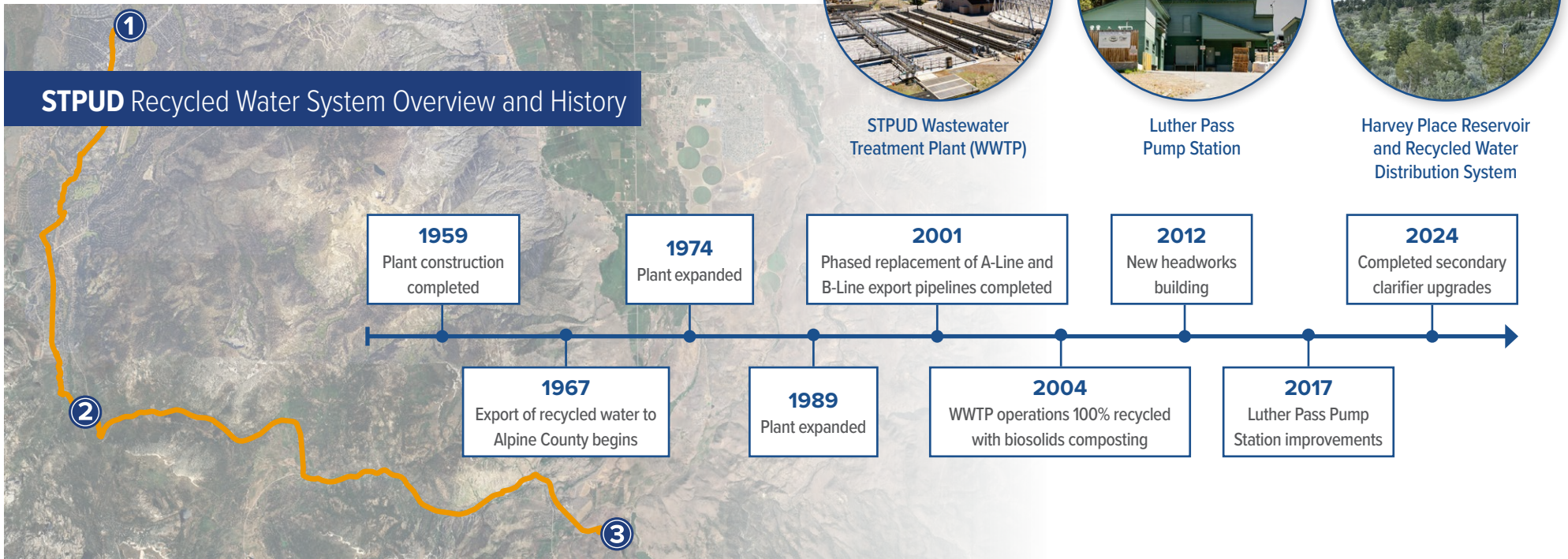
COMPLIES WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS



REUSES 100 PERCENT OF WASTEWATER FROM THE DISTRICT’S SERVICE AREA



RECYCLES 100 PERCENT OF THE BIOSOLIDS PRODUCED IN THE TREATMENT PROCESS

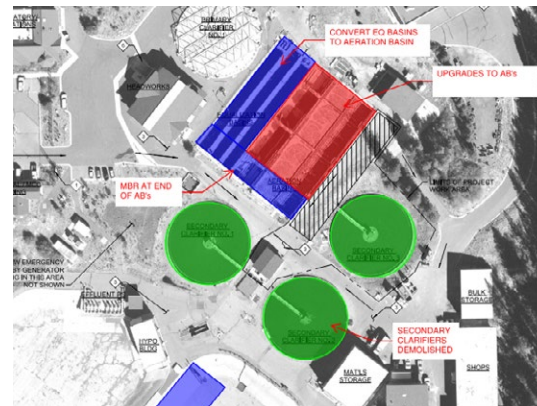


The Process

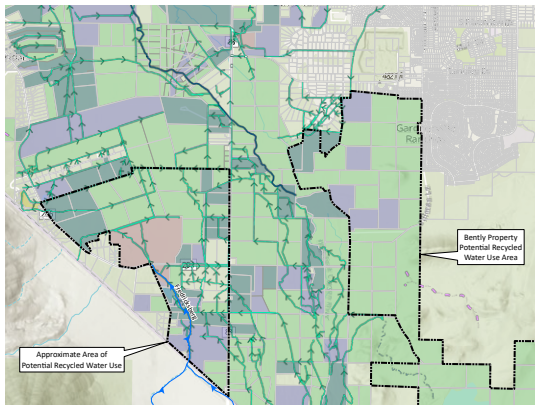
Looking forward 50 years requires not only detailed technical and regulatory analysis, but also careful coordination with the public, affected agencies, native tribes, and other stakeholders. The District followed the process shown at right to “filter” options down to the most feasible suite of alternatives for inclusion in the Plan. Throughout the process, detailed analysis and stakeholder advisory group (SAG) outreach informed the development of the Plan.



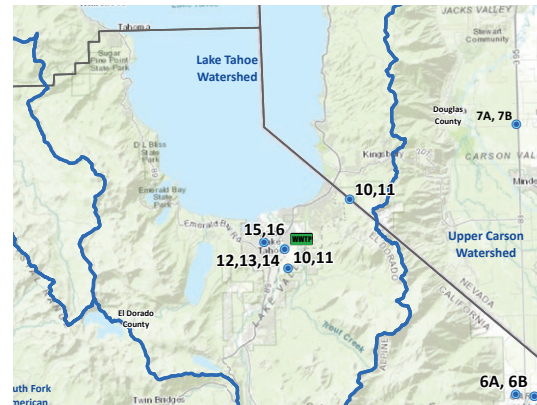
Public Outreach and Stakeholder Workshops
Photo: SAG and Public Meeting, May 2023



Treatment Analysis
Image: Conceptual STPUD WWTP layout for nutrient removal and higher water quality



End-Use Analysis
Image: Potential additional recycled water users in Nevada



Legal and Regulatory Analysis
Image: Locations of some of the initial 16 alternatives analyzed for legal and regulatory feasibility

Plan Development Process Summary

Identified existing and future regulatory constraints/opportunities

Brainstormed wide range of alternatives

Identified the most feasible suite of options through screening process

Additional detail on the suite of alternatives

Multi-criteria ranking of alternatives

The End Result

✓ Decision diagram to support consideration of the alternatives based on changing conditions

✓ Process for using these tools (evaluation and decision diagram) into the future (iterative)

The Path Forward

A plan is only as good as its implementation strategy. The District analyzed and ranked nine alternatives, the first of which represents the “status quo” approach. The other eight represent a variety of improvements to the treatment process, different uses of recycled water, and connections to other recycled water customers. Over the next 50 years, the District will follow a trigger-based decision diagram to periodically re-evaluate and implement the most beneficial and cost-effective alternative(s) based on both opportunities and constraints that arise.

Alternative 1: Status Quo

If Rancher contracts are renewed in 2028 and recycled water demand continues to account for all the District’s recycled water, a status quo or “no project” alternative would continue to benefit both the District and its customers.

Alternatives 2-7A: A Suite of Solutions

If Rancher contracts are **not** renewed, the District’s evaluation of additional alternatives showed that Alternative 2 was the most feasible and beneficial based on current knowledge. The other alternatives evaluated are all feasible and can be re-ranked as the economic, regulatory, and water demand conditions continue to evolve.



Decision-making for the next 50 years. As shown in detail on page 48 and in Appendix C, a Decision Diagram will aid the District in evaluating all the feasible alternatives. This diagram, along with the multi-criteria decision analysis process, can be used to make decisions and score alternatives at a future date.

Existing System

The District's existing wastewater treatment plant (WWTP) processes an annual average of 3.9 million gallons per day (mgd), or 4,370 acre-feet per year (AFY) of treated effluent. The treated effluent meets CA Title 22 regulations for disinfected secondary-23 recycled water. The recycled water is exported out of the Lake Tahoe Watershed and into Harvey Place Reservoir, which is within the Carson River Watershed. Recycled water is stored in Harvey Place Reservoir and used in the summer months for irrigation supply. The end uses of recycled water include:

- Irrigation of hay and alfalfa on the District's Diamond Valley Ranch (DVR) property.
- Irrigation supply for contract irrigators (Ranchers) in Alpine County.

Export Pipeline Route

The export pipeline is approximately 27 miles of cement mortar lined and coal tar epoxy-coated steel pipe. It was constructed in the late 1960s, and major segment replacements were completed in the late 1990s and early 2000s.



1. District WWTP

- Maximum capacity: 7.7 mgd
- Produces 3.9 mgd (annual average) of recycled water
- Constructed in 1956 and upgraded in 1974, 1989, 2012, and 2024
- Biosolids recycled by Bently Agrodynamics in Nevada

2. Luther Pass Pump Station

- Firm capacity: 5,800 gpm
- Constructed in 1967 and upgraded in 2017
- Lifts recycled water approximately 1,260 ft from the pump station elevation (6,480 ft) to the top of Luther Pass (7,740 ft)

3. Hydroelectric Plant

- Installed in 2018
- Can produce 381,000 kW per year (equivalent to 30-40 homes' annual power use)

4. Harvey Place Reservoir

- Clay core earthen dam
- Constructed in 1988
- 3,800 acre-feet of storage
- Typically filled with recycled water during winter and drawn down during summer

5. Diamond Ditch and Recycled Water Users

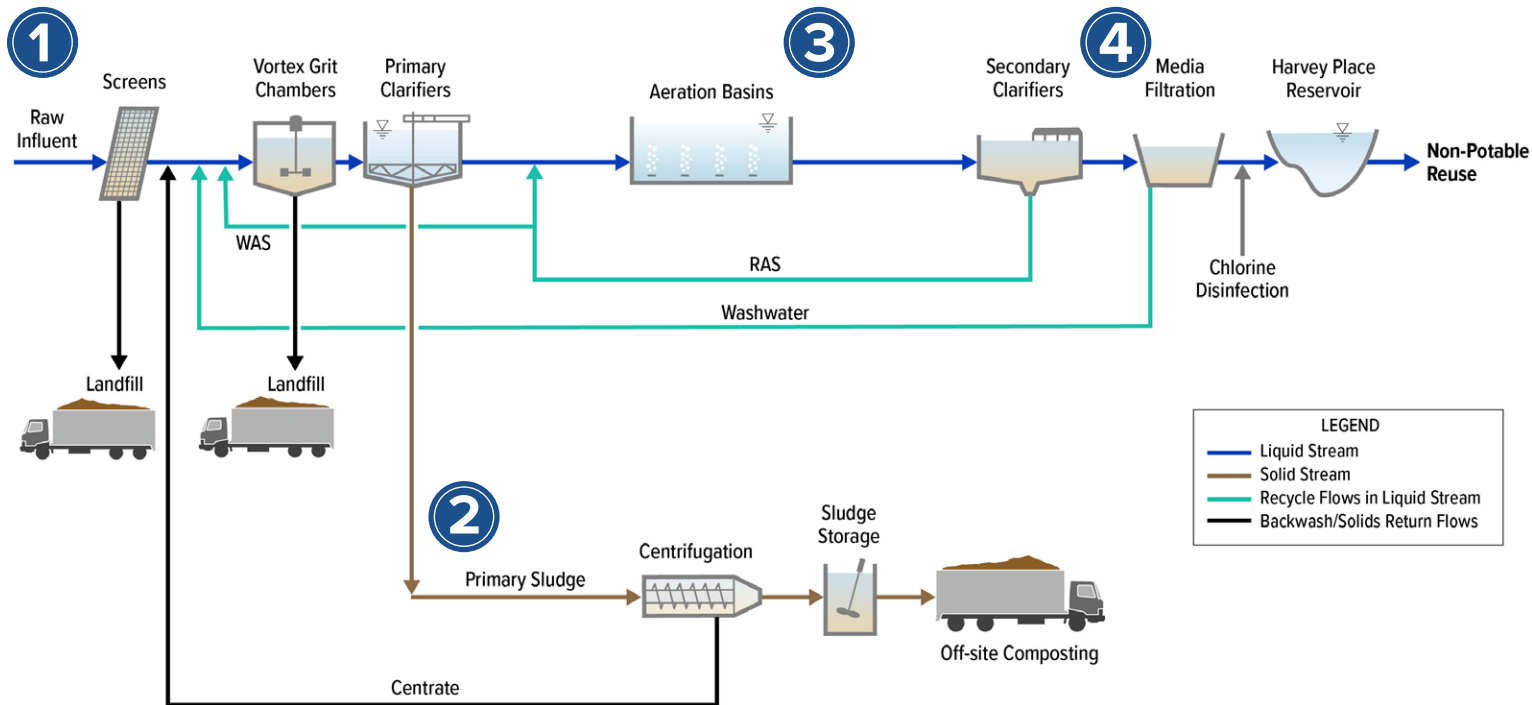
- Recycled water conveyed from Harvey Place Reservoir through Diamond Ditch to recycled water users
- Users include six independent ranch owners and District-owned Diamond Valley Ranch, which grows and sells alfalfa

Wastewater Treatment Plant

The District's WWTP is a 7.7 mgd maximum daily flow advanced secondary treatment facility. It produces a daily average of 3.9 mgd (4,370 AFY) of treated effluent, which meets the California Title 22 regulations for disinfected secondary-23 recycled water. All of the WWTP's effluent is exported out of the Lake Tahoe Watershed, as required by the Porter-Cologne Act of 1969. All of the facility's biosolids are recycled as fertilizer for agricultural land at Bently Agrodynamics in Douglas County, Nevada.



STPUD WWTP Process Flow Diagram



1. Large objects like wood and rocks, as well as smaller solid particles like sand and gravel, are removed and sent to a landfill.
2. Primary sludge, or biosolids, consists of organic and inorganic matter, which is settled out in primary clarifiers and sent off-site to be used as fertilizer.
3. Remaining contaminants are broken down into harmless by-products by bacteria in the aeration basins.
4. Excess bacteria is removed in secondary clarifiers and filter media. The effluent is then disinfected with chlorine and exported out of the Lake Tahoe Watershed.

WWTP Design Parameters, Performance, and Flows

The WWTP currently treats an average daily flow of 3.9 mgd (4,370 AFY), and the estimated future flow is 5.4 mgd (6,050 AFY). The recycled water demand and treatment plant upgrades associated with the alternatives are based on the future flow.

The disinfected secondary-23 effluent produced by the WWTP is the second of four levels of non-potable reuse per California regulations. Disinfected secondary-23 is approved for use in some landscape irrigation applications, as well as non-recreational landscape impoundment and application to pastures used by milking animals.

Treating the recycled water to a higher standard would allow additional approved uses, including irrigation of food crops. Several of the alternatives considered in this Plan require treatment upgrades to meet higher levels of recycled water in California or Nevada. The existing effluent water quality provides a baseline for evaluating treatment processes to meet more stringent limitations associated with some alternatives.

Summary of WWTP Effluent Water Quality

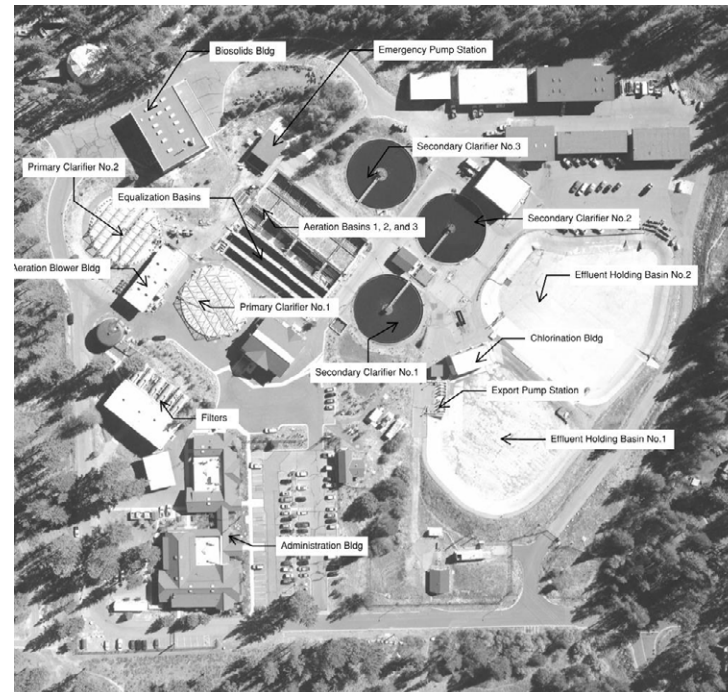
Parameter	Units	Average Value (Based on 2019 to 2020 Data)
Total Dissolved Solids	mg/L	269
Electrical Conductivity	µS/cm	647
Chloride	mg/L	58
Total Nitrogen	mg/L	30
Ammonia	mg/L - N	29
Nitrate	mg/L - N	0.29
Total Phosphorus	mg/L	3.6

California Title 22 Treatment Levels

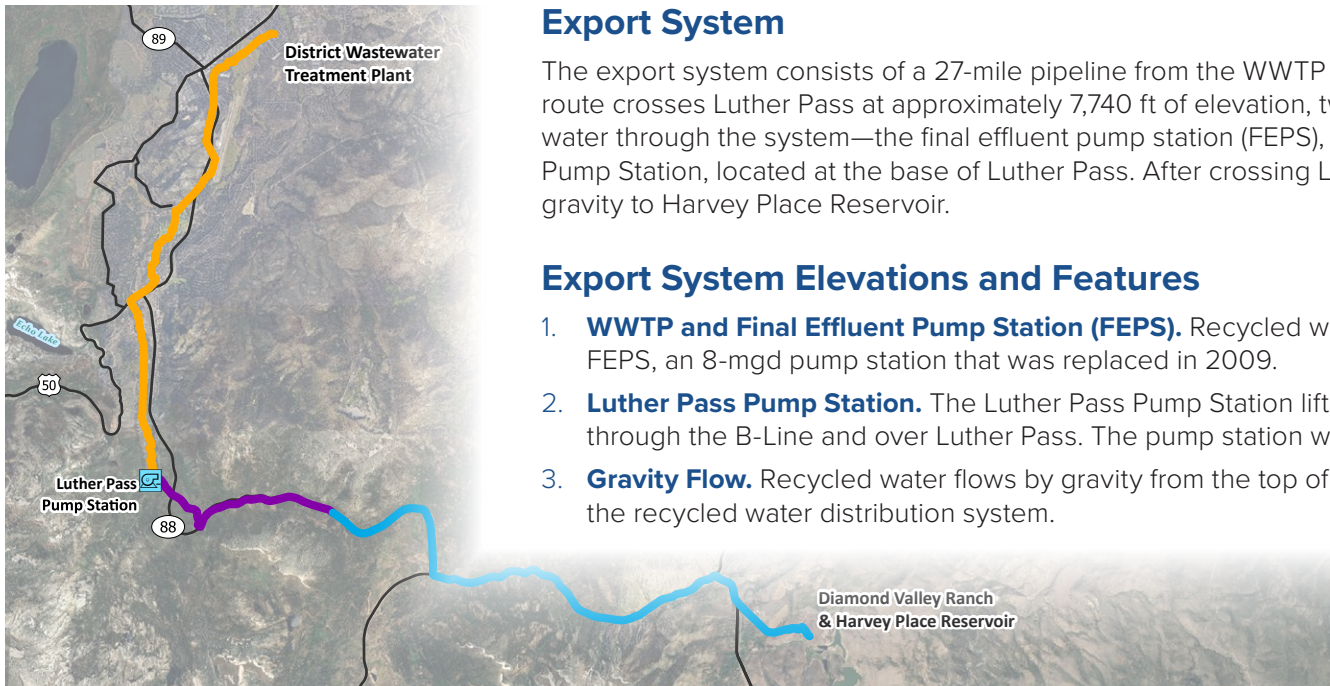
Treatment Level	Approved Uses
Title 22 Disinfected Tertiary Recycled Water	<ul style="list-style-type: none"> Spray Irrigation of Food Crops Landscape Irrigation¹ Non-restricted Recreational Impoundment
Title 22 Disinfected Secondary – 2.2 Recycled Water	<ul style="list-style-type: none"> Surface Irrigation of Food Crops Restricted Recreational Impoundment
CURRENT DISTRICT TREATMENT LEVEL	
Title 22 Disinfected Secondary – 23 Recycled Water	<ul style="list-style-type: none"> Pasture for Milking Animals Landscape Irrigation² Landscape Impoundment
Undisinfected Secondary Recycled Water	<ul style="list-style-type: none"> Surface Irrigation of Orchards and Vineyards³ Fodder, Fiber, Seed Crops

Notes:

1. Includes unrestricted access golf courses, parks, playgrounds, school yards, and other landscaped areas with similar access.
2. Includes restricted access golf courses, cemeteries, freeway landscapes, and landscapes with similar public access.
3. Provided no fruit is harvested that has come in contact with irrigating water or the ground.



Existing WWTP Layout

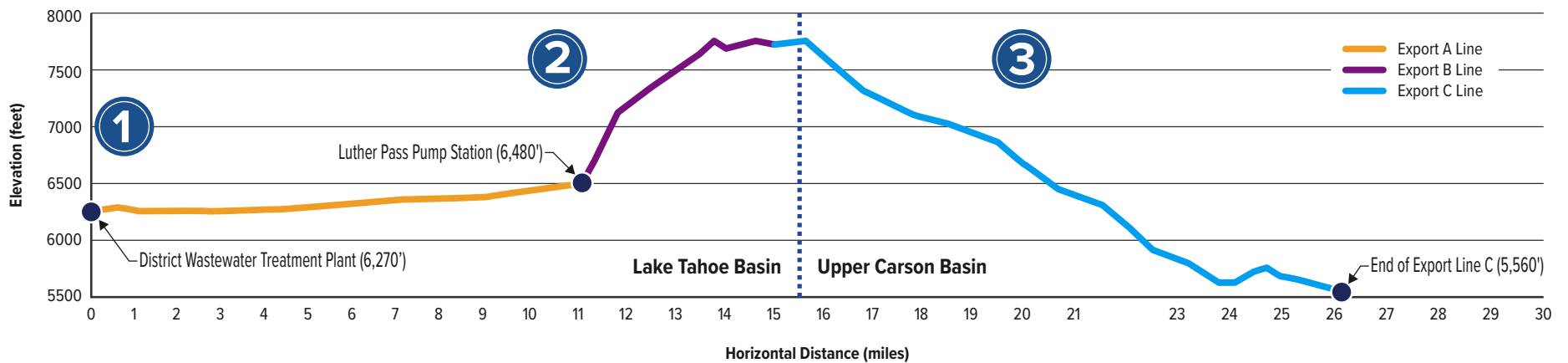


Export System

The export system consists of a 27-mile pipeline from the WWTP to Harvey Place Reservoir. Because the route crosses Luther Pass at approximately 7,740 ft of elevation, two pump stations are required to lift recycled water through the system—the final effluent pump station (FEPS), located at the WWTP, and the Luther Pass Pump Station, located at the base of Luther Pass. After crossing Luther Pass, the recycled water flows by gravity to Harvey Place Reservoir.

Export System Elevations and Features

- WWTP and Final Effluent Pump Station (FEPS).** Recycled water is pumped through the A-Line by the FEPS, an 8-mgd pump station that was replaced in 2009.
- Luther Pass Pump Station.** The Luther Pass Pump Station lifts recycled water approximately 1,260 ft through the B-Line and over Luther Pass. The pump station was most recently upgraded in 2017.
- Gravity Flow.** Recycled water flows by gravity from the top of Luther Pass to Harvey Place Reservoir and the recycled water distribution system.



A-Line

- 10.5 miles
- 30-inch diameter
- Replaced between 1996 and 2000

B-Line

- 4.9 miles
- 24-inch diameter
- Majority replaced in 2001

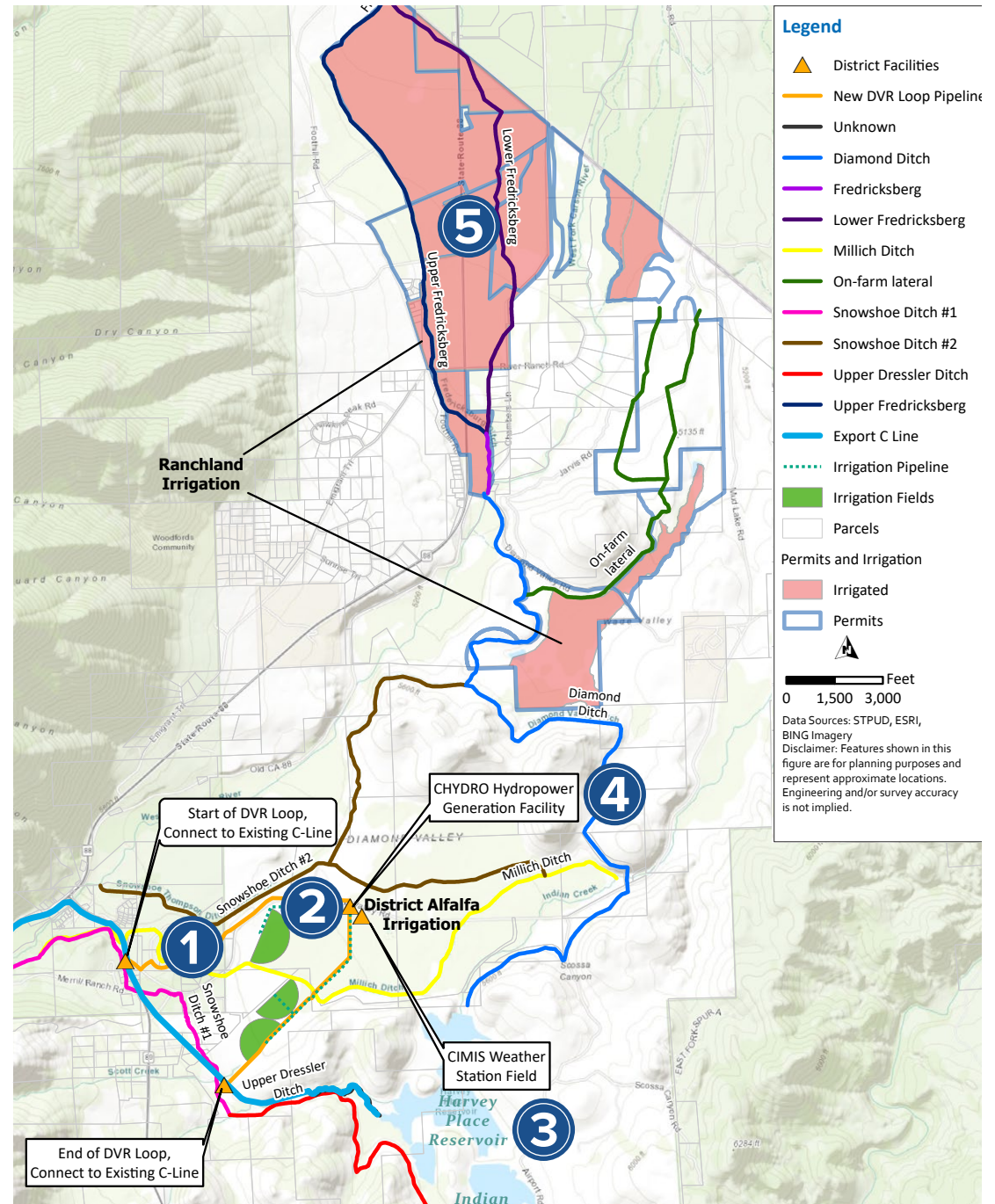
C-Line

- 12 miles
- 18-inch and 21-inch diameter
- Constructed in 1968

Recycled Water Facilities

The export system C-Line ends in the Upper Carson Watershed in Alpine County, California. At the end of the C-Line, recycled water is distributed to District-owned alfalfa fields and privately owned ranchland via the distribution systems described below.

1. **Diamond Valley Ranch Loop.** The District owns the 1,400-acre Diamond Valley Ranch property and uses a portion of the site to grow and sell alfalfa. The alfalfa is irrigated by recycled water from the Diamond Valley Ranch Loop, a pipeline that connects directly to the C-Line.
2. **Hydropower Facility.** The District's CYHDRO facility is located on the Diamond Valley Ranch Loop and generates 381,000 kW per year, which the District sells back to the electric grid.
3. **Harvey Place Reservoir.** The export system ends at Harvey Place Reservoir, a clay core, earthen dam constructed in 1988. The reservoir is typically filled during winter months and drawn down during summer months to supply water to recycled water users via Diamond Ditch.
4. **Diamond Ditch.** Diamond Ditch is used to convey recycled water from Harvey Place Reservoir to ranchland irrigators. It consists of open channels, a section of pipeline, and a double-barrel inverted siphon where it crosses Diamond Valley Road and Indian Creek. Choke points currently limit the capacity of Diamond Ditch to 11 mgd.
5. **Ranchland Irrigation.** Several irrigation laterals distribute water from Diamond Ditch to recycled water application areas on privately owned ranchland. This recycled water use is governed by individual contracts the District has signed with landowners, as well as permits obtained by landowners with the Lahontan Regional Water Quality Control Board. The recycled water is permitted for irrigation of fodder, fiber, and seed crops, as well as pasture irrigation for animals.



Recycled Water System Photos



STPUD Wastewater Treatment Plant



Luther Pass Pump Station



Harvey Place Reservoir Area



Rancher Irrigation Canal



District Alfalfa Fields



Recycled Water Distribution Infrastructure

Existing System Regulations

The District’s existing system is subject to regulatory requirements associated with the treatment and reuse of domestic sewage. In addition, the District must comply with laws and contractual agreements associated with the end uses of recycled water in Alpine County. There are several laws, regulations, and agreements that have directly or indirectly influenced the configuration and operation of the existing treatment and export system. These are summarized below.

Agency	Statute / Regulation / Agreement	Description	Appendix A Section Reference
State of California	Porter-Cologne Act	<ul style="list-style-type: none"> Required for export of effluent outside the Lake Tahoe Basin. 	III.B.1.A IV.A.1
Tahoe Regional Planning Agency	Tahoe Regional Planning Agency Code of Ordinances Chapter 60, and Tahoe Regional Planning Agency Regional Plan	<ul style="list-style-type: none"> Prohibitions on the discharge of effluent (surface waters, groundwater, and land) in the Lake Tahoe Basin. 	IV.A.2.a,b,c
Lahontan Regional Water Quality Control Board	Water Quality Control Plan	<ul style="list-style-type: none"> Basis for the Lahontan Regional Water Quality Control Board regulatory program. Requires export of wastewater from the Lake Tahoe Watershed. 	III.B.1.A
Lahontan Regional Water Quality Control Board	Waste Discharge Requirements and Water Reclamation Requirements	<ul style="list-style-type: none"> Specifies that the effluent must meet disinfected secondary-23 standards, per California Code of Regulations Title 22, Section 60301.225. Specifies District effluent disposal locations and use of recycled water for irrigation on District-owned property. Specifies non-District water recycling permit holders (total of six), approximate use of recycled water, and acreage of irrigated area. 	IV.B.1.a
Federal, States of California and Nevada	Public Law 101-618, Truckee-Carson-Pyramid Lake Water Rights Settlement Act, California-Nevada Interstate Compact	<ul style="list-style-type: none"> Governs the allocation of water rights between California and Nevada. 	IV.A.4
States of California and Nevada	Alpine Decree	<ul style="list-style-type: none"> Adjudicated water rights on the California and Nevada portions of the Carson River. 	IV.A.4
State Water Resources Control Board	Title 22 Code of Regulations	<ul style="list-style-type: none"> Approved recycled water uses and associated treatment requirements. 	III.B.1.b
Ranchers in Alpine County	Recycled Water Use Contracts	<ul style="list-style-type: none"> Contracts with individual Ranchers describing type of use and quantity of recycled water. 	IV.B.4

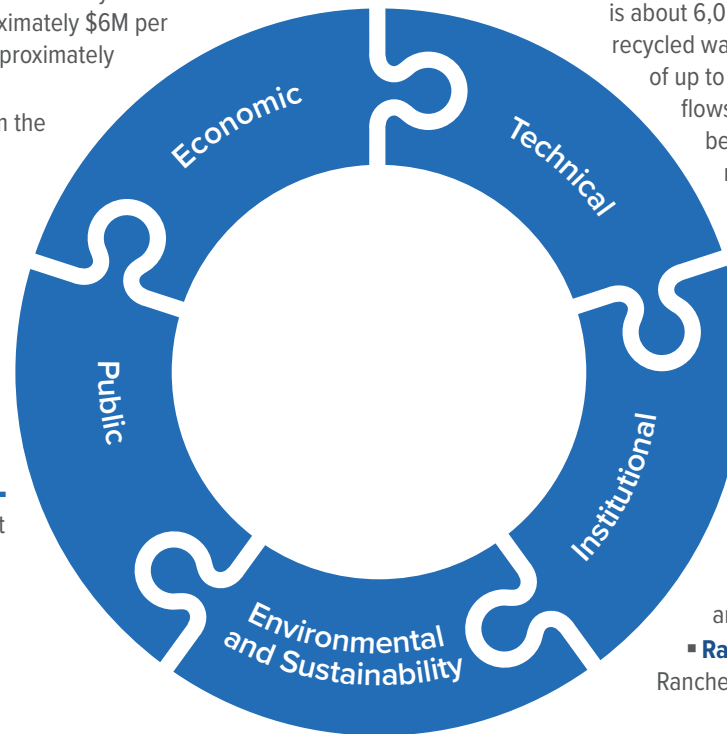
Existing System Challenges

The existing system has served the District well for decades. The system complies with all local, state, and federal regulations, and it recycles 100 percent of the District’s wastewater and biosolids. The drivers for this Plan and for considering alternatives to the existing system stem from a handful of challenges associated with the existing system, which are summarized below.

Notes: Abbreviations: M - million; MWh - megawatt hours; O&M - operations and maintenance.

- **Annual O&M** – Annual O&M cost for the wastewater treatment system (collection, treatment, export, recycled water) is approximately \$6M per year. Annual cost for energy for export accounts for approximately \$1.2M per year of the total annual O&M cost.
- **Revenue** – The District generates limited revenue from the sale of hay and alfalfa.
 - » The District does not generate any revenue from the recycled water provided to the Ranchers. This is based on existing agreements between the District and the Ranchers, where a fee for recycled water is not included.

- **Cost of Service** – General public concern with the cost of service to treat and export effluent out of the Lake Tahoe Watershed.



- **Aging Infrastructure** – Continued operation of the existing WWTP, export system, and recycled water system will require continued investment for repair and replacement to maintain District established level of service.
- **Recycled Water Use Capacity** – The total recycled water use capacity is about 6,050 AFY. This is the combination of maximum delivery of recycled water to the Ranchers of 5,800 AFY, and an approximate use of up to 250 AFY by the District in DVR. Projected future effluent flows are 5.4 mgd (6,050 AFY). If future effluent flows increase beyond 6,050 AFY, then there would be no available buffer of recycled water end use capacity.

- **Agreement with Alpine County** – There is ongoing legal action over the provisions of 1967 Agreement (and amendments) between the District and Alpine County.
- **Rancher Contracts** – The agreements between the District and Ranchers will expire in 2028.

- **Energy Consumption** – The annual energy demand for the export system is 6,680 MWh.
- **Alternative Approaches** – Internal and external stakeholders have provided input on potential alternatives approaches to recycled water treatment and use.

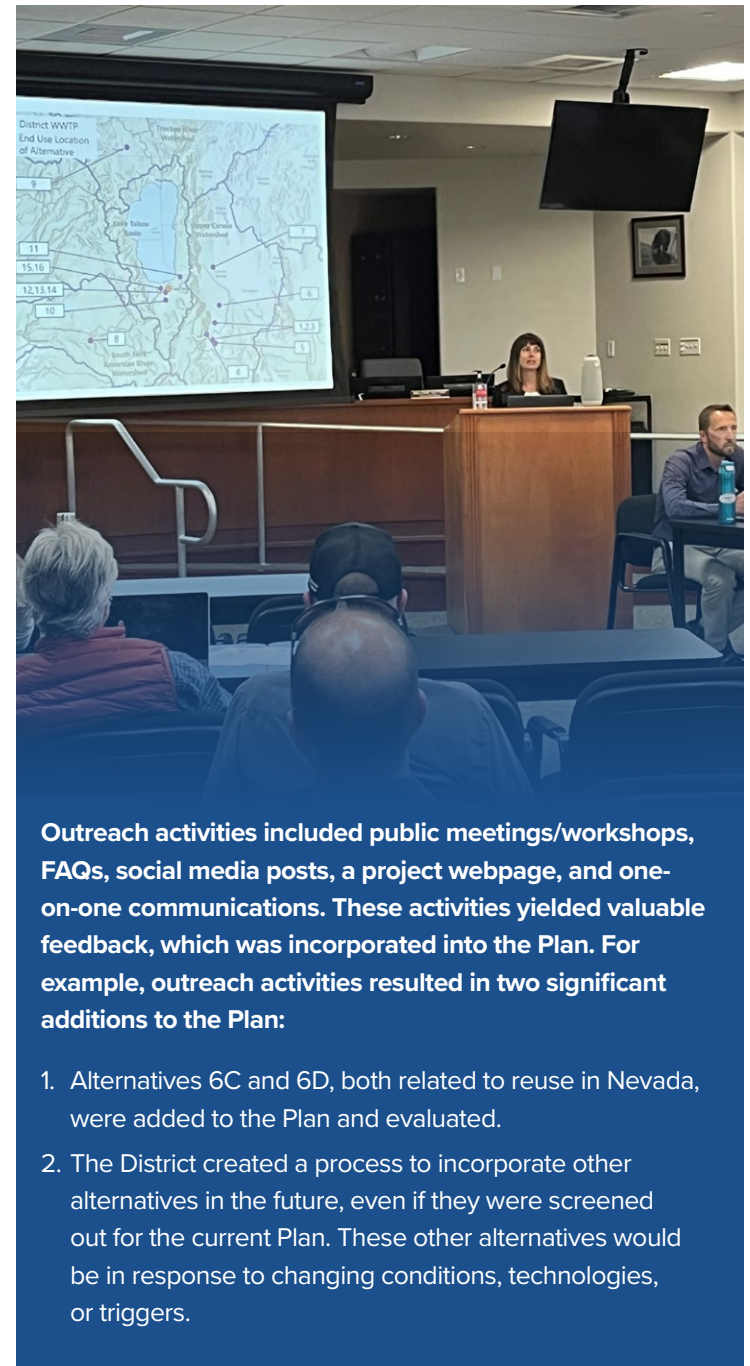
Public Outreach

The District conducted public outreach as part of the Plan activities, milestones, and decision points. The objectives of that outreach were:

- Build trust and confidence in the District and its departments as a provider of high quality, safe, and reliable recycled water.
- Achieve public understanding of recycled water.
- Explain the District's efficiency in handling recycled water and utilizing ratepayers' funds to find solutions.
- Receive stakeholder and public feedback.
- Be inclusive and transparent in sharing information through stakeholder and public workshops and posting information on the project webpage.

To facilitate inclusivity and transparency, the District formed a Stakeholder Advisory Group (SAG) and held 17 meetings between 2022 and 2024 with SAG members, additional stakeholders, and the public to gather feedback. SAG members included:

- Alpine Watershed Group.
- California Tahoe Conservancy.
- Carson Water Subconservancy District (CWSD).
- City of South Lake Tahoe.
- Douglas County Lake Tahoe Sewer Authority (DCLTSA).
- El Dorado County.
- Incline Village General Improvement District.
- Lahontan Regional Water Quality Control Board (LRWQCB).
- League to Save Lake Tahoe.
- Lukins Brothers (also representing Tahoe Keys Water).
- Nevada Division of Environmental Protection (NDEP).
- Nevada Division of Water Resources (NDWR).
- Sierra-at-Tahoe.
- Sierra Nevada Alliance.
- Tahoe Environmental Research Center.
- Tahoe Regional Planning Agency (TRPA).
- Tahoe Resource Conservation District.
- Tahoe Water Suppliers Association.
- United States Forest Service (USFS).
- Washoe Tribe of Nevada and California (Washoe Tribe).



Outreach activities included public meetings/workshops, FAQs, social media posts, a project webpage, and one-on-one communications. These activities yielded valuable feedback, which was incorporated into the Plan. For example, outreach activities resulted in two significant additions to the Plan:

1. Alternatives 6C and 6D, both related to reuse in Nevada, were added to the Plan and evaluated.
2. The District created a process to incorporate other alternatives in the future, even if they were screened out for the current Plan. These other alternatives would be in response to changing conditions, technologies, or triggers.

Identification and Screening of Alternatives

Identification

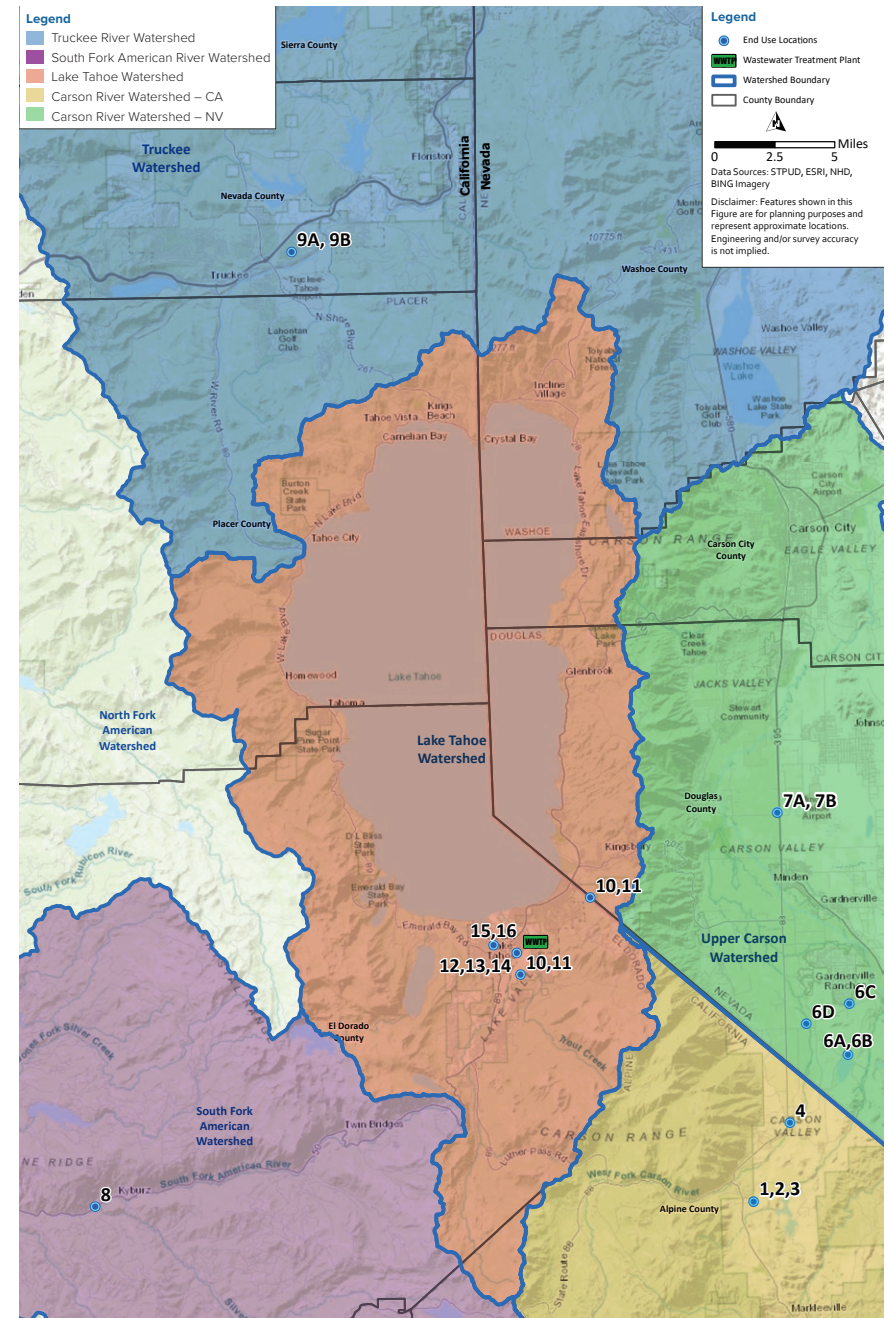
The alternatives identification and screening analysis was conducted by the District's project team. In addition, throughout the process, the District engaged the SAG and the general public to provide information and to solicit feedback. Sixteen alternatives (some with sub-alternatives) were initially developed. The alternatives are shown on the map at right and include a range of recycled water discharge and end use locations. The recycled water end use locations are in California and Nevada, and within four watersheds.

Screening Approach

The alternatives screening analysis consisted of a high-level, relative comparison of the justification/benefits and key issues/challenges of each alternative. The qualitative assessment was based on six screening criteria.

1. **Technical:** Pertaining to the technical challenges with implementing and operating treatment processes and infrastructure.
2. **Watershed and Regional Regulatory and Legal:** Regulatory and legal issues associated with the broader watershed/State location of the discharge and end use of recycled water.
3. **Alternative Specific Regulatory and Institutional:** Related to the specific regulatory and institutional requirements for an alternative based on the specific discharge location, end use location, and end use type.
4. **Environment and Sustainability:** Pertaining to environmental impacts of construction and operation, as well as sustainability issues with a specific focus on energy demands.
5. **Economic:** Qualitative assessment of capital and O&M costs associated with treatment and infrastructure.
6. **Public Acceptance:** Pertaining to general concerns the public may have about any of the topics listed above and others.

Initial Sixteen Alternatives



Identified Alternatives

Alt. No.	Name	Description
2	Expanded Disinfected Secondary-23 Delivery in Alpine County	Transmission over Luther Pass to Harvey Place Reservoir. Existing treatment would allow use for irrigation of landscape or pastureland. This alternative would serve new users or expand use with additional District facilities.
3	Expanded Disinfected Tertiary Reuse in Alpine County	Transmission over Luther Pass to Harvey Place Reservoir. Additional treatment would allow use for landscape and agricultural irrigation. This alternative would serve new users or expand use with additional District facilities.
4	Discharge to West Fork of Carson River and Use in Nevada	Transmission over Luther Pass to Harvey Place Reservoir with new discharge piping to the West Fork Carson River in California. Additional treatment would allow water to travel in the river to Nevada for potential utilization by downstream users.
5	Groundwater Recharge for Disposal in Alpine County	Transmission over Luther Pass to inject effluent into the Carson Valley Groundwater Basin in Alpine County. This alternative is a disposal mechanism and there is not technically an end use associated with it. Additional treatment of water would be required.
6A	Expanded Class A or B Reuse in Nevada via Indian Creek	Transmission over Luther Pass to Harvey Place Reservoir to Indian Creek. Additional treatment would allow transmission to Nevada via Indian Creek for potential utilization by downstream users.
6B	Expanded Class A or B Reuse in Nevada via Pipeline Conveyance	Transmission over Luther Pass to Harvey Place Reservoir, then to Mud Lake. From Mud Lake, transmission to Nevada via a new transmission pipeline for potential utilization by downstream users. Additional treatment of water would be required.
7A	Treated Effluent Conveyance to DCLTSA	Transfer of treated wastewater to DCLTSA. DCLTSA has existing effluent piping to land-applied irrigation sites and reservoir storage. Additional treatment of water would be required.
7B	Raw or Partially Treated Effluent to DCLTSA	Transfer of raw or partially treated wastewater to DCLTSA. Water would be treated at the DCLTSA WWTP and sent via their existing effluent piping to land applied irrigation sites and reservoir storage.
8A	Recycled Water for Irrigation in South Fork American River Watershed	Transmission to recycled water users in the South Fork American River watershed, via a new conveyance pipeline. Additional treatment of water would be required.
8B	Discharge to South Fork American River	Transmission to South Fork American River via a new conveyance pipeline. Water could potentially be utilized by downstream users. Additional treatment of water would be required.
9A	Treated Effluent Conveyance to T-TSA	Transfer of treated wastewater to T-TSA. Water would ultimately be discharged into the Truckee River for potential downstream use. Additional treatment of water would be required.
9B	Raw or Partially Treated Effluent Conveyance to T-TSA	Transfer of raw or partially treated wastewater to T-TSA. Water would be treated at the T-TSA WWTP and would ultimately be discharged into the Truckee River for potential downstream use.
10	Land Application (Landscape Irrigation) in Lake Tahoe Basin	Reuse in the Tahoe Basin for urban irrigation. Additional treatment of water would allow irrigation by major customers, including local parks and golf courses.
11	Land Application (Snowmaking) in Lake Tahoe Basin	Reuse in the Tahoe Basin for snowmaking at local ski resorts. Additional treatment of water would be required.
12	Discharge to Waters in Lake Tahoe Basin (Heavenly Valley Creek)	Transmission of treated water to Heavenly Valley Creek for potential utilization by downstream users. Additional treatment of water would be required.
13	Discharge to Waters in Lake Tahoe Basin (Trout Creek)	Transmission of treated water to Trout Creek for potential utilization by downstream users. Additional treatment of water would be required.
14	Discharge to Waters in Lake Tahoe Basin (Upper Truckee River)	Transmission of treated water to the Upper Truckee River for potential utilization by downstream users. Additional treatment of water would be required.
15	Indirect Potable Reuse (IPR) in Lake Tahoe Basin	Advanced treatment and injection into the Tahoe Valley South Groundwater Subbasin. Water would be reused as a source of drinking water supply for the existing domestic and municipal wells in the basin.
16	Direct Potable Reuse (DPR) in Lake Tahoe Basin	Advanced treatment for a DPR supply within the District water supply system.

Screening of the Alternatives

Screening was based on an assessment of the relative degree of challenge, on a relative scale of 1 to 4, where:

- 1 = low level of difficulty (green)
- 2 = moderate level of difficulty (yellow)
- 3 = moderately high level of difficulty (orange)
- 4 = high level of difficulty (red)

One of the most important criteria in the alternatives screening/evaluation process is the watershed/regional scale regulatory and legal constraints. As the location (i.e., watershed) of the end use of recycled water significantly influences the feasibility of implementation, this screening criteria was considered very important relative to the other criteria.

1. High

Key Issues include a requirement to modify the Porter-Cologne Act, a Basin Plan Amendment, and modification of TRPA Code of Ordinances.

2. Moderately High

Key Issues include interstate water rights and agreements, stringent water quality objectives for the South Fork American River, and limitations on discharge locations.

3. Moderately High

Key Issues include interstate water rights and agreements, and stringent water quality objectives for the Truckee River.

4. Low

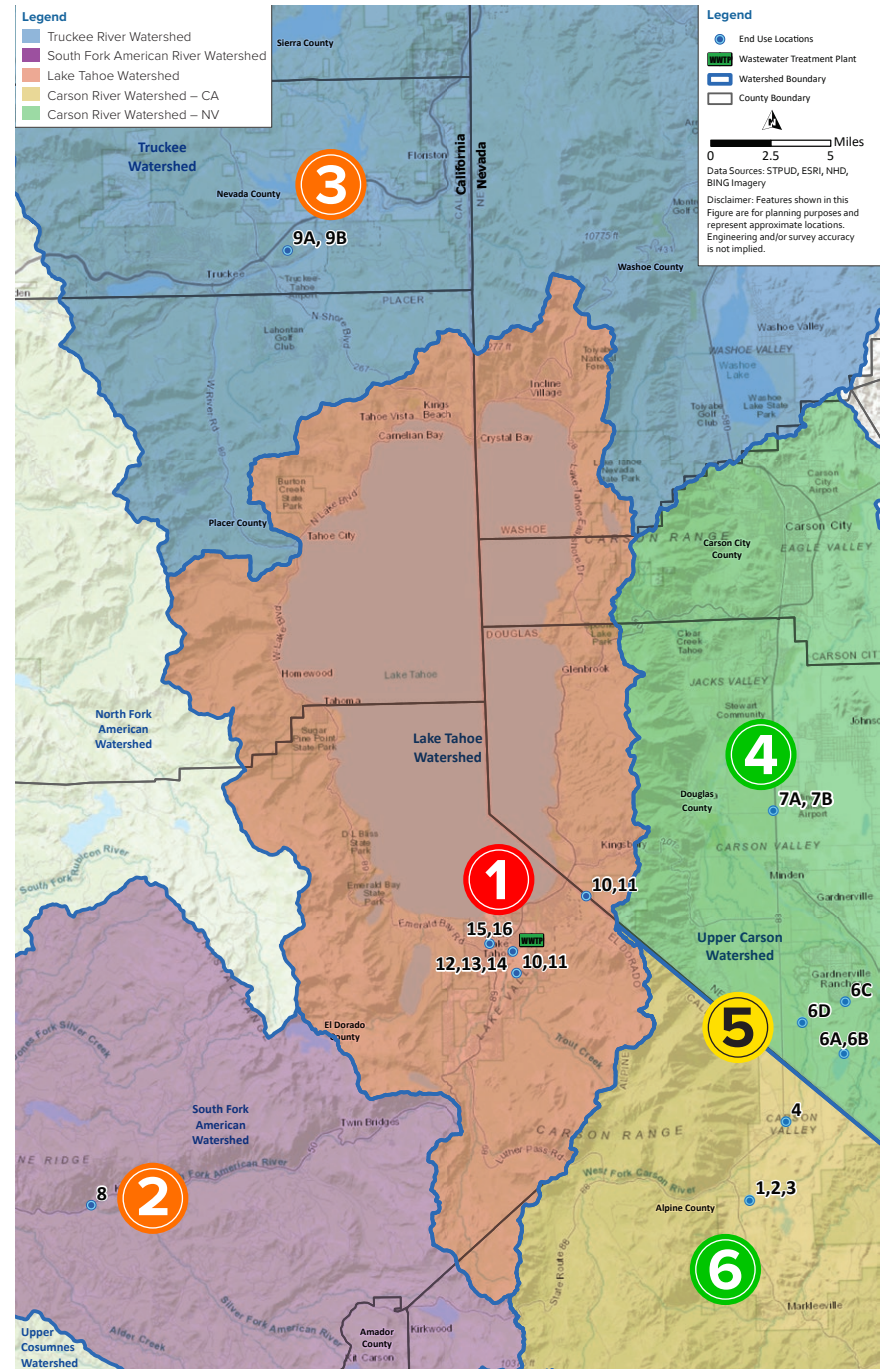
Key issues include interstate water rights and agreements.

5. Moderate

Key Issues include West Fork Carson River total maximum daily loads (TMDLs), and stringent water quality objectives.

6. Low

Key issues include ordinances and agreements associated with recycled water use in Alpine County.



Screening Results

The alternatives were screened by the District project team, with input from the SAG and the public. The qualitative screening was based on the potential benefit/justification of an alternative, along with the anticipated challenges and issues associated with implementing that alternative. Alternatives were screened into two general categories:

- **Low Potential Alternatives** – No significant additional evaluation of this alternative is included as part of the Plan.
- **High Potential Alternatives** – Additional evaluation of this alternative is included as part of the Plan.

No.	Alternative Name	Level of Challenge								
		Watershed and Regional Regulatory and Legal	Alternative-Specific Regulatory and Institutional	Technical-Treatment Level	Technical-Infrastructure (Conveyance and Treatment Facility Capacity)	Environmental/Sustainability	Public Perception	Economic	Recycled Water Capacity Limitation	Included in Evaluation Phase (Y/N)
1	Existing System	Green	Yellow	Green	Green	Green	Yellow	Green		Y
2	Expanded Disinfected Secondary-23 Delivery in Alpine County	Green	Yellow	Green	Green	Green	Yellow	Green	Yellow	Y
3	Expanded Disinfected Tertiary Reuse in Alpine County	Green	Yellow	Yellow		Yellow	Yellow	Green	Orange	Y
4	Discharge to West Fork of Carson River and Use in Nevada	Yellow	Orange	Orange		Yellow	Orange	Yellow	Yellow	Y
5	Groundwater Recharge for Disposal in Alpine County	Green	Red	Red	Orange	Orange	Red	Orange	Green	N
6A	Expanded Class A or B Reuse in Nevada via Indian Creek	Green	Orange	Yellow	Green	Green	Yellow		Green	Y
6B	Expanded Class A or B Reuse in Nevada via Pipeline Conveyance	Green	Orange	Yellow	Yellow	Yellow			Green	Y
7A	Treated Effluent Conveyance to DCLTSA	Green	Orange	Orange	Yellow	Yellow			Green	Y
7B	Raw or Partially Treated Effluent to DCLTSA	Green	Red	Orange	Red	Red	Yellow	Yellow	Green	N
8A	Recycled Water for Irrigation in South Fork American River Watershed	Yellow	Orange	Yellow	Orange	Orange	Orange	Orange	Orange	N
8B	Discharge to South Fork American River	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Green	N
9A	Treated Effluent Conveyance to T-TSA	Orange	Red	Red	Red	Red	Red	Red	Yellow	N
9B	Raw or Partially Treated Effluent Conveyance to T-TSA	Orange	Red	Red	Orange	Orange	Red	Red	Yellow	N
10, 11	Landscape Irrigation and Snowmaking in Lake Tahoe Basin	Red	Red	Red	Red	Red	Orange	Orange	Yellow	N
12, 13, 14	Discharge to Waters in Lake Tahoe Basin	Red	Red	Red	Yellow	Yellow	Red	Orange	Yellow	N
15	Indirect Potable Reuse in Lake Tahoe Basin	Red	Red	Red	Orange	Orange	Red	Orange	Green	N
16	Direct Potable Reuse in Lake Tahoe Basin	Red	Red	Red	Orange	Orange	Red	Red	Green	N

Descriptions of High-Potential Alternatives

The alternatives screening process reduced the number of alternatives from the initial list of 16 to the six most feasible alternatives. A more detailed evaluation of the six alternatives was conducted. As part of that process, two additional alternatives were identified by the SAG for more detailed evaluation. The following pages include fact sheets for the eight alternatives, listed below.

Alternative 1: Existing System / “No Project”	18
Alternative 2: Expanded Disinfected Secondary-23 Delivery in Alpine County	21
Alternative 3: Expanded Disinfected Tertiary Reuse in Alpine County.....	23
Alternative 4: Discharge to West Fork Carson River and Use in Nevada.....	27
Alternative 6A: Expanded Class A or B Reuse in Nevada via Discharge to Indian Creek.....	30
Alternative 6B: Expanded Class A or B Reuse in Nevada via Discharge to Mud Lake	33
Alternative 6C: Indirect Potable Reuse in Nevada	36
Alternative 6D: Expanded Reuse in Nevada via Direct Delivery	39
Alternative 7A: Treated Effluent Conveyance to DCLTSA with Reuse in Nevada	42

Alternative 1: Existing System / “No Project”

Description

Alternative 1 is currently in use and is therefore considered the “No Project” alternative. The District’s existing system consists of primary and advanced secondary treatment of wastewater at the District Wastewater Treatment Plant (WWTP). The WWTP processes an annual average of 3.9 mgd of treated effluent. The treated effluent meets CA Title 22 regulations for disinfected secondary 23 recycled water (disinfected secondary-23). The recycled water is then exported out of the Lake Tahoe Watershed over Luther Pass through the export pipeline and discharged into Harvey Place Reservoir, which is in Alpine County and within the Carson River Watershed. Recycled water is stored in Harvey Place Reservoir and used in the summer months for irrigation supply.

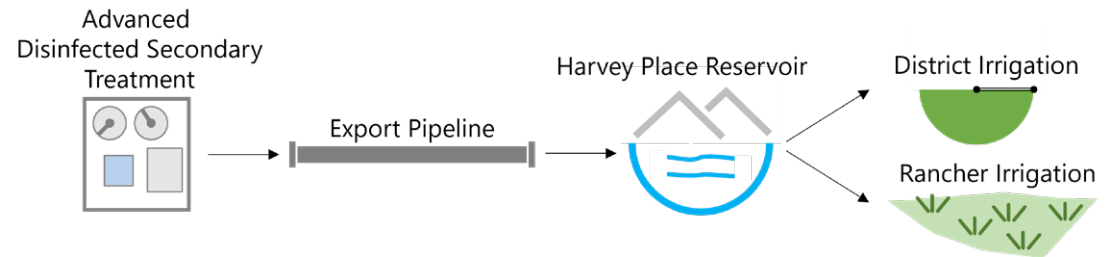
The end uses of recycled water include:

- Irrigation of hay and alfalfa on the District’s Diamond Valley Ranch (DVR) property.
- Irrigation supply for Ranchers in Alpine County.

Alternative 1 Potential Users

Users/Areas	Estimated Demand (AFY)
Diamond Valley Ranch (District-owned)	200
Six Privately Owned Ranches	5,800

Alternative 1 Schematic (Existing System)



Alternative 1 Costs

Component	Capital Costs (\$M)	O&M Costs (\$M/yr) ⁽¹⁾
Existing Treatment at WWTP	\$0	\$3.9
Export System	\$0	\$1.6
TOTAL COSTS	\$0	\$5.5

Notes:

1. These costs are based on the District’s current adopted FY 24/25 budget as well as energy costs associated with these facilities.



Triggers to Implement Alternative 1

The following triggers may give the District reason to continue implementing this alternative:

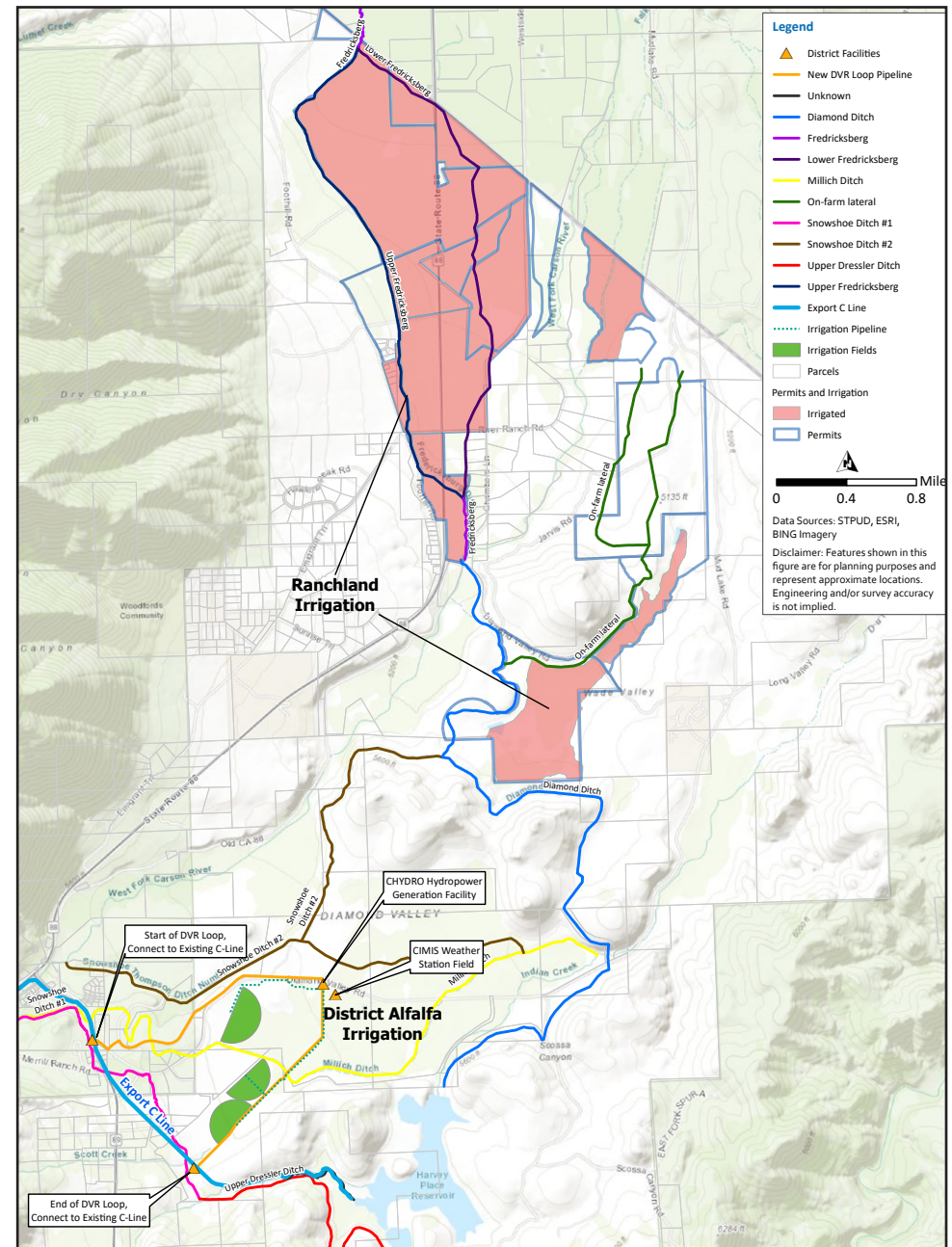
- Rancher contracts are renewed in 2028.
- Recycled water production does not exceed demands from Ranchers and District DVR irrigation.

Alternative 1 Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued use and maintenance of export system, including potential investment in aging pipeline segments. The A-Line segment was replaced between 1996 and 2000, the B-Line segment was replaced between 1996 and 2005, and the C-Line segment has not been improved, although the District has found some deficiencies based on a 2012 condition assessment, which have not yet been addressed.
- Continued use and maintenance of the Harvey Place Reservoir, Diamond Ditch, and District irrigation infrastructure.

Alternative 1 Existing System Recycled Water End Use

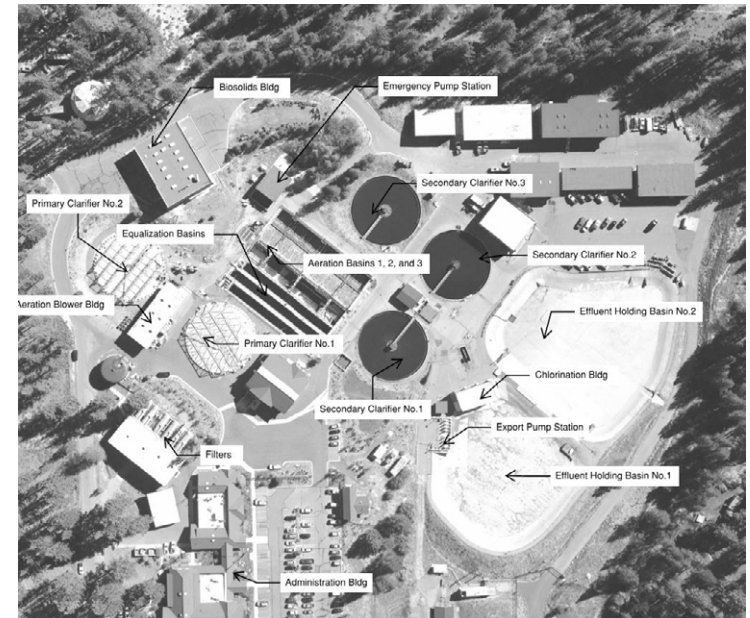


Alternative 1 Recycled Water Treatment Key Components

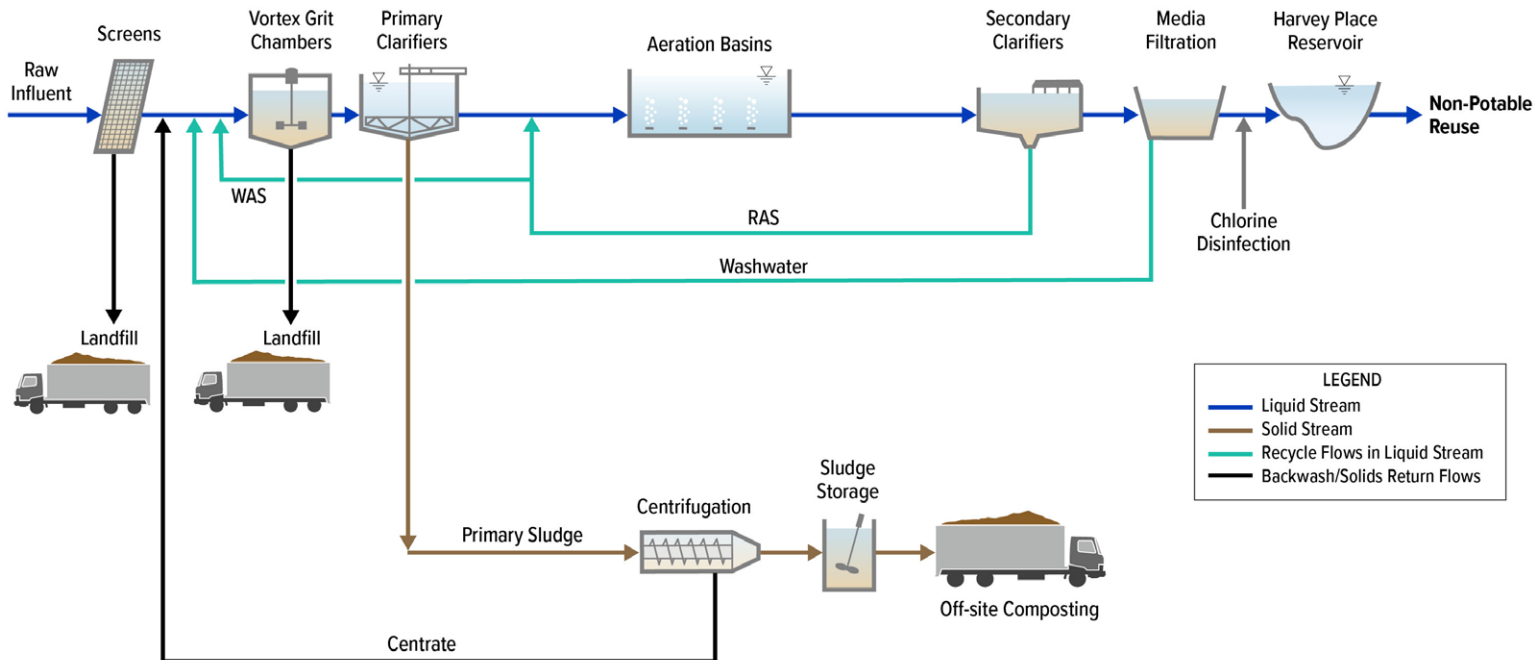
Key components of this alternative include:

- Continued use and maintenance of the existing WWTP in its current configuration.

Alternative 1 Recycled Water Treatment Layout (Existing)



Alternative 1 Recycled Water Treatment Process (Existing)



Alternative 2: Expanded Disinfected Secondary-23 Delivery in Alpine County

Description

Alternative 2 builds off the existing recycled water system with expanded reuse in Alpine County. Both the discharge and end uses of recycled water would be in the California portion of the Carson River Watershed. This alternative would involve providing disinfected secondary-23 to existing users, along with either providing recycled water to new users in the vicinity of the existing operations, and/or expanding recycled water use on District-owned properties. Disinfected secondary-23 is limited to the following approved uses:

- Pastureland for milking or non-milking animals.
- Restricted landscape irrigation.
- Landscape impoundment (i.e., water storage, not for recreational use).

Alternative 2 Potential Users

Users/Areas	Estimated Demand (AFY)
Four new privately owned users and additional District irrigation	3,774
Washoe Tribe	1,424 ⁽¹⁾

Notes:

1. Demand is theoretical. Amount of acreage that might be able to utilize recycled water is uncertain at this time.

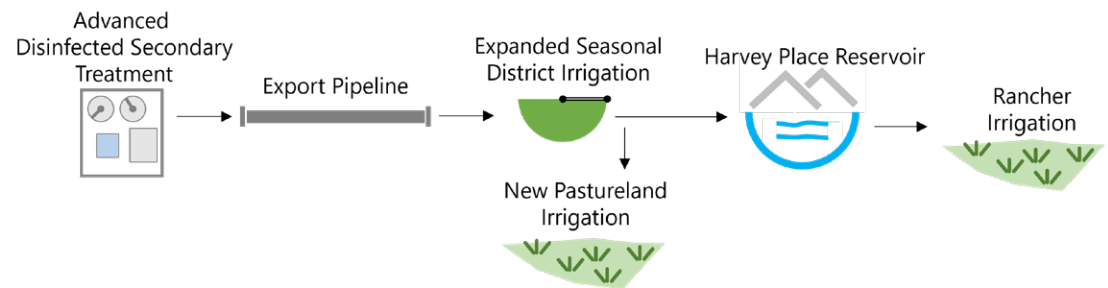
Alternative 2 Costs

Component	Capital Costs ⁽¹⁾ (\$M)
New District irrigation fields at DVR	\$13.6
Distribution pipelines	\$4.2
TOTAL COSTS	\$17.8

Notes:

1. Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.

Alternative 2 Schematic



Triggers to Implement Alternative 2

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District expands irrigation operations at DVR to increase revenue or for another reason.
- The District wishes to generate revenue by selling disinfected secondary-23 water.
- The District desires additional flexibility and capacity for recycled water uses.
- New users for disinfected secondary-23 water are identified.



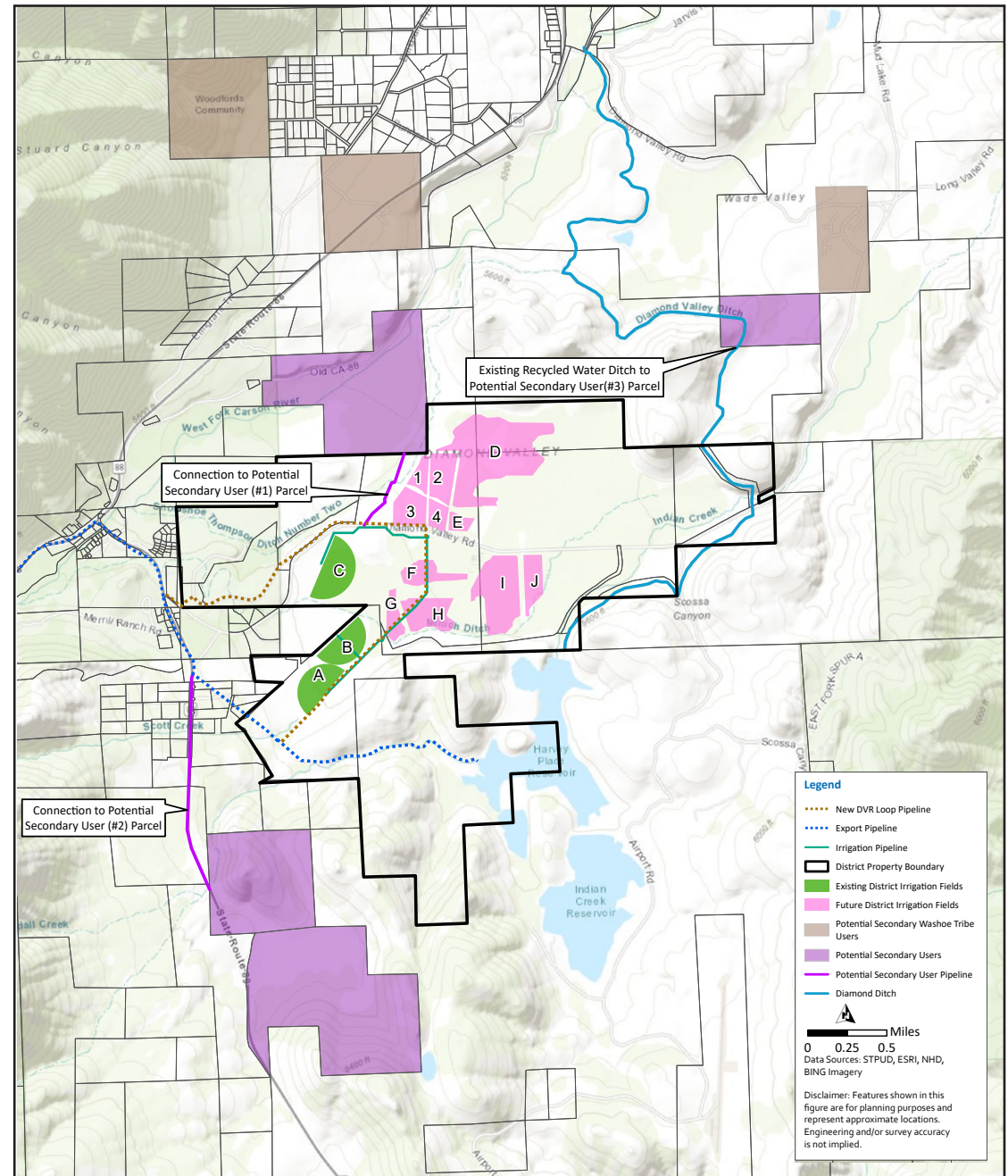
Alternative 2 Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- Additional infrastructure to expand District recycled water use in DVR.
- Recycled water could be delivered either via the existing ditch system at DVR or through direct delivery via new irrigation pipelines off the new DVR Loop Pipeline or the C-Line. Delivery to water users from the C-Line is dependent on whether the LPPS is pumping, and whether the C-Line has water in it.
- Expansion of the ditch system may be required to deliver recycled water to one of the new users.
- New conveyance infrastructure to deliver recycled water to new users would also be required. Approximately 1.53 miles of new irrigation piping would be required to serve these two users.
- New conveyance infrastructure to the Washoe Tribe parcels would also be required. Given the elevation of the western-most Washoe Tribe parcels, pumping may also be required. Due to the uncertainty of recycled water use for these parcels, conceptual infrastructure alignments and cost estimates have not been prepared at this time.

Alternative 2 does not require treatment modifications to the existing WWTP.

Alternative 2 Potential Recycled Water Users



Alternative 3: Expanded Disinfected Tertiary Reuse in Alpine County

Description

Alternative 3 would expand recycled water reuse in Alpine County through the use of disinfected tertiary recycled water. The discharge and end uses of recycled water would be in the California portion of the Carson River Watershed.

By upgrading the treatment process to produce disinfected tertiary recycled water, the District would be able to implement unrestricted non-potable reuse. The disinfected tertiary recycled water could be used for the existing uses (currently served by disinfected secondary-23) as well as the following additional uses:

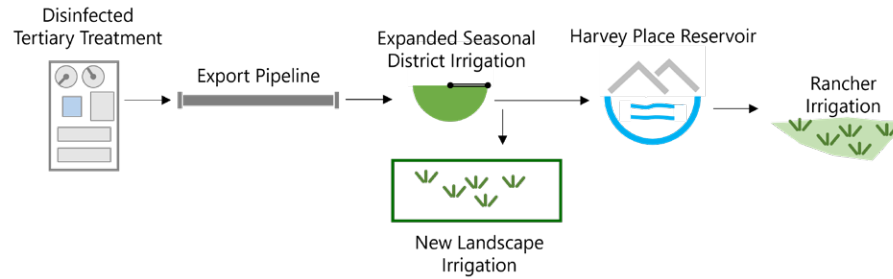
- Landscape irrigation.
- Surface and spray irrigation of food crops.
- Non-restricted recreational impoundment (i.e., water storage, appropriate for recreational use).

In this alternative, disinfected tertiary recycled water would be conveyed to Harvey Place Reservoir via the existing export system for Rancher irrigation and new landscape irrigation. Provided that 100 percent of the recycled water conveyed to Harvey Place Reservoir was treated to disinfected tertiary standards, then it would be possible for the reservoir to be used for recreational activities.

Alternative 3 Costs

Component	Capital Costs ⁽¹⁾ (\$M)	O&M Costs (\$M/yr) ⁽²⁾
Cost Estimate for Treatment at WWTP		
Treatment at WWTP	\$86.0	\$0.8
Distribution Pipelines	\$1.7	-
TOTAL COSTS	\$87.7	\$0.8
Cost Estimate for Split Treatment at DVR ⁽³⁾		
Split Treatment at DVR	\$13.0	\$0.1
Distribution Pipelines ⁽⁴⁾	\$1.7	-
TOTAL COSTS	\$14.7	\$0.1

Alternative 3 Schematic



Triggers to Implement Alternative 3

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to generate revenue by selling disinfected tertiary water.
- The District desires additional flexibility and capacity for recycled water uses.
- The District identifies new users for disinfected tertiary water.
- The District is required to revise its existing treatment system to meet disinfected tertiary treatment requirements for another reason.



Alternative 3 Potential Users

Users/Areas	Estimated Demand (AFY)
Three privately owned users of disinfected tertiary recycled water	79
Four new privately owned users and additional District irrigation of secondary-23 recycled water	3,774
Washoe Tribe (secondary-23 recycled water identified in Alternative 2)	1,424 ⁽⁵⁾

Notes:

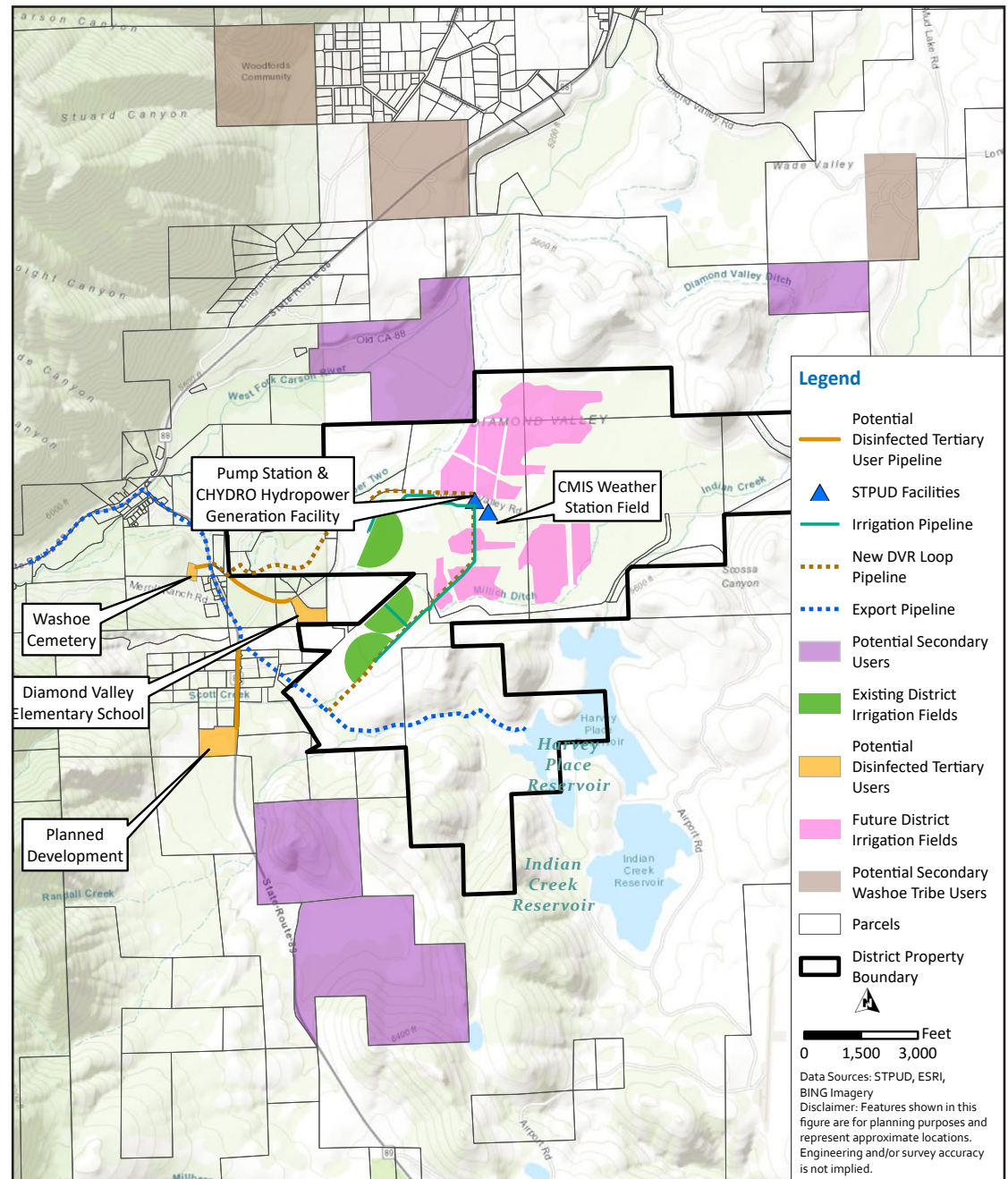
1. Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
2. O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.
3. This cost estimate is for a 0.25 mgd facility, which would meet the demands associated with the disinfected tertiary parcels, plus irrigation on the District's existing and future fields.
4. This cost estimate is based on treatment at the WWTP. If the split treatment option is pursued, additional small diameter and longer distribution pipelines and possibly pump stations would be required.
5. Demand is theoretical. Amount of acreage that might be able to utilize recycled water is uncertain at this time.

Alternative 3 Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- New conveyance infrastructure to deliver recycled water to new users. The map at right shows potential future users. Approximately 0.84 miles of new irrigation piping would be required to serve these three users.
- If the split treatment option at DVR is pursued instead of treatment upgrades at the WWTP, additional small diameter and longer distribution pipelines, and possibly pump stations, would be required.
- New conveyance infrastructure to the Washoe Tribe parcels would also be required. Given the elevation of the western-most Washoe Tribe parcels, pumping may also be required. Due to the uncertainty of recycled water use for these parcels, conceptual infrastructure alignments and cost estimates have not been prepared at this time.

Alternative 3 Potential Users

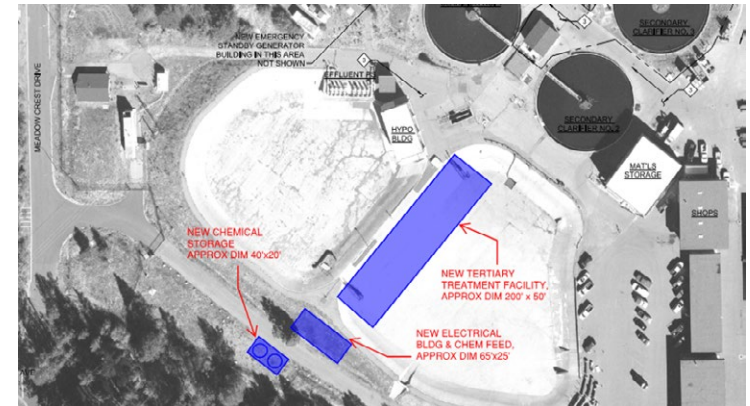


Alternative 3 Recycled Water Treatment Key Components

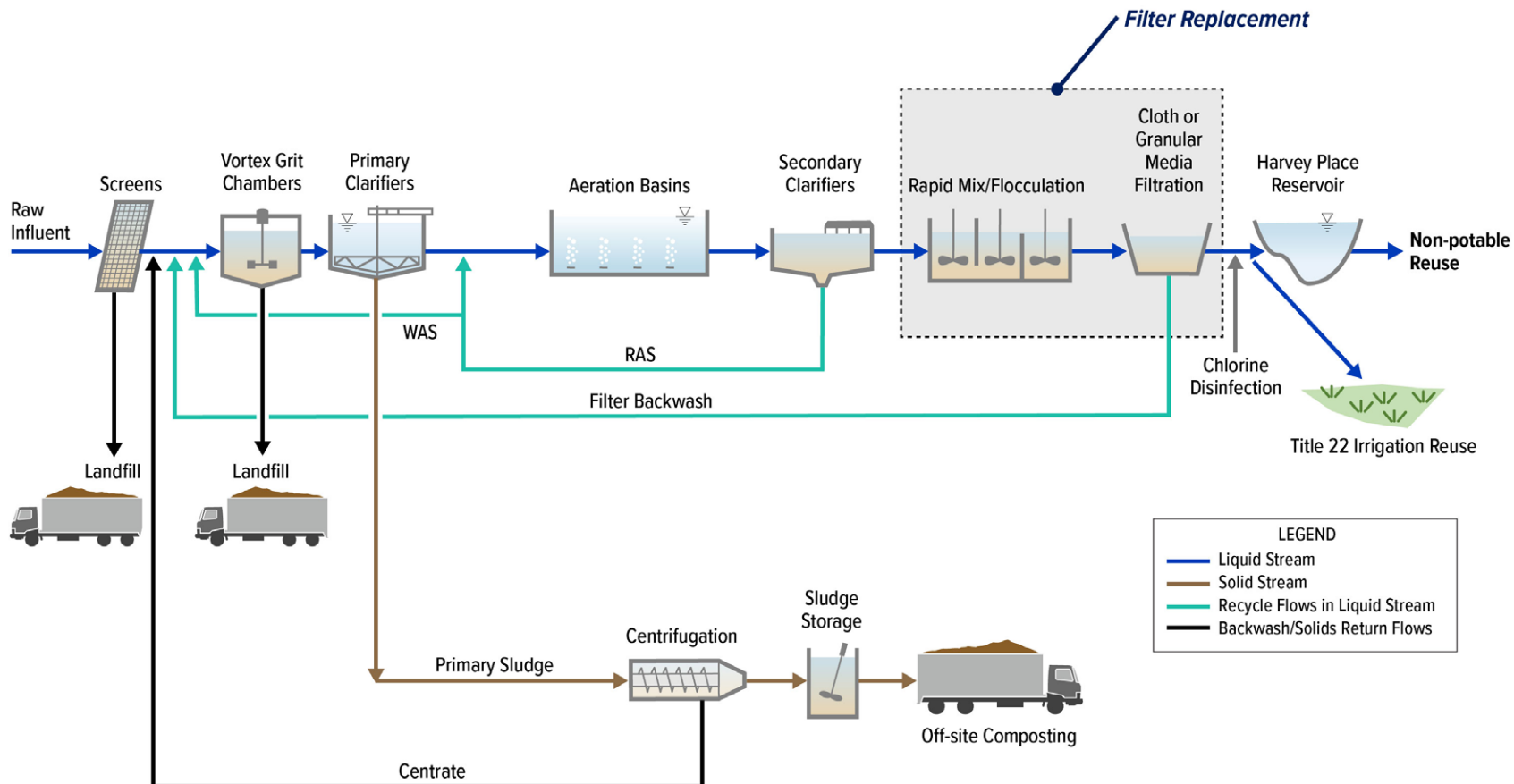
Key components of this alternative include:

- Upgrades to the existing WWTP to meet disinfected tertiary standards.
- An alternative approach, split treatment at DVR, is shown on the following page.

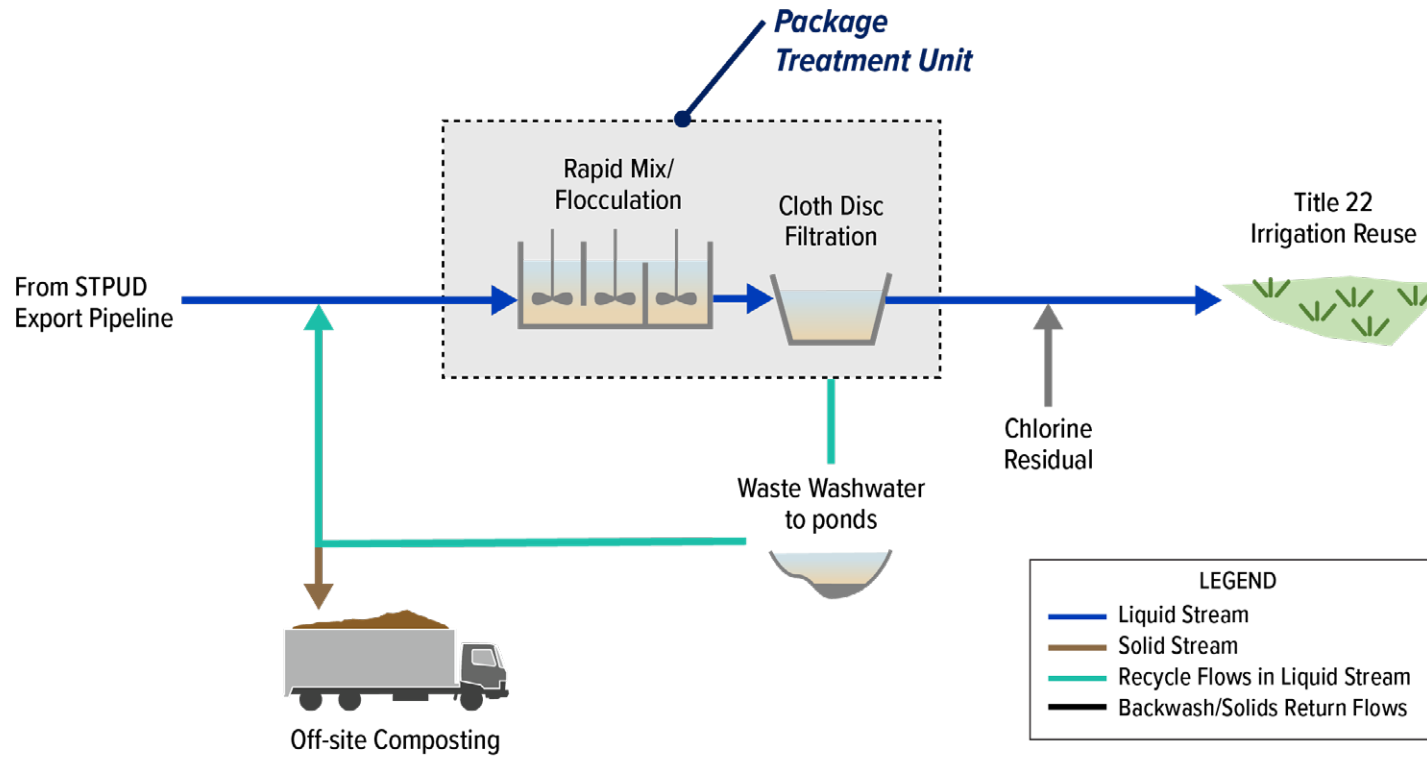
Alternative 3 Recycled Water Treatment Conceptual Layout (WWTP Treatment)



Alternative 3 Recycled Water Treatment Process (WWTP Treatment)



Alternative 3 Split Treatment at DVR Treatment Process



Alternatively, a separate 0.25-mgd split treatment facility at DVR could be constructed to produce disinfected tertiary recycled water only for new users that require this higher quality effluent.

Alternative 4: Discharge to West Fork Carson River and Use in Nevada

Description

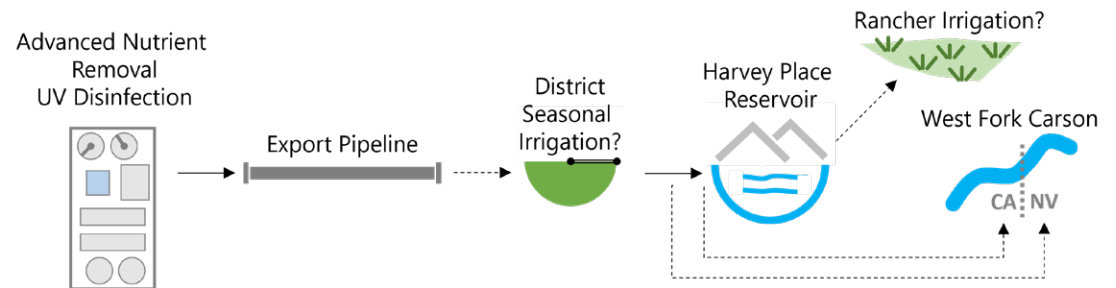
Alternative 4 consists of direct surface water discharge to the West Fork Carson River. The water, once discharged to the West Fork Carson River, could potentially be utilized by downstream users. The amount of flow discharged to the West Fork Carson River in this location would depend on regulatory approval and permitting requirements. Any water in excess of the permitted discharge could be used for District irrigation and/or conveyed to Harvey Place Reservoir for downstream use by Ranchers.

Water quality is also a significant consideration for Alternative 4, given that the West Fork Carson River is an impaired water body on the State of California's 303(d) List. Water quality issues in the river include bacteria, metals, murky water, nitrogen (N) and/or phosphorus (P), and salts. For this reason, the Alternative 4 evaluation considers the most conservative regulatory scenario, where the discharge would be required to meet the water quality objectives of the West Fork Carson River at the point of discharge, in absence of studies/permit negotiations that would allow a mixing zone, allowance for a seasonal discharge, and/or modifications to the West Fork Carson River water quality objectives.

Alternative 4 Potential Users

No specific potential users have been identified. Generally, water right holders in the Carson Valley could potentially benefit from additional flow in the West Fork Carson River.

Alternative 4 Schematic



Alternative 4 Costs

Component	Capital Costs ⁽¹⁾ (\$M)	O&M Costs (\$M/yr) ⁽²⁾
Treatment at WWTP	\$224.0	\$3.1
Conveyance pipeline and outfall to West Fork Carson River	\$21.2	-
TOTAL COSTS	\$245.2	\$3.1

Notes:

- Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
- O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.

Triggers to Implement Alternative 4

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to reduce or eliminate the existing recycled water system in DVR and Alpine County.
- Carson River Watershed water right holders or water users express interest in obtaining additional supplies.

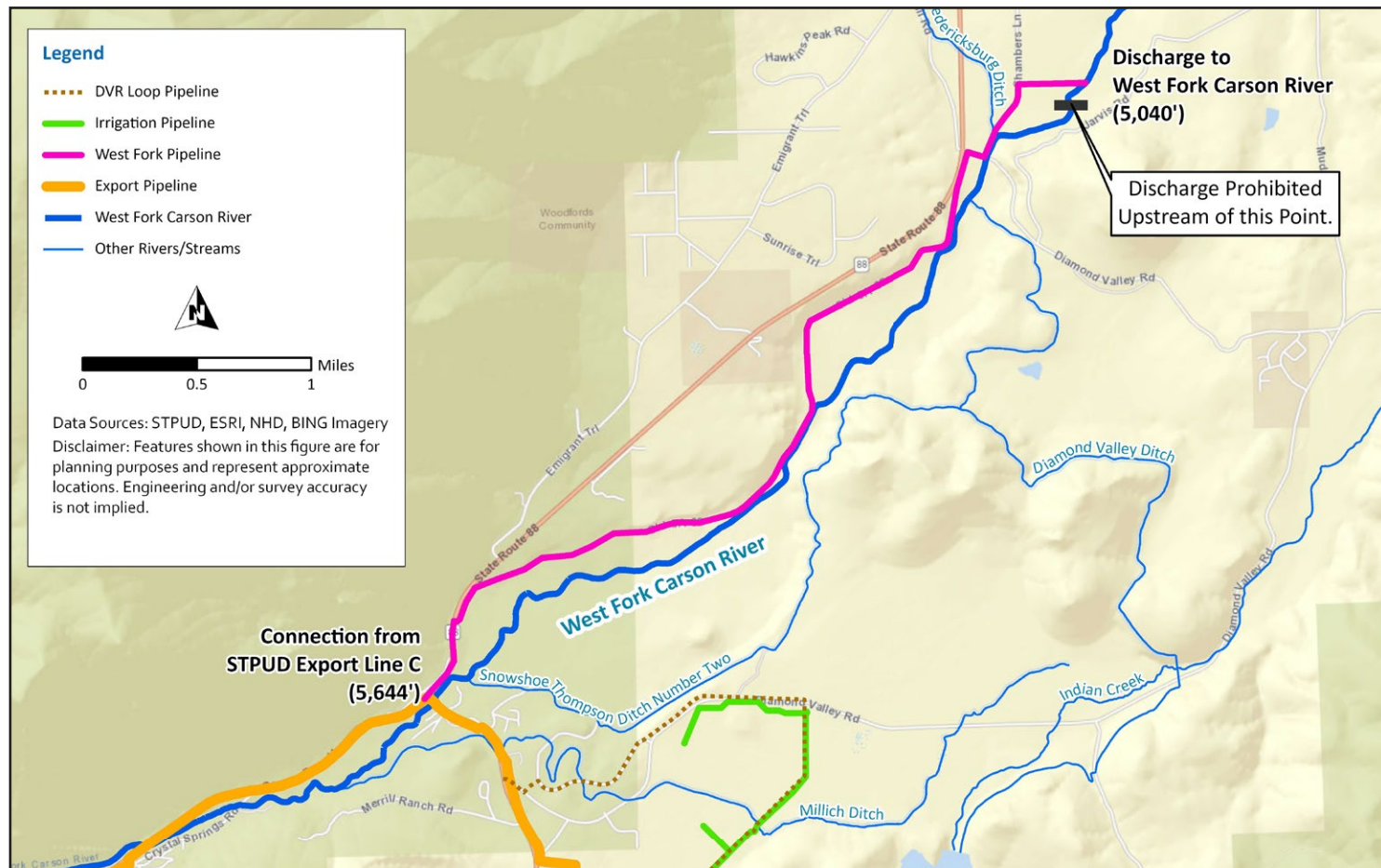


Alternative 4 Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- Construction and maintenance of approximately 4.58 miles of recycled water transmission piping from the existing Export C-Line to a new outfall on the West Fork Carson River. The location of the outfall is based on compliance with the Alpine County 1965 Ordinance for Recycled Water. A conceptual alignment is shown at right.
- Construction and maintenance of a new outfall structure to discharge to the West Fork Carson River.

Conceptual Alternative 4 Pipeline Alignment



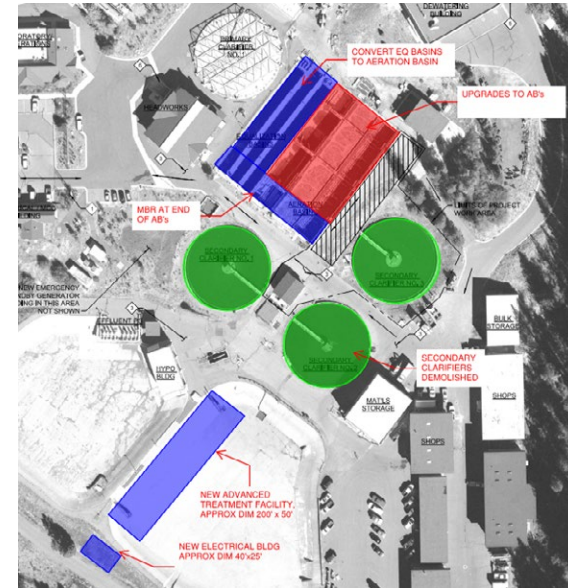
Alternative 4 Recycled Water Treatment Key Components

Key components of this alternative include:

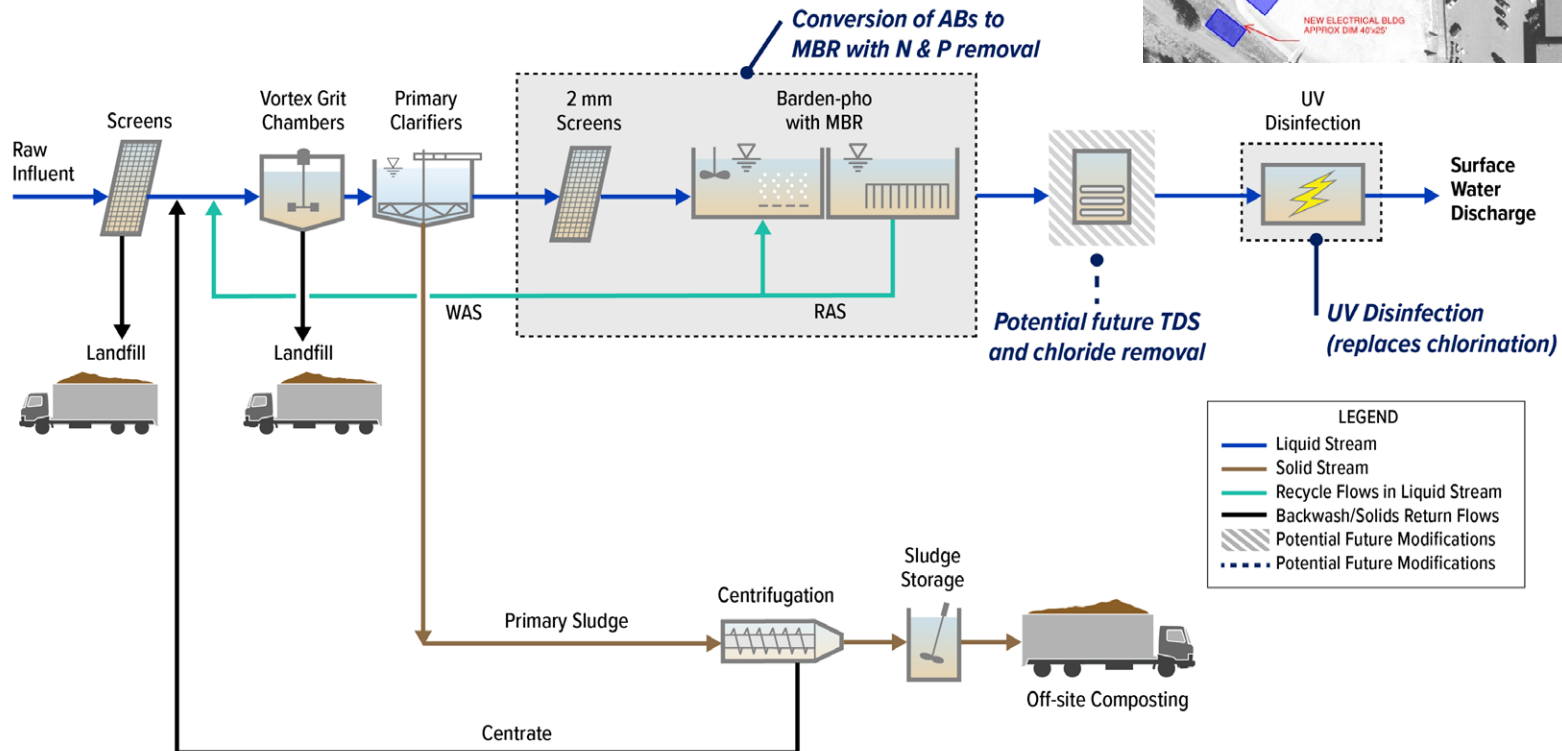
- Significant upgrades of the existing WWTP facility to meet future discharge permit requirements, which are assumed to require best available technologies for (N and P) removal.
- Conversion of chlorine disinfection to UV disinfection.
- Potential (future) TDS and chloride removal.

Note: Alternative 4 treatment requirements are the same as those for Alternative 6A and Alternative 6B.

Alternative 4 Recycled Water Treatment Conceptual Layout



Alternative 4 Recycled Water Treatment Process



Alternative 6A: Expanded Class A or B Reuse in Nevada via Discharge to Indian Creek

Description

Alternative 6A involves discharge to Indian Creek, which flows across the California/Nevada border, past Mud Lake and ultimately joins the East Fork Carson River. Treated water discharged into Indian Creek could be subsequently used via direct use off Indian Creek or further downstream use off the East Fork Carson River. This alternative would include the existing export infrastructure over Luther Pass and new conveyance pipelines to Indian Creek, at the location of the infrastructure that allows Harvey Place Reservoir to release into Indian Creek. The water, once discharged to Indian Creek, could potentially be utilized by downstream users in the Carson River Watershed.

Alternative 6A Potential Users

No specific potential users have been identified. Generally, water right holders in the Carson Valley could potentially benefit from additional flow in Indian Creek and the East Fork Carson River.

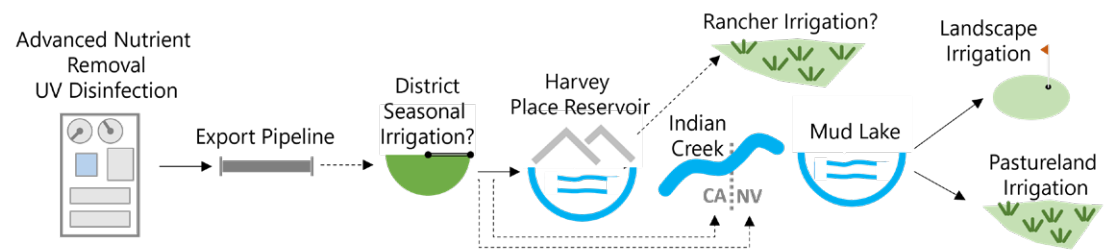
Alternative 6A Costs

Component	Capital Costs ⁽¹⁾ (\$M)	O&M Costs (\$M/yr) ⁽²⁾
Treatment at WWTP	\$224.0	\$3.1
Conveyance Pipeline	\$2.9	-
TOTAL COSTS	\$226.9	\$3.1

Notes:

- Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
- O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.

Alternative 6A Schematic



Triggers to Implement Alternative 6A

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to reduce or eliminate the existing recycled water system in DVR and Alpine County.
- Carson River Watershed water right holders or water users express interest in obtaining additional supplies.

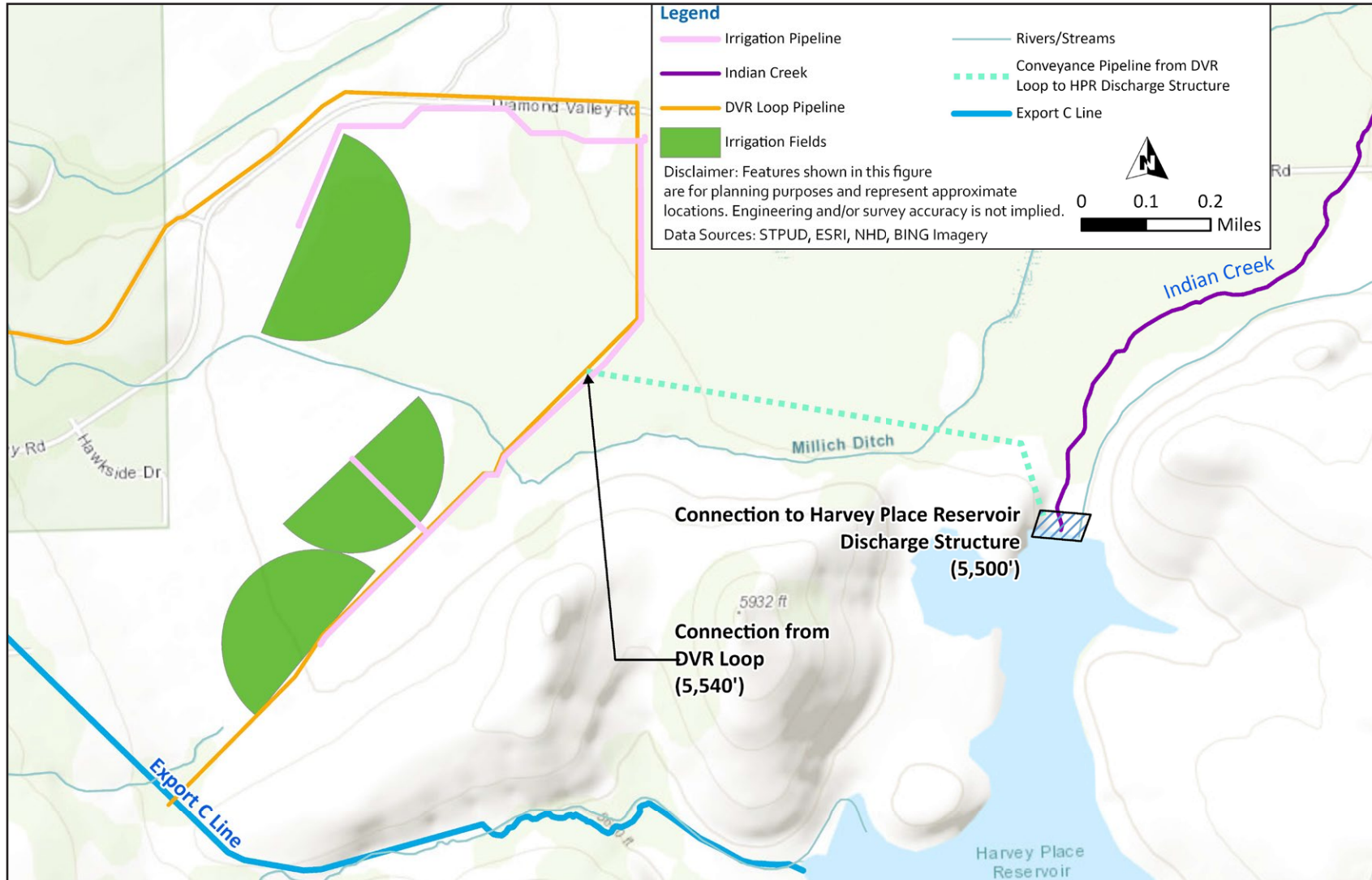


Alternative 6A Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- Construction and maintenance of approximately 0.74 miles of recycled water transmission piping from the DVR Loop Pipeline to the existing Harvey Place Reservoir outfall structure to Indian Creek. A conceptual alignment is shown to the right.

Alternative 6A Conceptual Alignment



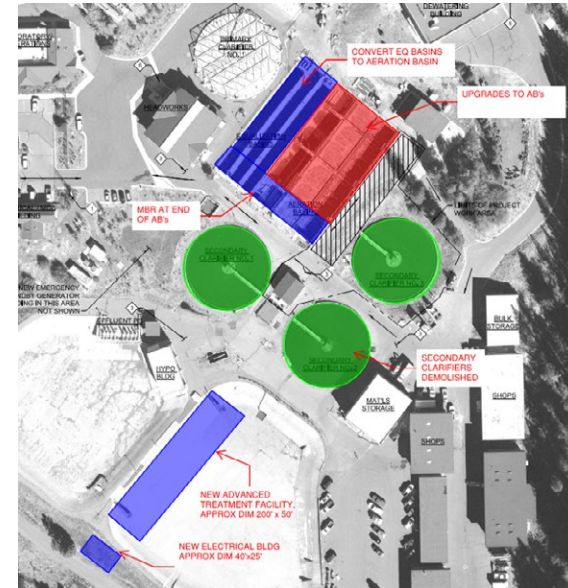
Alternative 6A Recycled Water Treatment Key Components

Key components of this alternative include:

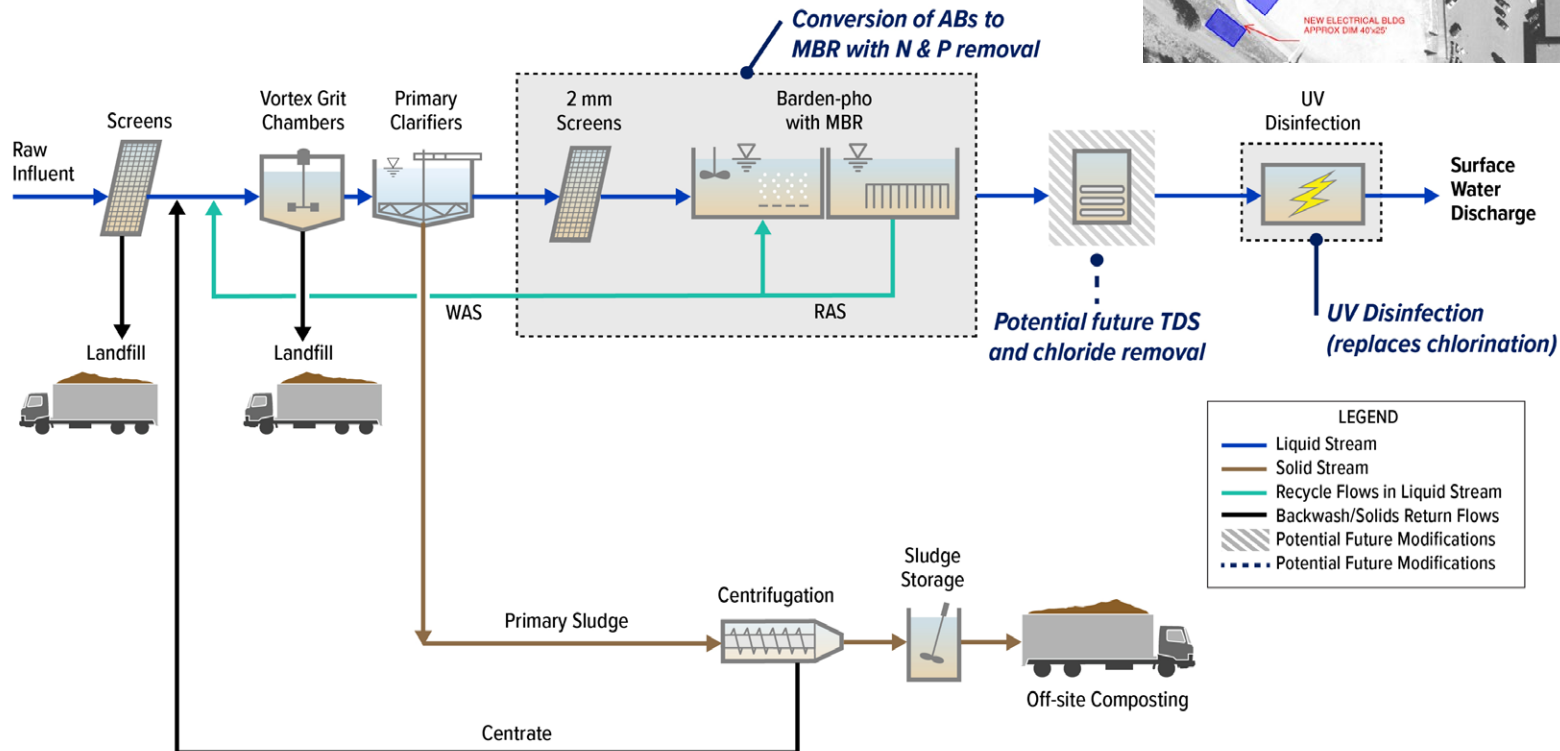
- Significant upgrades of the existing WWTP facility to meet future discharge permit requirements, which are assumed to require best available technologies for (N and P) removal.
- Conversion of chlorine disinfection to UV disinfection.
- Potential (future) TDS and chloride removal.

Note: Alternative 6A treatment requirements are the same as those for Alternative 4 and Alternative 6B.

Alternative 6A Recycled Water Treatment Conceptual Layout



Alternative 6A Recycled Water Treatment Process



Alternative 6B: Expanded Class A or B Reuse in Nevada via Discharge to Mud Lake

Description

Alternative 6B involves export of District effluent for beneficial reuse in the Nevada portion of the Carson River Watershed. This alternative would include the existing export infrastructure over Luther Pass, storage in Harvey Place Reservoir, and conveyance into Nevada and storage in Mud Lake for recycled water use in Nevada.

The alternative includes a new pipeline to convey stored water from Harvey Place Reservoir across the Nevada state line, with direct discharge to Mud Lake. The water would then be diverted from Mud Lake for use in Nevada. The amount of flow discharged to Mud Lake would depend on regulatory approval and permitting requirements. Any water in excess of the permitted discharge could be used for District irrigation and/or conveyed to Harvey Place Reservoir for downstream use by Ranchers. Mud Lake is owned by Bently Properties, so use of Mud Lake for storage would need to be coordinated with the property owner.

Alternative 6B Potential Users

Any users with water rights to Mud Lake, including Bently Properties, which owns Mud Lake, could potentially benefit from this alternative. Also, irrigators in the Carson Valley currently using surface water could benefit from this alternative.

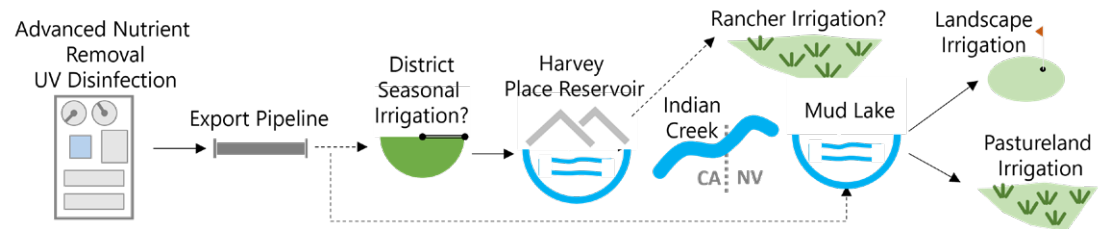
Alternative 6B Costs

Component	Capital Costs ⁽¹⁾ (\$M)	O&M Costs (\$M/yr) ⁽²⁾
Treatment at WWTP	\$224.0	\$3.1
Conveyance Pipeline and Outfall to Mud Lake	\$38.2	-
TOTAL COSTS	\$262.2	\$3.1

Notes:

- Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
- O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.

Alternative 6B Schematic



Triggers to Implement Alternative 6B

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to reduce or eliminate the existing recycled water system in DVR and Alpine County.
- Carson River Watershed water right holders or water users express interest in obtaining additional supplies.

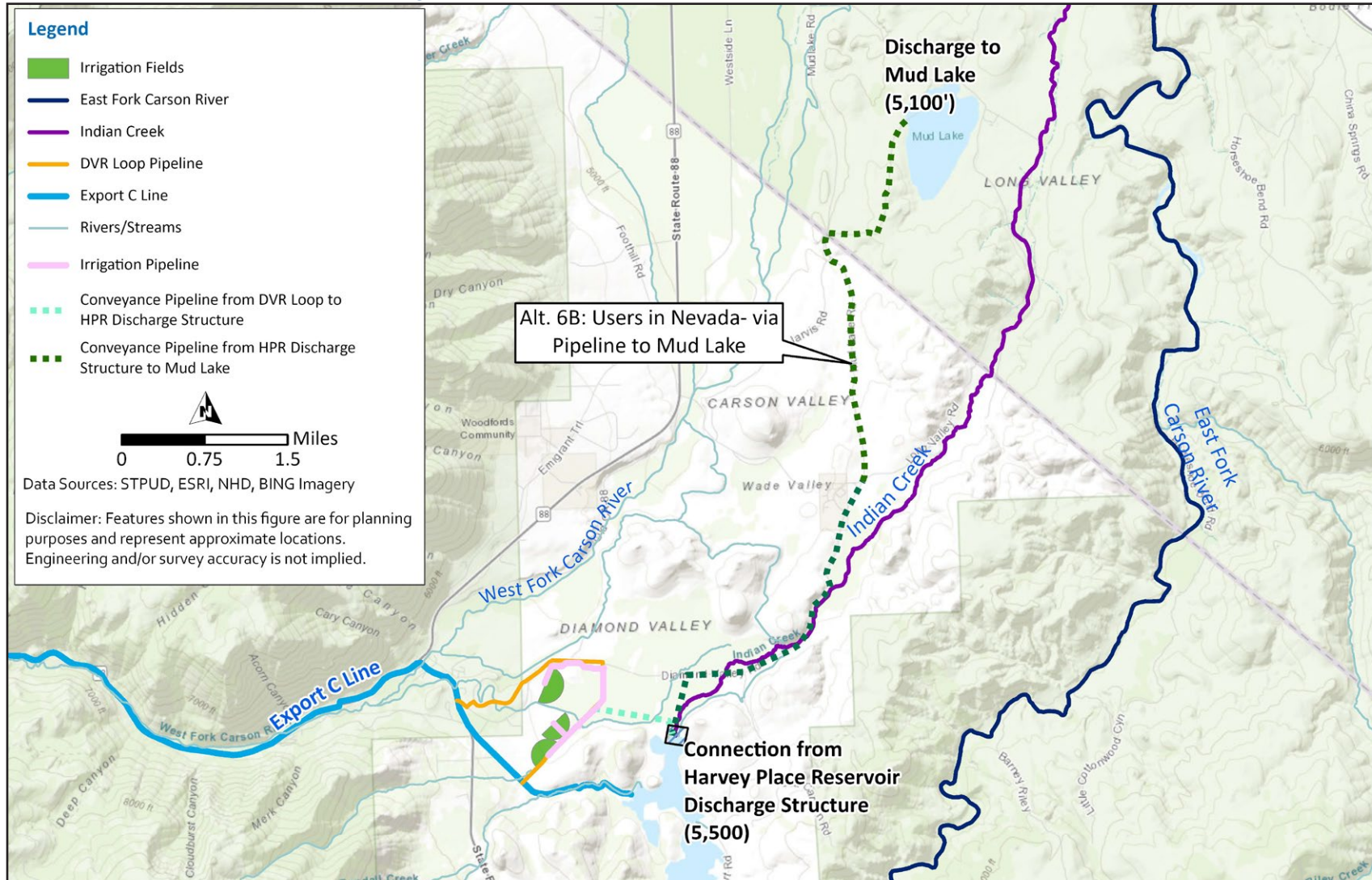


Alternative 6B Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- Construction and maintenance of approximately 12.69 miles of recycled water transmission piping from the DVR Loop Pipeline to the existing Harvey Place Reservoir outfall structure to Mud Lake. A conceptual alignment of this conveyance piping is shown to the right.
- Construction and maintenance of a new outfall structure to Mud Lake.

Alternative 6B Conceptual Alignment



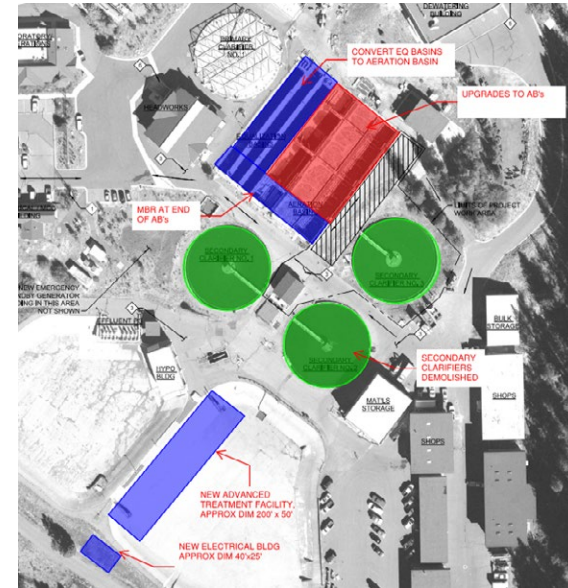
Alternative 6B Recycled Water Treatment Key Components

Key components of this alternative include:

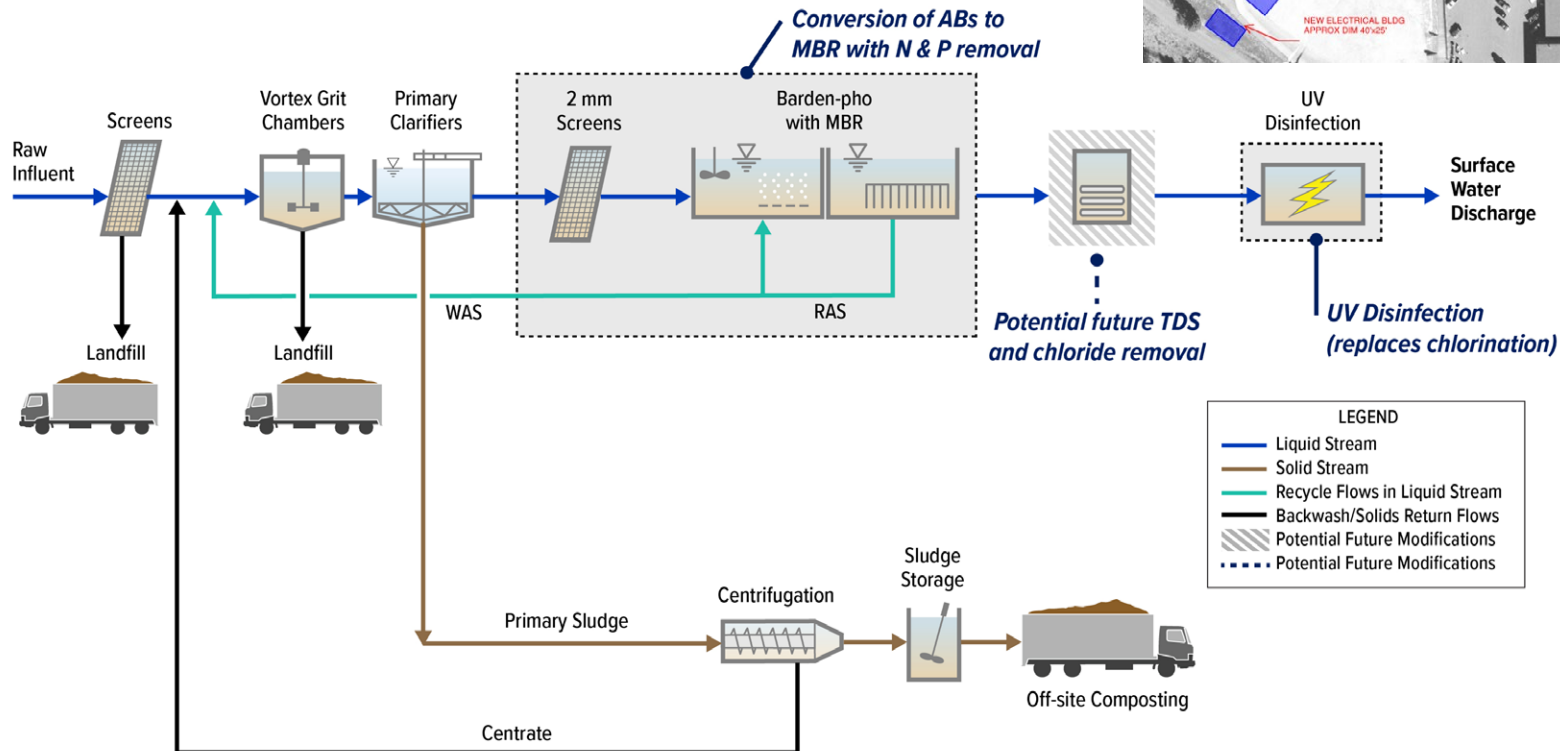
- Significant upgrades of the existing WWTP facility to meet future discharge permit requirements, which are assumed to require best available technologies for (N and P) removal.
- Conversion of chlorine disinfection to UV disinfection.
- Potential (future) TDS and chloride removal.

Note: Alternative 6B treatment requirements are the same as those for Alternative 4 and Alternative 6A.

Alternative 6B Recycled Water Treatment Conceptual Layout



Alternative 6B Recycled Water Treatment Process



Alternative 6C: Indirect Potable Reuse in Nevada

Description

Alternative 6C consists of treating the District's WWTP effluent to Nevada A+ standards for indirect potable reuse (IPR) in Nevada. This alternative would include the existing treatment at the District's WWTP followed by conveyance to Nevada for further treatment at an advanced water treatment facility (AWTF). The existing export line would provide a portion of the conveyance between the District's WWTP and an AWTF in Nevada. Following treatment, the purified water would be injected into the ground via injection wells, providing residence time in the aquifer before being extracted for municipal drinking water use.

District irrigation operations at DVR, Harvey Place Reservoir, and irrigation by Ranchers would be eliminated, although Harvey Place Reservoir would remain in operation to provide storage, depending on how this supply would be used in Nevada. The concept for this alternative is that it would be implemented to take all the District's future effluent. One potential user is Gardnerville Ranchos General Improvement District (GRGID), however, because GRGID's currently identified demands of 5,054 AFY are less than the District's 6,050 AFY of effluent flows, additional recycled water demands would need to be identified. Another potential user is the Washoe Tribe, but demands have not been quantified at this time. Those additional demands may influence the location of the treatment facilities and infrastructure.

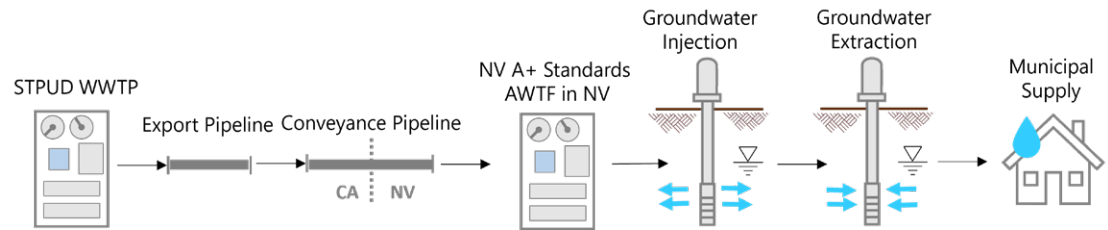
Alternative 6C Potential Users

Users/Areas	Estimated Demand (AFY)
Gardnerville Ranchos General Improvement District (GRGID)	5,054
Washoe Tribe	Unknown ⁽¹⁾

Notes:

1. The Washoe Tribe has expressed interest in potentially using recycled water, although that amount has not yet been quantified.

Alternative 6C Schematic



Alternative 6C Costs

Component	Capital Costs ⁽³⁾ (\$M)	O&M Costs (\$M/yr) ⁽⁴⁾
Conveyance Pipeline	\$54.8	-
A+ Advanced Water Treatment Facility in Nevada ⁽²⁾	\$265.0	\$7.5
TOTAL COSTS	\$319.8	\$7.5

Notes:

- Land acquisition is not included in the treatment costs.
- Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
- O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.

Triggers to Implement Alternative 6C

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to reduce or eliminate the existing recycled water system in DVR and Alpine County.
- GRGID, the Washoe Tribe, or other Nevada water users express interest in purchasing recycled water at Nevada A+ standards for indirect potable reuse or selling water rights to other users.

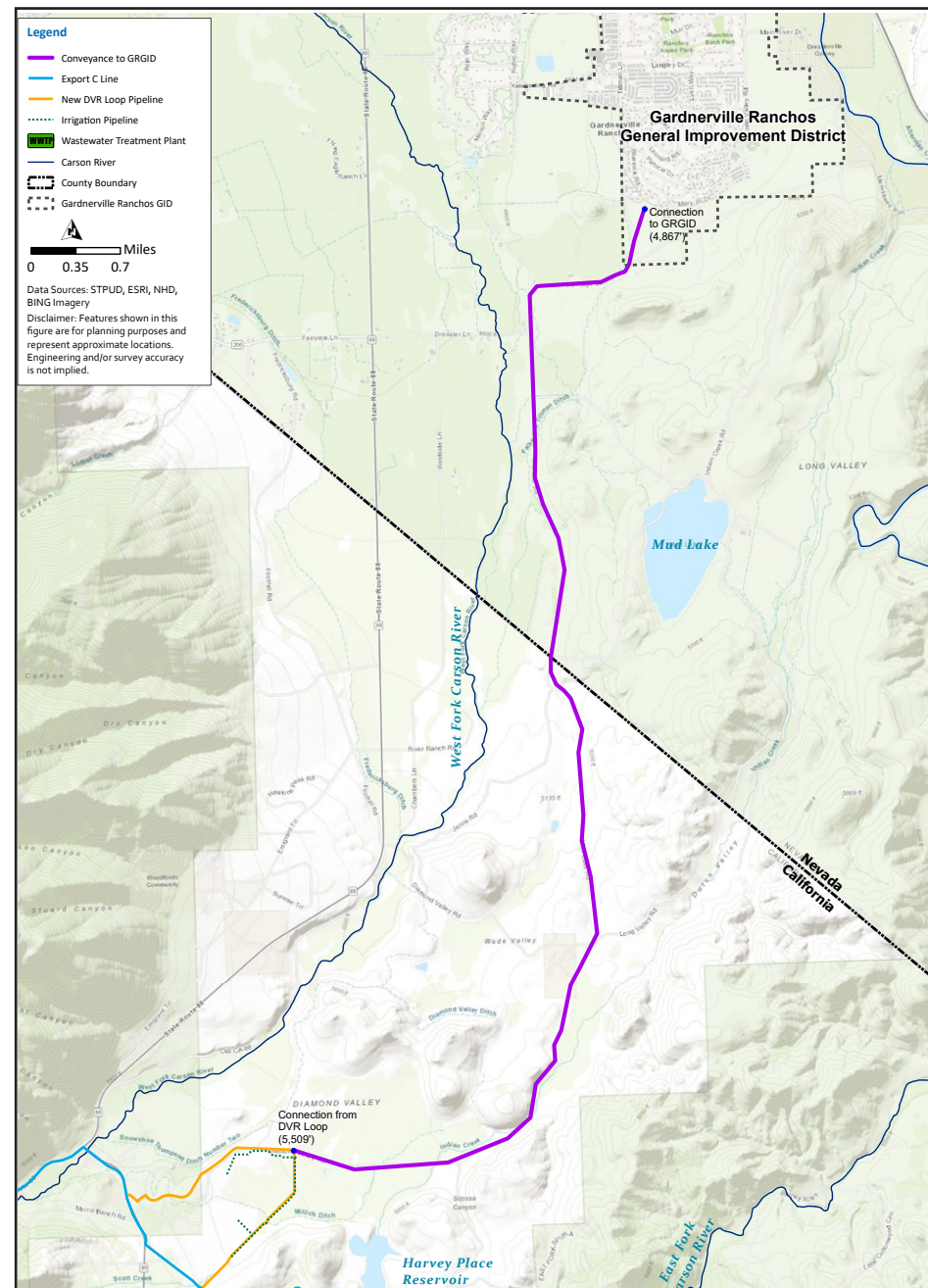


Alternative 6C Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- Construction and maintenance of approximately 9.98 miles of recycled water transmission piping from the New DVR Loop Pipeline to GRGID. A conceptual alignment of this conveyance piping is shown at right.

Alternative 6C Conceptual Alignment

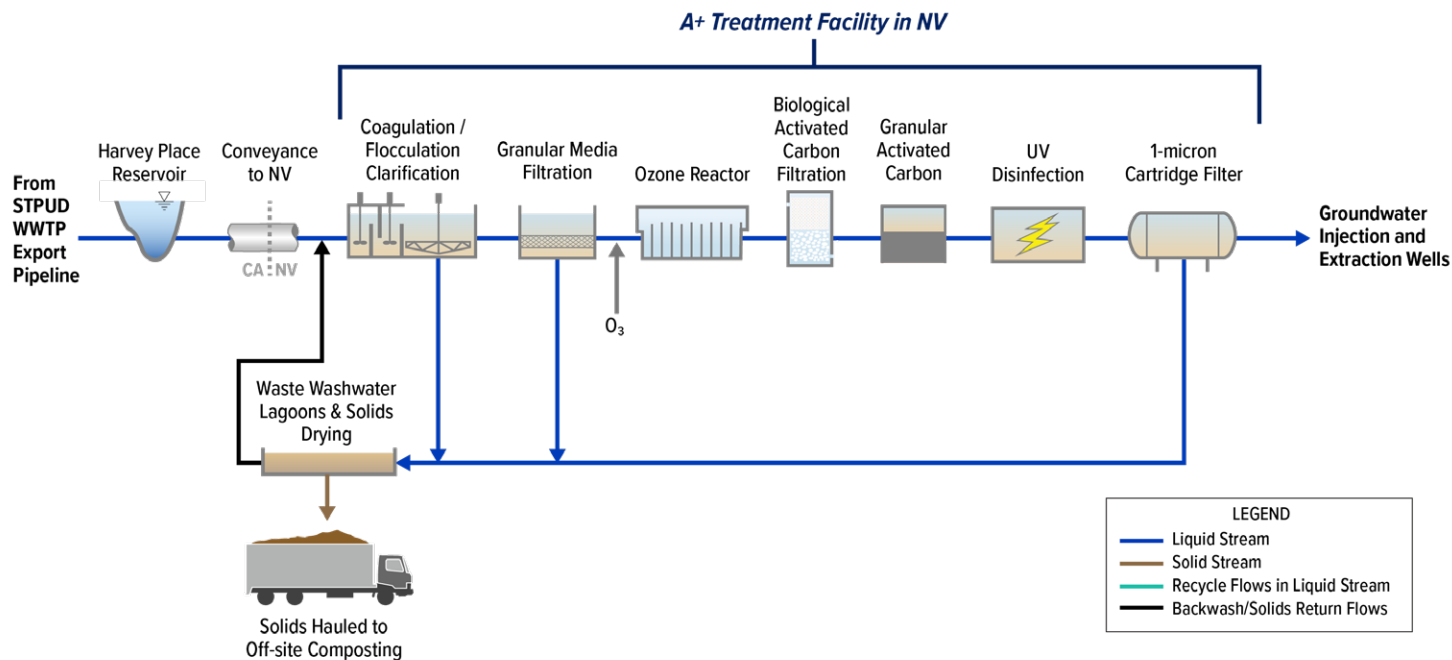


Alternative 6C Recycled Water Treatment Key Components

Key components of this alternative include:

- A new A+ Advanced Water Treatment Facility in Nevada designed to meet drinking water standards. Processes include:
 - » Granular Media Filtration.
 - » Ozonation.
 - » Biological Activated Carbon Filtration.
 - » Granular Activated Carbon.
 - » UV Disinfection.
 - » 1-micron Filtration.
 - » Groundwater Blending.
 - » Solids Handling.
- Approximately five acres of land for the new treatment facility.

Alternative 6C Recycled Water Treatment Process



Alternative 6D: Expanded Reuse in Nevada via Direct Delivery

Description

Alternative 6D consists of conveying water through the existing export pipeline and delivering it to potential new users in Nevada, located north of the location of existing recycled water use by Ranchers. Two general areas of potential recycled water use have been identified; one area is west of State Route 88 and south of Centerville Lane, and the second area is Bently Properties. A third potential area for recycled water use is located west of Mud Lake, within Nevada, but near the California/Nevada state line. In the future, the Washoe Tribe may own land in this region and there could be another potential demand for recycled water. Recycled water would be used for ranchland/pasture or fodder crop irrigation.

It is assumed that a recycled water distribution system would be constructed to deliver water directly to users in Nevada.

Alternative 6D Potential Users

Users/Areas	Estimated Demand (AFY)
West of State Route 88 and South of Centerville Lane	5,075
Bently Properties	14,385

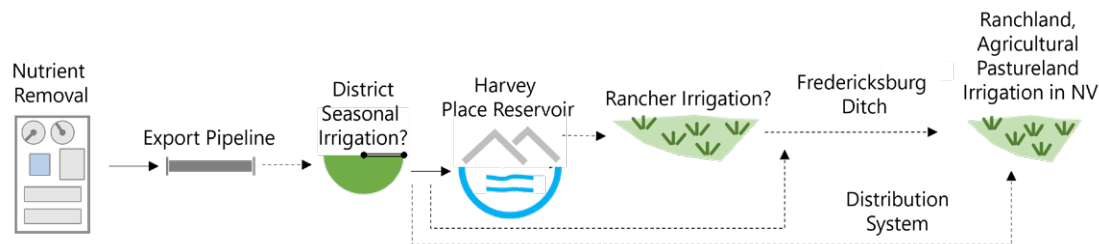
Alternative 6D Costs

Component	Capital Costs ⁽¹⁾ (\$M)	O&M Costs (\$M/yr) ⁽²⁾
Treatment at WWTP	\$32.0	\$1.2
Conveyance Pipeline ⁽³⁾	\$87.5	-
TOTAL COSTS	\$119.5	\$1.2

Notes:

- Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
- O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.
- This assumes that the conveyance pipeline goes all the way to the Bently Properties.

Alternative 6D Schematic



Triggers to Implement Alternative 6D

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to reduce or eliminate the existing recycled water system in DVR and Alpine County.
- Carson River Watershed water users express interest in obtaining additional supplies.

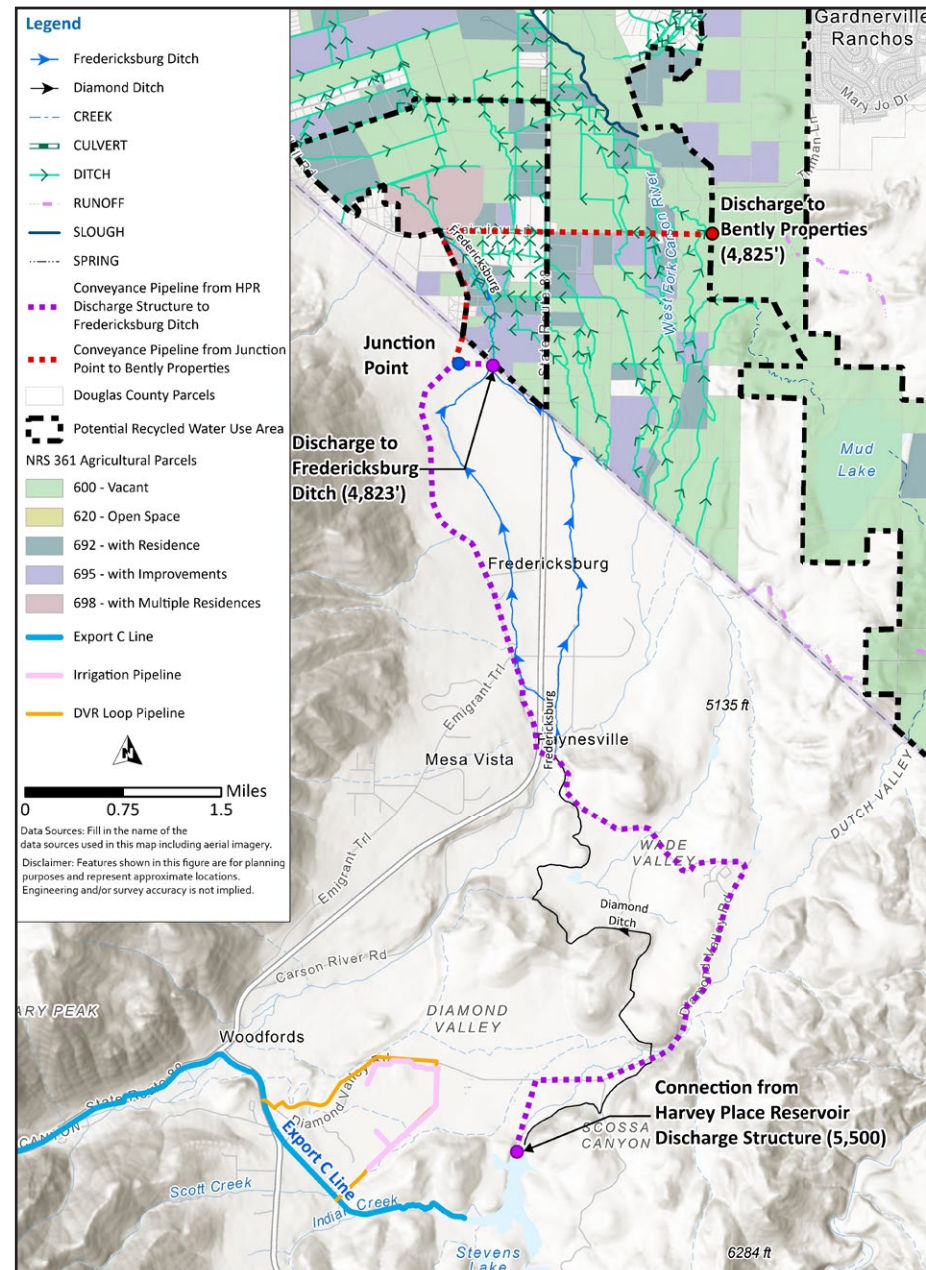


Alternative 6D Export and End Use Infrastructure Key Components

Key components of this alternative include:

- Continued maintenance and investment in existing aging export system infrastructure.
- New recycled water distribution system to deliver water directly to users in NV. One approach would be an 8.87-mile conveyance pipeline that would deliver water from Harvey Place Reservoir into the Fredericksburg Ditch and from there it would get to users via the existing ditch system. Alternatively, if the Bently Properties were the recipients of the recycled water, the conveyance pipeline would be extended by 3.05 miles to convey water to Bently Properties.

Alternative 6D Potential Locations of Recycled Water Use and Conveyance Pipeline Alignment

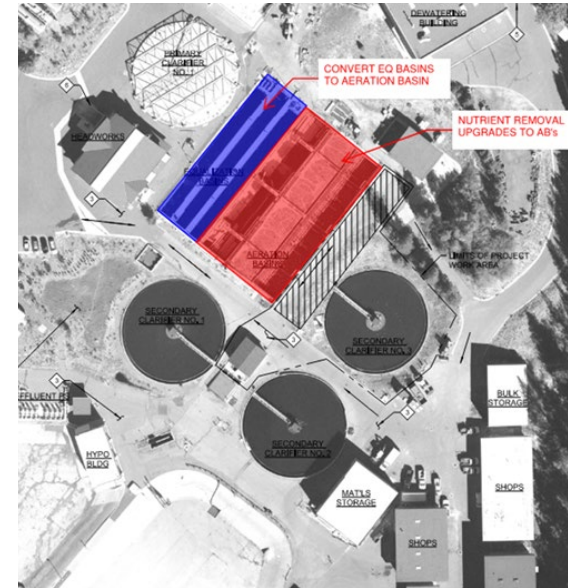


Alt 6D Recycled Water Treatment Key Components

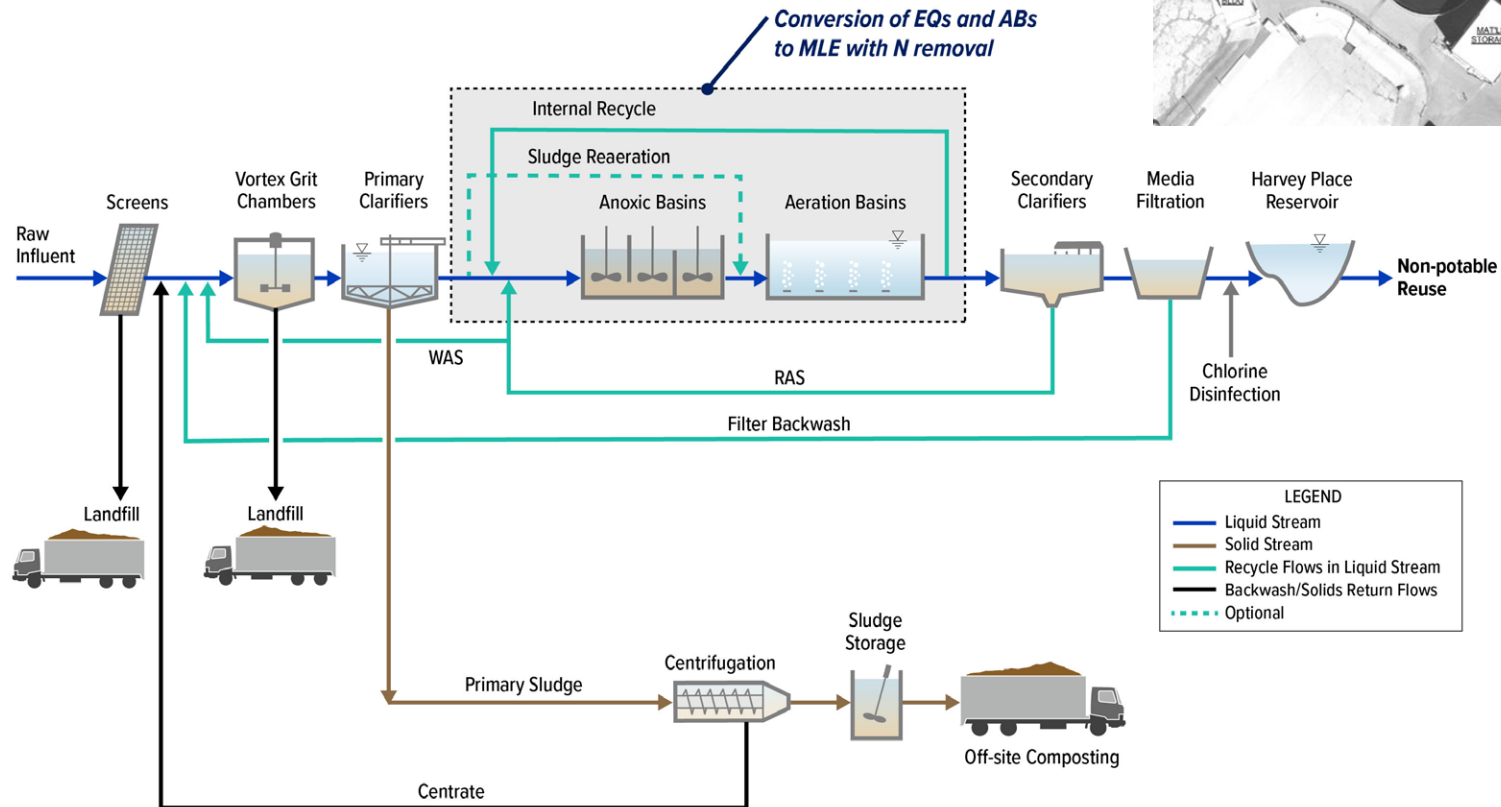
Key components of this alternative include:

- Upgrades to the existing WWTP for nutrient removal to meet anticipated NDEP recycled water permit requirements. The upgrades are based on the treatment requirements for the DCLTSA treatment facility, which delivers recycled water in Carson Valley for similar recycled water uses in Nevada. Processes include:
 - » Biological nutrient removal to meet anticipated permit requirements.
 - » Potentially other processes to meet recycled water requirements.

Alternative 6D Recycled Water Treatment Conceptual Layout



Alternative 6D Recycled Water Treatment Process



Alternative 7A: Treated Effluent Conveyance to DCLTSA with Reuse in Nevada

Description

Alternative 7A would involve conveying treated recycled water from the District's WWTP to Douglas County Lake Tahoe Sewer Authority (DCLTSA), downstream of DCLTSA's treatment facility, and into the gravity section of DCLTSA's existing effluent export pipeline. DCLTSA currently provides recycled water to portions of the Park Cattle Ranch and portions of the Bently Ranch in Carson Valley. The recycled water from the District's WWTP would be combined with the DCLTSA recycled water and delivered to users in the NV portion of the Carson River Watershed.

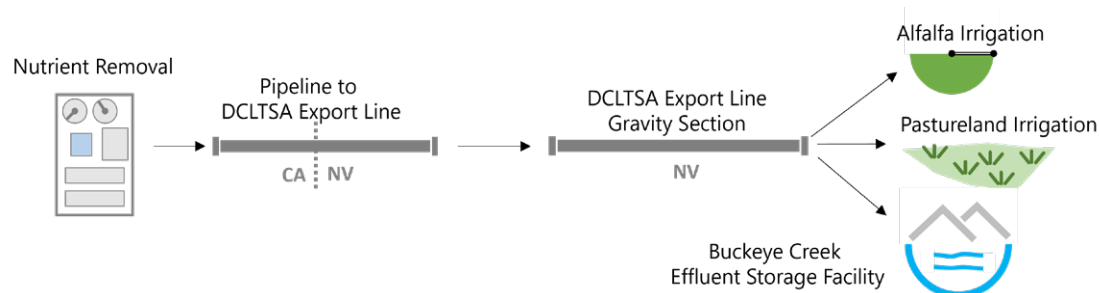
Alternative 7A Costs

Component	Capital Costs ⁽¹⁾ (\$M)	O&M Costs (\$M/yr) ⁽²⁾
Treatment at WWTP	\$32.0	\$1.2
Conveyance from District to DCLTSA	\$150.6	\$1.7 ⁽³⁾
Replacement of DCLTSA pipeline segments	\$31.6	-
Distribution pipelines	\$13.3	_(4)
Lining of Buckeye Creek Effluent Storage Facility	\$15.2	_(4)
Additional Recycled Water Storage Facility	\$5.9	_(4)
TOTAL COSTS	\$248.6	\$2.9

Notes:

- Level 5 cost estimates are considered to be accurate within plus 50 percent to minus 30 percent.
- O&M associated with new recycled water distribution system infrastructure is assumed to be minimal.
- These costs are associated with the FEPS and the proposed new pump stations.
- O&M associated with the storage facilities is assumed to be minimal.

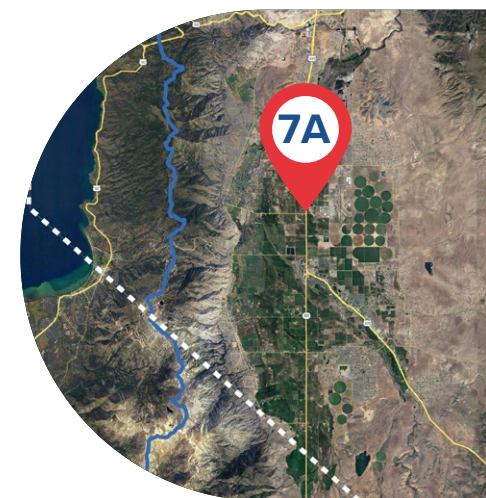
Alternative 7A Schematic



Triggers to Implement Alternative 7A

The following triggers may give the District reason to implement this alternative:

- Recycled water production exceeds existing demands from Ranchers and District DVR irrigation.
- The District wishes to generate revenue by selling recycled water.
- The District wishes to reduce or eliminate the existing recycled water system in DVR and Alpine County.
- The District wishes to partner with DCLTSA to share costs of export infrastructure.
- Carson River Watershed water right holders or water users express interest in obtaining additional supplies.
- The District wishes to reduce pumping costs by seeking an agricultural energy rate from the energy utility (only available in Nevada).



Alternative 7A Potential Users

Users/Areas	Estimated Demand (AFY)
Three potential users identified by DCLTSA	16,650 ⁽¹⁾

Notes:

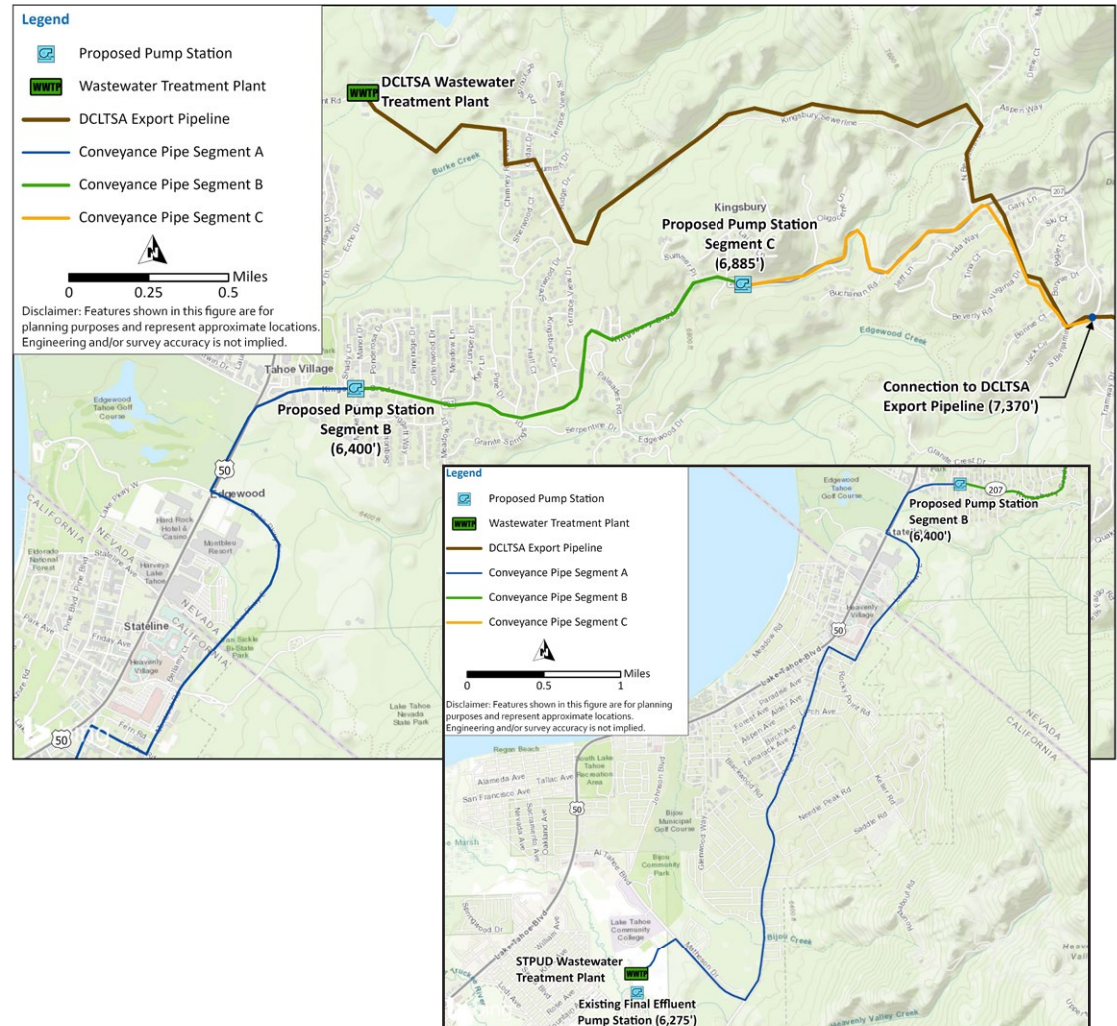
- Demand only used during growing season. Additional storage would need to be identified.

Alternative 7A Export and End Use Infrastructure Key Components

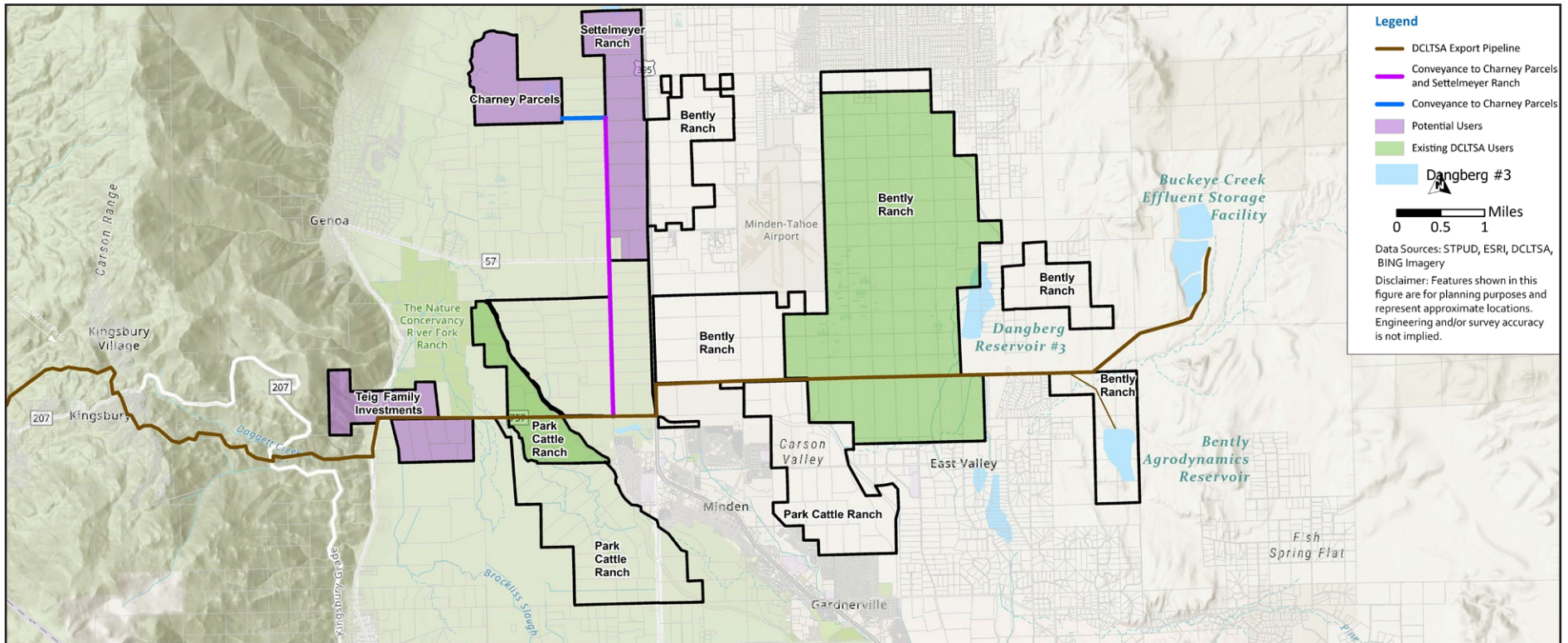
Key components of this alternative include:

- Construction of a new 24-inch, 8.3-mile transmission pipeline and 2 pump stations, within the Lake Tahoe Watershed, from the District's WWTP to the gravity portion of DCLTSA's export line. The District's existing FEPS would be used as well. A conceptual horizontal alignment is shown to the right.
- The gravity section of DCLTSA's existing export pipeline has segments that are 10-inch, 12-inch, and 14-inch diameter. Given the age and size of these segments, they would need to be replaced with approximately 3.64 miles of new 20-inch pipe.
- DCLTSA's Buckeye Creek Effluent Storage Facility would need to be lined for storage of the District's recycled water.
- Development of 1,600 AF of additional storage would likely be required for the District's recycled water.
- Expansion or modification of the ditch system may be required to deliver recycled water to the Tieg Family Investments property.
- To serve the Charney Parcels and Settlemeyer Ranches, approximately 3.91 miles of new irrigation piping would be required, as shown on the following page.

Alternative 7A Conceptual Alignment



Alternative 7A Potential Users

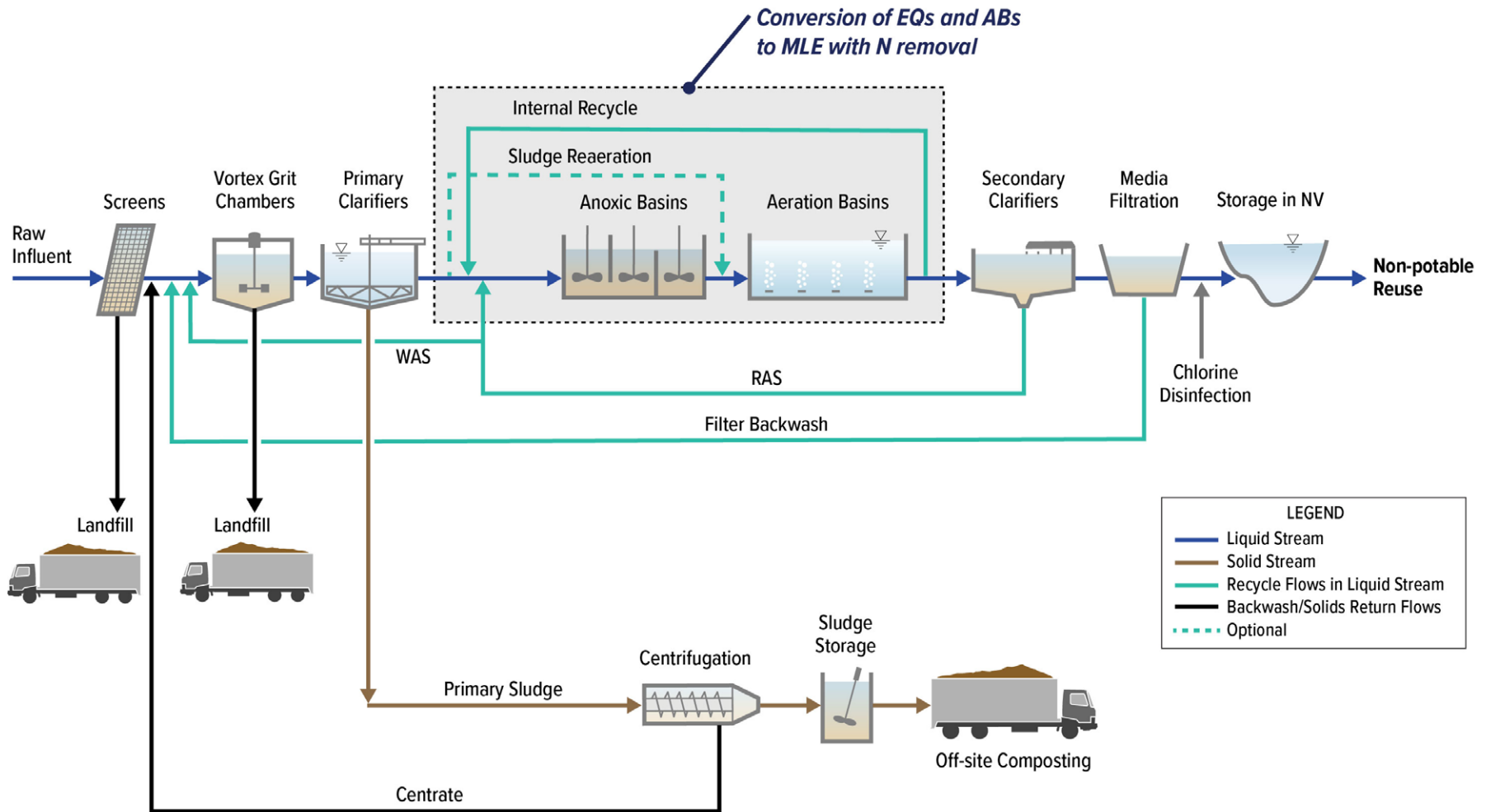


Alternative 7A Recycled Water Treatment Key Components

Key components of this alternative include:

- Upgrades to the existing WWTP for nutrient removal to provide effluent with similar quality to current DCLTSA effluent. DCLTSA recently upgraded their facility to include nitrogen removal in anticipation of future changes to their permit requirements.

Alternative 7A Recycled Water Treatment Process

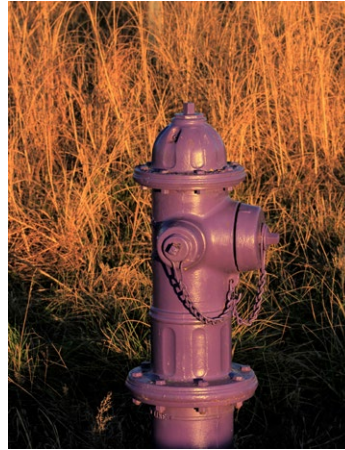


System Modifications

During the alternatives identification process, there was discussion of ideas and concepts that did not represent a standalone alternative that could replace the existing export and use of recycled water. Rather, these concepts were not standalone alternatives for recycled water use, but concepts that may be applicable in implementation of one or more alternatives. These concepts were termed as “system modifications” and may be considered as part of several alternatives. The five system modifications considered included:

1. Urban Fire Protection.
2. Tunneling.
3. Split Treatment.
4. Export System Energy Recovery.
5. Constructed Wetlands.

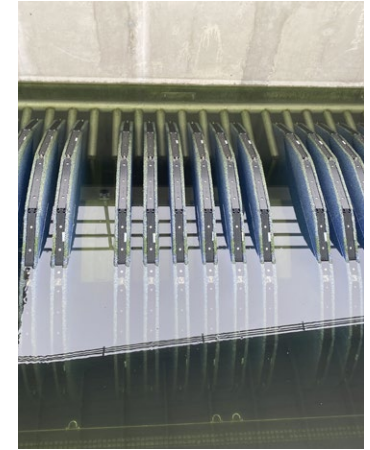
Based on technical and economic challenges, the development of an urban fire protection system and the use of tunneling to significantly reduce/eliminate the significant elevation gain in the export line were eliminated from consideration. Split treatment, where treatment processes were split between two locations, was considered, where feasible, in Alternative 3 and Alternative 6C. Energy recovery and constructed wetlands were developed to a conceptual level and are described in the following pages.



Urban Fire Protection



Tunneling



Split Treatment



Export System Energy Recovery
(photo courtesy of Canyon Hydro)



Constructed Wetlands

Export System Energy Recovery

Energy recovery could be implemented as part of the District’s or DCLTSA’s export infrastructure. The energy recovery analysis for both systems is based on limited information and assumptions, and a feasibility analysis would need to be conducted to refine the energy recovery system sizing and location, supporting infrastructure improvements, estimated energy recovery and pay-back, use of energy generated, and regulatory approvals/permits. The conceptual analysis for the District and DCLTSA export systems generally included two options for increasing energy recovery:

- A single energy recovery system located at/near the low point of elevation on the downstream side of the export line.
- A series of energy recovery systems located along the export line, downstream of export line peak elevation.

Both of these options require energy recovery equipment, supporting infrastructure, and improvements or replacement to the existing export infrastructure. The options for the District and DCLTSA export systems are summarized in the tables below.

STPUD Energy Recovery Options

Option	Flow Assumption (mgd)	Estimated Energy Recovery (MW)	Cost
A – Pelton Wheel at base of C-Line	5.4	1.23	\$123M
B – Series of Pumps as Turbines along the C-Line	5.4	0.91	\$52M

Export system energy recovery for the STPUD export system could be combined with any of the alternatives that require conveyance of recycled water to Alpine County, including:

- Alternative 1: Existing System.
- Alternative 2: Expanded Disinfected Secondary-23 Delivery in Alpine County.
- Alternative 3: Expanded Disinfected Tertiary Reuse in Alpine County.
- Alternative 4: Discharge to West Fork Carson River and Use in Nevada.
- Alternative 6A, 6B, and 6D: Expanded Class A or B Reuse in Nevada.
- Alternative 6C: IPR in Nevada.

Definitions: mgd = million gallons per day, MW = megawatt(s).

DCLTSA Energy Recovery Options

Option	Flow Assumption (mgd)	Estimated Energy Recovery (MW)	Cost
A – Pelton Wheel at base of DCLTSA Export Line	7	1.4	\$45M
B – Series of Pumps as Turbines along the DCLTSA Export Line	7	1.04	\$40M

Export system energy recovery for the DCLTSA export system could be combined with Alternative 7A: Treated Effluent Conveyance to DCLTSA with Reuse in Nevada, since this alternative involves use of the DCLTSA Export Line.

Constructed Wetlands

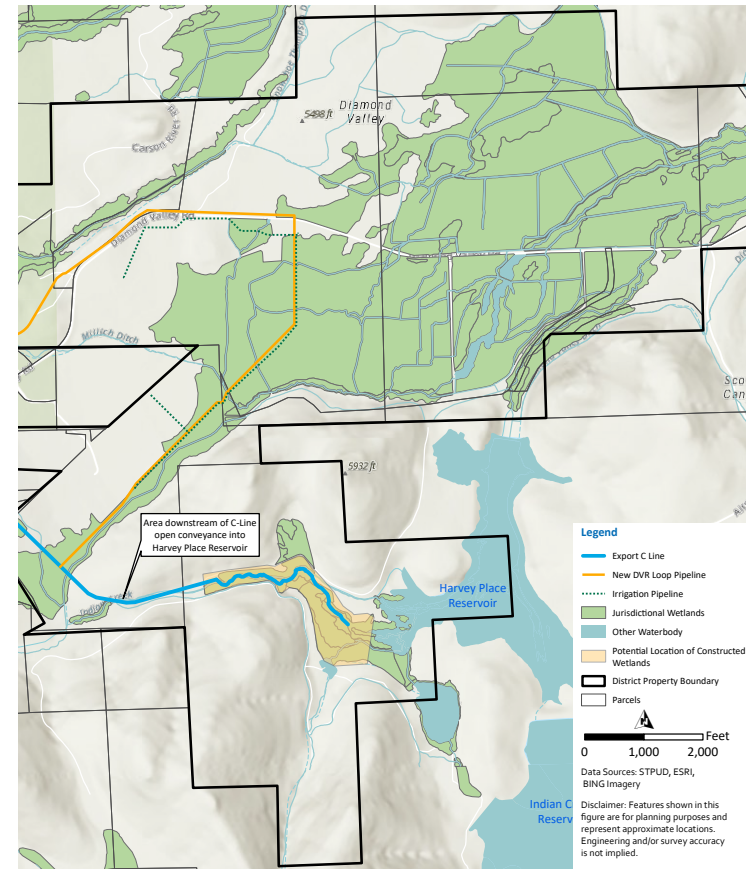
This system modification involves the addition of constructed wetlands in Alpine County on existing District property. The primary purpose of the wetlands would be to provide additional capacity for recycled water storage, in particular during periods when release from Harvey Place Reservoir is prohibited. In addition, wetlands may be designed to also provide water quality polishing, wetland habitat/ecological benefits, and possibly be used as a wetland mitigation bank.

The area located at the end of the C-Line, where there is open channel conveyance into Harvey Place Reservoir, was identified as a potential site for constructed wetlands. There are approximately 30 acres in the identified area. The wetlands would be designed to be supported by flow-through of recycled water under normal conditions. If there was an anticipated need for additional short-term storage, then the wetlands could be temporarily inundated with up to 6 ft of recycled water. Under these circumstances, approximately 180 acre-feet (AF) of additional temporary storage could be provided. At a future flow of 5.4 mgd, the wetlands could provide an additional 10 days of storage. The additional storage may provide the District with the additional time necessary to determine if early release of Harvey Place Reservoir was needed.

Obtaining regulatory approvals and permits may be challenging for constructed treatment wetlands. Field verification and additional analyses would be necessary to assess regulatory/permitting feasibility.

The applicable alternatives include all alternatives that convey effluent to Alpine County, where some portion of the water could be used to flow through wetlands prior to flowing into Harvey Place Reservoir. Applicable alternatives include:

- **Alternative 1:** Existing System.
- **Alternative 2:** Expanded Disinfected Secondary-23 Delivery in Alpine County.
- **Alternative 3:** Expanded Disinfected Tertiary Reuse in Alpine County.
- **Alternative 4:** Discharge to West Fork Carson River and Use in Nevada.
- **Alternatives 6A, 6B, and 6D:** Expanded Class A or B Reuse in Nevada.
- **Alternative 6C:** Indirect Potable Reuse in Nevada.



National wetlands mapping and potential location of constructed wetlands

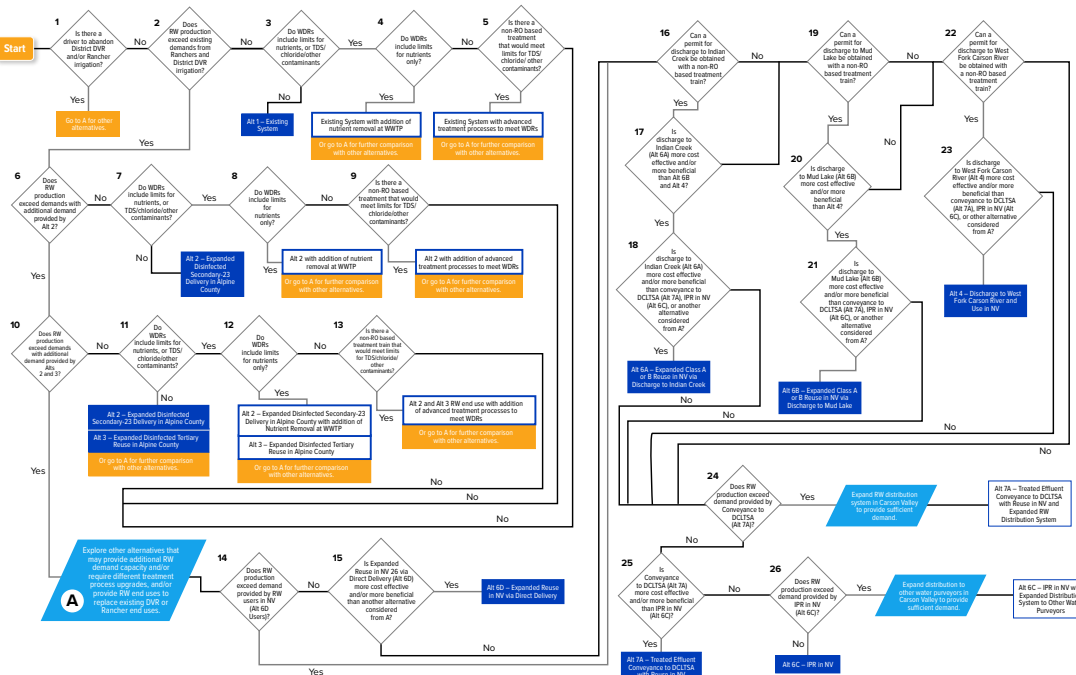
Decision-Making Framework and Tools

The District developed two tools to support selection of a recycled water system alternative:

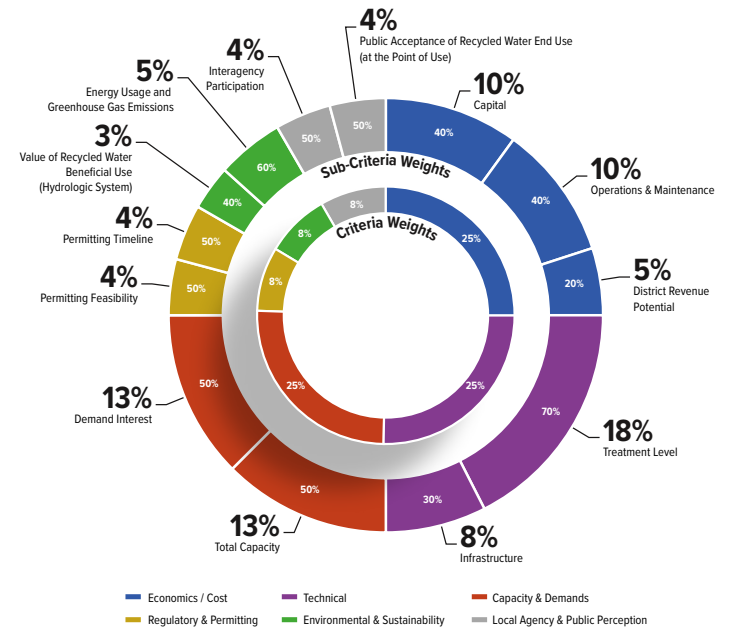
1. A Decision Diagram, which includes potential triggers for implementation and the potential alternatives that may be implemented in response to the trigger
2. Multi-Criteria Analysis, which is a framework for comparing and ranking alternatives.

These tools are intended to be used together and sequentially. The Decision Diagram is used to identify a subset of alternatives that would address a specific trigger, and the Multi-Criteria Analysis is used to select the most beneficial alternative among the subset of alternatives.

Decision Diagram



Multi-Criteria Analysis



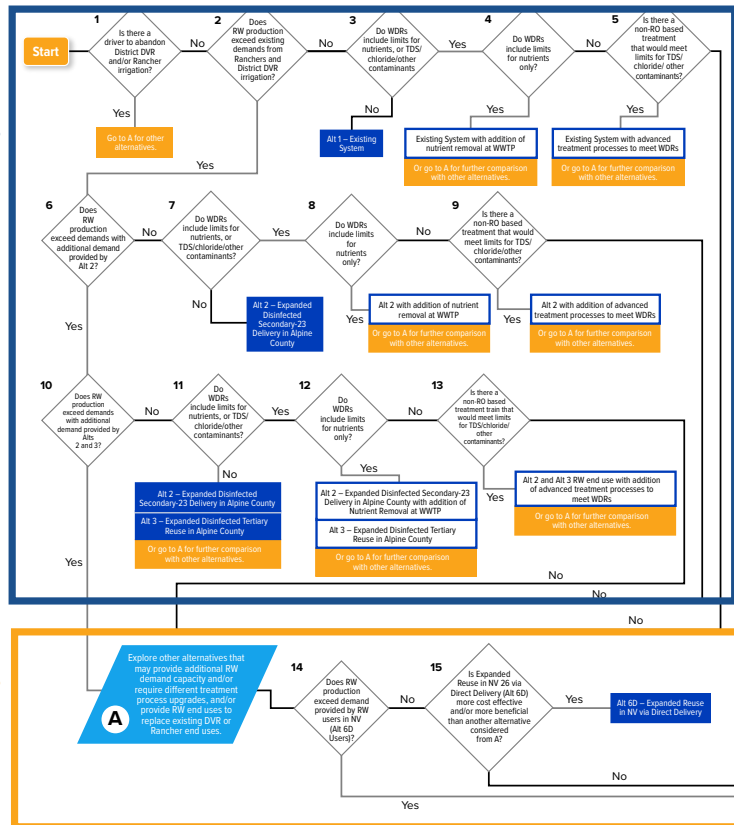
Decision Diagram

The Decision Diagram includes anticipated triggers (constraints or opportunities) and a sequence of questions to help identify the most applicable alternative(s) for implementation in response to the triggers. Going forward, the District should pay close attention to four main triggers:

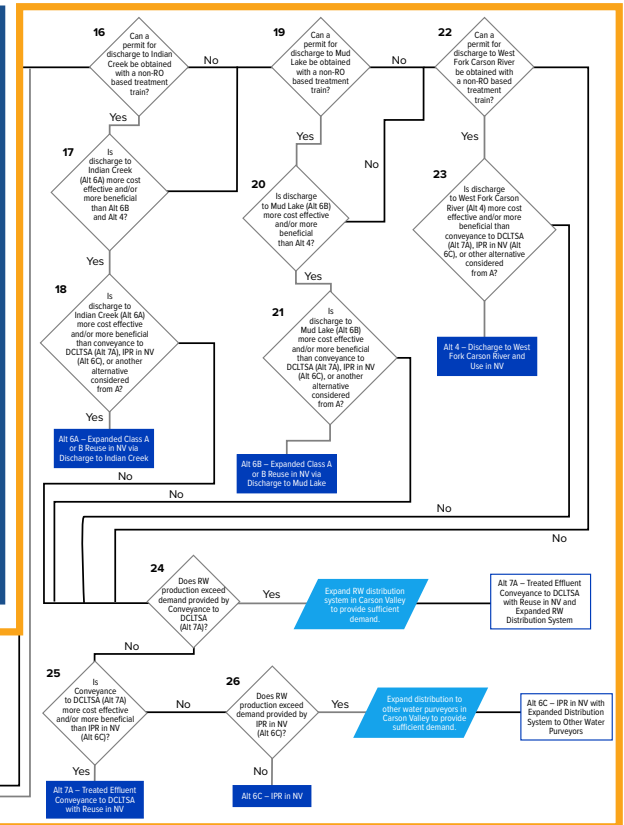
1. Anticipated limitations on recycled water capacity.
2. Changes in institutional agreements that would limit recycled water capacity.
3. Changes in permit conditions/requirements.
4. Interest in recycled water by other users.

Generally, these four triggers will determine the alternatives available, and combined with the multi-criteria decision analysis, will support selection of the best alternative. The Decision Diagram provides more specific guidance related to alternatives both within Alpine County and outside Alpine County.

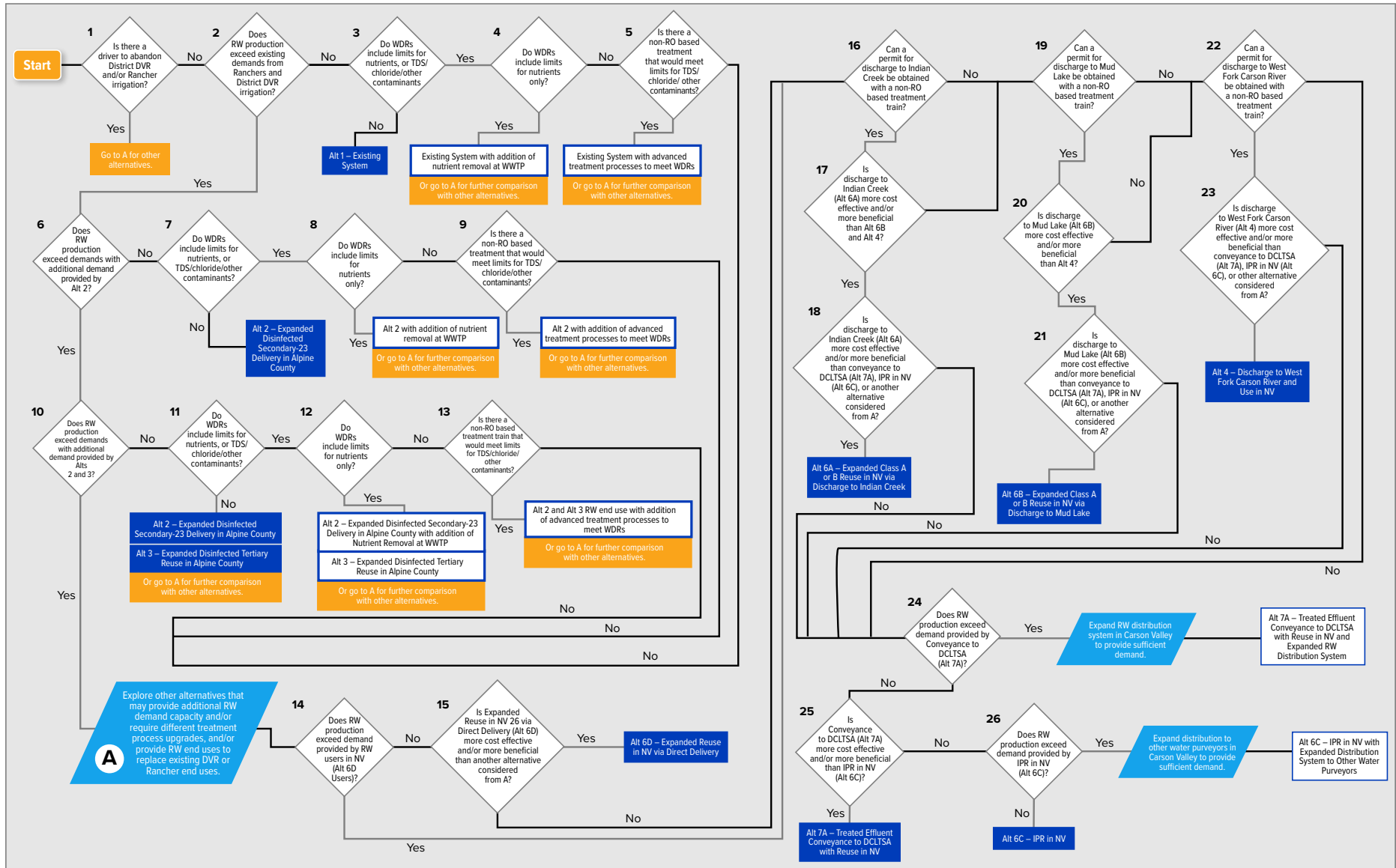
Alternatives in Alpine County



Alternatives outside Alpine County



Decision Diagram Detail



Multi-Criteria Analysis

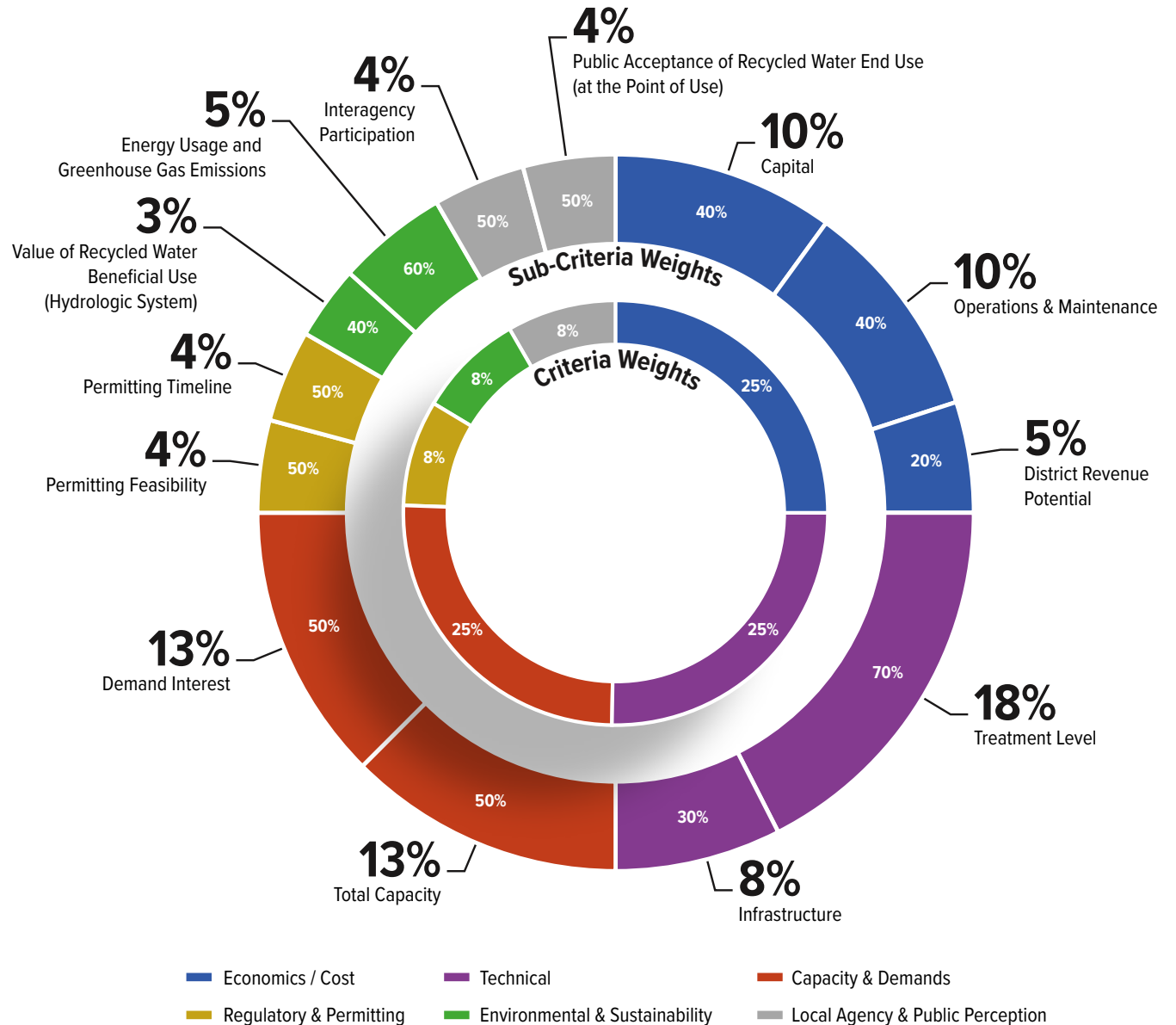
The Multi-Criteria Decision Analysis involves the use of multiple criteria, which each have associated sub-criteria. The criteria and sub-criteria utilized in this analysis are shown at right.

Each of the sub-criteria can be scored from 0 to 10, with 0 being the lowest score and 10 being the highest score. Some criteria and sub-criteria were more important than others, and therefore were weighted differently to reflect that consideration. For example, Economics / Cost, Technical, and Capacity & Demands were all weighted higher than the other criteria. Weighting of the criteria and sub-criteria was refined through feedback from the District and is shown in the graphic at right.

Weighted score = [Sub-Criteria Score x Sub-Criteria Weight] x Criteria Weight

Note: Weighting per July 2024 workshop with the District.

Weighted Scores



Recommendations

Recommended Alternatives

The recommended alternative was selected in a workshopping process with the District in July 2024, which included a ranking of alternatives and consideration of near-term constraints and opportunities (i.e., triggers for implementation). The District is faced with potential changes in the existing Rancher contracts in the next few years, which may impact the recycled water capacity of the system.

It is important to recognize the existing condition was not specifically evaluated in the July 2024 workshop. Under existing conditions, the Decision Diagram would lead to Alternative 1 – Existing System, via the following logic:

QUESTION
#1

Is there a driver to abandon District DVR and/or Rancher irrigation?

Under existing conditions, the response is “**No**”.

QUESTION
#2

Does recycled water (RW) production exceed existing demands from Ranchers and District DVR irrigation?

Under existing conditions, the response is “**No**”, which leads to Alternative 1– Existing System.

Therefore, the recommended alternative under the existing conditions is Alternative 1 – Existing System.

In the July 2024 workshop, the potential near-term constraint of reduced recycled water system capacity (if not all current Rancher contracts were renewed) was a key consideration in the process of employing the Decision Diagram and ranking the alternatives. The evaluation was conducted from the hypothetical assumption that additional recycled water capacity would be needed. Under this assumption, the Decision Diagram would lead to the consideration of multiple alternatives, via the following logic:

QUESTION
#1

Is there a driver to abandon District DVR and/or Rancher irrigation?

The response is “**No**”, as there are no foreseeable drivers.

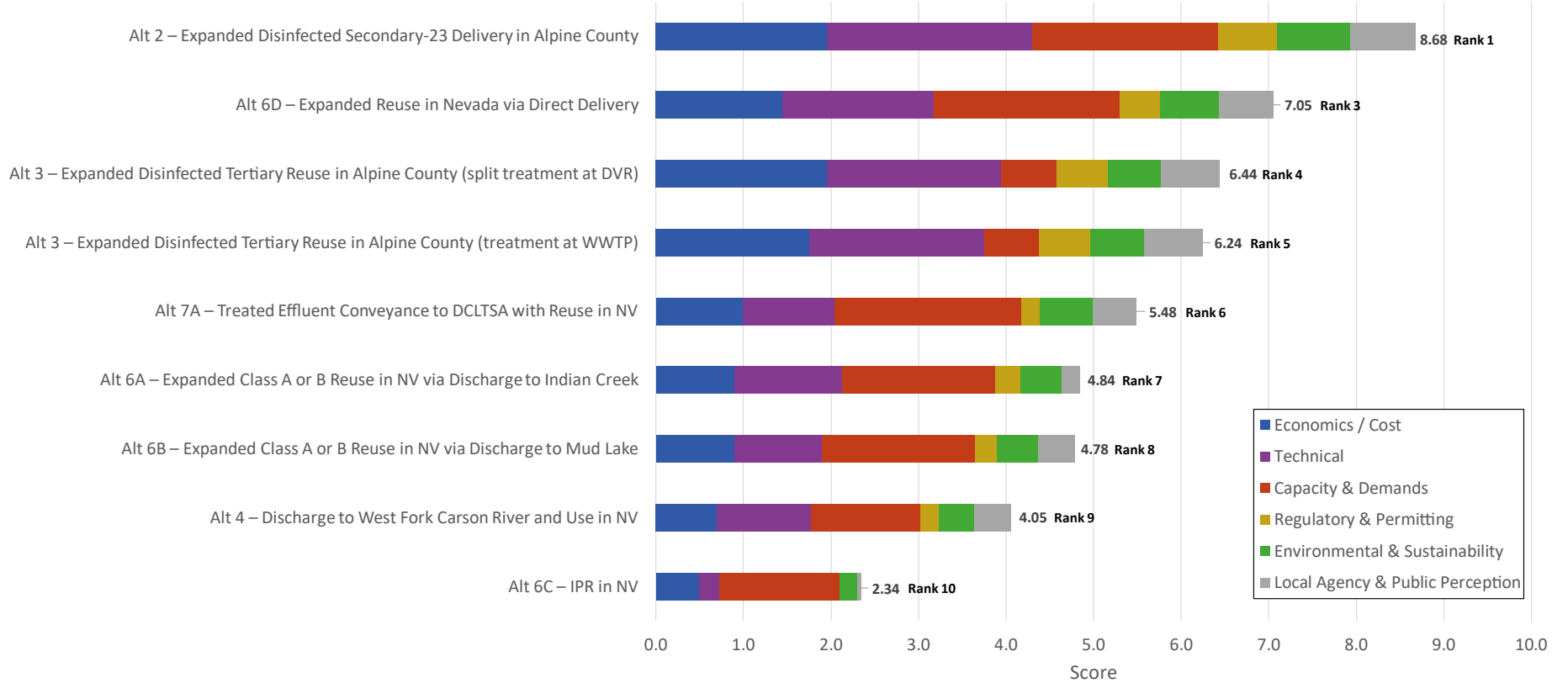
QUESTION
#2

Does recycled water (RW) production exceed existing demands from Ranchers and District DVR irrigation?

Under the hypothetical assumption of a capacity need, the response is “**Yes**”, which leads to Alternative 2 or several other alternatives.

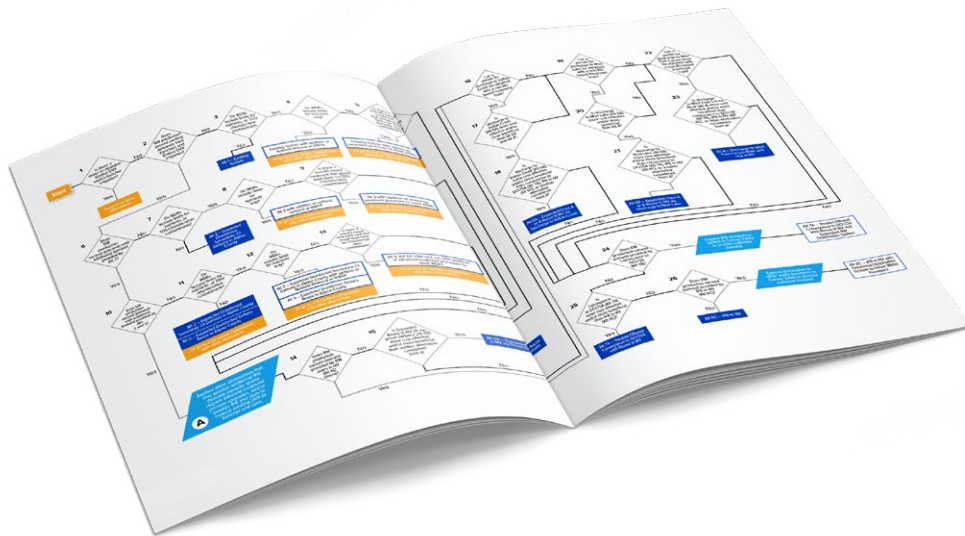
The multi-criteria decision analysis was used to compare and rank the alternatives with consideration of the potential near-term limitation on recycled water system capacity. Under these assumptions, the recommended alternative is Alternative 2 – Expanded Disinfected Secondary-23 Delivery in Alpine County, as shown on the following page.

Multi-Criteria Decision Analysis Results



Adapting to Future Conditions

In the future, threats to the continued use of the existing system may cause the District to revisit the comparison and ranking of alternatives under new assumptions. In this case, the tools created during development of the Recycled Water Strategic Plan can be revisited and updated to support future decision-making. The recommended process for revisiting and updating the tools is as follows.



Step 1: Revisit the Decision Diagram

- Revisit the Decision Diagram based on the triggers for implementation that reflect the opportunities or constraints at the time of re-evaluation.

Step 2: Update the Multi-Criteria Decision Analysis

- Modify (as needed) the list of criteria and associated weights.
- Modify (as needed) the list of sub-criteria and associated weights.
- Update the alternatives with any new information associated with the scoring metrics. For example, updated costs or new information on potential recycled water users/capacity, etc.
- Revise the scoring of alternatives.

Appendices

Appendix A: Technical Memorandum 1, Regulatory and Legal Framework

Appendix B: Technical Memorandum 2, Alternatives Identification

Appendix C: Technical Memorandum 3, Alternatives Evaluation

Appendix D: Meeting Materials and Minutes

Appendices excluded. Please see Recycled Water Strategic Plan full version.