



TECHNICAL MEMORANDUM

TO: Nathan Schellenberg, P.E.
FROM: Brad Rasmussen, P.E.
DATE: July 14, 2026
SUBJECT: Nordic Village WWTF – O&M Cost, Cost-Per-Connection, and Additional Needs Analysis
PROJECT NO.: 002923.C

1. INTRODUCTION & PURPOSE

This memorandum evaluates the operation and maintenance (O&M) cost of the Nordic Village wastewater treatment facility (WWTF) currently in design, develops a cost-per-connection figure to support monthly sewer fee billing, and identifies additional capital needs required to reach buildout capacity or reduce major O&M costs. It does not evaluate the capital cost of the treatment facility currently under design.

This analysis follows the same Equivalent Residential Unit (ERU) fee methodology used in the August 2024 Nordic Wastewater Treatment Rate Evaluation, updated for the treatment process, cost basis, and connection phasing now defined for this facility.

2. TREATMENT PROCESS DESCRIPTION

The facility consists of a membrane bioreactor (MBR) process followed by a reverse osmosis (RO) system to meet groundwater discharge requirements. As currently designed, the MBR is built out to 125,000 gpd and the RO system consists of two skids rated at 125,000 gpd each (one duty, one standby), so the facility's firm treatment capacity today is 125,000 gpd against an ultimate design flow of 250,000 gpd. RO reject (concentrate) is currently planned to be hauled by truck over the mountain to evaporation ponds located in west Weber County near the Great Salt Lake.

The project also intends to install an evaporator system to process RO reject on site, which would eliminate the need to truck reject to the evaporation ponds. Additional capital needs associated with the evaporator and with future MBR and RO capacity expansion are addressed in Section 6.

The facility is designed for 250,000 gpd, with a buildout cumulative average flow of 229,776 gpd at 685 ERUs.

3. O&M COST BASIS

Table 1 presents the estimated annual O&M cost at full buildout, assuming the facility continues to haul RO reject by truck. Each line item describes the assumed scope or calculation basis used to develop the annual cost.

Table 1. Estimated Annual O&M Cost – Full Buildout

Item	Description	Basis	Annual Cost
1	1/2 Manager Salary with burden	Assuming a part-time manager	\$80,000
2	1/2 Administration / Billing	Part-time person for billing	\$60,000
3	Rent	General overhead item for operating the district	\$8,400
4	Utilities	General overhead item for operating the district	\$6,000
5	UASD Dues	General overhead item for operating the district	\$1,200
6	Legal Consulting Fees	General overhead item for operating the district	\$50,000
7	Engineering Consulting Fees	General overhead item for operating the district	\$50,000
8	Directors & Officers Insurance	General overhead item for operating the district	\$2,000
9	Accounting Service Fees	General overhead item for operating the district	\$15,000
10	MBR Cleaning Chemicals	Allowance for sodium hypochlorite, citric acid, and other routine MBR membrane cleaning chemicals at buildout	\$10,000
11	Water Testing (2x/week influent & effluent)	Allowance for twice-weekly influent and effluent laboratory testing	\$12,000
12	E. coli Testing (daily, Type I reuse)	Allowance for daily E. coli testing under Type I reuse operating assumption	\$73,000
13	Contract Operations (Class IV operator / DRC)	Contract operator allowance for Class IV operator/DRC coverage, routine site operations, sampling coordination, reporting support, and normal operating oversight	\$180,000
14	Sludge Dewatering	Allowance for sludge dewatering equipment operation, washwater, routine service, and related consumables	\$30,000
15	Solids Disposal (landfill, 700 tons)	Estimated 700 tons/year of dewatered solids hauled to landfill, including tipping fee allowance	\$28,000



Item	Description	Basis	Annual Cost
16	RO Cleaning Chemicals	Allowance for RO cleaning chemicals, antiscalant, acid, cartridge filters, and clean-in-place consumables	\$21,900
17	RO Reject Hauling (12,500 gal/day to evaporation pond)	Estimated hauling and disposal of 12,500 gal/day of RO reject to off-site evaporation ponds; cost is removed if the evaporator system in Section 6 is installed	\$400,000
		Estimated Annual O&M Cost (Full Buildout)	\$1,167,900

4. CONNECTION (ERU) BASIS AND PHASE-IN

The facility is assumed to reach 685 ERUs at buildout over a 5-year phase-in period, per the current Nordic Village Sewer Master Plan. Table 2 shows the cumulative flow and ERU count by year. Note that cumulative flow exceeds the facility's current 125,000 gpd firm capacity partway through Year 3 — this is the point by which the RO and MBR expansion described in Section 6 would need to be in service.

Table 2. Connection (ERU) Phase-In

Year	Cumulative Flow (gpd)	ERUs Added	Cumulative ERUs
1	64,445	192	192
2	83,495	57	249
3	132,445	146	395
4	185,895	159	554
5	229,776	131	685

5. COST-PER-CONNECTION ANALYSIS

The annual O&M cost was separated into fixed and variable components. Fixed costs include district administration, overhead, contract operations, and testing, totaling \$537,600/year at buildout. Variable costs include power, chemicals, dewatering, disposal, and hauling, totaling \$630,300/year at buildout. During the 5-year phase-in, variable costs are scaled to each year's cumulative flow as a fraction of the buildout flow, while fixed costs are held constant. Both components are escalated at 3% per year. Years 6–10 assume flow and connections remain at the 685-ERU buildout level. Equipment and membrane replacement reserves are addressed separately in Section 7 and are not included in Table 1 or Table 3.



Table 3. Estimated Monthly Fee per ERU by Year

Year	Total O&M Cost	Cumulative ERUs	Monthly Fee per ERU
1	\$715,100	192	\$310.37
2	\$791,200	249	\$264.79
3	\$958,500	395	\$202.22
4	\$1,149,700	554	\$172.94
5	\$1,167,900	685	\$142.08
6	\$1,202,900	685	\$146.34
7	\$1,239,000	685	\$150.73
8	\$1,276,200	685	\$155.25
9	\$1,314,500	685	\$159.92
10	\$1,353,900	685	\$164.71

The monthly fee per connection is highest in Year 1 because fixed costs are spread across only 192 ERUs. The rate declines through buildout as connections grow faster than costs, reaching about \$142/month per ERU at full buildout in Year 5, then rises gradually with 3% annual cost escalation once connection growth levels off. This table does not include capital recovery, debt service, the effect of installing the evaporator system, or the equipment and membrane replacement reserves addressed in Section 7.

6. ADDITIONAL CAPITAL NEEDS

This section does not evaluate the capital cost of the treatment facility currently in design. Discussion is limited to additional items required to reach full 250,000 gpd buildout capacity or materially reduce O&M cost, including the future RO train, additional MBR membranes, equipment installation, and the optional evaporator system for RO reject management. The costs below are additional needs only and do not include site work, buildings, electrical, instrumentation and controls integration, engineering, or other ancillary costs unless specifically noted.

The facility currently in design provides 125,000 gpd of firm MBR and RO capacity. Certain infrastructure, including MBR tankage, blowers, and controls, has been sized for the full 250,000 gpd buildout; therefore, the additional capacity needs identified below are limited to the incremental equipment required to use that planned buildout capacity, subject to vendor confirmation.



Table 4. Future Expansion Equipment and Installation Needs (to reach 250,000 gpd buildout capacity)

Item	Description	Capital Cost
Additional RO Train	3rd RO skid (Stage 1: \$257,439 + Stage 2: \$177,834) to bring RO firm capacity to 250,000 gpd	\$435,273
Additional MBR Membranes	2nd cassette per train (2 cassette frames + 96 ZeeWeed 500 modules) to bring MBR capacity to 250,000 gpd; tankage/blowers already sized for this	\$340,000
Equipment Installation	Installation allowance for MBR membrane expansion equipment, estimated at 24% of the MBR membrane cost	\$80,000
	Total, future expansion capital	\$855,273

Table 5. Evaporator System (eliminates RO reject hauling)

Item	Description	Installed Cost
Evaporator System (replaces RO reject hauling)	Alfa Laval AlfaFlash MVR-D-1E-2.0, sized for 12,500 gal/day RO reject (~2,000 kg/hr water evaporated, remaining salts at 85% dryness); budgetary quote received by email	\$1,600,000
Building Cost	Building allowance for evaporator system	\$1,000,000
Installation	Installation allowance for evaporator system	\$800,000
	Total, evaporator system capital	\$3,400,000

The evaporator system is estimated at \$3,400,000, including \$1,600,000 for equipment, \$1,000,000 for the building, and \$800,000 for installation. The estimated connected load is approximately 154 kW. If operated continuously to match the 12,500 gal/day RO reject flow, the evaporator would use approximately 1,349,000 kWh/year, or about \$162,000/year at \$0.12/kWh. This would eliminate the \$400,000/year RO reject hauling cost included in Table 1, resulting in estimated net O&M savings of approximately \$238,000/year before evaporator maintenance and salt disposal costs. Based on the \$3,400,000 installed cost and \$238,000/year net savings, the simple payback is approximately 14 years. On-site evaporation would also reduce operational and safety risks associated with hauling RO reject over mountain roads, particularly during winter conditions when snow, ice, road closures, and limited access can increase the risk of service interruptions or hauling incidents.



7. PUMP, BLOWER, AND MEMBRANE REPLACEMENT RESERVE (R&R)

This section identifies the pumps, blowers, and membrane systems that should be carried in a separate repair and replacement (R&R) reserve rather than in the annual O&M cost table. Pumps and blowers are generally shown with a 15-year equipment life, while MBR membranes use a 10-year life and RO membranes use a 3-year life.

Table 6. Repair and Replacement Reserve for Pumps, Blowers, and Membranes

Equipment (P&ID Tag)	Service / Type	Qty	Motor Power	Equipment Replacement Cost	Annual Reserve
Membrane Blowers (20-B-201A/B/C)	MBR air scour, positive displacement (Aerzen GM 15L)	3	20 HP ea	\$30,000	\$2,000
Process/Permeate Pumps (20-P-301-1/2)	MBR permeate & backpulse, rotary lobe, reversible	2	20 HP ea	\$15,000	\$1,000
Drain Pumps (20-P-401A/B)	MBR tank drain, end-suction centrifugal (Gorman-Rupp T4A)	2	3 HP ea	\$4,000	\$267
Instrument Air Compressors (90-CO-001A/B)	MBR pneumatic valve/ejector air supply, piston	2	~10 HP ea	\$6,000	\$400
Prefilter Transfer Pumps	RO feed transfer, duty/standby	2	n/a	\$29,000	\$1,933
Carbon Filter Feed Pumps	RO pretreatment feed, duty/standby	2	10 kW ea (~13 HP)	\$15,000	\$1,000
RO Train Feed & High-Pressure Pumps	Stage 1 & 2 feed and HP pumps, per train	2 trains (8 pumps)	1–50 HP ea	\$20,000	\$1,333
RO CIP Recirculation Pumps	Stage 1 & 2 CIP recirc	2	n/a	\$10,000	\$667
Acid Dosing Pumps	RO acid feed, duty/standby, Stage 1 & 2	4	n/a	\$23,000	\$1,533
Antiscalant Dosing Pumps	RO antiscalant feed, duty/standby, Stage 1 & 2	4	n/a	\$20,000	\$1,333



Equipment (P&ID Tag)	Service / Type	Qty	Motor Power	Equipment Replacement Cost	Annual Reserve
Sludge Feed Pump	Dewatering press feed (Netzsch NM038BY01L06B)	1	n/a	\$10,000	\$667
MBR Membranes	Membrane module replacement reserve	1 lot	10-year life	\$150,000	\$15,000
RO Membranes	Replacement elements for current two-train RO system	90 elements	3-year life	\$64,000	\$21,333
				Subtotal, identified annual R&R reserve	\$48,466

The annual reserve is calculated by dividing equipment cost by the applicable reserve life: 15 years for pumps, blowers, and compressors; 10 years for MBR membranes; and 3 years for RO membranes. Based on Table 6, the identified annual R&R reserve totals \$48,466/year, including \$12,133/year for pumps, blowers, and compressors, \$15,000/year for MBR membranes, and \$21,333/year for RO membranes.

This list reflects the Phase 1 equipment configuration: two RO trains and one MBR cassette per train.

8. SUMMARY

At full buildout, and assuming continued truck hauling of RO reject, the Nordic Village WWTF is estimated to cost approximately \$1,167,900 per year to operate, equating to roughly \$142/month per ERU at 685 connections before any capital recovery, debt service, or repair and replacement reserve. Because fixed costs dominate the early phase-in years, the monthly fee needed to cover O&M costs is higher in Year 1 than at buildout.

Additional capital-related needs identified in this review are summarized below:

- Future expansion items total approximately \$855,273, including the additional RO train (\$435,273), additional MBR membranes (\$340,000), and estimated equipment installation (\$80,000).
- The optional evaporator system is estimated at \$3,400,000, including equipment (\$1,600,000), building cost (\$1,000,000), and installation (\$800,000).
- If installed, the evaporator would eliminate the \$400,000/year RO reject hauling cost and replace it with an estimated \$162,000/year power cost. The resulting net O&M savings are estimated at \$238,000/year before evaporator maintenance and salt disposal costs.
- Based on the \$3,400,000 installed cost and estimated net annual savings, the simple payback is approximately 14 years.



- The evaporator would also improve operational reliability and safety by reducing RO reject hauling over mountain roads, especially during winter weather when road conditions and access restrictions can affect hauling reliability.

A separate repair and replacement reserve is identified in Section 7 and summarized below:

- The currently identifiable annual R&R reserve totals approximately \$48,466/year.
- Pumps, blowers, and compressors account for approximately \$12,133/year.
- MBR membranes account for approximately \$15,000/year.
- RO membranes account for approximately \$21,333/year.
- Before this memo is used for budgeting or billing, the RO reject hauling cost, final equipment pricing, and replacement reserve assumptions should be confirmed.

For budgeting purposes, the District may collect either the O&M-only amount or the combined O&M plus R&R amount. The O&M-only approach lowers the monthly fee but does not build a dedicated reserve for future equipment replacement. The combined approach provides a more complete long-term funding strategy by setting aside annual reserve funds for pumps, blowers, compressors, and membranes as those components reach the end of their expected service lives.

Table 7. Summary of Full Buildout Annual O&M and R&R Costs

Cost Component	Annual Cost
O&M Cost at Full Buildout	\$1,167,900
Annual R&R Reserve	\$48,466
Combined O&M plus R&R Cost	\$1,216,366

Table 8. Estimated Monthly Fee per ERU Including R&R Reserve

Year	Combined O&M + R&R Annual Cost	Cumulative ERUs	Monthly Fee per ERU
1	\$763,566	192	\$331.41
2	\$841,120	249	\$281.50
3	\$1,009,918	395	\$213.06
4	\$1,202,660	554	\$180.75
5	\$1,222,449	685	\$148.72
6	\$1,259,085	685	\$153.17
7	\$1,296,871	685	\$157.77



Year	Combined O&M + R&R Annual Cost	Cumulative ERUs	Monthly Fee per ERU
8	\$1,335,807	685	\$162.51
9	\$1,375,895	685	\$167.39
10	\$1,417,137	685	\$172.41

