West County Water Quality and Recycled Water Supply Feasibility Study: Alternatives Development and Evaluation

The heart of the feasibility study is an analysis of possible alternatives for regionalizing wastewater treatment systems in west Sonoma County, with the goal of making treatment more resilient, efficient and able to comply with future regulations.

The wastewater treatment systems in the study area include Russian River County Sanitation District (Russian River), Occidental County Sanitation District (Occidental), Graton Community Service District (Graton), and Forestville Water District (Forestville). (Note: Because wastewater from Occidental is no longer treated onsite and will eventually be treated at Graton, the alternatives' analysis assumes that Graton and Occidental systems are combined.)

The West Yost consulting team visited the wastewater treatment plants in the study area, met with treatment plant operators, and reviewed studies, plans, and regulatory actions for each location.

Based on its review of the existing systems and evaluating wastewater flows and capacities, the consulting team developed the following eight regionalization scenarios which are grouped into three categories and ranked the options using several factors.

1. **Local facility scenarios,** in which all wastewater would be treated at upgraded or expanded treatment plants within the west county. The three local facility alternatives are:
    a. Russian River district flows would be treated at the existing Russian River treatment plant while Forestville, Graton and Occidental flows would be treated at a combined and upgraded Forestville/Graton treatment plant. Estimated capital costs for this scenario are $55.8-$83.6 million. No new wastewater conveyance pipelines are needed.
    b. All west county flows would be treated at an expanded Russian River treatment plant. Estimated capital costs for this scenario are $97.5-$146.3 million and 24.3 miles of new wastewater conveyance pipelines – with four river crossings – would be needed.
    c. All west county flows would be treated at a new treatment plant at the current Forestville plant location. Estimated capital costs for this scenario are $115.1-$172.7 million and12.1 miles of new wastewater conveyance pipelines – with two river crossings –would be needed.
2. **Export scenarios,** in which the flows from all the west county agencies would be treated at treatment plants outside of west county. The three export scenarios are:
    a. All untreated wastewater flows from west county would be treated at the Windsor plant. Estimated capital costs for this scenario are $142.2-$213.2 million and 20.5 miles of new wastewater conveyance pipelines – with seven river crossings – would be needed.

b. All untreated wastewater flows from west county would be treated at the subregional Laguna treatment plant operated by the city of Santa Rosa. Estimated capital costs for this scenario are $161.8-$242.6 million and 20.8 miles of new wastewater conveyance pipelines – with four river crossings – would be needed.
c. All untreated Russian River district wastewater would be treated at Windsor while Graton, Occidental and Forestville wastewater would be treated at the Laguna plant. Estimated capital costs for this scenario are $165.7 - $248.5 million and 29.3 miles of new wastewater conveyance pipelines – with nine river crossings – would be needed.

3. **Combination scenarios**, in which some west county wastewater would be treated locally while other flows would be exported. The two combination scenarios are:
    a. Russian River district flows would continue to be treated at the Russian River treatment plant, while all Graton, Forestville and Occidental wastewater would be treated at the Laguna treatment plant. Estimated capital costs for this scenario are $84.2-$126.2 million and 10.4 miles of new wastewater conveyance pipelines – with three river crossings – would be needed.
    b. Russian River district wastewater would be treated at the Windsor treatment plant, while all Graton, Occidental and Forestville wastewater would be treated at a combined, upgraded plant. Estimated capital costs for this scenario are $142.5-$213.7 million and 18.9 miles of new wastewater conveyance pipelines – with seven river crossings – would be needed.

Table 1 (attached) summarizes each alternative, the plant improvements that would be needed, the pipes and pumps that would be constructed to convey wastewater and recycled water between plants, and the number of times pipelines would cross the Russian River.

Table 2 (attached) summarizes the estimated capital costs for treatment upgrades and expansions, conveyance (pipelines and pump stations), and disbursal of recycled water. Total costs range from a low of $55.8 million (alternative 1a) to a high of $248.5 million (alternative 2c).

This quantitative information was supplemented by seven qualitative screening criteria, described in **Table 3** (attached):

1. Reliability/ease of operation
2. Long-term regulatory compliance
3. Flexibility for adding unsewered communities
4. Local recycled water benefits
5. Environmental
6. Resiliency
7. Ease of implementation

The Technical Advisory Committee (TAC) scored each alternative using a 1-5 scale for each of the six screening criteria (**Table 4**, attached). Alternative 2a (exporting to Windsor) scored the highest with 23.5 points while 3a (combination of treating at Russian River and exporting to the Laguna treatment plant) scored the lowest with 15.0 points.

Because there are many stakeholders involved who place different values on each of the screening criteria, the consultants conducted a Monte Carlo analysis that used a range of weightings for each criteria. In addition to evaluating the seven qualitative categories, the analysis included the capital cost scores.

In the Monte Carlo analysis, alternative 1a (two local facilities) scored the highest with alternatives 2a (export to Windsor), 1c (one facility at Forestville) and 3b (treat at Graton/Forestville and export Russian River to Windsor) scoring second highest. Alternative 2b (export to Santa Rosa) scored slightly lower but was in the same range as the higher ranked options.

At its February meeting, the stakeholder committee briefly reviewed the alternatives and screening criteria. The committee requested additional information and a more in-depth discussion of both the alternatives and the criteria at its May meeting. The May 14 feedback from the stakeholder committee will be incorporated into further discussions with the TAC and will be used to determine which top alternatives move forward for further definition of facilities and costs:

- Alternative 1a: Two local facilities (Russian River and Forestville)
- Alterative 1b: One expanded facility at Russian River
- Alternative 1c: One new facility at Forestville/Graton
- Alternative 2a: Export all wastewater flows to Windsor treatment plant
- Alternative 2b: Export all wastewater flows to Laguna treatment plant
- Alternative 2c: Export Russian River wastewater to Windsor and direct Forestville/Graton wastewater to Laguna treatment plant
- Alternative 3a: Treat at Russian River and export Graton/Forestville wastewater to Laguna treatment plant
- Alternative 3b: Treat at Graton/Forestville and export Russian River wastewater to Windsor treatment plant

Table 1. Summary of Major Infrastructure Required

Element 1	1a: Two Local Facilities	1b: One Facility at RRCSD	1c: One Facility at FWD	2a: Export to Windsor	2b: Export to Santa Rosa	2c: Export to Windsor and Santa Rosa	3a: Treat at RRCSD; GCSD/FWD Export to Santa Rosa	3b: Treat at GCSD/FWD; RRCSD Export to Windsor
Treatment								
RRCSD	• Condition-related improvements	• Capacity expansion to accommodate all West County flows • Condition-related improvements	• Convert storage ponds to equalization facility	• Convert storage ponds to equalization facility	• Convert storage ponds to equalization facility	• Convert storage ponds to equalization facility	• Condition-related improvements	• Convert storage ponds to equalization facility
FWD	• Expansion of Tertiary Filtration and Disinfection	• Convert treatment ponds to equalization facility	• Construct new nitrogen removal/tertiary treatment facility (MBR)	• Convert treatment ponds to equalization facility	• Convert treatment ponds to equalization facility	• Convert treatment ponds to equalization facility	• Convert treatment ponds to equalization facility	• Expansion of Tertiary Filtration and Disinfection
GCSD	• Headworks Improvements • Convert treatment ponds to complete mix system	• Headworks Improvements • Convert treatment ponds to equalization facility	• Headworks Improvements • Convert treatment ponds to equalization facility	• Headworks Improvements • Convert treatment ponds to equalization facility	• Headworks Improvements • Convert treatment ponds to equalization facility	• Headworks Improvements • Convert treatment ponds to equalization facility	• Headworks Improvements • Convert treatment ponds to equalization facility	• Headworks Improvements • Convert treatment ponds to complete mix system
Windsor	-	-	-	• ~$38 million connection fee	-	• ~$24 million connection fee	-	• ~$24 million connection fee
Santa Rosa	-	-	-	-	• ~$61 million connection fee	• ~$21 million connection fee	• ~$21 million connection fee	-
Conveyance								
New Pipelines	-	• 24.3 miles	• 12.1 miles	• 20.5 miles	• 20.8 miles	• 29.3 miles	• 10.4 miles	• 18.9 miles
New Pump Stations	• GCSD (low head) for secondary transfer • GCSD (relatively low head) for tertiary transfer • FWD (relatively low head) for tertiary transfer	• GCSD to FWD (low head) • FWD to GCSD (low head) • GCSD to recycled water customers (low head) • FWD (high head) • RRCSD (high head)	• 2 at GCSD (low head) • RRCSD (high head, high flow) • FWD (low head, high flow)	• GCSD (low head) • FWD (high head) • RRCSD (high head, high flow)	• GCSD (high head) • FWD (high head, high flow) • RRCSD (high head, high flow)	• GCSD (high head) • FWD (high head) • RRCSD (high head, high flow)	• GCSD (high head) • FWD (high head)	• GCSD (low head) for secondary transfer • GCSD (relatively low head) for tertiary transfer • FWD (relatively low head) for tertiary transfer • RRCSD (high head)
River Crossings	--	4 crossings	2 crossings	7 crossings	4 crossings	9 crossings	3 crossings	7 crossings
Other	• Rehab existing 1.7 mile, 8-inch pipeline between GCSD and FWD	• Rehab existing 1.7 mile, 8-inch pipeline between GCSD and FWD	• Rehab existing 1.7 mile, 8-inch pipeline between GCSD and FWD	• Rehab existing 1.7 mile, 8-inch pipeline between GCSD and FWD	-	-	-	• Rehab existing 1.7 mile, 8-inch pipeline between GCSD and FWD
Recycled Water Pipelines	• 0.8 mile, 6-inch pipeline • 1.7 mile, 6-inch pipeline	• 0.8 mile, 6-inch pipeline • 1.7 mile, 6-inch pipeline • 10 miles of new pipeline from RRCSD to FWD	• 0.8 mile, 6-inch pipeline • 1.7 mile, 6-inch pipeline	-	-	-	-	• 0.8 mile, 6-inch pipeline • 1.7 mile, 6-inch pipeline
Recycled Water								
Land Application Area	• 5 acres (RRCSD)	-	-	-	-	-	• 5 acres (RRCSD)	-
Storage	• 310 acre feet (GCSD)	-	-	-	• Potential need for additional storage at Santa Rosa	• Potential need for additional storage at Santa Rosa	• Potential need for additional storage at Santa Rosa	• 310 acre feet (GCSD)

Table 2. Summary of Estimated Capital Costs, $ million

Score Category	Alternatives							
	1a: Two Local Facilities	1b: One Facility at RRCSD	1c: One Facility at FWD	2a: Export to Windsor	2b: Export to the Laguna WWTP	2c: Export to Windsor and the Laguna WWTP	3a: Treat at RRCSD; Export GCSD/FWD to the Laguna WWTP	3b: Treat at GCSD/FWD; Export RRCSD to Windsor
Treatment	40.8 – 61.2	25.6 – 38.4	53.6 – 80.4	38.4 – 57.6	59..2 – 88.8	44.8 – 67.2	47.2 – 70.8	38.4 – 57.6
Conveyance	8.6 – 12.8	71.9 – 107.9	61.5 – 92.3	103.8 – 155.6	98.6 – 147.8	118.5 – 177.7	34.6 – 51.8	97.7 – 146.5
Recycled Water	6.4 – 9.6	0	0	0	4.0 – 6.0	2.4 – 3.6	2.4 – 3.6	6.4 – 9.6
Combined Total	**55.8 – 83.6**	**97.5 – 146.3**	**115.1 – 172.7**	**142.2 – 213.2**	**161.8 – 242.6**	**165.7 – 248.5**	**84.2 – 126.2**	**142.5 – 213.7**
Normalized Score[(b)]	**5.0**	**2.9**	**2.4**	**2.0**	**1.7**	**1.7**	**3.3**	**2.0**

(a) Combined total costs are normalized by dividing by 350 to have a maximum value of 5.0 to compare with subject criteria scores.

Table 3. Selected Subjective Screening Criteria	
Criteria	Description
Reliability/Ease of Operation	Are the proposed infrastructure components relatively simple to operate and maintain for the West County agencies?
Long-Term Regulatory Compliance	Does the alternative entail a long-term reliable treatment solution for meeting effluent quality requirements? Is there more risk for non-compliance?
Flexibility for Adding Unsewered Communities	To what extent does the proposed alignment allow for connections to unsewered, disadvantaged communities of interest?
Local Recycled Water Benefits	Does the alternative support West County recycled water opportunities?
Environmental	Is there potential for impacts to flood plains, wetlands, endangered species, historical and archaeological properties? Are efforts associated with handling wastes minimized? Is the alternative energy efficient and/or minimize power usage?
Resiliency	Is the proposed or retained infrastructure vulnerable to flooding, climate change and/or seismic impacts?
Ease of Implementation	Would the project construction be relatively simple, with regard to both treatment improvements and pipelines? What level of governance structure and agency coordination would be required? Can the project be reasonably phased into smaller elements to increase funding resources?

Table 4. Preliminary Screening Criteria Scoring

Criteria	Scoring of Alternative[a]								Scoring Comments
	1a: Two Local Facilities	1b: One Facility at RRCSD	1c: One Facility at FWD	2a: Export to Windsor	2b: Export to Santa Rosa	2c: Export to Windsor and Santa Rosa	3a: Treat at RRCSD; Export GCSD/FWD to Santa Rosa	3b: Treat at GCSD/FWD; Export RRCSD to Windsor	
Reliability/ Ease of Operation	1	2	3	5	5	4	2.5	2.5	• The Export Scenarios (2a, 2b and 2c) involve sending flow to larger, regional facilities and would offer greater reliability and ease of operation for West County agencies. • Alternative 2c was slightly derated because two different export systems would be needed. • The remaining alternatives were scored lower depending on how many, smaller facilities would continue to be operated and whether additional flow equalization would be provided. • The lowest score assigned to the alternative that continues to have three facilities in operation with no additional equalization for peak flows (1a). • Alternative 1b scored higher because only one facility would need to be operated. However, ongoing operations at RRCSD is complicated by peak flow issues. • Alternative 1c score the highest of the local facility scenarios, as it provides for equalization at all three existing sites and provides for a new treatment system. • Alternative 3a was slightly derated from Alternative 1c. Management of GCSD/FWD flows would be significantly simplified. However, ongoing management of RRCSD WWTP with no added equalization would continue to provide challenges. • Alternative 3b was also slightly derated from Alternative 1c. The RRCSD system would be similar under both options, but the FWD treatment system would involve two different treatment plants with no additional equalization.
Long-Term Regulatory Compliance	2.5	1	3	5	5	5	2	4	• The Export Scenarios (2a, 2b and 2c) involve sending flow to larger, regional facilities and would offer greater potential for adjusting to future regulatory changes. The local facilities would be operated to provide equalization, which would also help to mitigate compliance concerns related to peak flows. • Alternative 3b scored the second highest because it includes a GSCD/FWD facility that has zero surface water discharge and export from the RRSCD. A zero-surface water discharge approach provides significant resilience to changing regulatory requirements. • The four remaining alternatives all include one local treatment facility that discharges to surface water. – Having all treatment at RRCSD (1b) scored the lowest due to the ongoing compliance issues at this site related to management of peak flows. These issues would only be exacerbated if the facility had to also manage peak flows from other sites. – The other two alternatives that continue to provide treatment for RRCSD flows only at the RRCSD WWTP (1a and 3a) scored higher. While the ongoing peak flow issues would continue at the RRCSD WWTP, they would not be amplified. Alternative 1a scored slightly higher than 3a because having zero surface water discharge provides a higher level of resilience than discharging to the Santa Rosa facility that continues to provide surface water discharge. – Providing all treatment at FWD (1c) scored the highest of the local treatment surface water discharge scenarios. Although all the flow would be discharged to surface waters, the new facility would be properly sized to accommodate this flow. Moreover, all three of the existing treatment systems would have equalization to help mitigate peak flow concerns
Flexibility for Adding Critical Unsewered Communities	1	3	3	5	3	5	1	5	• Alternatives that involve export to Windsor (2a, 2c and 3b) would include a pipeline alignment along Russian River to pick up critical unsewered communities and received the highest ranking. • Scenarios that can be modestly altered to include a pipeline alignment along Russian River to pick up critical unsewered communities (1b, 1c and 2b) received a slightly derated scoring. • Scenarios 1a and 3a would require significant, additional piping along Russian River to pick up critical unsewered communities and received the lowest scoring.
Local Recycled Water Benefits	4.5	5	4	1	1	1	2.5	3.5	• The local scenarios (1a, 1b and 1c) ranked the highest because they preserve the highest amount of recycled water for local uses. Scenarios 1a and 1b would retain all existing recycled water uses, but 1b scored slightly higher than 1a because it includes export of recycled water to the higher use areas near Forestville/Graton. • Alternative 1c would maintain recycled water in West County but would consolidate it only in one area and eliminates existing recycled water use for the Northwood golf course. Therefore, this alternative scored slightly lower than the other two local scenarios. • The export scenarios (2a, 2b and 2c) scored the lowest because they involve loss of all locally available recycled water. • The combination scenarios (3a and 3b) scored lower than the local scenarios because they would retain some local recycled water. 3a scored lower than 3b because recycled water would be maintained only near the Russian River WWTP, which has limited opportunity for reuse, and would export recycled water currently used in the Forestville/Graton area.

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Environmental	5	2.5	3	2	3	1	2.5	2.5	• Alternative 1a scored the highest because it requires the least amount of additional construction. It also allows for continued pond-based treatment at the Forestville/Graton plants, which is a relatively low energy-use approach to wastewater treatment. • Alternative 1b involves expansion of the Russian River WWTP and 1c construction of a new conventional facility at the Forestville WWTP site. Both would require major construction. In addition, both involve construction of new, major conveyance pipelines. Alternative 1b scored slightly lower due to the distance from the Russian River WWTP to areas where biosolids can be disposed. • Alternative 2a, 2b and 2c would include pumping of wastewater to large, conventional wastewater facilities that in themselves use significant energy. Therefore, these alternatives would require the most energy usage. Alternative 2a would also require construction along River Road, which could have construction-related environmental impacts. Therefore, 2a scored slightly lower than 2b. Alternative 2c scored the lowest because it would involve construction of two major export pipelines in addition to the above impacts. • Alternative 3a is similar to 2b (both involve export to Russian River) but 3a was scored slightly lower than 2b due to the distance from the Russian River WWTP to areas where biosolids can be disposed. • Alternative 3b is similar to 2a (both involve export to Windsor) but 3b was scored slightly higher because a significant amount of wastewater would be treated using a lower-energy pond-based treatment system.
Resiliency	2	1	3	4	5	4	2.5	3	• The export scenarios (2a, 2b and 2c) will be more resilient because the larger, regional facilities will have more resources to maintain resiliency over the long term. These scenarios therefore scored the highest; with 2a and 2c being slightly derated because of a need for construction of the pipeline along River Road which could be more susceptible to seismic and flooding impacts. • Alternatives that continue to rely on the Russian River WWTP are scored the lowest (1a, 1b, 3a) due to their reliance on a treatment facility that is near the Russian River and thus particularly vulnerable to seismic and flooding impacts. 1b scored the overall lowest because all treatment would be occurring at the Russian River facility. 3a was slightly higher than 1a because export to Santa Rosa would be more resilient than providing all treatment at the existing Forestville/Graton WWTPs. • Alternatives relying partially or fully on the Forestville/Graton WWTPs (1a, 1c and 3b) are considered more resilient than those that rely on the Russian River WWTP. Alternatives 1c and 3b were considered equivalent because export of flow from the Russian River WWTP to a new Forestville/Graton WWTP or to Windsor would have similar levels of resiliency.
Ease of Implementation	5	3	3.5	1.5	1	1.5	2	2.5	• Alternative 1a is the most similar to the status quo. It also offers flexibility of phasing the project elements to increase funding potential. So it is considered easiest to implement. • Alternatives 1b and 1c both could be phased to optimize funding opportunities like Alternative 1a. However, both would require expanding and/or constructing new facilities, which would increase the implementation complexity over Alternative 1a. Expanding the Russian River WWTP would likely be more complicated than constructing a new facility at the Forestville WWTP. Finally, both of these alternatives are slightly derated because they would likely require modifying the existing governance structure for the West County utilities. • The export alternatives (2a, 2b and 2c) are large linear construction projects that would bring some construction complexity. It also would generally not be feasible to phase these projects, with 2c offering some flexibility for phasing. These alternatives would also require coordination with the Town of Windsor or the City of Santa Rosa for a discharge agreement. Coordinating with the City of Santa Rosa will likely require more negotiation than with the Town of Windsor due to both the uncertainty in costs and a governance structure involving multiple external agencies. Alternative 2c would require coordination with both Windsor and Santa Rosa. It is assumed that the governance structure for the West County facilities would not change (each existing agency would still be responsible for management of their collection system). • The two combination scenarios (3a and 3b) would also be relatively simple to construct from a treatment perspective (like 1a). However, the large export pipeline brings added complexity, with the Windsor pipeline being significantly longer. These alternatives also provide less flexibility for phasing than the local treatment alternatives. Finally, 3a is further derated because coordinating with the City of Santa Rosa will likely require more negotiation than with the Town of Windsor.
Average Score	**3.0**	**2.5**	**3.2**	**3.4**	**3.3**	**3.1**	**2.1**	**3.3**	
Total Score	**21.0**	**17.5**	**22.5**	**23.5**	**23.0**	**21.5**	**15.0**	**23.0**	

(a) Not all categories include scores of 1 or 2 because the relative scoring is similar among the alternatives.