FINAL PROJECT MEMORANDUM

TOWN OF PARADISE

Paradise Sewer Project

Project No.:	204890
Date:	August 4, 2026
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Reviewed By:	Darren Baune, PE
Subject:	Technical Comparison between Full Low Pressure Sewer System and Hybrid Gravity Sewer Collection

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1.0 PURPOSE

HDR prepared the *Alternatives Analysis Technical Memorandum, Paradise Sewer Project (HDR, January 2026)* to evaluate collection, treatment, and discharge alternatives for the Town of Paradise's (Town) Sewer Project (Project). The Alternatives Analysis technical memorandum (TM) recommended that the Town implement the hybrid gravity/ septic tank effluent pumping (STEP) collection system, aerated lagoon treatment, and an evaporation/ percolation land discharge pond.

Carollo performed geotechnical investigations of the proposed treatment plant sites in 2026 and found very low percolation rates at each proposed site. The low percolation rates make the aerated lagoon treatment with evaporative/percolation ponds treatment technology infeasible. The Town decided to revise the treatment facility to a membrane bioreactor (MBR) with surface water discharge.

The Town requested that Carollo perform an independent technical evaluation of HDR's recommendation to implement the hybrid gravity/septic tank effluent pumping (STEP) collection system. Specifically, the Town requested that Carollo evaluate the following collection system alternatives.

- Full low-pressure sewer collection system (LPSS).
- Hybrid gravity and low-pressure sewer collection system.

The purpose of this Project Memorandum (PM) is the following:

- Perform a technical evaluation of the full low-pressure sewer collection system vs hybrid gravity and low-pressure sewer collection system.
- Summarize community input and discuss ideas proposed by the community.

2.0 PROJECT GOALS

The Town does not have a centralized sewer collection system and relies solely on septic systems for wastewater treatment and disposal from private residences, businesses, and industry. This has negatively impacted the Town's economic recovery from the 2018 Camp Fire and poses a threat to the groundwater and surface water quality of the region.

The Sewer Project Ad Hoc Committee has identified the following goals for the Project:

1. Affordable: Implement a project that provides a long-term, efficient, and reliable wastewater disposal solution that remains affordable for the community while supporting economic recovery by eliminating septic-related capacity limitations and reducing the burden of on-site wastewater management for businesses.
2. Scalable: The Project should accommodate regrowth of the Town and be expandable in an efficient manner to allow service to the full sewer service area (SSA) and in the future to the extended SSA area.
3. Permittable: It is important to consider the permitting of the Project since the Town is considering wastewater treatment plants that will discharge treated effluent to surface water. New wastewater treatment plants must secure permits through the State Water Resources Control Board and local Regional Water Quality Control Board.

3.0 BACKGROUND

3.1 Sewer Collection System Overview

The Town's proposed sewer collection system will convey wastewater from homes, businesses and industry within the SSA shown in Figure 1. The sewer flow will be collected with a system of pipelines to convey wastewater to a wastewater treatment facility (WWTF) that will be owned and operated by the Town. The SSA will serve approximately 256 parcels in Phase 1 and 1,500 parcels at full build out.

In February 2026, Carollo began the preliminary design for Phase 1 of the SSA based on the recommendations in the Alternatives Analysis TM (HDR, January 2026). Phase 1 includes the downtown area of the Town and includes parcels along Skyway, Pearson Road, Almond Street, and Black Olive. Figure 1 shows the SSA and the preliminary Phase 1 sewer collection system area. The boundaries of the Phase 1 service area will be refined and finalized as design progresses.

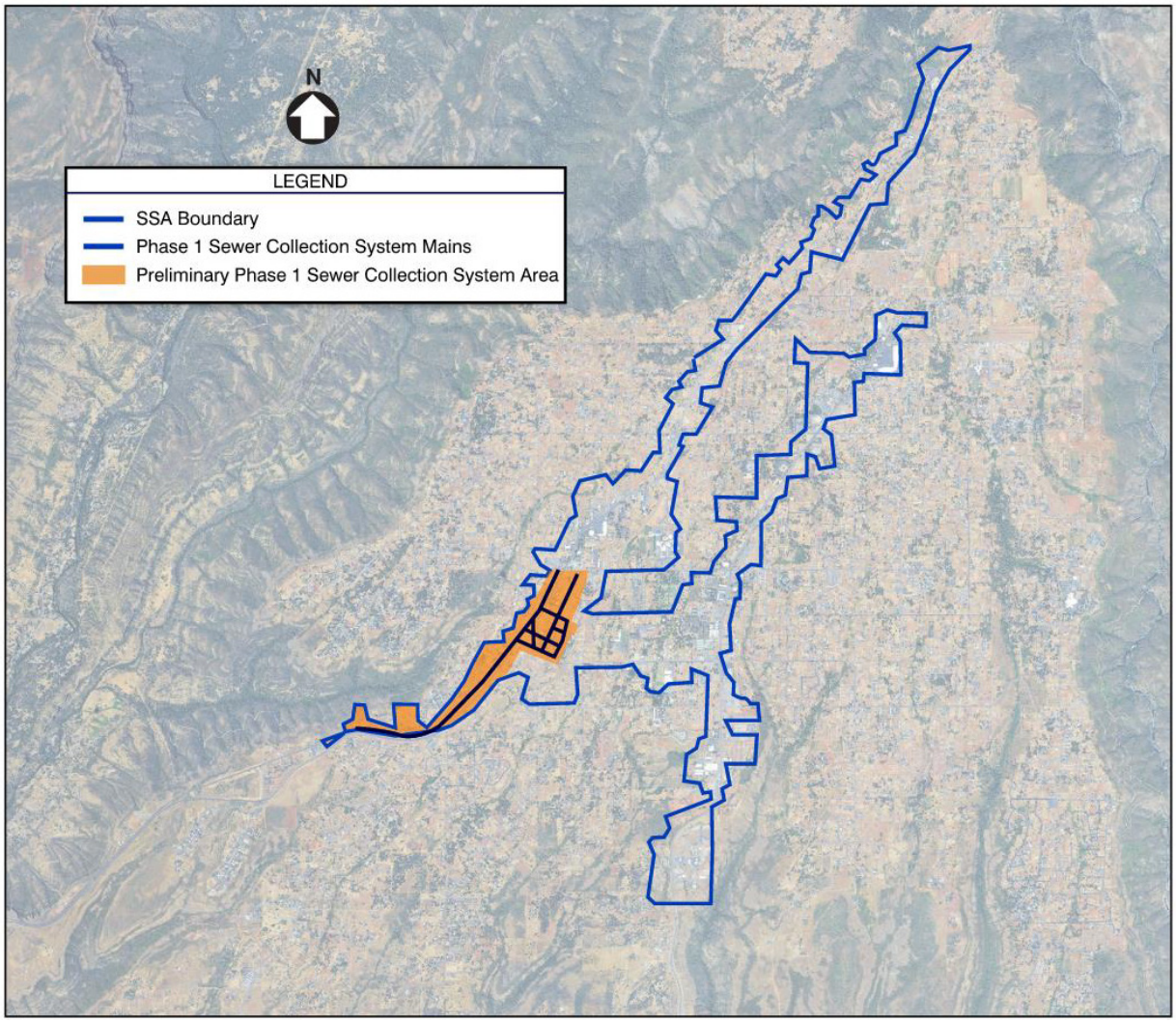


Figure 1 Town of Paradise Sewer Collection System

3.2 HDR Alternatives Analysis Technical Memorandum

The Alternatives Analysis TM (HDR, January 2026) evaluated collection system alternatives including, a full gravity collection system, a full LPSS utilizing STEP, and a hybrid gravity/ STEP system. The Alternatives Analysis TM recommended a hybrid gravity/ STEP system, a Town-owned WWTF using aerated lagoon treatment, and an evaporation/percolation land discharge pond. The Alternatives Analysis TM concluded that a full LPSS was infeasible due to high system pressure in the sewer collection system because of the elevation change in Town.

4.0 OVERVIEW OF LOW PRESSURE AND HYBRID GRAVITY SEWER COLLECTION SYSTEMS

4.1 Low Pressure Sewer Collection Systems

LPSS are wastewater collection systems that pump sewage from each home, business, or industrial connection into a low-pressure conveyance system. LPSS are typically used in low lying areas of a Town to lift wastewater up to a gravity flow pipeline or wastewater treatment facility. Low-pressure systems can be effective in communities where conventional gravity sewers are challenging to install due to shallow bedrock, high groundwater, and hilly or flat terrain.

Sewage from each parcel is pumped into the conveyance system using either STEP or grinder pump systems. The STEP and grinder pump stations include a tank, pump(s), vault, electrical supply, and control panels, which alarm if a pump malfunctions.

The following summarizes the key elements of LPSS:

- LPSS typically operate between 20 and 80 pounds per square inch (psi) of system pressure. The maximum operating pressure is generally limited by 90% of the pump's maximum allowable total dynamic head which is approximately 70 psi to 90 psi depending on the type of pump and manufacturer.
- Compared to gravity sewer systems, LPSS utilize smaller diameter pipelines because the flow is pumped and conveyed under pressure.
- If the system uses fully welded high-density polyethylene (HDPE), LPSS typically have less infiltration and inflow. LPSS systems can also be constructed with gasketed polyvinyl chloride (PVC) pipelines which will have infiltration and inflow.
- Since the system is pressurized, the pipelines can be designed to accommodate changing pipeline slopes to achieve required utility clearances. They also require appurtenances such as air-release valves at high points, back flow prevention valves at each pump location, and isolation valves every 500- to 800-feet (ft) and at major connections to operate and maintain the system.
- Where LPSS systems discharge to gravity pipelines, turbulent flow from the pressurized laterals can increase hydrogen sulfide (H_2S) off gassing in the mains creating a corrosive environment with foul odors. Without proper corrosion protection measures, H_2S gas will corrode concrete and metal components over time.
- Due to H_2S off-gassing, odor control measures are recommended at the air-release valves, and corrosion-resistant materials are recommended for the pipeline and appurtenances. Due to the absence of manholes, installation of pigging ports is recommended to access the pipeline for cleaning operations.

There are two types of LPSS systems common in the industry: STEP and grinder pump systems. The following sections describe each system in more detail.

4.1.1 Septic Tank Effluent Pump (STEP) LPSS

In a STEP LPSS, wastewater flows by gravity from a home, commercial business or industrial connection into a two-compartment septic tank where the solids settle and are retained in the tank. The liquid effluent flows into the second compartment of the septic tank, which contains a pump. The liquid effluent is then pumped through a small diameter lateral where it is discharged to a collection main. Figure 2 shows the general configuration of a STEP system.

Source: Orenco Prelos System

Figure 2 STEP System Schematic

STEP systems require a septic tank, effluent pump, control panel, and connection to power, which are all typically installed near the structure on private property. Settled solids in the septic tank accumulate over time until the septic tank reaches capacity and the settled solids are required to be removed with a vacuum truck. The solids from the septic pump outs will need be hauled to a septage receiving station. Currently, property owners typically haul septage to Lincoln, CA for disposal which is approximately 70 miles away from Paradise.

Orenco is one of the primary manufacturers of STEP system equipment and there are relatively few manufacturers that provide complete STEP system packages. However, the pump and tank equipment can be purchased separately from various manufacturers, which means sole source procurement is not required. Table 1 provides descriptions and notes for the equipment required on private property for STEP systems.

Table 1 Equipment for STEP Systems located on Private Property

Equipment	Notes
Septic Tank	▪ Tanks are sized per the sewer flow of each parcel and typically provide 24 hours of flow storage. ▪ Recommended tank sizes: » 1,500 gallons for 1 EDU (or three-bedroom house). » Commercial and multifamily housing tank sizes must be specifically engineered and designed for high flow. Sizes can range from 8,000- to 16,000- gallon tanks. ▪ Tanks can be precast concrete or fiberglass. ▪ Tank lids are not generally designed to withstand H-20 traffic loading. ▪ Re-use of existing septic tanks is possible but requires an evaluation of the structural integrity of each tank to check if the tank leaks and if it can be retrofitted for a STEP pump. ▪ It is anticipated that most of the existing septic tanks will require replacement during construction. ▪ Requires pump out of solids every 3 to 5 years.
Effluent Pump	▪ Pump Size: 0.5 to 1 hp. ▪ TDH: Up to 240 ft. ▪ Pump housed in a pump filter – filter requires periodic cleaning.
Level Controls	▪ Pumps are activated by a float control system. ▪ A high-water level float triggers alarms.
Control Panel	▪ Outdoor control panel on structure includes a pump run light, off switch, and alarms.
Lateral Discharge Piping	▪ Discharge piping can be pressure-rated PVC or HDPE. ▪ Check valve and isolation valve are included for every assembly.
Power Requirements	▪ Single family houses (1 EDU) will require 120V power, with a dedicated 20 amp service. ▪ Commercial and multifamily properties will require 240V power and 20 amp service. ▪ Two separate circuits are recommended – one for pump control and one for alarms. ▪ Home, commercial, or multi-family properties will need to provide power supply.

Notes:
EDU – equivalent dwelling unit; hp – horsepower; TDH – total dynamic head; V - volts.

Table 2 summarizes the advantages and limitations of STEP systems.

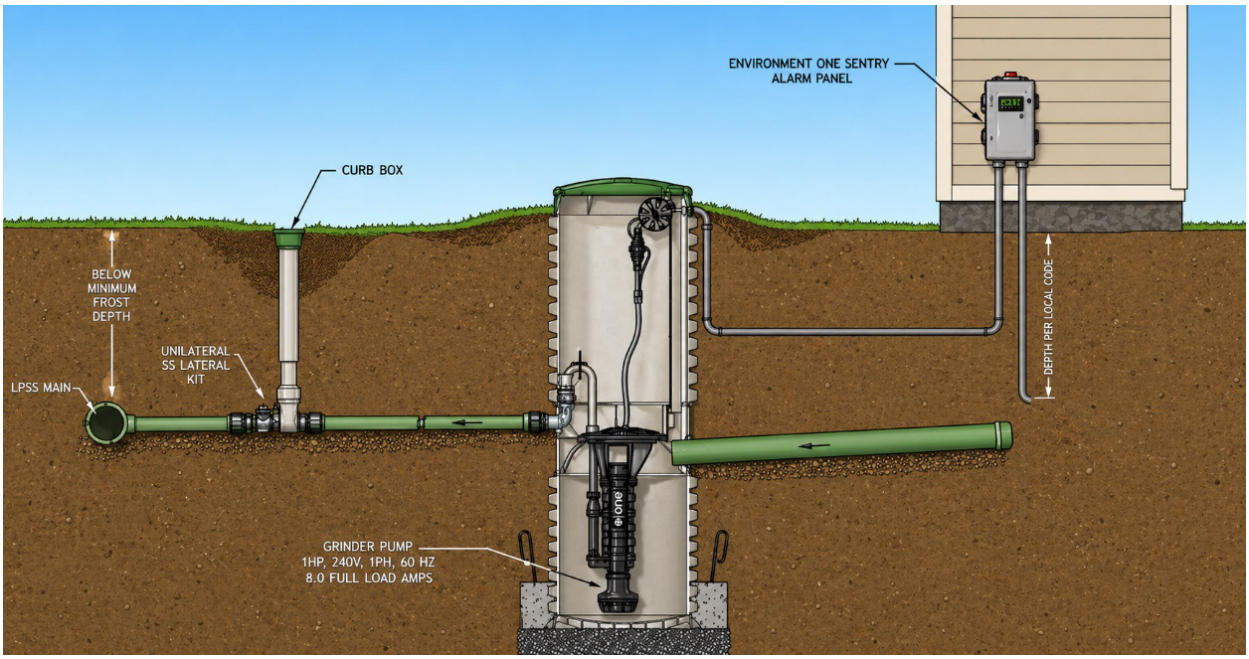
Table 2 Advantages and Limitations of STEP Systems

Advantages	Limitations
Ease of Construction: STEP pipelines are generally smaller diameter and installed at shallower depths than conventional gravity pipes.	Power Requirements: STEP systems require power at each service connection. This could be a limitation in areas that experience safety power shutoffs.
Primary Treatment: STEP tanks provide primary treatment at the septic tank when solids settle out of the liquid.	Long Term O&M: STEP tanks require periodic septic pump outs, tank inspections, filter cleaning, and valve exercising. At the end of its useful life, equipment would need to be replaced. The useful life of the equipment will vary widely between users but is estimated to be between 15 to 25 years for the pumps.
Storage: STEP tanks are sized with approximately 24 hours of emergency storage.	Town Equipment Access: Each STEP system will require access to the equipment by the Town. This requires an easement or MOU for every parcel with a STEP system.
	Equipment Failure: STEP systems have more points of failure than a conventional gravity system because they have more mechanical equipment. For example, rags can clog pumps, floats can get stuck, or filters can get clogged.
	Increased Owner Coordination during Construction: STEP systems will require coordinating with each owner to decide the location of each STEP tank, control panel, and will involve connecting the STEP power to the owner's electrical system.
	STEP Tank Size: A residential, 1,000 gallon tank is approximately 10-ft long by 5-ft wide by 4.5-ft deep. Installation will be more difficult on properties with limited space.
	Interconnected Hydraulic System: In a full STEP system, each STEP tank pumps into a common pressurized sewer network. Since the system pressure varies with elevation, the pressure will be the lowest at higher elevations and highest at lower elevations. Due to the Town's topography, pressures at lower elevations exceed the capacity of typical STEP pumps preventing sewage from parcels at the bottom of the system from entering the pressurized sewer network. The pressures also exceed the pressure ratings for common pipes, valves, and appurtenances used in wastewater systems.

Notes:
O&M – operations and maintenance; MOU - Memorandum of Understanding.

4.1.2 Grinder Pumps LPSS

The grinder pump LPSS consists of a semi-positive displacement grinder pump located inside a basin. The grinder pump station receives wastewater flow via gravity from the structure, macerates the wastewater and solids, and pumps it through a small diameter lateral where it is discharged to a collection main. Figure 3 shows a general configuration of a grinder pump system.



Source: E-One Grinder Pump Systems

Figure 3 Grinder Pump Schematic

Grinder pumps do not require a septic tank. Wastewater flows into a basin located on the property that is generally smaller than septic tanks. Grinder pumps require a pump, control panel, and connection to power, which are all typically installed near the structure on private property similar to STEP systems. E-One is one of the primary manufacturers of grinder pump LPSS systems. However, there are several manufactures that can provide a complete grinder pump package. Table 3 provides descriptions and notes for the equipment required on private property for grinder pump systems.

Table 3 Equipment for Grinder Pump Systems located on Private Property

Equipment	Notes
Pump Basin	▪ The pump basins are sized for the sewer flow of each parcel and whether a simplex (one pump), duplex (two pumps), or quad (four pumps) system is used. Some residential parcels use duplex pump systems to provide an extra pump for redundancy. ▪ Recommended basin sizes for 1 EDU (or three-bedroom house): » Simplex: Provides 100 gallons of storage capacity and is rated for a flow of 700 gpd. » Duplex: Provides 150 gallons of storage capacity and is rated for a flow of 1,500 gpd. ▪ Commercial and multifamily basin sizes must be specifically engineered and designed for high flow. Basin capacity volumes can range from 250-to 500-gallons with flows rated up to 10,500 gpd. ▪ Tank lids are not generally designed to withstand H-20 Traffic Loading. ▪ Re-use of existing septic tanks is not possible as the grinder pump basin layout is significantly different than a septic tank layout.
Semi-Positive Displacement Grinder Pump	▪ Pump Size: 1 to 2 hp. ▪ TDH: Up to 185 ft.
Level Controls	▪ Pumps activated by an integrated pressure switch which detects changes in an air column as the water level in the tank fluctuates.
Control Panel	▪ Outdoor control panel on structure includes a pump run light, off switch, and alarms.
Lateral Discharge Piping	▪ Discharge piping can be pressure-rated PVC or HDPE. ▪ Check valve and isolation valve are included for every assembly.
Power Requirements	▪ Single family houses (1 EDU) will require 240 V, with a dedicated 30-amp service. Occasionally, a 120 V connection with a dedicated 40-amp service may be allowed with pumps rated up to 1 hp. ▪ Commercial and multifamily properties will require 240V power and 30-amp service. ▪ Two separate circuits are recommended – one for pump control and one for alarms.

Notes:
gpd – gallons per day.

Advantages and limitations of grinder pumps are shown in Table 4.

Table 4 Advantages and Limitations of Grinder Pumps

Advantages	Limitations
Ease of Construction: Conveyance pipelines are generally smaller diameter and installed at shallower depths than conventional gravity pipes.	Power Requirements: Grinder pumps require small amounts of power to run. This could be a limitation in areas that experience safety power shutoffs.
Solids are Pumped: Grinder pumps do not require septic pump outs since all solids are pumped.	Long Term O&M: Grinder pumps require periodic inspections. At the end of its useful life, equipment would need to be replaced. The useful life of the equipment will vary widely between users but is estimated to be between 15 to 20 years for the pumps.
	Town Equipment Access: Each grinder pump will require access to the equipment by the Town. This means that an easement or MOU will be required for every parcel having a grinder pump.
	Scouring Velocities: Grinder pumps will transport more solids than STEP systems. This means that meeting minimum scouring velocities in the pipeline is critical. The system will be designed to meet minimum scour velocities, however, during periods of low flow, minor settlement of solids may occur. As a result, more frequent pigging, flushing or cleaning of the pipelines is recommended.
	Increased Owner Coordination during Construction: Grinder pumps will require coordinating with each property owner to decide the location of each grinder pump vault, control panel, and will involve connecting the grinder pump power to the property owner's electrical system.
	Storage: Grinder basins provide 2.5 to 24 hours of storage. Town staff will need to respond within that window to pump down the tank during an extended power outage.

4.2 Hybrid Gravity/LPSS Collection System

Hybrid gravity/LPSS collection systems use gravity sewers as the primary collection system and LPSS in low lying areas of Town. Figure 4 shows a potential hybrid gravity/LPSS collection system with a combination of gravity flow pipelines and a LPSS in low-lying areas of Town.

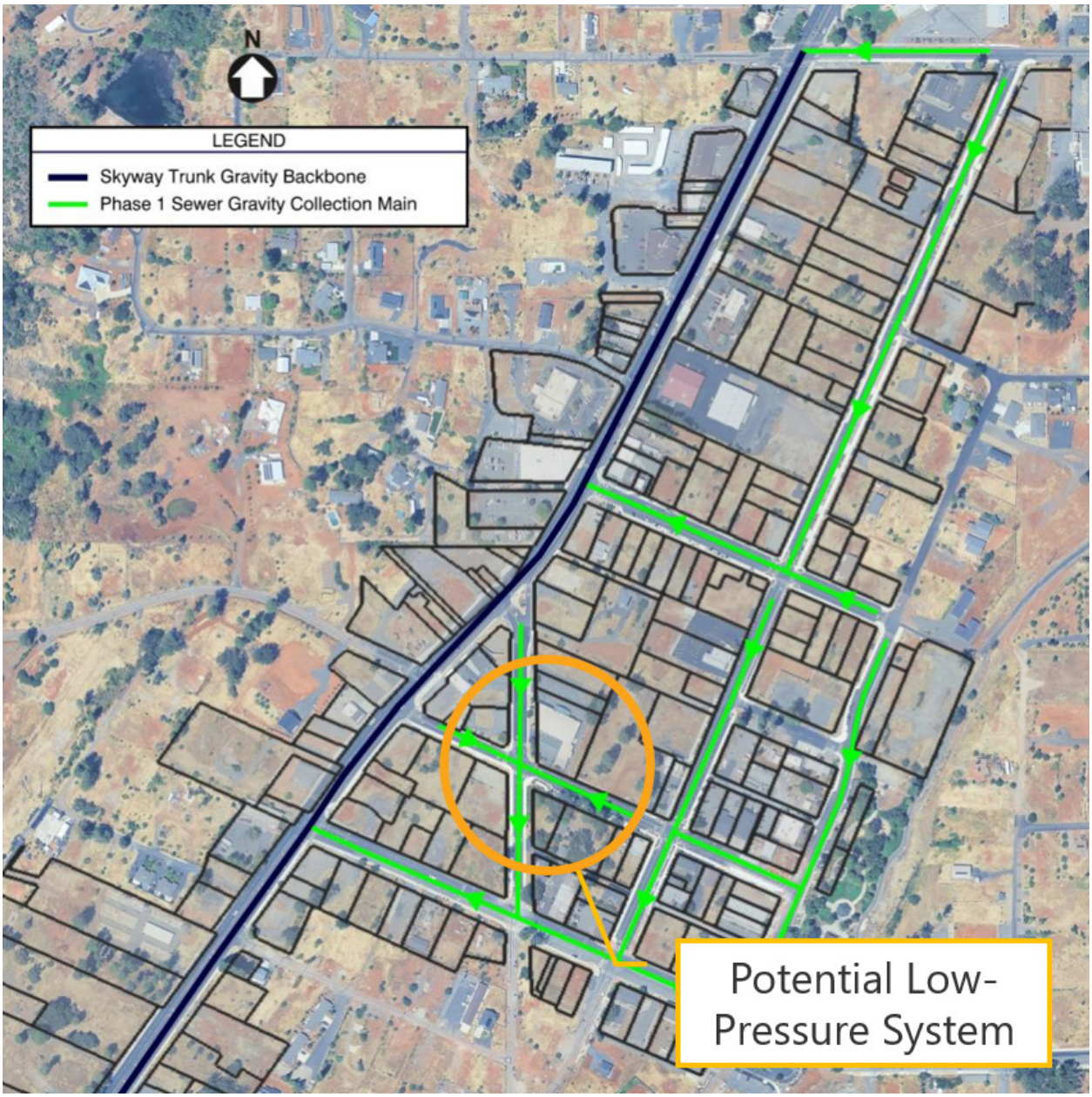


Figure 4 Potential Gravity Hybrid Sewer Layout

The detailed design of the gravity hybrid collection system will depend on the topography, existing utility locations and depths, ground conditions, and other factors. It is anticipated that both gravity and LPSS pipelines will need to be installed below the parallel water mains throughout Town to maintain the minimum vertical clearance required at each water service crossing.

Conversations with Paradise Irrigation District (PID) and record drawings suggest that the existing water lines have a minimum of 3.5 ft of cover. For the 6-inch to 12-inch water lines in the Phase 1 area, this will result in sewer lines with at least 5.5 ft of cover depending on the location. The gravity and LPSS sewer pipelines will be designed to be installed as shallow as possible, while meeting minimum burial depth and minimum utility clearance requirements as shown in Table 5.

Table 5 Gravity & LPSS Pipeline Design Requirements

Requirement	Gravity Sewer	LPSS Sewer
Minimum Pipe Cover(1)	3-ft minimum.	3-ft minimum
Minimum Horizontal Clearance to Dry Utilities Joint Trench(2)(3)	3-ft minimum 5-ft recommended from high pressure gas lines	3-ft minimum 5-ft recommended from high pressure gas lines
Minimum Vertical Clearance to Dry Utilities(2)	12-inches minimum	12-inches minimum
Minimum Horizontal Clearance to Potable Water(4)	10-ft minimum	10-ft minimum
Minimum Horizontal Clearance to Recycled Water(5)	6-ft minimum, 10-ft preferred	6-ft minimum, 10-ft preferred
Minimum Vertical Clearance to Potable Water(6)	12-inches minimum below water line	12-inches minimum below water line

Notes:
(1) Minimum pipe cover is based on manufacturer recommendations based on pipe material and industry standards.
(2) Dry utilities include electrical, gas, and fiber optic lines. Joint trenches have been installed throughout Town as part of the Pacific Gas and Electric Company (PG&E) undergrounding project in conjunction with AT&T and Comcast. Minimum horizontal clearance of 36 inches matches PG&E and American Water Works Association (AWWA) standards. Vertical clearance requirement per PG&E Greenbook and matches industry standard.
(3) PG&E mapping in Town indicates multiple high-pressure gas lines. Work within 5-ft of a high-pressure gas line requires a pre-construction meeting with PG&E and a PG&E inspector to be on site during any excavation.
(4) California Code of Regulations 64572 Title 22 (CCR T22) Chapter 16 requires sewers and force mains installed parallel to a water main to have a minimum of 10 ft of clearance between pipes. When local conditions or existing utilities do not allow for 10 ft of clearance, a sewer pipeline may be installed 4 to 10 ft clear from an existing water pipeline with special design and design review and approval by the Division of Drinking Water (DDW).
(5) DDW letter to the Town titled, Division of Drinking Water's Updated Response Comments, Pipeline Separation Requirements, Town of Paradise, dated May 14, 2026.
(6) CCR T22 Chapter 16. Minimum vertical clearance also applies to sewer main and sewer lateral crossings of water main lines and water services.

The hybrid gravity/LPSS option will require ongoing maintenance of equipment located on private property (STEP or grinder pump systems). Periodic gravity system maintenance includes flushing and closed-circuit television (CCTV) inspection of the mains. As referenced in Section 4.1, the turbulent flow from the LPSS pressurized laterals will increase H_2S off-gassing in the gravity mains. Therefore, anti-corrosion measures are recommended at manholes located within 1,000-ft of locations where LPSS discharge to gravity sewers. Anti-corrosion measures could include the installation of polymer concrete manholes or lining of the interior of manholes. Odor control is recommended at the discharge points. Table 6 lists the advantages and limitations of a hybrid gravity/LPSS sewer collection system.

Table 6 Advantages and Limitations of Hybrid Sewer Systems

Advantages	Limitations
Reduced Number of Equipment on Private Property: Reducing the number of STEP or grinder pumps throughout Town results in less long-term O&M by the Town, fewer easements required by the Town to access the equipment, and as a result, less impacts to property owners.	Minimum Scour Velocities: The hybrid system may require an accelerated cleaning schedule on the gravity portion for the first several years of operation if minimum scour velocities are not met.
Flexibility: A hybrid system gives the Town the flexibility to install gravity or pressure sewers based on existing site conditions such as available space on private property and topography.	Increased Pipe Cost: Gravity sewer pipelines are larger in diameter than the pressurized mains which increases the excavation and pipeline raw material cost. In the Phase 1 area, gravity sewer pipelines are expected to be approximately 8-inches in diameter, while low pressure mains would be 4-inches in diameter for an LPSS area.
Easy Access for O&M: Manholes every 350-ft allow the Town to periodically check the conditions of the gravity sewer and low-pressure system tie-in points.	Construction Complexity: Gravity sewers are generally installed deeper than LPSS which increases construction complexity. It should be noted gravity sewers will be installed as shallow as possible while meeting minimum burial and utility clearance requirements shown in Table 5.
Ease of System Expansion: The Phase 1 system can be expanded to include future phases.	

5.0 TECHNICAL EVALUATION OF FULL LPSS VERSUS HYBRID GRAVITY/ LPSS

This section compares implementing a full LPSS throughout Town (STEP or grinder pump system) to a hybrid gravity / LPSS system. Since the Town is working to locate a site for the WWTF, this PM assumes the potential locations listed below, which are the most feasible sites at this time. Figure 5 shows the assumed locations of the WWTF.

- North of the intersection of Skyway and Media Way south of Town.
- North of the intersection of Clark Road and Old Clark Road.

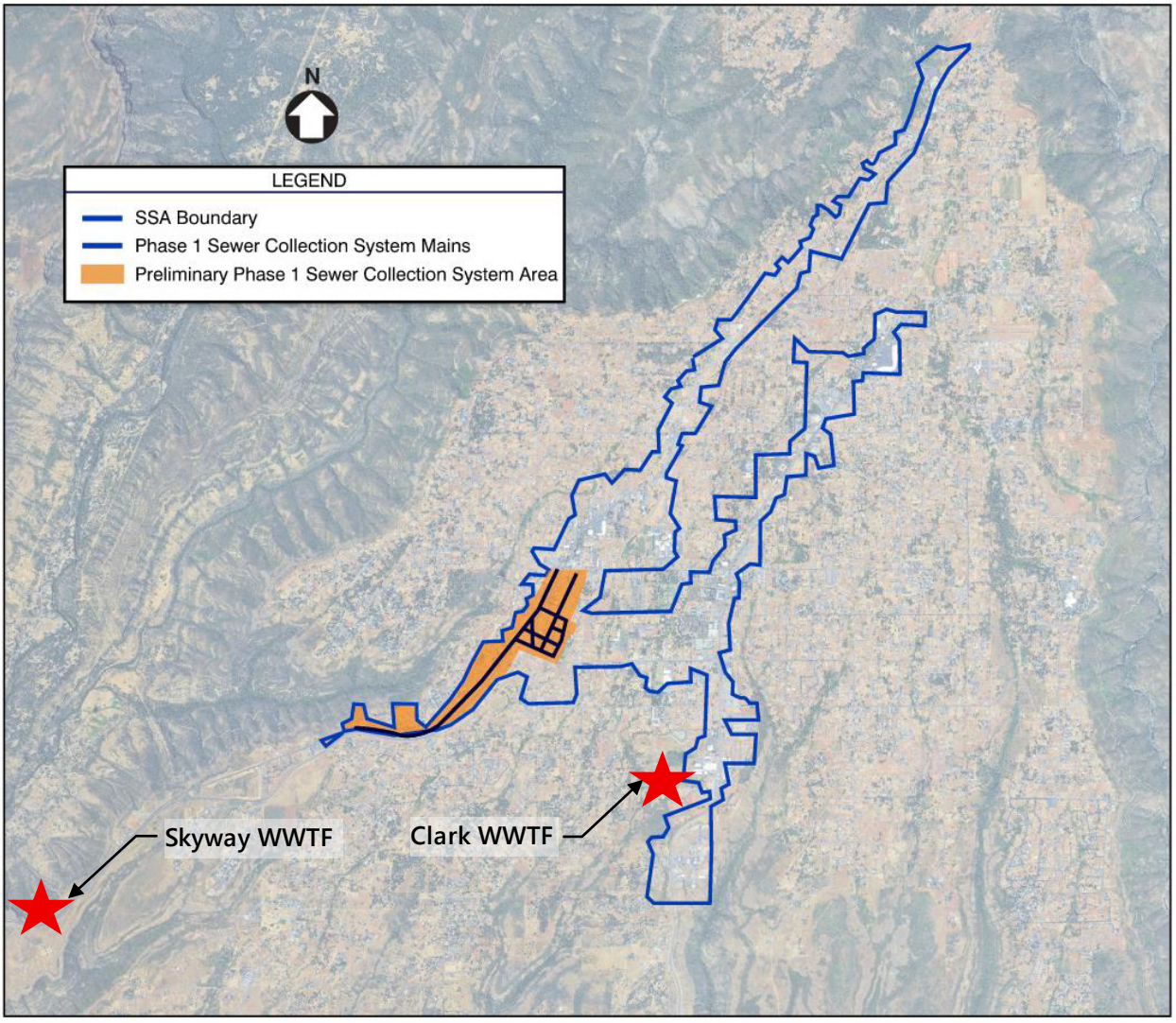


Figure 5 Town of Paradise Potential WWTF Locations

5.1 Technical Evaluation of Full LPSS Collection System

The full LPSS would require installation of STEP or grinder pump stations on each parcel within the Phase 1 service area (as shown in Figure 6) that would pump into a low-pressure collection system. The low-pressure system would convey wastewater to the WWTF.

LPSS are typically used to pump uphill from low-lying areas of Town to a WWTF or gravity pipeline where the system breaks head. However, the Town's potential WWTF locations are all located at significant elevation differences downhill from the users/connections which creates a unique and complex hydraulic system. Since the system is fully hydraulically interconnected, the lower portions of the system will see very high system pressures.

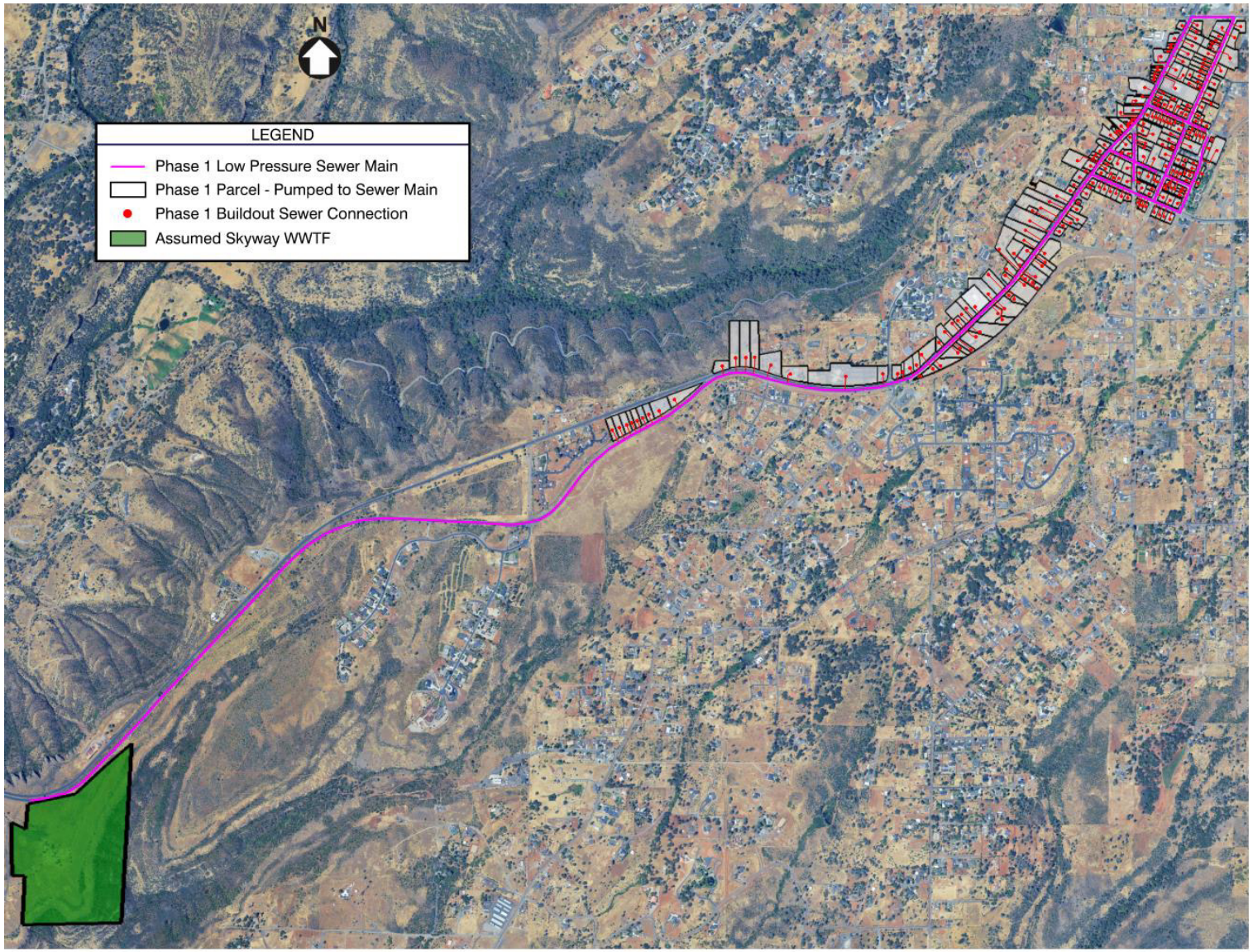


Figure 6 Phase 1 of Collection System (Full Low Pressure Sewer Service)

As part of this technical evaluation, Carollo met with both Orenco and E-One to better understand the capabilities and limitations of their collection systems and to discuss their experience implementing full LPSS in communities with similar conditions. This subsection expands on the estimated system pressures, as well as additional LPSS considerations such as pipeline bury depth, shared trenching, and long-term O&M considerations

5.1.1 System Pressure Considerations

Figure 7 shows a schematic drawing of the profile of the elevation change from the highest point in the collection system to the wastewater treatment facility (WWTF) located on Skyway. In a pressurized pipeline system, the internal pressure is primarily a function of the hydrostatic pressure and the dynamic friction losses in the pipeline. At any point in the system, hydrostatic pressure is created by the weight of the water column above that point, which increases by approximately 1 psi for every 2.31 feet of downward elevation change. Accordingly, all pipelines, pumps, valves, and other appurtenances must be rated to withstand the pressure conditions where they are installed in the system. Because hydrostatic pressure increases with decreasing elevation, the lowest point in the system (the WWTF) will experience the highest system pressure.

Any pump discharging into the pressurized wastewater collection system must generate sufficient pumping head to overcome dynamic friction loss in the pipeline between the pump and the discharge point, the elevation difference between the pump and the discharge point, and the system pressure. Table 7 summarizes the estimated system pressures at the two proposed WWTF sites based on the elevation difference between each site and the system high point.

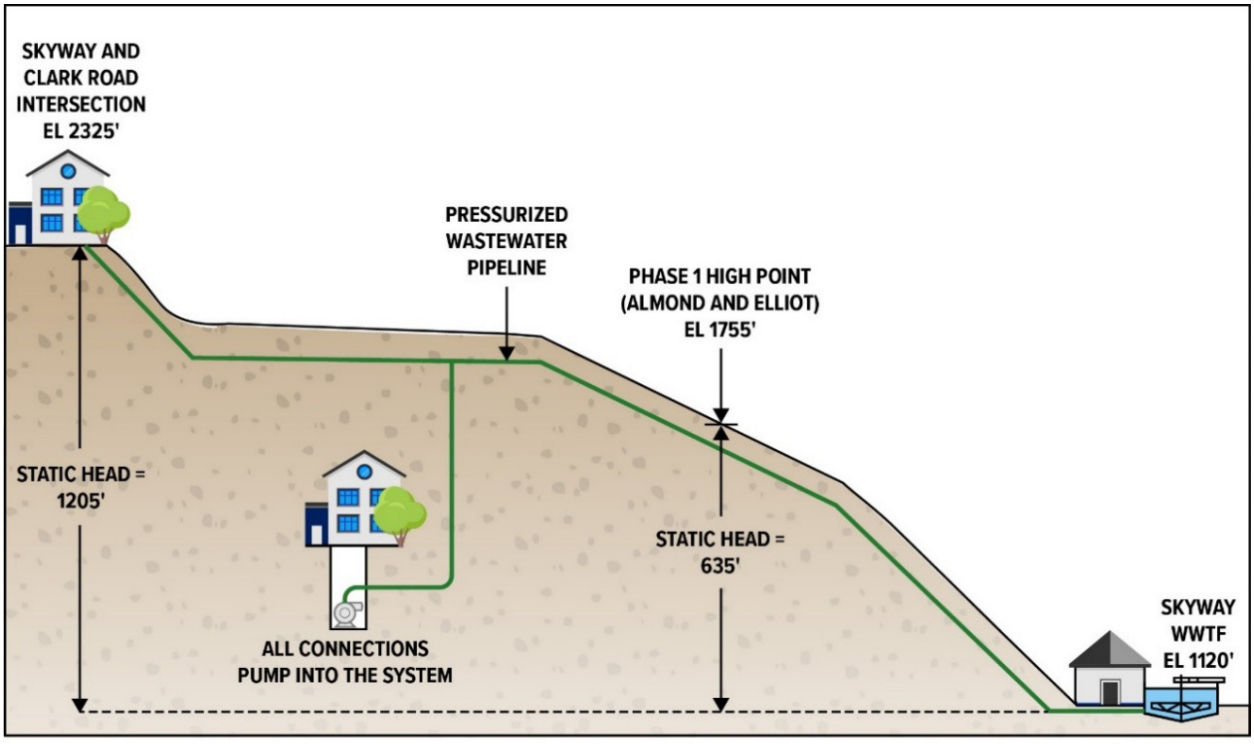


Figure 7 Town of Paradise LPSS Profile Schematic

Table 7 Town of Paradise Estimated Static Pressure in LPSS

Sewer Phase	Elevation at High Point of System(1)	Elevation at Skyway WWTF(2)	Static Pressure at Skyway WWTF(4)	Elevation at Clark WWTF(3)	Static Pressure at Clark WWTF(4)
Phase 1	1,755-ft	1,120-ft	276-psi	1,555-ft	87-psi
SSA Build-Out	2,325-ft	1,120-ft	523-psi	1,555-ft	334-psi

Notes:
(1) Phase 1 high point elevation is at Almond Street and Elliot Road. SSA build-out high point elevation is at Skyway and Clark Road.
(2) Skyway WWTF has been assumed to be located just north of Skyway and Media Way intersection. WWTF elevation was determined using a topographic survey performed in April 2026 as part of the design phase for the Town of Paradise Sewer Project.
(3) Clark WWTF has been assumed to be located just north of Clark Road and Old Clark Road intersection. WWTF elevation was determined using Google Earth.
(4) Static pressure was calculated by subtracting the low point elevation in the system from the high point elevation and dividing by 2.31 to convert from feet of water to psi.

The high system pressure developed in a single pressurized system due to the elevation difference in Paradise is a technical fatal flaw for the following reasons:

- Common operating pressure for LPSS is approximately 20 to 80 psi.
- The system develops extremely high pressure in lower parts of the hydraulic system.
  - Phase 1 has a 635-ft elevation change from the high point in the system to the WWTF (assumed to be Skyway South for this analysis) that results in 276 psi at the WWTF.
  - At buildout, there is a 1205 ft elevation change from the high point in the system to the WWTF (assumed to be Skyway South for this analysis) that results in 523 psi at the WWTF.
- 276 to 523 psi is beyond the pressure rating of common pipes, pumps, valves and other wastewater system components.
- LPSS pumps are not rated for high pressures. The pump head must exceed the system pressure otherwise pumps will not pump into the system. STEP pumps are rated for 240-ft of TDH (105-psi) and grinder pumps are rated for 185-ft of TDH (80-psi). At lower elevations in the sewer system, where the system pressure is higher, the pumps would not be able to operate, especially when the SSA is fully built out.
- The typical pressure pipeline materials used in LPSS are HDPE and PVC. The highest pressure-rated HDPE pipe is HDPE DR 7 which is rated for 335 psi. The highest pressure rated PVC pipeline is AWWA C-900 DR-14 pipe, which is rated for 305-psi.

Carollo investigated installing wastewater pressure reducing valves (PRVs) to reduce pressure and create different pressure zones within the LPSS, similar to a potable water system. However, Carollo found that PRVs are generally unsuitable for wastewater collection systems because solids and other debris can clog pressure-reducing valve control ports, creating significant O&M challenges for the Town. Also, the LPSS manufacturers (E-One and Orenco) were not able to provide a case study where LPSS systems have been installed in a similar system that required significant pressure reduction.

5.1.2 Requirements for Clearance between Potable and Wastewater Pipelines for LPSS Pipelines

The California State Water Resources Control Board DDW requires 10-ft of horizontal clearance between sewer and potable water lines. If the sewer pipeline is located within 10-ft, a 1-ft vertical separation must be met between the parallel sewer and water pipelines. The sewer pipeline must be located below the potable water and the minimum 1-ft of vertical clearance between the two pipes must be maintained. Any proposed deviations to these requirements must be submitted to DDW for review and include additional measures to protect the potable water such as concrete encasement, a casing pipeline, or fused/restrained pipe joints.

The Town is in a unique position where all the Town's utilities, including potable water, dry utilities (electrical and telecommunications), gas, and storm, have already been installed underground. Areas outside of the road, but within the Town's right-of-way have electrical and communications vaults installed as part of PG&E's underground efforts. Additionally, based on PG&E design drawings and discussion with PID, in some areas utilities were abandoned in place and left underground. The number of existing utilities in the right-of-way creates challenges where maintaining 10-ft of horizontal clearance from the potable water main while meeting the minimum required clearances from dry utilities (as shown in Table 5) will not always be possible. In these cases, the sewer pipeline would need to stay 1-ft below the parallel water main. Additionally, each sewer lateral that crosses a water pipeline must cross below the water pipeline with a minimum 1-ft of vertical clearance.

5.1.3 LPSS Joint Pipeline Trench Considerations

DDW has jurisdiction over water and recycled water line separation in public right of way, while the plumbing code governs private property. The separation criteria pursuant to the California Waterworks Standards, CCR T22, Chapter 16, Section 64572 requires domestic water pipeline installation shall not be installed in the same trench and shall be at least 10 ft horizontally from a parallel pipeline conveying non potable water.

DDW sent a letter to the Town titled, *Division of Drinking Water's Updated Response Comments, Pipeline Separation Requirements, Town of Paradise,* dated May 14, 2026 (Attachment D) that clarified separation requirements between recycled water and sewer pipelines based on CCR T22. The letter states, "For instances of separation of recycled water lines and sewer lines, DDW applies pipeline separation requirements similar to those for potable water lines and pipelines conveying sewage. For horizontal separation between recycled water lines and sewer lines, a minimum separation of 6-ft should be maintained, though a 10-ft separation is preferred. Since the separation required is a minimum of 6-to 10-ft, installing recycled water and LPSS pipelines in the same trench would not reduce construction cost.

The ability to treat effluent to recycled water quality is part of a separate evaluation underway as part of the WWTF design.

5.1.4 LPSS Operations and Maintenance Considerations

There are currently no regulations in California dictating whether agencies or property owners must own the sewer pumping equipment on private property such as STEP or grinder pumps. However, due to the risk of sewer overflows from poorly maintained systems, it is recommended that the Town own and

maintain all pumping equipment on private property. For the full system SSA build-out, this means that the Town would be responsible for operating and maintaining up to 1,500 separate pumping systems throughout Town at buildout.

A summary of the O&M requirements is shown in Table 8.

Table 8 Full LPSS O&M Requirements

System	O&M Component	O&M Frequency
STEP System	Septic tank inspections	Annual
	Septic tank cleanouts(1)	Every 3-5 years
	Effluent Filter Cleaning	Every 3-5 years
	Pump alarm system testing (floats, alarms, and controls)	Annual
	Inspect lateral appurtenances (shutoff valve and check valve)	Annual
Grinder Pump Systems	Grinder tank inspections	Annual
	Pump alarm system testing (floats, alarms, and controls)	Annual
	Inspect lateral appurtenances (shutoff valve and check valve)	Annual
LPSS Collection System Equipment(2)	Valve exercising	Annual
	Air-release valve inspection	Annual
	Odor Control Inspection/ Replacement	Every six months
	Mainline Pigging	As needed

Notes:
(1) Septic tank cleanouts will require hauling the solids to a solids receiving station outside of Town.
(2) Due to the corrosiveness of the effluent, isolation and air-release valves will be more prone to failure. An accelerated exercise, inspection, and replacement program may be necessary based on Agency feedback received (as discussed in Section 6).

In addition to the O&M requirements listed above, the Town would be responsible for responding to all property owner alarm calls as well as replacing the equipment above at the end of its useful lifecycle.

5.2 Technical Evaluation of Hybrid Gravity/ LPSS

Hybrid gravity/ LPSS collection systems use gravity sewers as the primary collection system and LPSS in low lying areas of Town that pump to the gravity sewers as shown in Figure 4. After setting the elevation of the gravity sewer as shallow as possible based on existing utilities, each area throughout Town would be evaluated to determine whether the area can flow via gravity, or whether it is advantageous to build a LPSS that discharges to the gravity sewer. The gravity mains and LPSS mains would be designed to meet the minimum vertical clearance requirements from adjacent and crossing utilities and would be installed with similar depths of cover.

5.2.1 System Pressure Considerations

The hybrid gravity/ LPSS system will not face system pressure challenges since the pipelines would be designed to flow open channel (not pressurized) to the WWTF. Pressurized sewer pipelines would only be used to pump uphill and high system pressures would not be a concern. Based on these reasons, this alternative is technically feasible.

5.2.2 Operations and Maintenance Considerations

As discussed in Section 5.1.4, it is recommended that the Town own and maintain all sewer pumping equipment on private property (STEP and grinder pump systems). With the hybrid gravity/ LPSS option, the Town would still be responsible for maintaining these systems. However, the number of parcels with this equipment would be lower under the hybrid option, allowing the Town to focus on other areas of the collection system. Where a lift station is required in the hybrid system to convey sewage to the WWTF or to the gravity main, additional maintenance will be required.

A summary of the O&M requirements is shown in Table 9.

Table 9 Hybrid Gravity/ LPSS O&M Requirements

System	O&M Component	O&M Frequency
STEP Systems(1)	Septic tank inspections	Annual
	Septic tank cleanouts(1)	Every 3-5 years
	Effluent Filter Cleaning	Every 3-5 years
	Pump alarm system testing (floats, alarms, and controls)	Annual
	Inspect lateral appurtenances (shutoff valve and check valve)	Annual
Grinder Pump Systems(1)	Grinder tank inspections	Annual
	Pump alarm system testing (floats, alarms, and controls)	Annual
	Inspect lateral appurtenances (shutoff valve and check valve)	Annual
LPSS Collection System Equipment	Valve exercising	Annual
	Air-release valve inspection	Annual
	Odor Control Inspection/ Replacement	Every six months
	Mainline Pigging	As needed
Gravity Collection System Equipment	Gravity Sewer CCTV(2)	Every 3 to 5 years
	Gravity Sewer Flushing(2)	Every year until flow increases and 3 to 5 years after flow increases
	Odor Control Inspection/ Replacement	Every six months
Gravity Lift Stations	Wet well inspections	Annual
	Pump alarm system testing (floats, alarms, and controls)	Annual
	Inspect lateral appurtenances (shutoff valve and check valve)	Annual

Notes:
(1) The number of STEP and grinder pump systems in Town will be lower as a result of some parcels flowing to the gravity sewer main via gravity.
(2) CCTV and flushing requirements vary based on user and wastewater characteristics. At start-up, the Town will likely follow an accelerated CCTV and flushing program due to low flow and to determine any hot spot areas (areas that may require additional cleaning due to sediment buildup, fats, oils, and grease). The accelerated program will likely result in flushing and CCTV annually. Once flow has been established and the hot spot areas have been determined, CCTV and flushing occur every 3 to 5 years.

6.0 AGENCY INTERVIEWS

The project team consulted multiple professional engineers (10+) within Carollo across the United States to discuss their experience with planning, design, and construction of LPSS and hybrid collection systems. In addition to discussing the project with internal experts, Carollo interviewed 9 agencies that operate LPSS. Interview information is provided in Attachment E. The agencies own a range of low-pressure systems installed in the 1970's to systems installed in 2025 and included both STEP and grinder LPSS.

Table 10 summarizes the agencies interviewed during this project.

Table 10 Agency Interview Summary

Agency	System Type	System Age	Current Connections
City of Camas, WA	Hybrid Gravity/ STEP System	STEP systems installed in early 1980's	7,000 STEP
Marshall Beach, CA	Full STEP System	2008	50 STEP
Nevada County, CA	Hybrid Gravity/Grinder/ STEP System	STEP installed in 1980's; Grinder installed in 2007	380 STEP; 100 grinder pumps
Placer County, CA	Hybrid Gravity/STEP System	Late 1980's	700 STEP
Port Hadlock, WA	Full Grinder System	Online since September 2025	60 grinder pumps
Snyderville Basin Water Reclamation District, UT	Hybrid Gravity/Grinder System	Early 2000's	Several hundred grinder pumps
Lacey, WA	Hybrid Gravity/ Grinder/ STEP System	STEP systems installed in 1992	4,200 STEP, 300 grinder pumps, and the rest is gravity
Yelm, WA	Full STEP System	Early 2000's	4,500 STEP; 2 City owned grinder pumps
Grizzly Ranch Community Services District, CA	Currently converting from full grinder to full STEP system	Started converting to STEP in May 2019	62 STEP; Build-out is 299.

7.0 COMMUNITY INPUT AND RESPONSES

7.1 Community Input Letters

The Town requested that Carollo develop technical responses to two letters received from community members. Our responses are based on the current status of the preliminary design, available project information, applicable engineering standards, and professional engineering judgment. The community input letters and Carollo's technical responses are included for reference in Attachments B and C.

7.2 Community Input regarding Serving the Downtown Only

The Town has received input from community members suggesting that the wastewater project should include a smaller, downtown-focused, full STEP collection system.

7.2.1 Discussion

It is possible to implement a smaller, downtown-focused, full STEP collection system. This concept would require installing a treatment plant at a similar elevation as the collection system to mitigate the high system pressures discussed earlier in this PM.

However, this concept is not consistent with the Town's objective to develop a wastewater collection system and treatment facility that can be expanded over time efficiently. Expanding a STEP system focused in the downtown would require constructing hydraulically independent STEP systems in other parts of Town with multiple treatment facilities due to the elevation difference in Town as discussed in this PM. Implementing multiple treatment facilities would require additional discharge locations, which will each have permitting requirements and would likely face challenges with community acceptance. This also reduces the economy of scale that supports project development, increases long-term O&M concerns, increases costs, and limits future expansion.

This concept also presents several challenges with siting the WWTF. For example, at this time the Town has not identified a feasible treatment plant site located near downtown, there are limited surface water discharge locations in this area, and it's likely not desirable to locate the treatment plant near downtown.

7.3 Wastewater Treatment Implications for STEP vs Raw Wastewater

The community input letters have noted that STEP systems reduce the cost of wastewater treatment considering most of the solids stay in the STEP tank.

7.3.1 Discussion

As discussed above, the full STEP collection system is not technically feasible for Paradise due to the significant elevation difference in the Town and cannot be implemented. However, we have provided a "theoretical" discussion below of the similarities and differences between a STEP fed WWTF and a raw wastewater fed WWTF.

The strength of the incoming wastewater is significantly lower in a STEP fed WWTF due to the removal of most of the solids in the septic tanks. With lower influent concentrations the following differences are likely:

- A STEP fed WWTF would likely have lower aeration demand, likely leading to smaller blowers being required and lower energy demand for the aeration system. However, the decrease would not be linear and may not be significant because the reduced strength of the influent wastewater would not contain enough carbon to support the nitrification and denitrification of the wastewater necessary to meet the expected effluent limit of 10 milligrams of nitrogen per liter (mg/L-N). Without adequate carbon supplied by the raw wastewater, supplemental carbon must be added, and the carbon creates an aeration demand that the aeration system must be able to accommodate.
- A STEP fed WWTF would require a chemical handling system for delivery, storage, and handling of the carbon that would not be required for a raw wastewater fed WWTF. This additional system is an additional operations and maintenance expense that a raw wastewater fed WWTF does not have.
- A STEP fed WWTF would likely have less solids production due to the lower influent concentration. However, similar to the aeration demand, the additional carbon will lead to the production of additional biomass that will have to be handled.

Regardless of the type of incoming wastewater, all MBR plants require fine screens and grit removal upstream of the membranes. The membrane manufacturers will not guarantee the integrity of the membranes without these pre-treatment steps. Fine screens and grit removal systems are not sized based on the influent loading, but rather the influent flow. Most of these systems are modular in design and accommodate a range of flows. It is possible that at the low flow rates that are expected that the design of these systems would be similar.

Similarly, package plant MBRs come in pre-manufactured sizes that can typically accommodate a range of flows. It is likely that a similar sized MBR would be needed for both STEP fed and raw wastewater fed WWTFs.

Whether the MBR is STEP fed or raw wastewater fed, the grade of operator required to run the system is the same. The MBR plants under 1.0 million gallons per day (mgd) are classified as a Class III facility. Regardless of the collection system type, the WWTF will fall in this classification for Phase 1 and require the same certifications.

7.4 Communications with STEP Effluent-Pump Manufacturer

The community has requested a record of Carollo's communication with Orenco, the STEP effluent-pump manufacturer.

7.4.1 Discussion

Carollo reached out to Orenco's engineering representative on May 1, 2026, via email to share information about the Project. Carollo requested a technical proposal from Orenco for a full STEP system throughout Town in that email.

Orenco sent a technical proposal for a full STEP system in Paradise for Carollo's review on May 21, 2026. Carollo, HDR, and Town staff reviewed Orenco's technical proposal and provided written comments and asked questions for clarification on May 27, 2026. Orenco did not respond to Carollo's comments in writing. Carollo's comments identified the technical fatal flaw of high system pressure in a full STEP system in the written comments.

Orenco responded on June 11, 2026, via email and acknowledged that design of a collection system with high system pressures and significant elevation drop is not an area that Orenco has extensive experience in, and the collection system design would need to rely heavily on Carollo's expertise.

On June 23, 2026, Carollo held a meeting with Orenco to discuss Carollo's comments on Orenco's proposal. We discussed the high system pressure and terrain challenges in Paradise. Orenco acknowledged verbally that the high system pressure is a technical fatal flaw if the Town were to construct a full STEP system in Town.

On July 17, 2026, Orenco sent an email following up on the June 23rd meeting and asked if Carollo would like Orenco to evaluate areas in the Town where STEP systems could connect to the gravity sewer system. Carollo responded on July 17, 2026, that we would appreciate their input on designing a low pressure sewer collection system in Phase 1. Carollo provided the Phase 1 startup flows and buildout flows.

It should be noted that Carollo also communicated with E-One during the preliminary design process. E-One designs and provides low pressure systems with grinder pump stations. E-One's lead engineer stated that installing a full low-pressure system in the Town is technically not feasible due to the high system pressure.

8.0 RECOMMENDATIONS AND CONCLUSIONS

Carollo does not recommend moving forward with a full low pressure (STEP or grinder pump station system) throughout Town due to the high system pressure. Given that this limitation is inherent to the hydraulic characteristics of the system, and due to the pressure limitations of the piping, pumps, and valves, further evaluation of this alternative, including a detailed life-cycle cost analysis, is not recommended for a full LPSS alternative.

It is technically feasible to construct a low-pressure system for a portion of the downtown only assuming the WWTF would be constructed at a similar elevation and near downtown. However, Carollo does not recommend moving forward with this alternative because the Town's stated goals are to implement a project that is affordable, scalable, and permittable. Implementing a low-pressure collection system and WWTF in the downtown is very challenging for the following reasons:

- The service area cannot be expanded beyond a narrow elevation range within Phase 1 without encountering similar pressure issues.
- Expanding the service area in the future will require multiple WWTFs to avoid high system pressures. Each WWTF will require its own NPDES permit and a receiving water body for discharge. This approach will make future system expansion challenging due to permitting requirements. In addition, operating and maintaining multiple WWTFs will substantially increase the O&M costs.
- Committing to an LPSS locks in all future system expansions to be pressurized connections and reduces flexibility for future expansion. Each future connection will be an additional asset owned and maintained by the Town.
- Each developed and undeveloped lot in future phases will require a new pump and tank/basin to connect to the central sewer system regardless of whether the sewage can flow via gravity.

Carollo recommends moving the hybrid gravity/LPSS system forward into final design. The hybrid gravity/LPSS system would meet the Town's stated project goals of building a collection system that is affordable, scalable, and permittable and does not have any technical fatal flaws.

ATTACHMENT A

2026 HDR ALTERNATIVES ANALYSIS TM

The 2026 HDR Alternatives Analysis TM is available on the Town's website through the following link: : https://paradisesewer.com/download_file/view/dda3266a-2ef6-4dd8-ba6c-b506222c96e9/297

ATTACHMENT B

COMMUNITY INPUT LETTERS

Information for the Paradise Town Council

On the wastewater collection and treatment decision — for the Tuesday Council meeting

To: Honorable Mayor and Members of the Paradise Town Council

From: Clifford L. Jacobson, Sr.; Melissa Schuster (Butte County Mosquito & Vector Control District Board); and Al McGreehan (former Community Development Director, Town of Paradise)

Date: June 2026

Encouraging common ground

We want to begin on a positive note. In our recent meeting, Town staff indicated the project is now moving toward membrane bioreactor (MBR) treatment producing Title 22 recycled-quality water. The reasons staff cited point clearly in one direction: there is not enough land to dispose of the effluent in percolation ponds; open ponds raise mosquito and vector concerns; and gaining the Water Board's permission to return the treated water to the environment — by land application or surface discharge — requires reaching Title 22 recycled-water quality, a level a percolation pond cannot achieve, because a pond is a means of disposal, not a process of treatment. In short, the Town has independently concluded it must treat to Title 22. That is real progress — and it is the foundation of the case below: once the water is being treated to Title 22 regardless, the real question becomes whether to put it to beneficial use rather than simply send it away. Our purpose here is to help the Council make sure the version it ultimately approves is the best-value, most resilient one, and to offer published, verifiable answers to the technical points that came up.

Three technical points, with sources

1. STEP works in Paradise's terrain. It was suggested that low-pressure STEP pumps cannot pump against the pressure created upstream in Paradise's topography. Respectfully, that is not how these systems work. STEP is a type of pressure sewer, and pressure sewers are the recommended solution precisely for hilly, rocky terrain — they follow the land's natural contours and avoid deep gravity trenching. Each home or business has a pump sized to overcome the system's pressure and elevation (its “total dynamic head”); these systems routinely serve networks of hundreds or thousands of connections across rolling ground. A pump that cannot meet the head simply means the pump was not sized for it — not that STEP cannot work here. (U.S. EPA, Pressure Sewers Technology Fact Sheet.)

2. A gravity system will not self-clean at 85 occupied parcels — which is why it needs STEP flow. Gravity sewers must maintain a minimum “self-cleaning” velocity, commonly 2 feet per second, to keep solids moving; design standards specifically warn that pipes shall not be oversized and require checking the velocity at low flow. With roughly 85 of 225 parcels occupied, a gravity main would run far below that velocity for years — causing solids to settle, along with hydrogen-sulfide odor, corrosion, and a need for routine flushing. This is the very reason the proposed hybrid relies on STEP effluent to provide the flow that carries the gravity system's solids. If STEP flow is what makes the system work, the fair question is why build and maintain the costlier gravity legs at all. (Recommended Standards for Wastewater Facilities “Ten States Standards”; state minimum-velocity design criteria.)

3. The cost of an MBR depends heavily on what is piped to it. This is the biggest single driver of treatment cost — and it is decided by the collection system. A gravity sewer delivers raw, whole sewage (grit, grease, rags, full solids) to the plant, so to protect the membranes a raw-sewage MBR must be preceded by a headworks and sludge train that a STEP-fed plant largely does not need:

- Coarse screening, then fine screening to 2 mm or smaller, often in multiple stages — membranes foul quickly on hair and fibers;
- Grit removal, washing, and disposal, to stop abrasion of pumps and membranes;
- Fats-oils-grease (FOG) removal, to keep grease from blinding the screens and fouling the membranes;
- Larger biological tanks and more aeration for the full raw organic load — aeration is the dominant energy cost;
- Substantially more sludge handling — thickening, dewatering, and hauling — plus screenings and grit disposal;
- Odor control at the headworks, and influent pumping and equalization sized for the infiltration and inflow a gravity system admits.

Each of these is both a capital item and an ongoing operating and replacement cost — energy, chemicals, screenings, grit and sludge hauling, more frequent membrane cleaning and earlier membrane replacement, and a higher-grade operator to run more processes. A STEP system removes most of this at the source: each parcel's interceptor tank settles the solids and grit, traps the grease, screens the effluent, and partly digests it, so the plant receives pre-treated, lower-strength, infiltration-free liquid. The MBR can then be smaller, foul more slowly, produce far less sludge, and cost markedly less to run. We ask that the Town's MBR cost be developed on STEP-effluent loading and compared, on a full lifecycle basis, against both a raw-sewage MBR and the evaporation/percolation-pond approach.

Putting the recycled water to use — and the trench question

Because the plan is now to produce Title 22 recycled-quality water in order to surface-discharge it, that same water could instead be put to beneficial use through a recycled-water ("purple-pipe") system — for landscape and revegetation irrigation, construction water, and dedicated wildfire-suppression storage — turning a discharge into a community asset. On the question of whether purple pipe may share a trench: the governing separation rule (California Code of Regulations, Title 22, §64572) is written to protect the potable water main, and does not on its face prohibit a recycled-water line from sharing a trench with a sewer or STEP main. Where site conditions prevent standard separations, the State Water Board's Division of Drinking Water provides a formal Main Separation Alternative approval process. We respectfully request the specific written basis for any determination that co-trenching is not allowed, and that the Town pursue the alternative-approval pathway rather than treat it as a flat prohibition.

A smaller, expandable system is easier to site — not harder

When we suggested starting with a smaller, expandable system, the response was "where would you put it" and "no one wants a sewer in the town proper." Both concerns actually favor this approach. What residents do not want is a conventional plant with open aerated lagoons and evaporation ponds — the odor, the footprint, the trucks. A membrane bioreactor treating pre-settled STEP effluent is the opposite: it needs no large secondary clarifier and far less land, it arrives as an enclosed, prefabricated package that can be housed in a building or placed below grade, and it produces little odor or noise. Systems like these are routinely sited discreetly within communities — at resorts, campuses, and small towns — because they go largely unnoticed. A small initial MBR near the first STEP cluster, sized to expand as the corridor rebuilds, lets the Town prove the approach at low cost and grow it only as far as demand warrants. That is easier to site, and easier to fund, than a single large plant-and-pond complex that has already failed to find an acceptable location twice.

On funding and the long-term bill

We understand the Town's capital funding picture has strengthened, and that is welcome news. Recent public reporting indicates roughly $115 million in Community Development Block Grant–Disaster Recovery (CDBG-DR) funds, with an additional amount still being sought from the State Water Board. Two points for the Council. First, that additional State funding is not yet secured, and State programs increasingly score water-reuse projects more favorably — a reuse design strengthens that application rather than weakening it. Second, and more important: grants pay to *build* the system; they do not pay to *operate* it for the next forty years. The Town's own 2023 rate analysis concluded the project must be essentially entirely grant-funded because ratepayers cannot bear much of the cost. That makes the operating cost — and any offsetting recycled-water revenue — the figure that protects Paradise residents over time. The system that is cheaper to run, and that can sell recycled water, is the one that keeps rates affordable long after the grant dollars are spent.

On maintenance over time

Staff also raised long-term maintenance — STEP versus gravity, ten years out. The honest answer is that neither is maintenance-free; the real question is which costs less over its life, which is exactly what a side-by-side should settle. Two facts deserve the Council's attention. First, the hybrid design already includes lift stations — the same kind of mechanical equipment attributed to STEP, only concentrated into a few large stations whose failure can back up an entire basin, rather than small distributed pumps where a failure affects a single connection. Gravity systems also carry costs their "no moving parts" reputation hides: infiltration and inflow through joints and manholes (which overwhelm treatment, and to which sealed STEP mains are immune), grease and root blockages, hydrogen-sulfide corrosion, and the low-flow solids deposition noted earlier — all of it expensive to reach in Paradise's lava-cap ground. Second, where a community has actually tracked both over time, the numbers favor STEP: a hybrid system in Lacey, Washington recorded nearly twenty years of O&M and found its effluent-sewer (STEP) operating costs virtually the same as gravity's, with lower capital and replacement costs

making its lifecycle cost clearly lower. Coburg, Oregon's municipally-owned STEP system has run more than a decade at roughly $90 per connection per month. We ask only that maintenance be compared on a documented lifecycle basis, not asserted as a one-line concern.

A policy note

A concern was also raised that recycling water could reduce Paradise Irrigation District water sales. PID is a public agency owned by this community. Whatever the merits, the prospect of a public utility selling marginally less water should not, by itself, decide a $100-million-plus infrastructure choice or forgo the drought, recovery, and fire-resilience benefits of reuse. We note it only so the Council is aware the consideration has been raised.

What we respectfully ask the Council to direct

- Have staff develop and cost the full STEP / MBR-on-effluent / Title 22 reuse alternative to the same level of detail as the adopted design, so the Council can compare them side by side.
- Develop the MBR cost on STEP-effluent loading — not whole, raw-sewage loading — and compare it, on a full lifecycle basis, against both a raw-sewage MBR and the evaporation/percolation-pond approach.
- Obtain the written regulatory basis for the purple-pipe trench position, and pursue the Division of Drinking Water alternative-approval process if separation is the only obstacle.
- Ask to see the funding broken out — secured versus pending, and capital versus the full 40-year operating, maintenance, and replacement cost — so the decision reflects the long-term cost to ratepayers, not only construction.
- Hold finalizing the Subsequent EIR project description until the Council has both options in front of it.

Sources: U.S. EPA, Pressure Sewers Technology Fact Sheet; Recommended Standards for Wastewater Facilities ("Ten States Standards") and state gravity-sewer minimum-velocity criteria; California Code of Regulations, Title 22, §64572 and the State Water Board Division of Drinking Water Main Separation Alternative process; MBR pretreatment design guidance (fine screening, grit and FOG removal).

Respectfully submitted,

Clifford L. Jacobson, Sr. • Melissa Schuster • Al McGreehan

Technical Memorandum

Suitability of STEP / Low-Pressure Effluent Collection in Steep Terrain

Response to the concern that low-pressure effluent pumps cannot operate against elevation-induced head

To: Marc Mattox, P.E., Director of Public Works / Town Engineer, Town of Paradise
From: Clifford L. Jacobson, Sr. — Paradise resident; 47 years in specialty water and wastewater chemistry
Date: June 2026
Re: Whether Paradise's topography precludes a STEP collection system

Marc, in our recent discussion you indicated that a STEP (septic tank effluent pumping) system would not be workable in Paradise's topography because low-pressure effluent pumps cannot pump against the pressure created by connections at higher elevations upstream. I want to respectfully lay out why that conclusion is not supported by pressure-sewer design practice, by the published design standards, or by the hydraulics of the pumps themselves — and to suggest the basis on which STEP should be evaluated before it is set aside.

1. How elevation head is actually handled

A STEP system is a form of pressure sewer. Each connection's pump discharges through a small-diameter lateral into a common pressurized main, and each pump is selected for the total dynamic head (TDH) it must develop at its location — the static lift from its elevation to the system's high point, plus the main's operating pressure and friction. The pumps that do this are small: STEP service uses fractional-horsepower effluent pumps that run only intermittently, in brief dosing cycles, so both their electrical draw and their energy use are low. Multiple pumps discharging into a shared pressurized main is normal operation, not a conflict: a check valve at each unit prevents backflow, and the network is designed around its operating pressure. A pump that cannot meet the head at a given location indicates a pump that was not specified for that location — a sizing decision, not an inherent limitation of STEP. These small effluent pumps have steep pump curves that develop ample head for the modest lifts a system like Paradise's requires; the same product lines offer higher-head models for genuinely steep applications, but those are a reserve for possible future zones, not anything the Phase 1 corridor needs. Where an unusually large elevation does arise, the standard approach is simply to divide the area into lower-pressure sub-systems feeding intermediate booster points, so no single pump lifts the full elevation.

2. Large elevation changes are a design input, not a disqualifier

Elevation change is a standard design parameter for pressure sewers, managed with well-established tools: dividing the network into pressure zones and, where warranted, using intermediate booster points or separate discharge points so no single pump must lift the entire elevation; air- and vacuum-release valves at high points to prevent air binding and damp surges (wastewater-rated valves are made for exactly this service); and pressure-control valves to protect low-elevation pipe from the static pressure that accumulates at the bottom of a steep run — pressure rises roughly 0.43 psi per foot of fall. These are routine appurtenances, not exotic measures.

3. Applied to Paradise: an all-STEP Phase 1, zoned as it expands

It is worth testing Paradise's own topography against these principles — and the Phase 1 service area makes the point most directly. Phase 1 is the downtown business corridor bounded by Skyway, Pearson Road, Black Olive Drive, and Elliott Road. Published figures place it between roughly 1,700 feet at its lower, southern end (near Pearson Road) and about 1,930 feet at its upper, northern end (near Elliott Road) — a drop of only about 230 feet over roughly a mile. These spot elevations should be confirmed from the Town's GIS or a USGS topographic map before being used as design values, but they are consistent with the published town-center reference elevation of about 1,778 feet.

That settles the head question for the project actually under design. Across the corridor's roughly 230 feet of total fall, any individual connection develops only a modest head — well within the small, low-draw effluent pumps that are standard to STEP. Phase 1 can therefore be served entirely by STEP as a single pressure regime, with no elevation zoning and no oversized, high-amperage pumps required at all. As the system is later expanded beyond the corridor — up or down the ridge, where the relief grows — it is simply zoned to suit: additional pressure zones with intermediate booster points are added for each new service area as it comes online. The design starts as simply as the Phase 1 corridor allows and adds zoning only where, and only when, future expansion actually calls for it — which is exactly how pressure-sewer networks are meant to grow, and it matches the Town's own phased approach to building the system.

4. Pressure sewers are the technology recommended for this terrain

Far from being unsuited to hilly ground, pressure sewers are specifically recommended for it. U.S. EPA guidance notes that gravity collection's slope requirements “may require deep excavations in hilly or flat terrain, as well as the

addition of sewage pump stations," driving up cost — the very problem pressure sewers solve by following the land's natural contours in shallow, small-diameter trenches. Industry design references describe pressure sewers as "especially cost-effective in challenging topographical areas where the soil is wet, rocky, or hilly," and capable of serving anything from a single building to a network of thousands of sources. The same shallow, contour-following installation is what makes pressure collection well suited to near-surface rock like Paradise's lava cap, where a deep gravity system would instead require rock excavation. None of this rests on analogy to any particular community — it follows directly from the pump curves and the published design guidance.

It has also been suggested that, because a STEP main must still be buried — and must pass beneath existing water lines — it requires the same trenching as gravity. It does not, and the reason is that the two are governed by different things. A gravity sewer's depth is set by slope: it must descend continuously at a minimum grade, so it grows progressively deeper along its run and may require significant excavation depths, or even tunneling, to hold an acceptable gradient toward the outfall, with deep manholes throughout. A STEP main needs no slope and no minimum flow; it follows the ground contour at a shallow, roughly constant depth — published references put effluent-sewer mains at only a metre or two of cover — dipping locally only where it must pass under a crossing utility, then returning to shallow depth. The separation requirement at issue (a sewer passing below a potable water main, with vertical clearance, to protect the drinking-water supply) is real, but it applies equally to a gravity sewer, and it is met by a local crossing detail, not by burying the whole line deep. The net excavation is therefore far smaller for STEP: a small-diameter pressure pipe in a shallow, constant-depth trench, versus a large-diameter gravity pipe in a deep, ever-deepening trench with manholes — a difference that is especially large, and especially costly, in Paradise's near-surface lava cap, where depth means rock.

And only the potable water main dictates that the sewer sit beneath it. Dry utilities do not: under California's General Order 128, electric lines require only about 12 inches of clearance from other pipe systems when paralleling and 6 inches when crossing, with communications and fiber treated the same way — a small clearance at the crossing, with lines offset rather than stacked. The STEP main may pass either above or below an electric or fiber conduit, whichever the crossing geometry favors, so long as that clearance is held and the crossing is supported; and since electric is itself typically buried only about thirty to forty-two inches, the pressure main shares that same shallow band. So the premise that "we have to trench deep anyway, so we might as well build gravity" does not hold. STEP does not trench deep: the water crossings are local duck-unders, the electric and fiber crossings are inches of clearance at the point of crossing, and between those points the main runs shallow along the contour. The deep, continuously deepening trench — and its cost in the lava cap — belongs to the gravity option alone; it is not a shared burden that cancels STEP's advantage. If anything, the burden runs the other way: a gravity main is driven deep by its slope, while electric sits only about thirty to forty-two inches down and cable shallower still, so a gravity line will almost certainly run beneath those utilities along its route — and, locked to a continuous grade, it cannot rise to weave over an obstruction the way a shallow pressure main can; it must hold its slope and pass under, deepening further into the rock to do so. **It is the gravity sewer, not STEP, that must go under everything**.

5. Clean effluent makes the head-management hardware more reliable, not less

Since the reliability of pumps and valves in a pressure network is a fair concern, it is worth noting that STEP conveys screened, settled septic-tank effluent — not raw sewage. Each interceptor tank removes grit, grease, and settleable solids and screens the effluent before it is pumped. That clean effluent makes the pumps, check valves, air-release valves, and any pressure-control valves markedly more reliable and lower-maintenance than the same hardware on a raw-sewage or grinder main. The very components that manage elevation head are therefore more dependable in a STEP system, not less.

6. Request

None of this asserts that STEP is automatically the right choice — that is what a side-by-side evaluation should determine. But the categorical conclusion that STEP "won't work" in Paradise's hilly terrain is not consistent with the design literature, the published standards, or the pump hydraulics. I respectfully ask that STEP be evaluated on a properly sized hydraulic design to Paradise's actual elevation profile — pumps selected for the real total dynamic head, the network zoned to the terrain — rather than set aside on the premise that elevation head is disqualifying. I am glad to provide the pump-head data, the design references, and a STEP hydraulic design basis at your convenience.

Sources: U.S. EPA, Pressure Sewers Technology Fact Sheet; WaterWorld and Pumps & Systems pressure-sewer design references; Orenco effluent pump product literature and published pump curves for STEP service; air-release and hydraulic-control-valve technical literature; effluent-sewer and gravity-sewer burial-depth references; CPUC General Order 128 and utility joint-trench separation standards for electric and communications crossings; Town of Paradise and published topographic references for Paradise elevation data.

Respectfully,

Clifford L. Jacobson, Sr.

Paradise resident; 47 years in specialty water and wastewater chemistry

cc: Jennifer Macarthy, Town Manager, Town of Paradise

ATTACHMENT C

CAROLLO RESPONSE TO COMMUNITY INPUT LETTERS

2795 Mitchell Drive
Walnut Creek, California 94598
P 925-932-1710
carollo.com

June 26, 2026

Marc Mattox, Public Works Director
Town of Paradise
5555 Skyway Road
Paradise, CA 95969

Subject: Technical Responses to Community Input Letters

Dear Marc Mattox:

The Town of Paradise (Town) requested that Carollo Engineers, Inc. (Carollo) review and provide responses to two community input letters regarding the Paradise Sewer Project (Project). The enclosed responses provide Carollo's technical evaluation of the comments and concerns presented in the following letters addressed to the Town:

- *Information for the Paradise Town Council – on the wastewater collection and treatment decision – for the Tuesday Council Meeting*, Dated June 2026
- *Technical Memorandum – Suitability of STEP/ Low-Pressure Effluent Collection in Steep Terrain – response to the concern that low-pressure effluent pumps cannot operate against elevation-induced head*, Dated June 2026

Carollo reviewed the information presented in each letter and prepared responses based on the status of design, available project information, applicable engineering standards, and professional engineering judgment. The attached responses address each comment individually and summarize the technical basis for the response. Carollo does not recommend moving forward with a full STEP system throughout Town due to the fatal flaw of high system pressure. It is technically feasible to construct a STEP system for a portion of the downtown only with a WWTF constructed within the same service area boundaries. However, Carollo does not recommend moving forward with this alternative because the Town's stated goals are to implement a project that is affordable, scalable, and permittable. Implementing a STEP collection system and WWTF in the downtown only is not scalable in the future and is challenging to permit.

We appreciate the opportunity to support the Town with this effort. Please let us know if you have any questions regarding the attached responses or if additional technical information would be helpful.

Sincerely,
CAROLLO ENGINEERS, INC.

Darren Baune, P.E.
Senior Vice President
Collection System Project Manager

Stephen Caswell, P.E.
Project Manager
Wastewater Treatment Facility Project Manager

Enclosures:

- Attachment 1 – Technical Responses to *Information for the Paradise Town Council – on the wastewater collection and treatment decision – for the Tuesday Council Meeting*, Dated June 2026;
- Attachment 2 – Technical Responses to *Technical Memorandum – Suitability of STEP/ Low-Pressure Effluent Collection in Steep Terrain – response to the concern that low-pressure effluent pumps cannot operate against elevation-induced head*, Dated June 2026

cc: Colin Nelson, Allison McReynolds, Brandon Hale

TOWN OF PARADISE

Sewer Project

Subject: Attachment 1 – Technical Responses to *Information for the Paradise Town Council – on the wastewater collection and treatment decision – for the Tuesday Council Meeting*, Dated June 2026

ITEM 1: STEP works in Paradise's Terrain *It was suggested that low-pressure STEP pumps cannot pump against the pressure created upstream in Paradise's topography. Respectfully, that is not how these systems work. STEP is a type of pressure sewer, and pressure sewers are the recommended solution precisely for hilly, rocky terrain — they follow the land's natural contours and avoid deep gravity trenching. Each home or business has a pump sized to overcome the system's pressure and elevation (its "total dynamic head"); these systems routinely serve networks of hundreds or thousands of connections across rolling ground. A pump that cannot meet the head simply means the pump was not sized for it — not that STEP cannot work here. (U.S. EPA, Pressure Sewers Technology Fact Sheet.)*

Carollo Response:

We agree that pressure sewers are used to pump sewage uphill in hilly/rocky terrain as described above. Carollo interviewed several agencies with STEP systems that utilize STEP systems in this way.

However, there is a unique technical issue with implementing a full low-pressure sewer system in the Town of Paradise. STEP pumps and pressurized sewers are typically used to pump uphill. The Town of Paradise's potential WWTF locations are all located downhill from the users/connections, which creates a unique and complex hydraulic system to control and manage pressure.

The difference in elevation between the high point in the system and the low point at the WWTF creates high system pressure in the lower portions of the system that are well beyond the maximum pressure rating of typical pipelines and equipment used in wastewater collection systems. For example, in the conceptual Phase 1 sewer service area, there is 635-feet of elevation change from high point in system (near Almond and Elliot) to WWTF (assumed Skyway South for this analysis). This elevation change creates a pressure of 275 psi at the assumed WWTF. At full collection system buildout, there is 1205-feet of elevation change from high point in system (along Skyway between Clark Road and Pentz Road) to WWTF (assumed Skyway South for this analysis). This elevation difference creates approximately 522 psi of static pressure at the WWTF. For reference, most STEP systems operate between 20-80 psi.

Carollo is not aware of any similar wastewater collection systems with similar high pressures (275 psi or up to 522 psi). Carollo also requested case studies of similar collection systems from the manufacturers of the low pressure systems and they were not able to provide case studies of similar systems.

ITEM 2: **A gravity system will not self-clean at 85 occupied parcels — which is why it needs STEP flow.** *Gravity sewers must maintain a minimum "self-cleaning" velocity, commonly 2 feet per second, to keep solids moving; design standards specifically warn that pipes shall not be oversized and require checking the velocity at low flow. With roughly 85 of 225 parcels occupied, a gravity main would run far below that*

velocity for years — causing solids to settle, along with hydrogen-sulfide odor, corrosion, and a need for routine flushing. This is the very reason the proposed hybrid relies on STEP effluent to provide the flow that carries the gravity system's solids. If STEP flow is what makes the system work, the fair question is why build and maintain the costlier gravity legs at all. (Recommended Standards for Wastewater Facilities "Ten States Standards"; state minimum-velocity design criteria.)

Carollo Response:

We agree the pipeline velocities will likely be low at start up due to the limited currently occupied parcels and the pipeline will require an accelerated cleaning schedule. The Town is planning to encourage as many connections to the system as possible.

The statement of "This is the very reason the proposed hybrid relies on STEP effluent to provide the flow that carries the gravity system's solids" is not accurate. The hybrid gravity/low-pressure system is not reliant on STEP effluent. A STEP system is one method for conveying wastewater from a low-elevation area that can also be achieved with grinder pumps or lift stations. STEP systems have O&M challenges as well and require annual tank and equipment inspections, float replacement, valve exercising, maintenance and replacement of pumps, and eventually replacement of STEP tanks.

ITEM 3: The cost of an MBR depends heavily on what is piped to it. *This is the biggest single driver of treatment cost — and it is decided by the collection system. A gravity sewer delivers raw, whole sewage (grit, grease, rags, full solids) to the plant, so to protect the membranes a raw-sewage MBR must be preceded by a headworks and sludge train that a STEP-fed plant largely does not need:*

- *Coarse screening, then fine screening to 2 mm or smaller, often in multiple stages — membranes foul quickly on hair and fibers;*
- *Grit removal, washing, and disposal, to stop abrasion of pumps and membranes;*
- *Fats-oils-grease (FOG) removal, to keep grease from blinding the screens and fouling the membranes;*
- *Larger biological tanks and more aeration for the full raw organic load — aeration is the dominant energy cost;*
- *Substantially more sludge handling — thickening, dewatering, and hauling — plus screenings and grit disposal;*
- *Odor control at the headworks, and influent pumping and equalization sized for the infiltration and inflow a gravity system admits.*

Each of these is both a capital item and an ongoing operating and replacement cost — energy, chemicals, screenings, grit and sludge hauling, more frequent membrane cleaning and earlier membrane replacement, and a higher-grade operator to run more processes. A STEP system removes most of this at the source: each parcel's interceptor tank settles the solids and grit, traps the grease, screens the effluent, and partly digests it, so the plant receives pre-treated, lower-strength, infiltration-free liquid. The MBR can then be smaller, foul more slowly, produce far less sludge, and cost markedly less to run. We ask that the Town's MBR cost be developed on STEP-effluent loading and compared, on a full lifecycle basis, against both a raw-sewage MBR and the evaporation/percolation-pond approach.

Carollo Response:

We would like to reiterate that a full STEP system is not feasible considering the technical fatal flaw of high system pressure as described in our response to Item 1. The response below is only "hypothetical" since a gravity hybrid system is required in the collection system.

- Design considerations for an MBR fed by a full STEP system versus a gravity or hybrid sewer system would include the following:
    - The STEP system would have lower organic loading leading to lower aeration demand, and therefore lower electrical power demand
    - The STEP system would need additional carbon chemical dosing to achieve denitrification, which is an additional O&M cost that would likely not be needed with a gravity system.
    - If a septage receiving station is included in the WWTF, the design for a STEP effluent system must accommodate much higher loading variation due to the slug loads of solids from STEP tanks.
    - Organic loading and hydraulic capacity must be balanced in sizing the units. While STEP-effluent has lower organic loading, the hydraulic capacity of both types would be the same, which would require the same size units.
    - Screening, grit removal, and FOG management are recommended for an MBR facility treating STEP effluent only or municipal wastewater to protect the integrity of the membranes. Membrane manufacturers require these systems upstream of the MBR to provide guarantees for membrane integrity. Since these facilities are often driven by hydraulic capacity and not organic loading capacity, sizing between the two types would be similar.
    - Odor control measures for the facility will be considered in the design of the WWTF.

ITEM 4: Putting the recycled water to use — and the trench question. *Because the plan is now to produce Title 22 recycled-quality water in order to surface-discharge it, that same water could instead be put to beneficial use through a recycled-water ("purple-pipe") system — for landscape and revegetation irrigation, construction water, and dedicated wildfire-suppression storage — turning a discharge into a community asset. On the question of whether purple pipe may share a trench: the governing separation rule (California Code of Regulations, Title 22, §64572) is written to protect the potable water main, and does not on its face prohibit a recycled-water line from sharing a trench with a sewer or STEP main. Where site conditions prevent standard separations, the State Water Board's Division of Drinking Water provides a formal Main Separation Alternative approval process. We respectfully request the specific written basis for any determination that co-trenching is not allowed, and that the Town pursue the alternative-approval pathway rather than treat it as a flat prohibition.*

Carollo Response:

Per letter written to the Town of Paradise by the California Department of Drinking Water on May 14, 2026, the minimum horizontal separation between recycled water pipelines and sewer pipelines is 6 feet (although 10 feet is preferred) and a minimum of 1-foot of vertical separation. Therefore, assuming that there will be cost savings of sharing a trench with recycled water pipelines is invalid.

ITEM 5a: On maintenance over time. *Staff also raised long-term maintenance — STEP versus gravity, ten years out. The honest answer is that neither is maintenance-free; the real question is which costs less over its life, which is exactly what a side-by-side should settle. Two facts deserve the Council's attention. First, the hybrid design already includes lift stations — the same kind of mechanical equipment attributed to STEP, only concentrated into a few large stations whose failure can back up an entire basin, rather than small distributed pumps where a failure affects a single connection. Gravity systems also carry costs their "no moving parts" reputation hides: infiltration and inflow through joints and manholes (which overwhelm treatment, and to which sealed STEP mains are immune), grease and root blockages, hydrogen-sulfide corrosion, and the low-flow solids deposition noted earlier — all of it expensive to reach in Paradise's lava-cap ground.*

Carollo Response:

As described above, the technical fatal flaw of high system pressure makes a full STEP system in Paradise not feasible.

Based on our interviews with nine agencies that operate low pressure collections systems, low pressure systems have operations and maintenance challenges. The following highlights a few of the challenges that multiple agencies shared during our agency outreach.

- The STEP tank and grinder pump stations require maintenance by the operating utility. The typical operations and maintenance activities include facility inspections, pumping out solids from STEP tanks, site visits to inspect facilities after alarms, and repair of pumps, floats and other mechanical devices.
- The corrosion of appurtenances (e.g., valves, ARVs) is a major challenge for operations and maintenance of low pressure systems. One agency removed all valving because of frequent corrosion and valve failure. This was a common complaint among most agencies.
- Fats, Oils and Grease (FOG) control was also mentioned by several agencies to be an operations and maintenance challenge. FOG can create a mat in the STEP tank that reduces biological process until maintenance staff removes the layer. With the smaller effluent pipe sizes (1 1/4" to 4"), if grease builds up in the STEP tank and enters the effluent main, the risk of blocking the line is much higher than with a larger gravity pipeline.

ITEM 5b: On maintenance over time. *Second, where a community has actually tracked both over time, the numbers favor STEP: a hybrid system in Lacey, Washington recorded nearly twenty years of O&M and found its effluent-sewer (STEP) operating costs virtually the same as gravity's, with lower capital and replacement costs making its lifecycle cost clearly lower. Coburg, Oregon's municipally-owned STEP system has run more than a decade at roughly $90 per connection per month. We ask only that maintenance be compared on a documented lifecycle basis, not asserted as a one-line concern.*

Carollo Response:

Carollo interviewed the City of Lacey, Washington's wastewater supervisor in May 2026. The wastewater supervisor said the City's operations and maintenance staff prefer the conventional gravity system over their STEP system due to the increased O&M requirements of the STEP system. Please refer to our

response to Item 5a for a summary of operations and maintenance challenges that multiple agencies shared during our outreach.

As discussed above, a full STEP system is not feasible considering the technical fatal flaw of high system pressure. However, Carollo is evaluating the potential for implementing a low-pressure system or other hydraulic structures in low lying areas of the Town and discharging to a gravity main (i.e. not pressurized) that conveys wastewater to the WWTF.

TOWN OF PARADISE

Sewer Project

Subject: Attachment 2 – Technical Responses to *Technical Memorandum – Suitability of STEP/ Low-Pressure Effluent Collection in Steep Terrain – response to the concern that low-pressure effluent pumps cannot operate against elevation-induced head*, Dated June 2026

ITEM 1: How elevation head is actually handled.

A STEP system is a form of pressure sewer. Each connection's pump discharges through a small-diameter lateral into a common pressurized main, and each pump is selected for the total dynamic head (TDH) it must develop at its location — the static lift from its elevation to the system's high point, plus the main's operating pressure and friction. The pumps that do this are small: STEP service uses fractional-horsepower effluent pumps that run only intermittently, in brief dosing cycles, so both their electrical draw and their energy use are low. Multiple pumps discharging into a shared pressurized main is normal operation, not a conflict: a check valve at each unit prevents backflow, and the network is designed around its operating pressure. A pump that cannot meet the head at a given location indicates a pump that was not specified for that location — a sizing decision, not an inherent limitation of STEP. These small effluent pumps have steep pump curves that develop ample head for the modest lifts a system like Paradise's requires; the same product lines offer higher-head models for genuinely steep applications, but those are a reserve for possible future zones, not anything the Phase 1 corridor needs. Where an unusually large elevation does arise, the standard approach is simply to divide the area into lower-pressure sub-systems feeding intermediate booster points, so no single pump lifts the full elevation.

Carollo Response:

STEP systems are typically used in low elevation areas of a Town or neighborhood to pump wastewater either directly to a wastewater treatment facility (WWTF) or to a pipeline that flows by gravity under open channel hydraulic conditions (i.e. not pressurized) and conveys wastewater to the WWTF.

The following provides a response to the statements highlighted in yellow.

- The description above of how a STEP system would overcome an "unusually large elevation difference" would be accurate if the flow were being pumped uphill to the WWTF or a location where flow discharges to atmospheric pressure. However, the Town of Paradise's potential WWTF locations are all located downhill from the users/connections, which creates a unique and complex hydraulic system to control and manage pressure. The difference in elevation between the high point in the system and the low point at the WWTF creates high system pressure in the lower portions of the system that are well beyond the maximum pressure rating of typical pipelines and equipment used in wastewater collection systems.

ITEM 2: Large elevation changes are a design input, not a disqualifier. *Elevation change is a standard design parameter for pressure sewers, managed with well-established tools: dividing the network into*

pressure zones and, where warranted, using intermediate booster points or separate discharge points so no single pump must lift the entire elevation; air- and vacuum-release valves at high points to prevent air binding and damp surges (wastewater-rated valves are made for exactly this service); and pressure-control valves to protect low-elevation pipe from the static pressure that accumulates at the bottom of a steep run — pressure rises roughly 0.43 psi per foot of fall. These are routine appurtenances, not exotic measures.

Carollo Response:

The statement above that, "Elevation change is a standard design parameter for pressure sewer, managed with well-established tools: dividing the network into pressure zones" seems to assume that flow is being pumped uphill to a WWTF.

The Town of Paradise's potential WWTF locations are all located downhill from the users/connections, which creates a unique and complex hydraulic system to control and manage pressure. The difference in elevation between the high point in the system and the low point at the WWTF creates high system pressure in the lower portions of the system that are well beyond the maximum pressure rating of typical pipelines and equipment used in wastewater collection systems. For example, the conceptual Phase 1 sewer service area has a 635-foot elevation change from high point in system (near Almond and Elliot) to WWTF (assumed Skyway South for this analysis). This is approximately 275 psi at the WWTF. At full sewer collection system buildout, there is 1205-foot elevation change from the high point in the system (along Skyway between Clark Road and Pentz Road) to WWTF (assumed Skyway South for this analysis). This elevation difference creates approximately 522 psi of static pressure at the WWTF.

The highlighted statement above is not accurate.

- Pressure control valves in wastewater systems are not routine appurtenances. Pressure reduction valves in wastewater systems are highly specialized equipment and require control systems that are not typically used in the wastewater industry. We agree that air relief valves are routine appurtenances but not pressure reducing valves.
- Carollo has reached out to multiple low-pressure system manufacturers requesting information on similar collection systems with similar elevation differences. The manufacturers have not provided a case study of a similar system.

ITEM 3A: Applied to Paradise: an all-STEP Phase 1, zoned as it expands. *It is worth testing Paradise's own topography against these principles — and the Phase 1 service area makes the point most directly. Phase 1 is the downtown business corridor bounded by Skyway, Pearson Road, Black Olive Drive, and Elliott Road. Published figures place it between roughly 1,700 feet at its lower, southern end (near Pearson Road) and about 1,930 feet at its upper, northern end (near Elliott Road) — a drop of only about 230 feet over roughly a mile. These spot elevations should be confirmed from the Town's GIS or a USGS topographic map before being used as design values, but they are consistent with the published town-center reference elevation of about 1,778 feet.*

Carollo Response:

The elevations listed above do not take into consideration the potential locations of the WWTF or the high point of the full collection system at buildout. The calculation of static system pressure must consider

the elevation change from the high point in the system to the WWTF during Phase 1 and at buildout of the sewer collection system.

In the conceptual Phase 1 sewer service area, there is 635-feet of elevation change from high point in system (near Almond and Elliot) to WWTF (assumed Skyway South for this analysis). This elevation difference creates approximately 275 psi of static pressure at the WWTF. At full sewer collection system buildout, there is 1205-feet of elevation change from high point in system (along Skyway between Clark Road and Pentz Road) to WWTF (assumed Skyway South for this analysis). This elevation difference creates approximately 522 psi of static pressure at the WWTF. The elevations considered in the calculation above are based on the PG&E lidar survey and recent topographic survey of the Town.

ITEM 3B: Applied to Paradise: an all-STEP Phase 1, zoned as it expands. *That settles the head question for the project actually under design. Across the corridor's roughly 230 feet of total fall, any individual connection develops only a modest head — well within the small, low-draw effluent pumps that are standard to STEP. Phase 1 can therefore be served entirely by STEP as a single pressure regime, with no elevation zoning and no oversized, high-amperage pumps required at all. As the system is later expanded beyond the corridor — up or down the ridge, where the relief grows — it is simply zoned to suit: additional pressure zones with intermediate booster points are added for each new service area as it comes online. The design starts as simply as the Phase 1 corridor allows and adds zoning only where, and only when, future expansion actually calls for it — which is exactly how pressure-sewer networks are meant to grow, and it matches the Town's own phased approach to building the system.*

Carollo Response:

Please refer to our response to item 3A above for additional information regarding the elevation of the collection system during Phase 1 and at buildout and design considerations.

ITEM 4a: Pressure sewers are the technology recommended for this terrain. *Far from being unsuited to hilly ground, pressure sewers are specifically recommended for it. U.S. EPA guidance notes that gravity collection's slope requirements "may require deep excavations in hilly or flat terrain, as well as the addition of sewage pump stations," driving up cost — the very problem pressure sewers solve by following the land's natural contours in shallow, small-diameter trenches.*

Carollo Response:

Please refer to our response to item 3A above for additional information regarding the elevation of the collection system during Phase 1 and at buildout and design considerations.

ITEM 4b: Pressure sewers are the technology recommended for this terrain. *Industry design references describe pressure sewers as "especially cost-effective in challenging topographical areas where the soil is wet, rocky, or hilly," and capable of serving anything from a single building to a network of thousands of sources. The same shallow, contour-following installation is what makes pressure collection well suited to near-surface rock like Paradise's lava cap, where a deep gravity system would instead require rock excavation. None of this rests on analogy to any particular community — it follows directly from the pump curves and the published design guidance.*

It has also been suggested that, because a STEP main must still be buried — and must pass beneath existing water lines — it requires the same trenching as gravity. It does not, and the reason is that the two are governed by different things. A gravity sewer's depth is set by slope: it must descend continuously at a minimum grade, so it grows progressively deeper along its run and may require significant excavation depths, or even tunneling, to hold an acceptable gradient toward the outfall, with deep manholes throughout. A STEP main needs no slope and no minimum flow; it follows the ground contour at a shallow, roughly constant depth — published references put effluent-sewer mains at only a metre or two of cover — dipping locally only where it must pass under a crossing utility, then returning to shallow depth. The separation requirement at issue (a sewer passing below a potable water main, with vertical clearance, to protect the drinking-water supply) is real, but it applies equally to a gravity sewer, and it is met by a local crossing detail, not by burying the whole line deep. The net excavation is therefore far smaller for STEP: a small-diameter pressure pipe in a shallow, constant-depth trench, versus a large-diameter gravity pipe in a deep, ever-deepening trench with manholes — a difference that is especially large, and specially costly, in Paradise's near-surface lava cap, where depth means rock.

Carollo Response:

Carollo is evaluating the potential for implementing a low-pressure system or other hydraulic structures in low-lying areas of the Town and discharging to a gravity main (i.e. not pressurized pipeline) that conveys wastewater to the WWTF. This is referred to as a hybrid gravity/low-pressure system. As described above, the technical fatal flaw of high system pressure makes a full STEP system in Paradise not feasible.

The following provides a response to the text highlighted in yellow above.

- It is general industry practice to design pressure sewer pipelines to minimize the number of high points in the pipeline. We do not recommend going under and over utilities constantly because this creates localized high points which require installation of an air release valve at each high point. Air release valves can be a source of odors and require operations and maintenance staff to maintain the equipment.
- Assuming the sewer pressure main is shallow, the sewer laterals will still need to cross 1-ft below the water main and laterals per DDW regulations.
- Based on the topographic survey of the Town, there are several locations where achieving 10-ft of horizontal separation is not possible due to existing utilities. Per DDW, when there is less than 10-ft of separation, the parallel low-pressure line must maintain at least 1-ft of clearance below the water pipeline.
- The City of Oakland indicated the minimum depth of low-pressure lines is 6 feet to avoid utility conflicts and to allow other utilities to be installed in the future.
- The statement above cites, "A metre or two of cover". It should be noted that 2 meters is 6.56 feet of cover.

ITEM 4c: Pressure sewers are the technology recommended for this terrain. *And only the potable water main dictates that the sewer sit beneath it. Dry utilities do not: under California's General Order 128, electric lines require only about 12 inches of clearance from other pipe systems when paralleling and 6 inches when crossing, with communications and fiber treated the same way — a small clearance at the*

crossing, with lines offset rather than stacked. The STEP main may pass either above or below an electric or fiber conduit, whichever the crossing geometry favors, so long as that clearance is held and the crossing is supported; and since electric is itself typically buried only about thirty to forty-two inches, the pressure main shares that same shallow band. So the premise that "we have to trench deep anyway, so we might as well build gravity" does not hold. STEP does not trench deep: the water crossings are local duck-unders, the electric and fiber crossings are inches of clearance at the point of crossing, and between those points the main runs shallow along the contour. The deep, continuously deepening trench — and its cost in the lava cap — belongs to the gravity option alone; it is not a shared burden that cancels STEP's advantage. If anything, the burden runs the other way: a gravity main is driven deep by its slope, while electric sits only about thirty to forty-two inches down and cable shallower still, so a gravity line will almost certainly run beneath those utilities along its route — and, locked to a continuous grade, it cannot rise to weave over an obstruction the way a shallow pressure main can; it must hold its slope and pass under, deepening further into the rock to do so. It is the gravity sewer, not STEP, that must.

Carollo Response:

Carollo is evaluating the potential for implementing a low-pressure system or other hydraulic structures in low lying areas of the Town and discharging to a gravity main (i.e. not pressurized) that conveys wastewater to the WWTF. As described above, the technical fatal flaw of high system pressure makes a full STEP system in Paradise not feasible.

The following provides a response to the text highlighted in yellow above.

- The Department of Drinking Water Code requires that sewers cross under water lines and water services with 1 foot of clearance minimum. The agencies Carollo interviewed generally had installed STEP pipelines with 6 to 8 feet of cover because of this requirement.

ITEM 5: Clean effluent makes the head-management hardware more reliable, not less. *Since the reliability of pumps and valves in a pressure network is a fair concern, it is worth noting that STEP conveys screened, settled septic-tank effluent — not raw sewage. Each interceptor tank removes grit, grease, and settleable solids and screens the effluent before it is pumped. That clean effluent makes the pumps, check valves, air-release valves, and any pressure-control valves markedly more reliable and lower-maintenance than the same hardware on a raw-sewage or grinder main. The very components that manage elevation head are therefore more dependable in a STEP system, not less*

Carollo Response:

Based on our interviews with nine agencies that operate low pressure collections systems, low pressure systems have operations and maintenance challenges. The following highlights a few of the challenges that multiple agencies shared during our agency outreach.

- The STEP tank and grinder pump stations require maintenance by the operating utility. The typical operations and maintenance activities include facility inspections, pumping out solids from STEP tanks, site visits to inspect facilities after alarms, and repair of pumps, floats and other mechanical devices.

- The corrosion of appurtenances (e.g., valves, ARVs) is a major challenge for operations and maintenance of low pressure systems. One agency removed all valving because of frequent corrosion and valve failure. This was a common complaint among most agencies.
- Fats, Oils and Grease (FOG) control was also mentioned by several agencies to be an operations and maintenance challenge. FOG can create a mat in the STEP tank that reduces biological process until maintenance staff removes the layer. With the smaller effluent pipe sizes (1 1/4" to 4"), if grease builds up in the STEP tank and enters the effluent main, the risk of blocking the line is much higher than with a larger gravity pipeline.

ITEM 6: Request. *None of this asserts that STEP is automatically the right choice — that is what a side-by-side evaluation should determine. But the categorical conclusion that STEP "won't work" in Paradise's hilly terrain is not consistent with the design literature, the published standards, or the pump hydraulics. I respectfully ask that STEP be evaluated on a properly sized hydraulic design to Paradise's actual elevation profile — pumps selected for the real total dynamic head, the network zoned to the terrain — rather than set aside on the premise that elevation head is disqualifying. I am glad to provide the pump-head data, the design references, and a STEP hydraulic design basis at your convenience.*

Carollo Response:

Carollo is evaluating the potential for implementing a low-pressure system or other hydraulic structures in low lying areas of the Town and discharging to a gravity main (i.e. not pressurized) that conveys wastewater to the WWTF. This is referred to as a hybrid gravity/low-pressure system. As described above, the technical fatal flaw of high system pressure makes a full STEP system in Paradise not feasible.

Based on interviews with nine agencies that operate low pressure systems, the operations and maintenance of a low-pressure system (STEP or grinder pump station) is challenging. These systems require a small pump station at every home/commercial business that must be serviced and maintained.

In the conceptual Phase 1 sewer service area, there is 635-feet of elevation change from high point in system (near Almond and Elliot) to WWTF (assumed Skyway South for this analysis). This elevation difference creates approximately 275 psi of static pressure at the WWTF. At full sewer collection system buildout, there is 1205-feet of elevation change from high point in system (along Skyway between Clark Road and Pentz Road) to WWTF (assumed Skyway South for this analysis). This elevation difference creates approximately 522 psi of static pressure at the WWTF. This static elevation difference is a fatal flaw for installing a full low-pressure system (STEP or grinder pump stations) throughout Town.

ATTACHMENT D

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, DIVISION OF DRINKING WATER LETTER TO TOWN OF PARADISE, MAY 14, 2026

State Water Resources Control Board
Division of Drinking Water

May 14, 2026

Marc Mattox (via email: mmattox@townofparadise.com)
Assistant Town Manager
Public Works Director/Town Engineer
Town of Paradise

DIVISION OF DRINKING WATER'S UPDATED RESPONE COMMENTS, PIPELINE SEPARATION REQUIREMENTS, TOWN OF PARADISE

Dear Mr. Mattox,

This letter transmits the State Water Resources Control Board, Division of Drinking Water's (DDW) response to the questions Town of Paradise has on the regulatory requirements governing the separation between domestic water pipelines, recycled water and wastewater collection pipelines and the alternative to the pipeline separation standards.

The California Waterworks Standards (CA WW Standards), California Code of Regulations Title 22 (CCR T22), Chapter 16, Section 64572 governs the criteria for the separation of water mains from non-potable pipelines (wastewater collection and recycled water distribution pipelines). DDW via its District Offices in coordination with the Recycled Water Unit reviews compliance with the pipeline separation requirements that are regulated by DDW's Domestic Water Supply Permit Amendment and by the Regional Water Quality Control Board (RWQCB). DDW's Title 22 Engineering Report's conditional acceptance recommendations are included in RWQCB's Waste Discharge and Water Reclamation Requirements Permit conditions.

The separation criteria pursuant to the CA WW Standards, CCR T22, Section 64572 requires domestic water pipeline installation shall not be installed in the same trench and shall be at least 10 feet horizontally from a parallel pipeline conveying the following non potable water:

Untreated sewage (sewer collection pipeline),
Primary or secondary treated sewage,
Disinfected secondary 2.2 and Disinfected secondary 23 recycled water.

Domestic water pipeline installation shall be at least 4 feet horizontally from and, one foot vertically above, any parallel pipeline conveying the following non potable water:

Disinfected tertiary recycled water
Storm drainage

Alternative to the CA WW Standards, Chapter 16 pipeline separation requirements can be considered subject to demonstrating the proposed use of the alternative would provide at least the same level of protection to public health. The circumstances under which the deviations from the separation requirements are typically evaluated are when new water mains, new sanitary sewer mains or other non-potable fluid carrying pipelines are installed in existing areas and the local conditions are restricting (e.g., available space, limited slope, existing structures) the installation of pipelines as per the CA WW standards separation criteria. Excessive costs in meeting the pipeline separation requirements may be considered as part of the rationale for seeking an alternative to the regulatory requirements, however, DDW will prioritize public health protection above the construction costs in determining an acceptable alternative.

DDW's position is for the potable water pipelines and non-potable pipelines conveying sewage or similar fluids shall not be installed within the same trench. Potable water pipelines are vulnerable to contamination that can pose a risk of waterborne disease outbreaks. Non potable pipelines such as sewer pipelines frequently leak and saturate the surrounding soil with sewage due to structural failure and when this happens at a nearby water main that is depressurized or if it is broken during installation, it will be a cause for public health hazard. Further, failure of domestic water pipeline in close proximity to other pipelines may disturb their bedding and cause them to fail. Also, earthquakes, landslides and other major soil disturbances can cause simultaneous failure of multiple adjacent pipelines.

DDW's interpretation regarding the separation requirements is consistent with the CA WW standards separation requirements, i.e., installation of septic tank effluent or domestic wastewater infrastructure (gravity or force main) and domestic water pipelines shall not be in the same trench, and the horizontal separation of 10-feet shall be maintained between the pipelines. This type of installation mitigates public health hazards including that associated with gravity or pressurized flow of the domestic wastewater or septic tank effluent. For deviation proposed from the separation requirements, DDW will evaluate the changes based on the hazard posed by the deviation. The alternative construction will be assessed for its reliability in mitigating the identified hazards and failures and whether it is providing the same level of public health protection.

For pipeline separation in crossing and parallel installation the following shall be noted. Domestic water pipeline crossing installation with respect to the following fluids pipeline shall be constructed no less than 45 degrees to and at least one foot above that pipeline. No connection joints shall be made in the domestic water pipeline within eight horizontal feet of the fluid pipeline.

Untreated sewage (sewer collection pipeline),
Primary or secondary treated sewage,
Disinfected secondary 2.2, disinfected secondary 23).
Type of recycled water (disinfected tertiary)
Storm drainage

Domestic water pipeline parallel installation requires 1-foot vertical separation above the pipeline conveying disinfected tertiary recycled water and storm drainage water as the minimum horizontal separation requirement is less than 10 feet.

The level of recycled water treatment affects the separation requirements from the domestic water pipeline. The domestic water pipeline is required to be installed at least 4 feet horizontally and one foot vertically above the disinfected tertiary recycled water pipeline. All other lower

levels of treated recycled water (disinfected 2.2, disinfected 23) pipelines are required to be installed in a separate trench, at a minimum horizontal distance of 10 feet from the domestic water pipeline.

The installation wastewater pipeline above the domestic potable water pipeline can be considered by submitting a request to DDW for review and approval of an alternative to the CA WW Standards. The proposed alternative shall provide the same level of protection for public health as the requirements set forth in Section 64572, CCR T22. The alternative proposal shall include adequate information for DDW to evaluate the proposed alternative. The information shall entail the following information and not be limited to: intended use of pipelines, fluid conveyed, pipe sizes, operating pressure or gravity flow, pipe material and AWWA material designation code, pressure class, thickness, coating, pipe joint type, pipe length, depth of cover, number of crossings, angle of crossing and description of crossing pipelines, and separation between pipelines (for parallel installation above water main) and description of additional protective measures.

For instances of separation of recycled water lines and sewer lines, DDW applies pipeline separation requirements similar to those for potable water lines and pipelines conveying sewage. For horizontal separation between recycled water lines and sewer lines, a minimum separation of 6 feet should be maintained, though a 10-foot separation is preferred. In addition, a minimum vertical separation of 1 foot should be maintained between recycled water lines and sewer lines; with the exception for gravity sewers where a 6-inch vertical separation may be maintained - though the 1-foot vertical distance is preferred.

If you have any questions regarding this letter, please contact Ginachi Amah at (818) 551-2046 or via email at ginachi.amah@waterboards.ca.gov.

Sincerely,

Dr. Ginachi Amah P.E.
Recycled Water Unit Supervisor
Division of Drinking Water
State Water Resources Control Board
500 North Central Ave., Suite 500
Glendale, CA 91203

Cc: Via Email

Ginachi Amah, Recycled Water Unit, State Water Resources Control Board - Division of Drinking Water

Randy Barnard, Chief Technical Operation Sections, Division of Drinking Water

Clint Synder, Assistant Executive Officer, Regional Water Quality Control Board (Region 5)

ATTACHMENT E

AGENCY INTERVIEW MEETING MINUTES

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: City of Camas, WA

Contact Name: Rob Charles, PE - Utility Manager

Location: Teams Meeting

Date: 04/24/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Majority is STEP south of the lake transitioning to gravity north of lake
Year installed	early 1980s
Approx. number of connections	About 7,000 properties connected to STEP
Service area characteristics (hilly terrain, coast, high groundwater, etc)	bedrock, elevation challenges, hilly
Why was this system selected originally over other alternatives?	No alternatives
Are you using Orenco Prelos system, or other?	Roth systems (STEP) with franklin electric ½ hp pump
Does the system have different pressure zones?	All in one zone – up to one elevation, and then becomes like gravity; north side section that is industry and residents, two different basins that collect step system. Come together and go right to the treatment plant
What is the minimum pipe size and material for the low pressure system?	N/A

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	According to DOE, city maintains all the private systems (commercial takes care of their own) City owns lines from tank to main (landscaping is an issue)… mostly lids are damaged. Poly tanks are pretty bulletproof. Not much I&I from those lids.
Who maintains on-lot equipment?	City
Who performs septic tank pump-outs?	Commercial/ industry by themselves. City does it for the residential
Who pays electrical costs?	Electrical is paid for by homeowner. Older homes don't have separate breakers so if we have to shut off, it shuts off all power
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	No easements (but implied by municipal code). City sends flyers out ahead of maintenance
Any challenges with restoration of private property after installation of tank/pressure connection?	N/A
Were there any challenges connecting to existing home electrical system or did you install a separate service?	Part of development
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	City calls homeowner every time they go out so the homeowner is aware. Check electrical connections, clean out filter, check condition of tank and lid. Older systems did direct bury on wire instead of conduit (from panel to breaker)
Maintenance frequency	8 year rotation for septic tank pump out

	Certain homes they go out sooner than 8 years. Now have preset maintenance program of 8 years. Some tanks 4 years. Started contracting recently. Pump trucks wear out a lot. Located in easements & off road, so focusing on ARV maintenance. Tanks under decks; landscape over them.
Number of staff supporting the system? In-house vs Contractor support?	Recently been contracting to outside contractor. Used to have city crews do it, but pump trucks wear out a lot When City did maintenance, they had 3 full time dedicated staff for year round pumping
Do you use telemetry/ SCADA?	No SCADA, everything is separate ($10-$12k per installation.) Homeowner receives alarm and then notifies the City
Average number of service calls per year?	Every other night they do emergency calls;
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Homes have had problems with oil & grease. Pumps get bound with wipes. electrical components failing, concrete tanks are bad… filter needs to O&M.
Typical response time	N/A
Overall System Reliability	When treated right, they'll be functional until failure

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	$150k on community tanks $120k on residential STEP tanks (1/8 of system)… do pumping twice a year

Typical pump lifespan	Should get about 20 years out of equipment… old panels didn't have right panels Some panels have lasted longer; $5-6k to rehab the panel… septage receiving at treatment plant. Costs keep going up
Replacement cost	Need to replace 7,000 tanks but are looking at $50M+ for replacement.

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	Issues with oil and grease. Issues with flushable wipes. Need to go out and educate homeowners
Mainline maintenance frequency	No cleanouts so no maintenance on mains
Odor/ sulfide issues?	They have issues with odor at receiving manholes (where step joins gravity). City puts in carbon filters and has to replace every 6 months… Also run bioxide in the system and do year round dosing. Dose upstream of manhole into the force main ARVs don't have as many issues

7. Treatment Impacts

Question	Response
Impacts to treatment plant	Starved for solids at WWTF

8. Customer Experience

Question	Response

Frequency of complaints	N/A
Typical complaints (alarms, odors, maintenance disruptions, others?)	Alarms and odors
How did you handle homeowner education and coordination?	Need to educate owners on what can and cannot be flushed (i.e. flushable wipes)

9. Lessons Learned

Question	Response
What would you do differently?	Add coatings to manholes, pigging ports, and breakers on electrical.
Would you select same system again?	No, if City can get away with grinder systems they would do that
Biggest advantages	N/A
Biggest challenges	No cleanouts. Can't pig. New step main replacement will add in cleanouts & pigging port. Starved for solids at WWTF – H2S is so damaging where it ties in. Damage downstream to MHs and gravity pipes.

They arte moving to grinder tanks for new areas. But

Issues with too many houses kicking on at the same time? No have not run into that issue

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: Marin County – Marshall Beach (lake canyon community services also has step)

Contact Name: Arti Kundu;

Location: Microsoft Teams

Date: 5/4/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Full STEP in Marshall Beach
Year installed	2008 (40 houses), and in 2015 added the rest to get 50 connections
Approx. number of connections	50 houses on system
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Flat area (right adjacent to Tomales bay) Sewer system are located in railroad fill, oyster shells, etc. Not ideal leeching and treating conditions
Why was this system selected originally over other alternatives?	STEP – a lot of resiliency (if pump goes out, enough storage); Much less power used with the ½ hp pumps Grinder has a smaller unit, so evacuate it more quickly, higher motors; no storage if power goes out. Conversion from existing septic, so were able to salvage some of the septic tanks. Septage tank reuse: inspected and tested the tanks to meet the criteria. Where people could save money on keeping tank, that was a positive to bring people to support system. Access agreement for each property, and Matt inspected every tank Kept both concrete and fiberglass tanks depending on condition.

	If homeowners couldn't reuse the tank, they would replace it, as part of project cost (homeowner wouldn't need to pay for it) Septic tank (state fund granting) are part of the treatment plant whereas grinder pumps are not, so funding played a part in it All new tanks that went in were 1,200 gallons (more storage in the new ones) Added a 500 gallon pump chamber to add additional capacity to the septic tanks Placed pump in the effluent side of the septic tank. Effluent side received a biotube; can either place on the bottom of the tank or hang from the top of the tank
Are you using Orenco Prelos system, or other?	Yes, Orenco
Does the system have different pressure zones?	N/A
What is the minimum pipe size and material for the low pressure system?	N/A

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	County
Who maintains on-lot equipment?	Expectation: if something deteriorates or is damaged (because of owner), it is the responsibility of the owner However, if it's the end of the useful life, then County would replace the equipment
Who performs septic tank pump-outs?	Homeowner pays for the pump outs. The County has a list of approved contractors
Who pays electrical costs?	Homeowner. Tap into the PG&E line ahead of the house, (after meter, before house

	panel and pull off a separate panel). That way you don't redo an old panel Most of the control panels are on the building (had to consider access, wind, sun, etc.)
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	Originally going after easement, but ended up with going after an access agreement (just identified approximate route, no survey or easement description) Homeowner provides water used to flush and clean out the biofilters – part of agreement with homeowner
Any challenges with restoration of private property after installation of tank/pressure connection?	Worked with every individual (get to know every homeowner) and figured out restoration for each property How did you handle bidding of landscape restoration? Hired a local contractor, and walked each parcel to figure out restoration (not elaborate landscaping areas)
Were there any challenges connecting to existing home electrical system or did you install a separate service?	Built a separate panel.
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Annual inspection – solids accumulation, clear zone is 70-75%; making sure floats are working correctly. Look for evidence of flooding because floats aren't working; access riser adherence meets code with tank. Looking that lids are tightly sealed, exercise lateral valves, etc.
Maintenance frequency	Annually
Number of staff supporting the system? In-house vs Contractor support?	N/A

Do you use telemetry/ SCADA?	No
Average number of service calls per year?	N/A
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Pumps and floats don't work. (very few pumps fail) Filters in STEP don't usually clog because they wash it every year If house has high grease, it can create issues (grease builds up on floats, which weighs float down and creates issues for biotube and floats) Identify problem areas and educate homeowners
Typical response time	N/A; County has generator plug at each STEP system Capacity is about 24hours (but the volume they provided is twice the amount of actual flows so have more like 48 hours)
Overall System Reliability	N/A

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	N/A
Typical pump lifespan	Depends on user.
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response

Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	Once had grease clog system
Mainline maintenance frequency	Flushed out system with high pressure fresh water from a terminal flush port at the end of system. Pushed it right into dosing tank . Otherwise, hasn't been maintenance. They don't find the need for cleaning the mains since they don't grow material or back up Most issues in main line – ARV box can corrode due to H2S; A good amount of air valves in the system due to going above and under utilities, etc.
Odor/ sulfide issues?	Arv's in remote areas so no complaints

7. Treatment Impacts

Question	Response
Impacts to treatment plant	N/A

8. Customer Experience

Question	Response
Frequency of complaints	Quite a lot of emergency calls (6 calls per week); They have their own maintenance contractor outside of business hours Not too many electrical issues, but mostly pump and control issues
Typical complaints (alarms, odors, maintenance disruptions, others?)	Alarms
How did you handle homeowner education and coordination?	Annual newsletters

9. Lessons Learned

Question	Response
What would you do differently?	Define ownership early Commercial (restaurants) – have a strong FOG program and limits in place; Environmental health has own permitting program and different revisions that may come to food program – recommend placing an MOU with restaurants to require them to notify each department for any changes (seating capacity equipment, or other) Set up budgeting in place (budget for emergencies, environmental sensitive areas) Should have an aggressive public outreach/ education: Community members are educated – but give a once a year newsletter to give them reminders on do's and don't's STEP sizing – had to have some commercial promise not to expand, but promises weren't held. So, keep in mind what can happen in future (Marhsall treatment system is very sensitive to fluctuations in restaurants flows) Have isolation valves at creek crossings and culverts
Would you select same system again?	N/A
Biggest advantages	Allowed them to install shallow pipe in areas that would not have worked with gravity.
Biggest challenges	Challenge was the commercial – fats, oils, and grease was a big component.

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: Nevada County

Contact Name: Brad Torres

Location: Teams

Date: 4/27/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Lake of the pines (Darkhorse) is a grinder system Low pressure system pumps to a singular pump station. Small pipe to lift station before being pumped to WWTP In darkhorse, they own the lateral from easement to mainline. Inspect and commission pumps, but homeowner owns everything Biggest thing is issues scouring at the end of the system for grinder pump due to the hydraulic grade All residential, no commercial. Lake wildwood (penn valley) is a STEP system County owns everything, this may be because this was built back in the 8190s. Also in the floodplain, so Brad thinks they have a lot of I&I. Penn valley uses Orenco.. No manholes in the penn valley system. No pigging ports, but they have blow-offs. Decent amount of scour, and not much blockage Mountain states estates is another step system Grinder vs step system: grinder is easier because the Town doesn't own it. STEP , run into issues pretty regular
Year installed	1980's for step system (1987); Grinder is from 2007 to 2008
Approx. number of connections	Penn valley – 380 connections; dark horse ~100 connections

	Issues with multiple houses running at the same time? Before when they were at higher pressure but not as much now. Force main downstream – issues during wet weather flow because I&I would add flow and they would compete.
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Penn Valley: Terrain is pretty flat; very high groundwater table Darkhorse: they don't have groundwater issues
Why was this system selected originally over other alternatives?	N/A
Are you using Orenco Prelos system, or other?	Penn valley uses Orenco
Does the system have different pressure zones?	Single system with a series of valves they can isolate. Had issues before the pressure reduction, but not as much. In Penn Valley step system, a lot of corrosion at the ARV.
What is the minimum pipe size and material for the low pressure system?	Penn valley system is PVC. Seeing some I&I from the septic tank, not much elsewhere. Reduced system pressure from 80 psi to 13 psi when changed discharge to WWTF, Improved reliability of system.

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	Penn Valley: County Dark Horse: Owner
Who maintains on-lot equipment?	Penn Valley: County Dark Horse: Owner
Who performs septic tank pump-outs?	County
Who pays electrical costs?	Homeowners pays tank including electrical. Multiple homes going to a single tank (can be problematic) . If a single home owns the power, then if they leave, they turn if off. Recommends all individual connections to the power.
Access/easement challenges – Do you have easements for access to private property?	No easements for the grinder; just for the STEP system. Easements are ten feet wide from tank to ROW (just a maintenance

How do you handle access for maintenance?	easement)
Any challenges with restoration of private property after installation of tank/pressure connection?	N/A
Were there any challenges connecting to existing home electrical system or did you install a separate service?	N/A
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Maintenance inspection program.. Annually, going out to check solids level (max 5 year program) others require more pump outs; look at integrity of tanks while out there. (Concrete tanks). County does not call property owners before going out there. Clean out effluent filters when they do pump outs
Maintenance frequency	At least yearly.
Number of staff supporting the system? In-house vs Contractor support?	8 collection workers responsible for 100% of district. Could get away with three workers for the STEP system. Any outside service contracts? County does 99% of the work themselves County has an electrician on the team.
Do you use telemetry/ SCADA?	N/A
Average number of service calls per year?	They need to have someone on call 24 hours per day for alarms. Some calls but not a lot since the pressure has dropped no pressure gauge on the force main in case

	something happens
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Not any backups at the tank because homeowners get annoying alarms. Most issues they have is in the force main (ARV, or break in the line) Have had issues with some grease blocking the main, but not too many. Homeowners do not have grease traps – Pine valley STEP has some commercial properties that have grease interceptors. Faulty floats with panels, no alarm component with the panels.
Typical response time	Response time within an hour
Overall System Reliability	N/A

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	N/A
Typical pump lifespan	In 2019 did regionalization. Liquid end section of pumps; ½, ¾, 1 hp in system. Commerical high HP
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	Main issues are at ARV's or breaks in line. Not enough access to lines. Hard to isolate line in areas due to not enough valves.

Mainline maintenance frequency	Valve exercising is very important because if an isolation valve doesn't work, then you have 400+ pumps that can't be controlled.
Odor/ sulfide issues?	Issues with odor, from communal force main.. periodic odor issues at the ARV's. Bohn odor control (essentially a diffuser).. Carbon filter would've been ineffective.

7. Treatment Impacts

Question	Response
Impacts to treatment plant	N/A

8. Customer Experience

Question	Response
Frequency of complaints	Sometimes get calls at night
Typical complaints (alarms, odors, maintenance disruptions, others?)	Alarms and floats
How did you handle homeowner education and coordination?	N/A

9. Lessons Learned

Question	Response
What would you do differently?	Penn Valley: Change tank material. Better access to isolate and clean out lines. Other problematic thing, is that not many valves and a lot of septic tanks hooked up, so you have to notify 100+ people for maintenance. Dark horse: pretty issue-free, not much he feels like they could've done differently

Would you select same system again?	N/A
Biggest advantages	N/A
Biggest challenges	Not enough isolation valves.

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: Placer County

Contact Name: Evan Cloutman & Thomas Young

Location: Teams

Date: 4/28; Why did county take over? Orenco prelos?

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	STEP (mostly in Auburn) Community in north auburn (County did not maintain it originally, but then started to maintain it due to issues) They have same grinder pumps that are completely owned by the owners, they will pump to a septic tank where it gets re-pumped
Year installed	Late 1980's
Approx. number of connections	700 spread out
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Most topographically challenged areas (very flat)… Eventually all flows to a gravity system
Why was this system selected originally over other alternatives?	Was originally installed by developer/ owner, but overseen by County. Requires contractor to provide 1-year warranty Original low pressure system was designed for all parcels (even empty)
Are you using Orenco Prelos system, or other?	Orenco pumps Use concrete tanks - 1,500 gallon is standard for residential Largest residential is 2,000 gallons Commerical tanks are completely unique (require own design)

Does the system have different pressure zones?	Just one low pressure line -> all houses in that community tie into it. Some sites have a single site/ pump station that it pumps to, and then a larger pump station that pumps everything out
What is the minimum pipe size and material for the low pressure system?	One low pressure line (2") all houses tie into it.

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	County.
Who maintains on-lot equipment?	Maintains system once it enters tank (everything from house to tank is homeowner's responsibility)
Who performs septic tank pump-outs?	County
Who pays electrical costs?	Homeowner pays for power to pump. Contractor that did installation did the electrical service. Homeowner responsible for providing power to panel, but County maintains panel
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	Originally not (they have a county code to grant access), but recently they have been starting to get easements for the equipment
Any challenges with restoration of private property after installation of tank/pressure connection?	Tell homeowners not to plant anything near to the septic tank, if not send notices to clear. Panel must be on pedestal with water spigot & GFCI. For hosing down or if basket get clogged back into tank. If pull out pump, wash into tank. GFCI is good for equipment – jackhammer.
Were there any challenges connecting to existing home electrical system or did you install a separate service?	N/A; Contractor that did installation & wiring, power to control panel. County maintains equipment & control panel, float switches.
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Pump outs depends on user. Some pumps last 20 years, and other last 5 years Float switch responsible for about 90% of responses (now mechanical, but previously they were mercury switches which were more reliable)
Maintenance frequency	4 year rotation – every four years the tank is inspected for solids, condition, alarms, floats, and pump outs (if necessary) Have some commercial systems. Bigger more flow, need bigger tank, more monitoring to make sure not exceeding allowable flow. Much more expensive when break and inspected more often. Inspect 1/week. (Duplex systems – California conservation, school, church, car wash)
Number of staff supporting the system? In-house vs Contractor support?	Minimum 2 workers.
Do you use telemetry/ SCADA?	No SCADA, someone will call in case there's an issue
Average number of service calls per year?	3-4 callouts per week for STEP 1-2 for gravity
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Orenco stackable pumps can only pass 1/8" solids, so they clog ore Highest head pressure is at 175' TDH (lowest ones are 20' TDH) Most issues seen in the higher head areas, clean out caps/ check valves breaking (things attributed with higher pressures) I&I – don't deal with poly tanks from Orenco – I&I is an issue attributed mainly to root intrusion. Lids have two be 2" above finished grade which helps I&I
Typical response time	30-minute to 1-hour response time (2 employees and a supervisor always on-call 24 hours per day)

Overall System Reliability	Used to have issues with multiple houses running at the same time, but now having pumps run at 10hp at all times Require Orenco PF Series. 60-70% of pumps are a certain orenco model which is 240V

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	County is currently auditing themselves on budget for O&M. Previously it was going into just one larger basket. STEP require separate fee/ tax Gravity vs STEP – gravity systems are more labor intensive to maintain entire infrastructure. STEP is more preventative to get there since there are so many. STEP callouts are larger than gravity
Typical pump lifespan	Anywhere from 5 to 20 years depending on user.
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	ARVs are the most troublesome, get clogged they get dirty and break 2” lines (PVC) occasionally break. Don’t pigging on low pressure line unless blocked. Ball valve & check valve at every parcel. Check valves break open and whole system backs up into tank. Have valves on lines.
Mainline maintenance frequency	Maintenance on low pressure lines – only when problem.

Odor/ sulfide issues?	Odor control at carbon filters at ARV. Used to do standpipe with filter. Use Wagner – green box with 50 lb basket for problem area . Change when someone complains 12/year.

7. Treatment Impacts

Question	Response
Impacts to treatment plant	N/A

8. Customer Experience

Question	Response
Frequency of complaints	Many calls right after power outages (water is still running…) Most complaints from odor and alarms. Biggest complaint is the eyesore of equipment
Typical complaints (alarms, odors, maintenance disruptions, others?)	Some issues with fats and grease, but not nearly as bad as they do at lift stations Low pressure effluent pipes discharge to both gravity mains and lift stations
How did you handle homeowner education and coordination?	Leave flyers at homes when they're about to go out for maintenance. They have an outreach system that are given to the realtors or HOA.

9. Lessons Learned

Question	Response
What would you do differently?	Would rather have more lift stations rather than having more STEP system connections. During COVID, ran into supply issues so with STEP they are at the mercy of manufacturer.
Would you select same system again?	Would rather have lift stations. Lift stations are more in their control (backup power, scada, etc.) more oversight.

	STEP has risk of liability on private property. No redundancy on low pressure systems. ROI not as much for STEP – time consuming, lots of maintenance, and require several on staff to be dedicated to them
Biggest advantages	County has not had to start replacing tanks yet, but they think it will happen soon
Biggest challenges	Number of emergency calls means that operators lag on maintenance for the rest of the system.

Grinder System – Agency Interview Form

1. Agency Overview

Agency Name: Port Hadlock (3 years to do construction + WWTP)

Contact Name: Sam Harper

Location: Teams

Date: 04/24/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid/ Grinder Pump Stations)	Low pressure sewer system using Eone grinder pumps; Entire system is low pressure. Installed new E/one grinder stations – did not place the grinder stations inside the existing septic tanks
Year installed	Online since September 2025
Approx. number of connections	Built 5 miles of pipe and 60 people hooked on right now. (designed for 74,000 gpd). Construction costs so far are $34M; $10-12M for WWTF, $5M for collection system Had to bring 24,000 gpd to plant online – which is why they used (treatment plant, collection system, grinder pump, and MBR bioreactor)
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Town is very hilly (min 200') elevation difference at one point
Why was this system selected originally over other alternatives?	They looked at STEP but unsure why it wasn't selected. Originally, everyone wanted gravity but they decided to go to Eone for cost savings (implementing gravity in a fully built out

	Town was going to be challenging for them)
Are you using Orenco Prelos system, or other?	This was an open bid for grinder pumps. Ultimately Eone had the lowest bid, and they were one of the few manufacturers who could provide everything the Town wanted (SCADA, control panel, pumps, wet well, etc) Very happy with Eone so far.
Does the system have different pressure zones?	No, one pressure zone.
What is the minimum pipe size and material for the low pressure system?	2" was the smallest and 6" was the largest… design was originally going to be 8" & 10" but flow was too small so installed small pipes and added a parallel pipe for future flow. All pipes are fused HDPE. All cleanouts are 2" camlock even if there were different sized cleanouts just to have one adapter City of Bremerton also has this system. Porthadlock has not flushed and Bremerton has not flushed either.

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	County owns everything, control panel, pumps, etc.
Who maintains on-lot equipment?	County maintains everything.
Who performs septic tank pump-outs?	N/A
Who pays electrical costs?	Homeowner. When everyone pays their own power, they estimated it would be about $1 more per month
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	Easements on every lot; each pump is a part of the collection system so used grant to pay for the pumps

Any challenges with restoration of private property after installation of tank/pressure connection?	Hand seed everywhere unless they have a gravel surface.. if someone had a problem they would text them…
Were there any challenges connecting to existing home electrical system or did you install a separate service?	Gave $2,500 rebate to each resident to hire individual electrician to buy disconnects and install disconnects for homes..
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Due to the newness of the system, no O&M activities have been required.
Maintenance frequency	N/A
Number of staff supporting the system? In-house vs Contractor support?	Had to hire treatment plant operator; WWTP level 3 They want somebody who knows how to operate treatment plants. Bought lab equipment, etc. Highly recommend
Do you use telemetry/ SCADA?	Treatment uses ignition for SCADA, MBR uses different SCADA, and they're hoping one of the platforms can talk to the Eone SCADA Century SCADA (Eone's system) – alarms, site map of grinder pumps, shows alarms, run times for pumps (no call out)
Average number of service calls per year?	Have gotten a number of calls, but seems more related to construction issues vs maintenance of the pumps (i.e missed a couple of connections at septic, Some pumps have failed for now, but not too many) PUD handles the calls now but County hasn't heard any news on a lot of calls being missed
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	System is new so not many failures.
Typical response time	N/A

Overall System Reliability	County is very happy with system. Too early to tell reliability

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	$35.5M to install entire project, and used about $30M right now. Collection system about $5M, $10M for treatment plant,
Annual O&M cost and breakdown (if available of cost)	N/A
Typical pump lifespan	N/A
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	No issues so far
Mainline maintenance frequency	N/A
Odor/ sulfide issues?	Odor control - proprietary gravel layers at WWTF. On collection system, above round charcoal (Wagner) install only at ARVs.

7. Treatment Impacts

Question	Response
Impacts to treatment plant	They use Ovivo MBR and then have a tertiary plant for class A water. Jockey pumps were installed at plant since pups at MBR are too large.

	Had to hire a WWTP operator that was Level 3.

8. Customer Experience

Question	Response
Frequency of complaints	N/A
Typical complaints (alarms, odors, maintenance disruptions, others?)	N/A
How did you handle homeowner education and coordination?	N/A

9. Lessons Learned

Question	Response
What would you do differently?	County paid for sewer interceptors for everyone but would not do that again. Eone did the design, but they hired another Consultant to check Eone's design.
Would you select same system again?	Yes – gave County flexibility on main alignment.
Biggest advantages	Could install shallow pipes across County.
Biggest challenges	Decommissioning of septic tanks (see below).

Additional Notes:

- Since the system came online in 2025, a lot of the discussion was geared towards lessons learned during design and construction. The system has been online for less than a year, so not as much discussion was had on the maintenance of the system.
- **Design Lessons/Notes:**
    - Rather than increasing the basin size of the E-One unit, decided to add generator plug (Appleton plug). This way, County could come to plug their

generator in and pump out sewage in case of emergencies vs needing to upsize the wet well for additional storage time. All residences have simplex units (101s). Commercial parcels use 230, and larger parcels use 480 units.
    - Used concrete manholes for drivable surfaces and Raven coated the interior of the manholes.
    - Trying to keep things simple so they spec'ed the same materials
    - Grinder unit had a valve and cleanout, and another valve and clean out at connection to pressurized main.
    - Two unions with quick disconnect.. HDPE welded cleanout mostly HDPE to that vault… will move to all stainless steel for the unions
    - Sewer flow had to stay live until WWTP could go live, so location of pump dependent on what could work to make flow stay live
- **Construction Lessons/Notes:**
    - Most residents wanted a collection system (since it was free), so everybody was easy to work with.
    - Tank decommissioning: decommissioned all septic tanks for residents, and had to bring trucks to pump out all the properties, had to drive to dump solids.
        - Had to dewater and deal with solids. Pumped out 200,000 gallons out of system.
        - Some tanks easy to pump out; cut the top and pump it out
        - Some tanks had additional equipment at septic tanks so they had to separate out all the metal, took everything to the dump… if septic had control panels or something, they left them as is because didn't know how they were wired. Called the dump company, and set up dumpsters. Have contractor call Town once the dumpsters are full
        - For large onsite septic, had to do decommissioning with the State. Filled out on all the applications and signed off on all things for the residents.
        - Some people had some treatment units that were like wiffle balls so they had to take everything out
        - In general, all parcels had individual septic tanks, but varies. Had to rely on record drawings for each property.
    - A lot of homeowner coordination was required to make this project be successful. Schedule each individual lot ; give them a heads up they were going around this time but may be there earlier depending on contractor.

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: Snyderville Basin Water Reclamation District (SBWRD), Utah

Contact Name: Dan Olson, Kevin Berkley, Scott McPhie, Cory Shorkey

Location: Teams

Date: 5/6/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Hybrid system with areas of low pressure system that are pumped with grinder pumps This is a resort Town so a lot of grinder pumps are installed in part time residences (residents leave them sitting for few months at a time). Grinder pumps have a small tank in the front yard
Year installed	25 years ago
Approx. number of connections	N/A
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Hilly, ski resort town (near Park City)
Why was this system selected originally over other alternatives?	Grinder pumps were selected and installed by developer
Are you using Orenco Prelos system, or other?	E-One grinder pumps; progressive cavity pumps
Does the system have different pressure zones?	No different pressure zones, because all pumps just max out at 85 psi. Does not allow mixing of any other manufacturer (any E/One pump will have the same pressure limitations). Pressure graph is flat

	so pressure will stay similar for the different flow rates (8-12 gpm)
What is the minimum pipe size and material for the low pressure system?	HDPE-fused; manholes at junctions or at dead end of system (flushing manholes) just use standard concrete manholes Isolation valves in front of each unit where it goes to LPSS. Grinder pumps pump sewage to a low pressure main that is up to 4-inches. The flow is then sent to their gravity system.

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	Homeowner owns everything outside of the roadway. This was picked because Developr installed grinder pumps and sold homes with that condition
Who maintains on-lot equipment?	Homeowner
Who performs septic tank pump-outs?	N/A – new homes
Who pays electrical costs?	Homeowner
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	N/A Phone number for local vendor is in control panel. If issues pop up, homeowner calls vendor and pays them to come out. District does not do anything
Any challenges with restoration of private property after installation of tank/pressure connection?	No issues with I/I or lids breaking
Were there any challenges connecting to existing home electrical system or did you install a separate service?	N/A
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Maintenance crew knows how to do HDPE butt fusion. All ARVs are inside manhole, so they have odor controls inside the manholes. Clean mains annually (started off annually)… District started out flushing the force mains every year – now that flow has picked up, flushing is done every 5 years. (discharge is the first line downstream of manhole) Start at bottom, add a little dye, and flush with high pressure nozzle. Flush out some sediment historically.
Maintenance frequency	District doesn't do grinder pump maintenance, use vendors to do the service calls (delco western); individual pays for each call out
Number of staff supporting the system? In-house vs Contractor support?	Use the vendor, with their phone number. Homeowner pays for Delco Western (for maintenance)
Do you use telemetry/ SCADA?	N/A
Average number of service calls per year?	N/A
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Have not had issues with grease in the system… Most of these are in resort communities, so do not have a lot of restaurants in the area. Do not have a lot of those connected to these.
Typical response time	N/A
Overall System Reliability	Very reliable system. Discharge location has to be at the high point of the E/One system

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	N/A
Typical pump lifespan	N/A
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	More odors when first starting, and it got better, but still some odor issues. ARVs at flushing manholes and high points. Recently switched most of the ARVs out (replaced because they were 25 years old and end of useful life). Went to all plastic, HDPE. Low pressure line main valve – took out the main line valves. Spending a lot more money exercising valves, and replacing valves. Were never needing those valve, so they took the valves out. If they need to isolate, then they use a pinch tool to close the HDPE pipe. now they just pinch the HDPE pipe (require 1.5' below any utility to avoid any issues).
Mainline maintenance frequency	Annual flushing due to variable seasonal flow (resort town, so many homes are empty for months out of the year) Check odor control baskets every 6 months. Need to replace once a year in high concentration systems, others go 2-3 years

	before replacing
Odor/ sulfide issues?	Pretty big odor issues and corrosion issues: Since solids are accumulated, there are odors, and corrosion in the discharge manholes Odor baskets inside manholes, activated charcoal Discharge manholes are polymer manholes (rest of system is standard concrete); Manholes with greater than 18" pipe diameter, and within 500' of loss or force main need polymers (District wants to increase to 1,000 feet)

7. Treatment Impacts

Question	Response
Impacts to treatment plant	N/A

8. Customer Experience

Question	Response
Frequency of complaints	N/A
Typical complaints (alarms, odors, maintenance disruptions, others?)	N/A
How did you handle homeowner education and coordination?	Constantly message rate-payers for homeowner education. Engaged developer to have them do some messaging and Delco Western. Specific example: If a homeowner is going to be gone for a while, let them know they need to flush. (6,000 sq ft homes on average… When they leave for season, fill bath tub or two of water and pull drain). Need to tell them not to leave stuff in there…

	Flip side is that houses have cleaning crew that comes in and flushes toilets, etc.

9. Lessons Learned

Question	Response
What would you do differently?	Early on had to replace a lot of valves. Generally simplified everything (taking out valves). Recommended Carollo read through the Snyderville specs to know which valves they recommend based on experience (use Asahi valves) Some odor control baskets need to be customized so they also have (frost free frame and manhole have an inner ring where carbon sits on.. better than having it sit on the lid so they don't fall in as much) Moving forward, District would simplify system (no valves)
Would you select same system again?	Yes
Biggest advantages	Overall, LPSS is reliable and District has only had one occurrence of the main getting hit. Minimal I/I, and the District does not have to deal with the individual grinder pumps, so not a ton of maintenance.
Biggest challenges	Most junction manholes/ flushing manholes have solid bottoms. When it rains, those manholes fill with water. Need to pump out 3'+ of water from those manholes which he thinks led to the corrosion of the valves. If we have metals, recommend 316 sst so they don't rust. Maybe do a gravel bottom?

Other: Developers need to approach E/One as part of submittal package -> E/One needs to get involved in design process to confirm developers approach works. E/One tell developer which pump works for their house (based on anticipated flow/ bedrooms)

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: City of Lacey, WA

Contact Name: Roger Dickinson (Wastewater Supervisor) & Tom Faye

Location: Teams

Date: 5/26/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Hybrid-gravity/ STEP/ Grinder
Year installed	1992
Approx. number of connections	4,200 STEP Systems, 300 grinder pumps, and the rest is gravity (population of Lacey is 75,000). System sends flow to a regional wastewater plant.
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Generally flat.
Why was this system selected originally over other alternatives?	Developer driven and cheaper than gravity. STEP has its place and uses, but also has its cost. Ongoing costs for the life of the system.
Are you using Orenco Prelos system, or other?	All STEP systems have been Orenco. Grinders are Eone or Liberty. Grinders have more maintenance. For STEP, City has found that Prelos tank lasts about five years, and Roth tanks usually last the full 8 years.
Does the system have different pressure zones?	No. Their pressure is between 15-30psi operating pressure. All interconnected into major trunk lines. One place has a spot with 50-60 psi pressure. But the rest of the system is at low pressure.

What is the minimum pipe size and material for the low pressure system?	2" to 18" force mains. 15 to 30 psi. Have bell & spigot PVC throughout system. All STEP areas ae interconnected. Pressure lines have an average bury depth of 68".

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	City of Lacey owns and maintains everything.
Who maintains on-lot equipment?	City of Lacey
Who performs septic tank pump-outs?	City of Lacey
Who pays electrical costs?	Owner. Just starting an electrical maintenance program.
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	See development guidelines. Access granted to City as part of owner joining system.
Any challenges with restoration of private property after installation of tank/pressure connection?	N/A – done by developer
Were there any challenges connecting to existing home electrical system or did you install a separate service?	N/A – done by developer
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Every 8 years, check pumps, floats, no major leaks. Then, fully vac both sides liquid and solids, and make sure it's good for the next 8 years. They have two dumpsites that will take care of the solids.

Maintenance frequency	No annual inspection. For the most part, City inspects equipment every 8 years but it also depends on the discharger. Some tank require additional maintenance than others. More maintenance in grinders than STEP tanks and City has found they cost more to operate and maintain over STEP tanks. For commercial – the RWWTF staff put commercial parcels on schedule & checks equipment/use – sets pump out schedule.
Number of staff supporting the system? In-house vs Contractor support?	N/A
Do you use telemetry/ SCADA?	No
Average number of service calls per year?	About 100 calls so far this year (January to May)… Varies a lot; Usually will have more than one call per week or sometimes can get 3 calls in the same day. Both commercial and residential.
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Variety of things fail – from early 90s to 1998 – 40% failure rate, now at 3% failure rate. City uses PVC ball valve & flapper check. Ball valve can freeze and split.
Typical response time	Grinder (238 gal) – technicians need to get there quick. Residential has more calls.
Overall System Reliability	STEP systems are more reliable than grinders. Dilemma with grinder systems is that tanks only provide 238 gallons with Eone (since tanks are small, not much time for technicians to respond to emergencies).

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	Grinder and STEP tank maintenance costs to be provided to Carollo.

Typical pump lifespan	N/A – depends on user.
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	ARV's are available through system – City recommended Town install ARI25 for ARV's. Pigging is done where needed. Have pig launchers & catchers. City has line valves, but they don't like operating valves because they break open or close a lot so City has stopped exercising valves.
Mainline maintenance frequency	As needed.
Odor/ sulfide issues?	Inject chemical for odor control at key points based on contact time.)

7. Treatment Impacts

Question	Response
Impacts to treatment plant	N/A

8. Customer Experience

Question	Response
Frequency of complaints	About a 100 calls this year.
Typical complaints (alarms, odors, maintenance disruptions, others?)	Variety of things, but mostly alarms go off.
How did you handle homeowner education and coordination?	Generic plamphets that each homeowner receives. Commercial has FOG requirements checked by someone else.

9. Lessons Learned

Question	Response
What would you do differently?	Grinder is the very last choice, but still allow STEP. 1 – gravity, 2-step, 3-grinder. Grinders are costly to maintain, require 2 people to pull pump, fand the failure rate and time to respond is higher. City recommends coating 2-3 manholes downstream of discharge point for anticorrosion prevention.
Would you select same system again?	Try to use more conventional sewer with lift stations if possible. O&M is expensive for all these step parcels
Biggest advantages	N/A
Biggest challenges	The number of calls received and the fact that the City has to treat each call as an emergency – need to be out there as quick as possible.

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: City of Yelm

Contact Name: Cody Colt

Location: Teams

Date: 5/26/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Full STEP, but City is planning to start allowing grinder systems and has a couple of grinder pumps in City owned facility.
Year installed	Early 2000s (oldest tank is 1999).
Approx. number of connections	4,500 connections.
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Yelm is extremely flat which is why they went to STEP (didn't have headworks previously at plant).
Why was this system selected originally over other alternatives?	All of these were installed as part of a new development
Are you using Orenco Prelos system, or other?	Used Orenco's Prelos tanks but did not work like they hoped. Now City uses prefab (fiberglass) or concrete tanks. For concrete, they use both precast and cast-in-place. Prelos tanks are good with good users, but most people aren't good users. Still use Orenco pump package and everything else (just not tanks). Lids of Prelos tanks are warping for whatever reason.
Does the system have different pressure zones?	Do not have different pressure zones throughout City. No PRVs or anything like that.

	Lowest pressure is 20 to 50 psi, but system goes up to 100 psi.
What is the minimum pipe size and material for the low pressure system?	All the way from 2" to 12" mains. PVC is the new material. Older pipes are HDPE, and some are AC pipe. Bell and spigot PVC is the standard now PVC is easier to maintain, and they already have a lot of PVC material so they can maintain it themselves.

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	City owns and maintains STEP tanks.
Who maintains on-lot equipment?	City.
Who performs septic tank pump-outs?	City does the septic tank pump outs now and bought their own truck. Used to use 3rd party to haul solids to Chehalis. Now they have a biodryer and septage receiving tank due to new upgrades at the plant. Recommend building a receiver station at the Town so less hauling.
Who pays electrical costs?	Owner.
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	Developer has to do a bill of sale for the sewer tank which gives them access to tanks. Now requires that all new tanks be installed in the front yards because new fences will be built. Usually try to notify resident first, if no answer, just go to back yard to access tank.
Any challenges with restoration of private property after installation of tank/pressure connection?	Some issues with people placing things over the lids (planter boxes, etc.). Usually addressed with homeowner education. Burying of lids is also an issue.

Were there any challenges connecting to existing home electrical system or did you install a separate service?	N/A
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	Every three years City checks tank, inspects blanket, sludge levels, and during inspection, they decide whether they need to pump out or not. 40-60% of tanks need to be pumped out every 3 years. Some tanks need more pump outs than others.
Maintenance frequency	Inspections every three years
Number of staff supporting the system? In-house vs Contractor support?	Two-man crew that inspects STEP tanks full time, and City is looking to increase to a 4-person crew. STEP is really hard to scale because the City owns all the tanks and growth would require a crew of 8.
Do you use telemetry/ SCADA?	No.
Average number of service calls per year?	About 2x per night. Have a call center where homeowners leave a voicemail with issue. They tell homeowner to curtail usage, and operator will be out in the morning.
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Floats getting stuck happens a lot, pump goes out, plugging due to wipes and diapers. Float related or electrical problem with the pump.
Typical response time	Operator goes out the next morning.
Overall System Reliability	N/A

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	N/A
Annual O&M cost and breakdown (if available of cost)	N/A
Typical pump lifespan	10 years. Will do replacement themselves and electrical upgrades.
Replacement cost	N/A

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	The City has some FOG issues. The City has a few pig ports and wished they had more when originally installed. Have not had to use pigging ports so far.
Mainline maintenance frequency	N/A
Odor/ sulfide issues?	The City has line valves and ARVs. No odor control issues at ARV. Recently replaced all ARVs inside City with new ones due to pressure issues.

7. Treatment Impacts

Question	Response
Impacts to treatment plant	City did not have headworks until this year. Town will have high ammonia & low BOD issues with STEP system. City now pumps out STEP tanks more often with new headworks. City uses the reclaimed water to pump back into aquifer.

8. Customer Experience

Question	Response
Frequency of complaints	N/A
Typical complaints (alarms, odors, maintenance disruptions, others?)	Alarms go off and resident calls City to inspect. About 2x calls per night
How did you handle homeowner education and coordination?	Big education push a couple of years ago. FOG is a big issue throughout the city. Inspect businesses every year, if >300 mg, fine for pumping. Biggest violators were barbershops and grocery stores (Safeway dumping milk and salad dressing down drain). Once they were fined, they learned and stopped. Diner opened in a retail spot & didn't have a grease trap. Strip malls often have a combined tank.

9. Lessons Learned

Question	Response
What would you do differently?	Require step tanks in front of house. By law in WA, agencies are required to own and maintain STEP tanks since it's the first step in the treatment system. Operators do not like STEP tanks & want grinder pumps as they are not required to maintain them. City experienced a really bad power outage about 2 years ago where power was out for 2 days. All pumps have gen switches now, and for bigger customers (Safeway, etc.) they will go out and hook the generator. Ended up with overflow and had to go into storm mode at plant. Don't ever do shared meters (in case one house doesn't pay their electric bill). They have a couple of community tanks (duplexes with one tank). If duplex, you have to install a city owned meter. Need a way to make sure power still goes to system.

Would you select same system again?	City would use grinder systems since they can turn over to residents and City wouldn't be responsible for maintenance.
Biggest advantages	Low I/I.
Biggest challenges	City is required to maintain and respond to every call.

STEP System – Agency Interview Form

1. Agency Overview

Agency Name: Grizzly Ranch Community Services District

Contact Name: Larry Smith (general manager), Travis Russell (chief operator)

Location: Teams

Date: 5/13/2026

2. System Overview

Question	Response
Type of system (Full STEP / Hybrid)	Converting from a full grinder system to a full STEP system. Transition to STEP started in May 2019. Implemented standard STEP for new construction CSD is purchasing the STEP and using them as assets. CSD is converting 3 grinder pumps to STEP tanks per year.
Year installed	STEP since May 2019
Approx. number of connections	62 STEP connections right now (10 commercial and 52 residential)– build out is 299. Current flow is 30,000 gpd.
Service area characteristics (hilly terrain, coast, high groundwater, etc)	Rural
Why was this system selected originally over other alternatives?	E/One Grinder is what was originally installed. Transitioning to STEP as it allows them to expand system by increasing capacity.
Are you using Orenco Prelos system, or other?	1,000 gallon Roth septic tank, 500-gallon effluent pump tank with Orenco Pumps
Does the system have different pressure zones?	All one pressure zone which pumps up/ down to AxMax treatment. (14-20 psi)

What is the minimum pipe size and material for the low pressure system?	HDPE pipe in system (1.75" diameter pipeline – lateral; main is 4" -> a few areas with a 6") 8-feet is the deepest pipe bury depth

3. Ownership & Responsibilities

Question	Response
Who owns on-lot equipment (tank, pump controls)?	District ends up owning and maintaining everything (20 year depreciation schedule). Residents have not had issues with changing to STEP since CSD takes care of inspections and pump outs.
Who maintains on-lot equipment?	District; Ax-Max has pretty easy maintenance. Stated that STEP systems have less moving parts than grinder pumps.
Who performs septic tank pump-outs?	District does.
Who pays electrical costs?	$9,000 per year for electrical costs on Ax-Max system For private, tie into homeowner (same voltage as grinder) electrical panel.
Access/easement challenges – Do you have easements for access to private property? How do you handle access for maintenance?	No easements – have an MOU that they can go onto residence property if they need maintenance
Any challenges with restoration of private property after installation of tank/pressure connection?	Place STEP in same general area as grinder. Remove grinder tank completely. Have had to purchase miscellaneous landscaping materials to restore landscaping to match before
Were there any challenges connecting to existing home electrical system or did you install a separate service?	No challenges. Tie-into home owner electrical panel. May have to go in and turn off breaker. If work is an upgrade – CSD will take care of it.
How were pressure laterals connected to the gravity system? (If applicable)	N/A

4. Operation & Maintenance

Question	Response
What are your standard O&M activities?	CSD has numerous cleanouts and valves throughout roads. Issues with replacing valves? Two have been found frozen, but not had to replace any just yet. CSD uses Plumas Sanitation to perform septic tank pump outs. Sludge is taken to their treatment plant and eventually ends up in NV. Seasonally see bugs die off when season changes and need to clean out mats.
Maintenance frequency	N/A
Number of staff supporting the system? In-house vs Contractor support?	CSD has two staff in field.
Do you use telemetry/ SCADA?	No. CSD has a 24-hour phone number that owners can call displayed at all control panels.
Average number of service calls per year?	Mostly for grinder pumps (about 3-4 calls per year)
Most common issues/ failure modes? (pumps, controls, clogging/blockages)	Grinders were plastic tanks (maybe ~250 gallons). Have had to deal with overflows (rotors in grinder pumps will stick or fail), then get high level alarm. They pull out grinders & replace. Used to keep spare grinders on shelf. Make sure have a shutoff at each house. Also have cleanouts & shutoff in street.
Typical response time	N/A
Overall System Reliability	System is reliable. Not much I/I seen throughout system. Sewer lines have not been damaged or broken for at least the last seven years. Staff recommended inspecting septic tanks regularly.

5. Costs

Question	Response
Capital costs per connection? Do you have a bid tab for the STEP system?	$40,000 for labor and installation of STEP (Pace is only supplier); $23,000 for vault. Inventory was higher for grinders than Orenco
Annual O&M cost and breakdown (if available of cost)	N/A
Typical pump lifespan	N/A
Replacement cost	$3,500 for grinder pump. Have not replaced STEP pump yet.

6. Collection System (Low-Pressure System Only)

Question	Response
Do you experience clogging issues? Need for flushing/ pigging? Any air/ vacuum issues?	Have issues with fats, oils, and bleach Lot of people would dump bleach down drain which would kill bugs at septic tank FOGs – have not seen fog issues in step tank, just at plant (not big issue) NTU seems to increase a bit near shoulder season (Under 1 NTU most of the time - up to 2 in shoulder).
Mainline maintenance frequency	N/A
Odor/ sulfide issues?	Lift station has some odor issues and plant, but no odor issues outside of plant. Have heavy rubber mats over lift station to keep odor down 15-20 ARVs are located throughout the system. ARVs were installed horizontally.

7. Treatment Impacts

Question	Response
Impacts to treatment plant	The switch has allowed them to expand system more easily since they use Orenco AxMax. Located on golf course, so discharge to large storage pond for off season. May to Oct is irrigation season.

8. Customer Experience

Question	Response
Frequency of complaints	3-4 calls per year.
Typical complaints (alarms, odors, maintenance disruptions, others?)	N/A
How did you handle homeowner education and coordination?	Have had to educate users to not dump bleach down drain.

9. Lessons Learned

Question	Response
What would you do differently?	Review loans and money to pay for financing. Have someone knowledgeable to manage construction. Operationally, it works great!
Would you select same system again?	N/A
Biggest advantages	Moving to STEP allows CSD to more easily expand system since they can use an AxMax treatment system and current treatment system was getting too expensive and hard to expand. Change was more due to capacity than cost. CSD is re-using the existing laterals where the grinder tank is for the new STEP tanks

	CSD has not seen any hydraulic issues as a result of changing from grinder to STEP. It was noted that Grizzly Ranch is on a golf course, so wastewater will be treated to reclaimed water which will be re-used on the golf course.
Biggest challenges	E/One grinder pumps work great as long as they are being used year-round. Staff noticed grinder pumps seized up when users were gone for months at a time.