Kirkwood Meadows Public Utility District
Operations Committee
REGULAR MEETING NOTICE

NOTICE IS HEREBY GIVEN that the Operations Committee of the Kirkwood Meadows Public Utility District has called a Regular Meeting of the Committee to be held on **Wednesday, November 13, 2024 2:00 p.m.** via Zoom at: https://us02web.zoom.us/j/87574849196

HOW TO PARTICIPATE / OBSERVE THE MEETING:

Telephone: Call Zoom at (669) 900-6833 and enter Meeting ID# **875 7484 9196** followed by the pound (#) key.

Computer: Follow this link to join the meeting automatically: https://us02web.zoom.us/j/87574849196

Mobile: Open the Zoom mobile app on a smartphone and enter Meeting ID# **875 7484 9196**

ACCESSIBILITY INFORMATION:

Committee meetings are accessible to people with disabilities and others who need assistance. Individuals who need special assistance or a disability-related modification or accommodation (including auxiliary aids or services) to observe and/or participate in this meeting and access meeting-related materials should contact the District, at least 48-hours before the meeting at (209) 258-4444 or info@kmpud.com Advanced notification will enable the District to swiftly resolve such requests and ensure accessibility.

Distribution Date: November 6, 2024

Kirkwood Meadows Public Utility District
Operations Committee
REGULAR MEETING NOTICE

AGENDA

1) **Utility Updates.**
    a. Electric
    b. Fire
    c. Playground
    d. Propane
    e. Snow Removal
    f. Solid Waste
    g. Water
    h. Wastewater
        i. WWTP Repair & Rehabilitation Project.
2) **Electric Master Plan.** Discussion & possible action.
3) **Regulation 620.03 Update.** Discussion & possible action.
4) **Future Topics.**

Next Meeting/Staff Recommendation: *Wednesday, December 11, 2024 - 2:00pm*.

The Kirkwood Meadows Public Utility District is an Equal Opportunity Provider and Employer.

In compliance with the Americans with Disabilities Act, if you are a disabled person and you need a disability-related modification or accommodation to participate in this meeting, please contact the District at (209) 258-4444, by email to info@kmpud.com. Requests must be made as early as possible, and at least two business days before the meeting.

Distribution Date: November 6, 2024

Kirkwood Meadows Public Utility District

Electric System Master Plan and Assessment including the impact of Electric Vehicle car charging in Kirkwood.

By

Cross Canyon Engineering

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Introduction

This Electric System Master Plan was prepared by Cross Canyon Engineering (CCE) for the Kirkwood Meadows Public Utility District (the District). The District currently provides electric service to 642 domestic and 127 commercial electric customers in Kirkwood California.

CCE staff has significant experience working with the District and is very familiar with all aspects of the District's electric system. CCE staff (working with a previous consulting company) prepared the following reports for the District:

- Report of System Assessment For Electric System Assets In Support of RUS Loan Application CA 47 "A8" Alpine
- 2012-2013 Construction Work Plan
- Report of Remaining Useful Life For Electric System Assets In Support of RUS Loan Application CA 47
- Report of Valuation of Electric System Assets In Support of RUS Loan Application CA 47 "A8" Alpine

Kirkwood California is located in the Sierra Nevada Mountains approximately 60 miles east of Jackson and 35 miles southwest of South Lake Tahoe. The community of Kirkwood, consisting of residences and commercial entities as well as the Kirkwood Mountain Ski Resort (KMR), owned by Vail Resorts (Vail) currently receives electric power and energy from the District's Out Valley power system as well as backup electric power from diesel powered generators that are owned and operated by the District at the District's powerhouse in Kirkwood.

The District has requested this Master Plan to create an orderly plan for ongoing capital improvements needed to provide adequate and reliable electric service to its customers and to projected electric load growth. As the sole electric utility in the Kirkwood area, the District will be making annual capital improvements for the long term in order to maintain service to existing and new consumers.

The District began providing electrical service on July 22, 2011 as a result of acquiring the existing propane gas and electric systems of Mountain Utilities, which was owned and operated as a subsidiary by KMR at the time (Mountain Utilities). The District's electric distribution system is primarily those assets acquired from Mountain Utilities.

In 2012, the District completed construction of the new 5-megawatt Powerhouse housing eight generators. The District provided electrical service to its customers from the powerhouse while the Out Valley project was constructed.

In November 2014, the District completed the Out Valley Project connecting the Kirkwood Valley to a Pacific Gas & Electric (PG&E) substation located at Salt Springs Reservoir. The District entered into an interconnection agreement with PG&E that covers the new interconnection. The District is a member of the California Independent System Operator Corporation (Cal ISO), who balance electric supply and demand for 80 percent of California's transmission grid power. The District purchases power off of the day-ahead market through an independent schedule coordinator based on load forecasts provided by the District, with actual usage monitored by Cal ISO.

Since the commencement of electric service through the Out Valley project, the Powerhouse has served as a backup in case of any interruption of the Out Valley project.

Electric System Description

Refer to Appendix G for a one-line diagram of the District's overall electrical system.

In Valley

The District's distribution system within Kirkwood (referred to as In Valley) encompasses a compact service area that is 2.5 miles by .75 miles. This electrical system, at an elevation of 7,800 feet, operates at a 12.47 kV voltage level, and is entirely an underground distribution system. This system is a four-wire system with an effectively grounded neutral. The four-wire system simplifies the type of distribution transformers needed as well as the ability to economically serve single-phase loads.

The powerhouse includes a duct bank system with three 12.47 kV underground feeders which connect the powerhouse switchgear to the existing main feeder vaults in the vicinity of the old MU powerhouse. These vaults are the terminus of the three distribution feeders which serve the entire the District service area. The switchgear provides three feeder breakers; one for each District feeder. Each of the three feeders has normally open connection points to at least one of the other feeders. Refer to Appendix C for a map of the three separate feeders. The three feeders are:

1. Residential Feeder
2. Commercial Feeder
3. Lifts Feeder

The ski area owner (Vail) currently owns two sections of underground cables connected to the District's In Valley system. A single-phase section crosses Highway 88 and serves the Kirkwood Inn area. A three-phase cable section fed from the Residential feeder extends east to the Caples Lake dam and a water pumping service. A three-phase connection off the Lifts feeder (referred to as the Backside) extends for a couple of miles south and east to serve multiple Vail chairlifts and other ancillary loads.

Out Valley

The Out Valley project consists of a number of sections including 1.2 miles of overhead 115kV transmission line from the PG&E substation at Salt Springs Reservoir to the District's KM Green substation. PG&E now operates and maintains this 1.2-mile 115kV line. The District's KM Green substation converts the system voltage from 115kV to the District's subtransmission voltage level of 34.5kV. Out Valley also includes 1.9 miles of overhead 34.5kV subtransmission line from the KM Green substation to the Bear River Reservoir. This overhead line is constructed with a 4/0ACSR primary conductor. At the end of the overhead 34.5kV line is the start of 25.69 miles of underground 34.5kV subtransmission line which ends in Kirkwood. The underground line is constructed with power cables configured with 345 mil of XLPE insulation around a 500mcm aluminum primary conductor, with a concentric neutral.

The Out Valley project also includes the KM Blue substation, located at the District's powerhouse, which converts the electrical power from the 34.5kV subtransmission level to the District's distribution operating voltage of 12.47kV. The KM Blue transformer includes a Load Tap Changer (LTC) which automatically adjusts the output 12.47kV voltage up or down by 10% to stay within operating standards. The KM Blue substation includes the interconnection from the substation to the District's 12.47kV switchgear at the powerhouse (described above).

The Out Valley system includes a 2.0MVAR reactor located at the KM Blue substation in the powerhouse. The 25 miles of underground 34.5kV line has a significant level of capacitance. Electrical capacitance in underground transmission and distribution systems is a factor affecting any utility with significant underground powerlines. When the Out Valley system was energized in 2014, the peak load at Kirkwood was between 2.5MW to 3.0MW and was not enough to offset the significant capacitance inherent in the underground system. The 2.0MVAR reactor at KM Blue offsets that capacitance, which maintains the 34.5kV operating voltage within the underground cable's design tolerance. This report will discuss the impacts of future load growth and provide recommendations on the use of the KM Blue reactor.

The Out Valley system was envisioned to have a capacity of up to 10MW of peak load at Kirkwood. The KM Green and KM Blue substation transformers are rated at 10.4MVA (at 65 degree C) capacity. CCE evaluated the ampacity of both the overhead conductor and the underground cable on the 34.5kV subtransmission system and confirmed adequate capacity for both types of conductors to reliably carry up to 10MW of peak load. Assessing the overall capacity of the Out Valley system is included in this report.

Powerhouse

The District's powerhouse includes 5 MW (nameplate rating at elevation) of diesel fired combustible engine generation. The main components of the powerhouse include:

- Powerhouse property, and powerhouse structure.
- One (1) double-walled diesel fuel tank (30,000 gallons)
- Three (3) CAT - 980 kW Prime· Rated Engine Generators
- Five (5) Volvo - 430 kW Prime Rated Engine Generators
- Engine Cooling Systems
- Exhaust System in Conjunction with Emission Controls
- Lubricating Oil and Antifreeze
- Four (4) 2500 kVA Generator Step-Up transformers (GSU)
- Battery banks, Rack and Battery Charger
- Paralleling Switchgear- Rated 27 kV, 2000A continuous, 16 kA AIC, digital multi-function protective relays, and metering.

The Out Valley power feeds into this switchgear and the three In Valley feeders feed out of it. The powerhouse includes generator controls and synchronization functions so that the powerhouse can be set to come on automatically in the event of a loss of Out Valley. In that case, when Out Valley power is restored, the control system will synchronize the generators to the Out Valley, parallel the Out Valley briefly to the generators, and then shut down the generators automatically.

The switch back to Out Valley power is done seamlessly without power interruptions to the District's customers. This switching includes a short-time parallel between the powerhouse generators and Out Valley. Such short-term parallel conditions meet PG&E interconnection requirements.

Currently, the District's use of the five Volvo engine-generators is problematic. Issues in operating the Volvos include:

1. Failure of generators on startup due to fuel pressure issues.
2. Failure of generators on startup during cold ambient temperatures.
3. Failure of generators to sync with the Out Valley line and/or online CAT generators.
4. Inability to maintain exhaust temperature required to meet permit requirements.
5. Lack of trained mechanics certified for Volvo generators.
6. Difficulty obtaining spare parts.

The powerhouse capacity is rated at 5.0MW. Considering the problematic operation of the five Volvo generators, the current capacity of the powerhouse should be considered to no greater than 2.9MW.

Scope of Electric System Master Plan and Assessment

The scope work to create this Electric System Master Plan and Assessment report includes the following components:

Phase 1: Field Investigations

CCE planned for one week of field investigations in Kirkwood. No field investigations were planned for the Out Valley system as the District has accurate drawings of that entire project. The plan was to coordinate with the District staff, open padmounted equipment, and do secondary line locates. The goals for the 2022 field investigations included:

- Determine which specific meters are served by specific transformers.
- Update maps for field-located service lines between transformers and meters.
- Determine which service lines are direct buried. In some cases, this could not be determined by opening the transformer.
- Determine which primary cables were direct buried (if possible).

Phase 2: Data Analysis and Utility System Modeling

CCE is to update the existing Milsoft WindMil model. This model was created in 2011 at the time of the Mountain Utilities acquisition. It was used for the Construction Work Plan that was prepared in support of the District's Rural Utilities Service (RUS) loan application. In addition, a model of the Out Valley system is to be added to the system model.

Using the updated model, CCE applied load growth scenarios to assess the capability of the District electric system to handle such growth. Historical electrical demand data was used as the starting point for these growth scenarios.

CCE identified electric system components that will require upgrades in order to meet the projected growth.

Phase 3: Development of Electric System Master Plan

Based upon the systems modeling and the field investigations, CCE developed a Master Plan for a twenty-year planning period. This plan identifies needed capital improvements and proposes a schedule for such improvements within this report. Utility systems improvement alternatives and prioritization were developed with input from District staff.

Field Investigations – Findings

CCE utilized the existing electric system maps as well as data available from District staff for CCE's planned field investigations. Based on data already available, the field investigations were limited to confirming each transformer (location and capacity), documenting which meters are served by specific transformers, and attempting to document all direct buried electric service lines. Field investigations took place the week of August 22nd, 2022.

In some cases, it was not possible to ascertain if a service was direct buried by what could be seen at the transformer. Appendix B of this report provides the maps with investigation notes for the District's electric system in Kirkwood.

System Modeling

The existing electric system model is developed in Milsoft WindMil engineering analysis software. WindMil is an engineering analysis software primarily developed for analysis of electric distribution systems. CCE maintains its own WindMil license. The model was created in 2011 and was based on limited system knowledge (at that time) since the District had only just taken over system operations.

In 2022, CCE met with the District staff and reviewed the model. The following summarizes updates to the 2011 model for use in this report:

1. CCE made a number of network connectivity changes to the model based on staff feedback.
2. Some transformers were added, updated, and deleted as per findings from the field investigations.
3. The calculated load of the Vail owned backside section of line was updated based on backside transformer capacities.
4. The proposed Palisades 6 development was added to the model. CCE has reviewed the electrical plans for this project which includes 21 new residences served by 7 transformers. This is based on the communications from the developer that the construction of the infrastructure is expected to occur in the next couple of years. This addition also provides a more conservative model by adding this load growth.
5. The Out Valley component of the model was adjusted based on known wire sizes and construction types.
6. The proposed District power delivery to the Caltrans Peddler Hill facility was added as it is expected that this new electrical service would occur within the next couple of years. This load was modeled as a 300kVA transformer connected to the 34.5kV Out Valley system. CCE is familiar with the capacity and location of the proposed peddler Hill service, having reviewed the new service for the District staff.
7. The snowmaking transformer located near the old powerhouse was added to the model. In that regard, the load at this point was allocated to be 1MW, since the load modeled on this feeder (Lift

Feeder) was derived from the feeder peak which included the snowmaking as well as some level of lift operations.

CCE then used recent peak loading data to bring the model up to current peak loads. Peak loading data for In Valley was obtained with the District staff's assistance by reading the real-time and peak values from the protective relays in the powerhouse switchgear. The base system model was updated to reflect known recent peaks on the three the District feeders. The three feeders and their associated model peaks are:

		Recorded Peak		01/31/23 11:00AM real-time readings	
Feeder Designation	Feeder Name	Peak (kW)	Peak Power Factor	Load at time data collection (kW)	Power Factor at time of data collection
MU-1	Commercial	1235	96.7%	607	99.0%
MU-2	Lifts	2294	79.1%	802	80.0%
MU-3	Residential	923	99.9%	340	99.0%

Table 1: In Valley Loading Data

The current loads were recorded on 01/31/23 at 11:00 AM. These values provide a snapshot of the loads on a typical weekday with the ski area operating.

Keep in mind that the three feeders rarely experience simultaneous peaks. As can be seen by summing the feeder peaks, they exceed the historic coincident electric peak for the District system which is 3.0MW (December 2018). This method of modeling is arranged to determine the worst case powerflows and voltage drops for each feeder.

The WindMil model was also used to assess powerflows and voltages for the Out Valley 34.5kV line. Now that the District has historic hourly peak load data from the CAISO meter at the KM Green substation, we now have accurate and timely peak data for the District system. In this regard, CCE modeled the current Out Valley peak value of 3.0MW. For the purpose of a long-range system assessment, CCE also modeled the Out Valley system with a hypothetical 10MW peak, which represents the peak demand allowed in the PG&E interconnection agreement.

Voltage drop calculation result tables are being provided to the District staff. These calculations were derived with the peak loading described above.

Growth Projections

CCE did not refer to a specific load growth projection in the assessment of the electrical power system. Instead, the analysis performed, and the recommendations provided herein provide an overall assessment of the peak load capabilities of the three system components (Out Valley, Powerhouse, and In Valley).

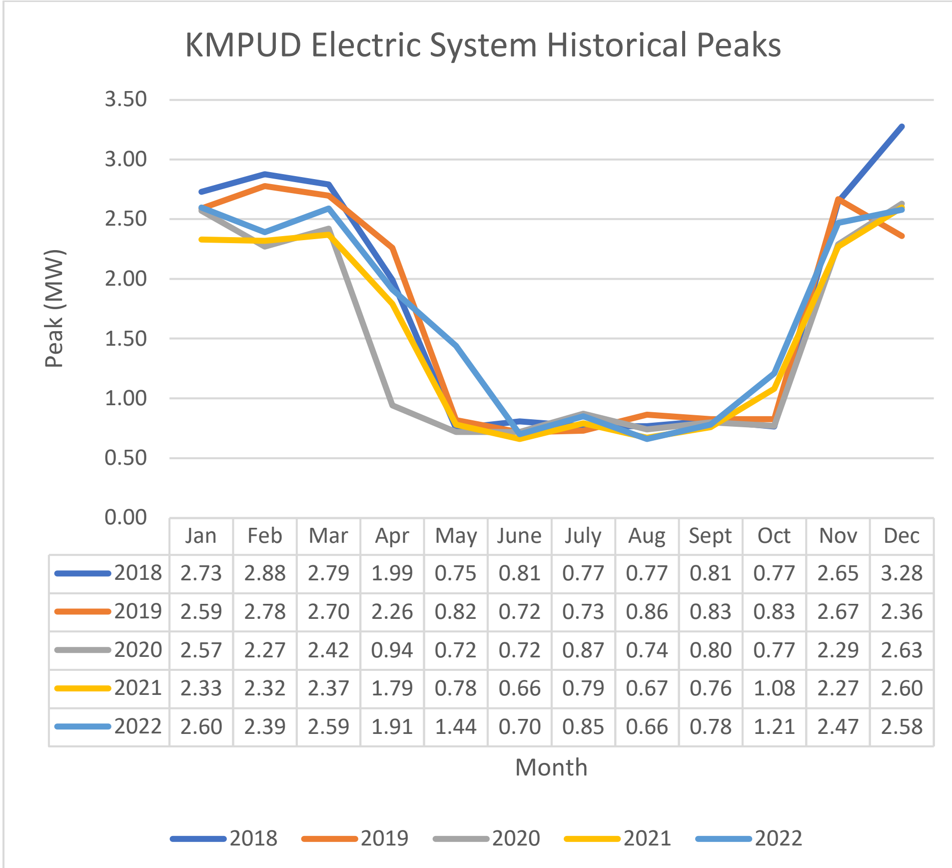
Growth for the District electric system could include:

1. Additional residential units – There are currently undeveloped lots and undeveloped properties in which new residential units could be built.
2. Limitations of available propane from the District – As of January 2025, the District will not accept additional propane customers. This will result in new residences and new commercial facilities being constructed as all electric units. Such facilities will have a higher electrical demand than gas heated facilities. Space heating will continue to be a major piece of energy consumption in Kirkwood (being a high elevation ski resort).
3. Commercial Expansion – This could include hotel style accommodations as well as other commercial enterprises.
4. Ski area expansion – additional or upgraded chair lifts, increased snowmaking operations, additional concession facilities.
5. Upgrades to ice melt systems – CCE has reviewed plans for such upgrades for the District over the past few years.

The proportion of motor loads (for Kirkwood, this would typically be chairlifts and pumps for snowmaking) to residential and commercial loads can affect the overall District peak load power factor. CCE used the same historical power factors in projecting future new loads (refer to Table 1).

Historical System Data

Since the energization of the Out Valley project, the District has access to hourly load profile data which is recorded at the KM Green substation on the Cal ISO meter. The District's powerhouse does not have a metering configuration to allow for total system load profile recording while Kirkwood is served from generator power. The Cal ISO metering data is a good snapshot for the total load which includes In Valley loads plus all system losses. Figure 1 provides a graph of total District loads for the previous five years (2018 through 2022). It is interesting that although the District experienced an historic peak of 3.28MW back in 2018, recent peaks have been recorded at no higher than 2.78MW in February 2024.



	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2018	2.73	2.88	2.79	1.99	0.75	0.81	0.77	0.77	0.81	0.77	2.65	3.28
2019	2.59	2.78	2.70	2.26	0.82	0.72	0.73	0.86	0.83	0.83	2.67	2.36
2020	2.57	2.27	2.42	0.94	0.72	0.72	0.87	0.74	0.80	0.77	2.29	2.63
2021	2.33	2.32	2.37	1.79	0.78	0.66	0.79	0.67	0.76	1.08	2.27	2.60
2022	2.60	2.39	2.59	1.91	1.44	0.70	0.85	0.66	0.78	1.21	2.47	2.58

Figure 1- Historic Monthly Peaks

System Outages and Reliability

The District records outage data as required under California regulations. Loss of the Out Valley line are the most common source of outages for the District since it was first brought online. Since the startup of the Out Valley, only one Out Valley outage was caused by a fault on the District's 35kV line (tree blown down from high winds). All other Out Valley outages have been from a loss of the 115kV source power at KM Green. In the future, the District should maintain a backup for Out Valley outages. PG&E's operations will likely continue to be affected by fire danger and will likely result in Out Valley outages over the 20-year planning period.

With the entire In Valley system underground, the District will continue to experience similar high reliability of the In Valley distribution system. The newer 4/0 copper cables installed by Mountain Utilities between 2000 and 2008 are installed in conduit and can be expected to provide high reliability through the 20-year planning period. The District should prepare for occasional In Valley cable failures, which have occurred in the past. A 12.47kV cable failure will always result in one of the three feeder breakers tripping offline. In that case, the District should anticipate a feeder outage during the fault locating work before the faulted cable can be isolated and the feeder restored.

System Losses

Our analysis of the KMPUD electric system included loss and voltage drop calculations for the system. To help KMPUD assess the magnitude of losses to be expected, the table below provides calculated losses for Out Vally for the highest peak load measured in the past (3.28MW) and a value of 1.0MW which will represent loads that may occur in the shoulder months. The table also includes calculated line losses for the In-Valley distribution system.

The In-Valley 12.47kV system has relatively short (compared to typical rural utilities) primary line lengths. The longest distance from any In-Valley distribution line end-point back to the powerhouse is approximately 2.3 miles. Our voltage drop analysis, which was run for various load levels all the way up to a 10MW load showed insignificant distribution line losses for In-Valley. In-Valley line losses at the 3.28MW peak load are shown in the table.

As for the other two loss components:

1. Our analysis did not specifically calculate the losses of distribution transformers on the system. Individual distribution transformer impedances were not built into the model, which is typical for performing distribution system voltage drop studies. Most distribution transformers meet ANSI standards and we expect losses for these units to fall within an expected range. Distribution transformer losses will typically include no-load losses in the 0.25 – 1.25kW range which adds to a total of peak load transformer losses of between .8% to 1.2%.
2. Service wire losses were also not calculated as we don't have actual demand profiles for each meter and service wire. However, our experience with the KMPUD system helps us understand that most service runs are less than 200'. We typically see service wires with no more than 5% losses.

System Loading for loss calculation (MW)	**1.00**	**3.28**
KM Green Transformer (no load losses in kW)	6.8	6.8
KM Green Transformer (calculated load losses in kW)	5.5	18
Out Valley line and KM Blue Transformer losses	12.87	78.24
Total Out Valley Losses (kW)	25.17	103.04
Percent Out Valley Peak losses	**2.52%**	**3.14%**
Total In Valley Line Losses (kW)		11.0
Percent In Valley Peak line losses		**0.34%**
Estimated Worst Case Distribution Transformer and service wire Loss Percentage		**5.00%**
Total calculated losses for KMPUD at 3.28MW		**8.48%**

Our calculated Out-Valley losses coupled with the negligible primary line losses and expected transformer and service wire losses should fall in the range of 7 to 8% overall system losses.

CCE has reviewed KMPUD's 2020/2021 performance report. The report provides monthly and annual data on electric purchases, generation, sales, and the subsequent losses. Annual losses for the 2020/2021 fiscal year were 16.29%. CCE's assessment is that overall system losses should be less than or equal to the 8.48% losses (which are the calculated historic peak losses).

Actual losses experienced could deviate from calculated losses for a number of reasons. CCE believes that these high system losses are most likely due to customer metering errors. Many of the three-phase meters on the system have existed since during the Mountain Utilities operations and may have developed problems that could affect metering accuracy. CCE recommends that the District obtain the services of a qualified contractor to provide evaluation and testing of meter installations. CCE recommends that the District create a priority list of three-phase meters (by usage and age) to be evaluated by the contractor. Such an evaluation would include confirming all meter wiring and checking for any physical problems. Field testing of metering CTs is recommended. CCE does not recommend calibration or testing of electronic Sensus meters. With electronic (non-electromechanical) meters, accuracy typically does not change over time and these meters do not have a means of adjustment of accuracy. CCE recommends a program in which the District performs a budgeted number of meter inspections per year until all high-revenue three phase meters have been checked. As meters are evaluated, District staff will continue monitoring the performance statistics.

Assessment of Impacts of Potential EV Car Charging

In this report, CCE uses the acronym EV Car which refers to a plug-in electric vehicle (PEV). The intention of this assessment is to specifically analyze the electric utility burden of charging EV cars as they exist commercially today. These would include any road vehicle that can utilize the grid to store electrical energy within its onboard rechargeable batteries, and thereby power an electric motor for propulsion. CCE does not distinguish between a straight EV car versus a plug-in hybrid car except in assessing the power required for such charging. A hybrid car will typically include a smaller battery system which takes less energy and time to recharge.

In this section of the report CCE assesses the impacts of load growth that might occur due to the increased use of EV Cars and the subsequent need to charge EV Cars in Kirkwood. As such, this assessment focuses on the potential load growth and the impacts to the District electric system. Load growth is considered within this overall study (refer to Section __). This section of the report analyzes growth specifically from EV Car charging, with other projected growth scenarios in the background.

This assessment is based on the current commercial availability of EV Cars and the associated charging equipment.

EV Car Charging Basics

Generally, in the U.S., there are three defined levels of EV Car Charging. These levels are described below. EV Car chargers include a variety of charging equipment within these three categories. However, these three distinct levels (primarily based on AC voltage required) will dictate how and where such charging equipment would be installed.

The duration of EV Car charging depends on the level of charger as well as on the charge level of an EV Car battery at the time it starts charging. The electric demand of EV Car charging will ramp down as the car charges, so peak charging demand will typically be immediately after charging commences.

EV Car manufacturers provide options for their EV Car products for all three levels. This report is not intended to provide specific specifications for EV Car charging equipment. Instead, we can assess the electric utility system impacts by modeling these three types of chargers.

Level 1 Charging: Level 1 charging uses a common 120-volt outlet. This type of charger will generally be no more than 1.5kW of power. Level 1 is the slowest way to charge an EV Car. By charging at a rate of between 3 and 5 miles of range per hour of charging, a homeowner would not be able to fully recharge an EV Car overnight. Level 1 charging works well for plug-in hybrid electric vehicles because they have smaller batteries, typically less than 25 kW.

Level 2 Charging: Level 2 charging uses a 208-Volt to 240-Volt outlet. This is the type of outlet you would need for a typical electric dryer or electric stove. Limited research indicates Level 2 charging is the most commonly used level for daily EV charging. Since most residences have either 240V service (typical home) or 208V service (more typical in a large multi-residential facility- including within Kirkwood), Level 2 charging equipment can be installed at a residence. Level 2 charging can replenish between 12 and 80 miles of range per hour, depending on the power output of the Level 2 charger, and the vehicle's maximum charge rate. CCE believe that most EV Car owners find that Level 2 charging better suited their daily charging needs. Homeowners may need to modify their residential wiring to provide a Level 2 charger in the garage, but such a new circuit is available from a typical residential AC panel.

Our research shows that Level 2 equipment is typically a 240VAC plug using 30 amps and will have a peak electrical demand of 7.2 kW of power. However, there are Level 2 chargers available on the market today that can demand as much as 19kW of power.

For multi-residential Level 2 charging, the owner of the facility will face some significant electrical upgrades in order to accomplish any significant penetration of Level 2 charging in the parking garage. CCE is familiar with the process for upgrades as we have assisted the District with upgrades related to ice melt systems and other HVAC changes.

Level 3 Charging: Level 3 charging requires a 400-Volt to 900-Volt service. A typical 480V service from a U.S. utility would be a three-phase 480Vac service. Level 3 charging is currently the fastest type of charging available. A level 3 charger is a major investment for the owner. Level 3 charging stations are typically provided commercially, will require a significant utility service, and are designed to provide fast charging to multiple cars simultaneously. In the summer of 2020, CCE analyzed a potential Level 3 charger for the District based on a developer's inquiry. This charger was proposed to require a three-phase, 750kVA, 480VAC service and would include 8 charging stalls. The potential charging customer calculated up to 774kW of power from such an installation. Peak demand would occur when all 8 stalls were hooked up and the EV Car battery systems were significantly discharged.

Approach to modeling of EV Car Charging

Based on available EV Car charging options, CCE used the following methods to model the electrical demand of new EV Car charging in Kirkwood:

1. As discussed previously in the report, known projected new loads were added to the model.
2. Then loads on all three feeders were then increased 10% over existing peak loads. – The 10% increase is CCE's method to model diversified EV Car charging loads coming on at or near peak load. Load duration curves provided in this report provide daily timelines for typical the District winter peaks. The load diversity assumption is based on CCE's expectation that much of the residential EV Car charging will occur at night. CCE does not anticipate that daytime Level 2 car charging will represent an EV Car charging peak. This 10% approach also attempts to replicate the installation of some Level 2 car charging in the multi-residential facilities in Kirkwood (typically on the Commercial feeder).
3. One 774kW Level 3 charger was modeled on both the Commercial and separately on the Lifts feeder. These proposed new loads were placed coincident with the feeder peak. This will provide a worst-case peak load and voltage drop assessment. Level 3 charging stations peak electrical demand will depend on how many EV Cars are being charged simultaneously, and the existing level of charge of each of these EV Car battery systems. This worst-case approach to modelling will cover a scenario in which a smaller (smaller than 774kW) EV Car charging station is considered. As described previously in this report, the Lifts feeder peak used in the modelling includes the snowmaking service located near the old powerhouse. Discussions with the District staff indicate that the snowmaking load is typically running in late fall and would not be coincident with winter month Lift feeder peaks (typically chairlift operation). Using this peak feeder value in this analysis provides a more conservative approach to modelling the feeder

conditions. CCE cannot predict if, in the future, there would be significant Level 3 charging coincident with snowmaking activities.

Once these load additions were made, voltage drop studies were run for all three feeders.

Assessment Results

As described in this report, the District In Valley distribution system provides excellent capacity for existing loads and future load growth due to the short line lengths, the 12.47kV operating voltage, and the existing distribution conductor sizes. This was confirmed in assessing the EV Car charging. Overall system capacity – Overall the District system peaks were not evaluated specifically for EV Car Charging. Overall system peaks are covered in this report and will include EV Car charging as well as other growth scenarios.

- Capacity of each feeder – No individual line segment was at or near capacity.
- Capacity of distribution transformers – as discussed previously in this report, this analysis of loads on individual distribution transformers was not completed. Spot checking of some transformer loads using the primary line loading values showed existing transformer loading to be less than 40% capacity. As mentioned previously, short term overload of these distribution transformers will not significantly affect them due to the winter ambient temperatures.

Worst case calculated voltage drop for the entire system was only 1.7V. With a 120VAC nominal source voltage at the powerhouse, delivery voltage at a customer meter would be approximately 118.3Vac which is much less than the 8% drop allowed in the District's service standards. Keep in mind that it would be easy for the District to raise the delivery voltage at the powerhouse with changes to the LTC controls at the Blue Substation transformer.

EV Car Charging Recommendations

CCE provides the following recommendations for EV Car charging.

Level 2 chargers:

For Level 2 chargers, it would be helpful if customers notify the District anytime load is added to a panel such as a charger being installed. For the typical 7.2kW Level 2 charger, the District should only need to document these installations. If a consumer intends to install a higher capacity Level 2 charger (up to 19kW), the District should review the analysis for the specific transformer. As described in this report, that would include a review of the metered data for all consumers on the same transformer and calculations of the estimated peak demand. Based on our findings, many the of District distribution transformers hold additional capacity, but it is prudent to check prior to the installation of such a charger. It is possible that the installation of a 19kW charger could require upgrading some transformers. If that is determined, the District would need to coordinate with the consumer for the timing of the upgrade. One alternative would be for the District to prohibit such a Level 2 charger at the specific location (unless a transformer replacement can be accomplished).

If Level 2 charging is proposed at multi-residential facilities, the owner will be in discussion with the District staff regarding the proposed upgrades. At that time, the overall electric service will need to be assessed. It is possible that such an upgrade may require replacement of the facility transformer.

If Level 2 chargers become more prevalent on the District system, CCE recommends outreach to the consumers. Such outreach would educate the consumers about the need to limit overall peak load (both the powerhouse and the Out Valley have limitations) and that using a timer for a Level 2 charger could benefit the District and its customers. Settings for the timers should be derived from the load duration curves included in this report as well as the monthly peak graphs.

Level 3 Chargers:

The deployment of Level 3 chargers will depend on the economic feasibility of such a service for any potential commercial enterprise investigating such an installation. Refer to Appendix D for the locations on both the Commercial and Lifts feeders that could handle a 774kW EV Car charging station. As the District is approached by potential Level 3 EV Car charging entities, CCE recommends the following process:

1. The map provided will clarify to the entity the areas that are viable for up to 774kW type stations.
2. Specific District requirements need to be clarified. While this assessment shows that the 774kW Level 3 charger can be reliably served at the specified locations, it does not assess the overall system impacts of the District peak demand, the availability of the powerhouse as a backup, and any Out Valley limitations. CCE cannot predict the sequence of load growth in Kirkwood and where Level 3 charging falls in that sequence. However, Level 3 car charging may be the kind of electric load that could utilize an interruptible load restriction. Interruptible load restrictions are less viable for some residential and commercial applications. One possible interruptible scenario for a level 3 car charging service would be during loss of Out Valley (operating on powerhouse only). Load interrupting schemes could possibly interrupt part of the Level 3 charging station if the station is electrically configured for such an operation. This would be the preferred option for the District and may make the interrupting system more amenable to a developer. CCE documented historic peak days and times. Such data could be used to determine load interruption windows.
3. As a location for such a service develops, the design of the distribution extension needed to serve the customer will need to occur. This would be similar to how developers provide the distribution designs to the District today for new development. The design of the service needs to include interruptible load requirements and may require communications infrastructure from the load back to the District network. It may involve remote control of a customer owned interrupting device (this could be a 480V breaker with a shunt trip).

Master Plan Findings and Recommendations

The District's electrical utility system has sufficient capacity to serve existing and projected new electric loads as outlined in this report. Appendix E includes CCE's recommended electric system improvements with projected costs for the 10-year planning period. Master Plan findings are broken out by the three major components of the District's System:

In Valley distribution system

The In Valley distribution system has significant capacity to serve additional loads. It also includes a number of backup distribution connections which improve reliability. CCE analysis indicates that existing In Valley distribution cables are adequate to serve up to the maximum PG&E interconnection load of 10MW. A 10MW load scenario would require some shifting of loads between the three feeders to avoid any specific section being over-loaded. Another option for In Valley as loads exceed 6.0MW would be to construct a fourth feeder out of the powerhouse. A new feeder cable extension from the powerhouse to the existing vaults, along with rearrangement of cables in the vaults, would be needed to create this fourth feeder. Due to the compact nature of the system, the system can serve up to 10MW of load with acceptable voltage at all customer locations.

Recommended In Valley system improvements are targeted as preventive measures to reduce equipment failures and to improve operational flexibility. In Valley recommended system improvements fall under these categories. Note that these categories are included in the replacement criteria for the specific improvements listed in this report:

1. Replacement of three-phase primary cables for Lift feeder within the meadow. This section is direct buried. CCE recommends replacement of this line with the 4/0Copper in conduit.
2. Replacement of old primary cable – The system includes some older primary cables, some of them installed at the time of the specific development. These cables include non-jacketed concentric neutral cables in a direct buried trench. These cables either have reached or soon will be approaching their remaining useful life as noted by multiple failures in recent years. These unjacketed cables are subject to loss of the neutral conductor due to corrosion. CCE recommends a systematic program to eventually replace all older cables over the extent of the Master Plan. Primary cable failures during the winter months could be problematic for the District. Fortunately, since some of the system can be looped and served from backup directions, the District may be able to restore power after a cable failure by switching and then plan for a summer season replacement.
3. Replacement of direct buried service lines – The field survey documented some of the direct buried service lines in Kirkwood. The District has experienced cable failures for some of these lines. CCE recommends a systematic program to replace these service lines. The replacements will be prioritized to replace the oldest cables first. Eventually, CCE recommends that all service cables be installed in conduit.
4. Damaged Loadbreak Junction Enclosures (LJE) – The District experiences approximately two occurrences of LJE damage during heavy snow winters. The Master Plan includes costs for replacement of damaged enclosures.
5. Replacement of the Lodge switching cabinet – This cabinet is becoming obsolete and should be replaced.
6. Fault Indicators – The District's fault indicators are old devices (some acquired in the MU purchase). Older fault indicators will be replaced, and some new indicators should be installed at strategic locations to improve the District's response during outages. Newer fault indicators should be purchased with radio communication technology. That way, the District can read the status of fault indicators, even if the vault or LJE housing the indicators is buried in snow. CCE also recommends acquiring the radio system required for the remote location capability.
7. Transformer replacements – Due to their age, CCE anticipates a number of transformer failures over the period of the Master Plan.
8. Installation of transformer retaining walls – for specific transformers located in problematic terrain.
9. Meter replacements – Due to regulatory requirements, the District is required to replace 10% of meters per year. Replaced meters will require the AMI radio transmitted capability.

10. Transformer oil containment – the El Dorado Irrigation District has expressed the need for a plan to install oil containment for padmounted transformer located below the Caples Lake dam. This transformer serves Vail's water pumping station.

Lines for new consumers will be constructed as needed for growth. The District policies require 100% consumer contribution for any new lines required to serve new consumers. This study does not project the locations of new consumers or new line extensions except for the Palisades 6 development.

Out Valley System

The Out Valley system will maintain acceptable voltage levels for the historic peak load (3.28MW in December 2018). It is helpful to understand the District's operating practices for Out Valley since some of these practices would need to change for some load growth scenarios.

The 25 miles of underground 34.5kV cable creates a significant level of electrical capacitance on the Out Valley 35kV system. During peak load flows, the capacitance helps maintain the system voltage at an acceptable level for the District's In Valley system. However, at lightly loaded powerflows (off-peak), the capacitance can lead to unacceptable high voltages on the 34.5kV Out Valley cables. A 2.0 MVAR reactor was designed and installed as part of the Out Valley system. This reactor, located at the powerhouse, helps maintain the system voltage during lightly loaded powerflows. Currently, the reactor remains on-line all year and the Out Valley transformer at the Powerhouse adjusts the In Valley operating voltage using its Load Tap Changer (LTC) to provide acceptable voltage to In Valley as the overall peak load fluctuates.

Another tool used by the District to offset the potential high voltage on the 34.5kV system is adjustment of the fixed taps on the two Out Valley transformers (KM Green and KM Blue). Currently these transformers are both tapped in such a way as to lower the operating voltage and reduce the amount of LTC operations at KM Blue.

CCE analysis considered specific load growth cases for Out Valley.

Up to 6MW peak load

This growth scenario includes residential and commercial development as well as some implementation of EV car charging. Keep in mind that a 6.0MW peak would represent a doubling of the system peak.

As loads increase, above the current 3.0MW levels, the District should continue to monitor and document the operating extents of the LTC at the KM Blue transformer. These measurements will provide the best barometer of the Out Valley operation.

1. Increases in the LTC "voltage raise" functions will provide the District a warning that system voltages need to be increased, especially at peak load levels. As LTC "voltage raise" extents increase with growth, KMPUD can plan to adjust the fixed taps at either the KM Green transformer, the KM Blue transformer, or both. These fixed tap changes must be made with the system off-line and can be scheduled for the following summer (after the peak loads are experienced).
2. Decreases in the LTC "voltage lower" functions could occur due to small increased voltage levels on the PG&E 115kV system. As grid transmission systems grow (specifically in the

Salt Springs/Tiger Creek PG&E transmission region) some level of voltage increases could occur. Such increases would be small and within the typical transmission delivery voltages documented in the PG&E interconnection agreement. If Kirkwood loads hold steady in the future, yet operating voltages increase (as documented in the LTC historical values), the District should plan to adjust the KM Green and KM Blue fixed taps accordingly during the subsequent summer season. These adjustments would make small reductions in the Out Valley 34.5kV system and are needed to protect the 25 miles of underground cable included in the Out Valley.

3. CCE does not recommend any switching of the KM Blue 2.0MVAR reactor for peak loads up to 6.0MW. The operating changes described above should be adequate for Out Valley to provide up to the 6.0MW while keeping the 34.5kV operating voltage within underground cable tolerances. As load grows in Kirkwood, CCE recommends that the District develop a procedure to record the 34.5kV voltages on a monthly basis. This process would involve District staff taking readings from one protective relay (SEL-311L) at KM Green, and the associated relay at KM Blue. These readings should be taken during both peak and off-peak conditions.

CCE's analysis shows that the Out Valley system has the capacity to maintain acceptable voltage levels for up to 6MW peak load at Kirkwood with the adjustments described above.

6MW to 10MW peak loads

This growth scenario was assessed because the 10MW peak is the maximum allowable under the KMPUD-PG&E interconnection agreement. Any load growth that results in a peak load greater than 6MW will have ramifications for the operation of the Out Valley system.

For loads exceeding 6.0MW, CCE recommends a number of electrical improvements that will allow the Out Valley to reliably carry up to the 10MW limit. Managing voltage and power factor seasonally and in real-time will be required. CCE recommends the projects (described below) in a sequence which will depend on the actual peak loads that occur, the actual summer peaks that occur in the future, and actual voltage recordings and LTC data.

1. Automate switching of the 2.0MW reactor – This project will involve programming existing protective relays at both KM Green and KM Blue to monitor power flows and voltages and automatically switch the KM Blue reactor. In essence, when peak loads are occurring and system voltages are low, the reactor will be switched off. As loads decrease and system voltages increase, the reactor will be switched back on. During peak winter months, it is possible the reactor will be switching daily.
2. Installation of switched capacitor(s) In Valley – Switched capacitors can be strategically placed in the Kirkwood area to compensate for significant motor loads. Switched capacitors will reduce the overall MVA powerflow of the Out Valley at high peak load periods and therefore improve the overall Out Valley capacity and the operating voltages on the In Valley system. Additional power factor data could be collected from the feeder breaker relays to trend power factor and provide guidance as to the location and capacity of any switched capacitors on the system.
3. Installation of a 35kV voltage regulator in a remote location between Peddler Hill and Kirkwood. This padmounted device will make up to 10% adjustments of the 34.5kV voltage depending on load values and operating voltages. The location of such a regulator can be

determined by the District with the knowledge that the regulator will require periodic maintenance and testing.

Out Valley Capital Improvements

CCE recommends only a couple of capital improvements for the Out Valley system for the 20-year planning period. The impetus for additional capital improvements for Out Valley will be based on if loads exceed the 6.0MW threshold. The following recommendation is based on the expectation that peak loads will not exceed 6.0MW:

1. Damaged 35kV Loadbreak Junction Enclosures (LJE) – The District has experienced some damage to these 34.5kV LJE during heavy snow winters. The LJEs were placed at specific points in the Out Valley project. The Master Plan includes costs for replacement of damaged enclosures and includes costs for LJEs as well as vaults. The replacements will typically be new LJEs (rather than installing a vault). The 34.5kV cable is larger and much less flexible than the District's 15kV cable. Replacing an LJE with a vault may result in the need to replace one entire section of the 35kV cable, which would increase the costs significantly. There are no other practical alternatives to the vaults or LJE style cabinets for 35kV underground cable systems.

Out Valley - Peddler Hill Service Considerations

As load grows in Kirkwood, and the District adjusts the Out Valley operating voltages, the District is aware that such changes will impact the operating voltage levels seen at the Peddler Hill delivery to Caltrans. Caltrans is aware of such potential fluctuations. As the District is making seasonal adjustments to Out Valley, CCE recommends that Caltrans be informed periodically.

Powerhouse

The District's powerhouse, as it is currently operated without the use of the Volvo 450kW generators, has a capacity of less than 3MW. Without the Volvo generators operational, the District is already at peak capacity of the powerhouse with historical peak loads between 2.7 and 3.28MW. CCE recommends that the District complete an investigation of the use of the five Volvo generators. Such an investigation will allow the District to compare options for the powerhouse as a backup power source. CCE expects the District would be faced with powerhouse upgrade options in order to be able to depend on the powerhouse to backup up to its originally rated capacity of 5.0MW:

1. Replace the Volvo generators with another Caterpillar generator which could utilize the existing generator step-up transformer and switchgear breaker. This upgrade would require significant physical changes in the powerhouse. CCE has not evaluated if a new Caterpillar generator could replace the Volvo generators within the existing building footprint. Modifications to the powerhouse structure would add additional costs if needed.
2. The vendor that designed and installed the complete generator system in the powerhouse, PowerSecure had stated back in 2011 that the powerhouse could incorporate a fourth 980 kW generator but would require some building remodel work, the new generator, and a new Generator Step-Up transformer.

A local backup power source remains the most viable backup power alternative for the District (in the event of loss of Out Valley). The Kirkwood area remains isolated from other parts of the electric grid. Adding a fourth generator takes advantage of the existing powerhouse infrastructure and would be able to utilize the existing switchgear breaker and step-up transformer which are currently dedicated to the bank of Volvo generators.

CCE made a preliminary assessment of a battery backup system at the powerhouse. This analysis showed that even for a short-lived 8-hour backup system over 13,000 square feet of floor space would be required (for batteries and inverters) and would likely require HVAC upgrades to the building to maintain the battery systems operating temperatures. The District should anticipate an Out Valley outage could last up to a week. In the event of damage to the Salt Springs to KM Green 115kV line, repairs along this rugged terrain could be hampered by weather, access across forest lands, and availability of replacement materials. The backup generators will provide a substantially higher level of resilience than a battery storage system.

Certification

CCE analyzed the District 12.47 kV distribution system. The distribution system has the capacity to serve the existing the District loads plus projected growth while maintaining acceptable electric reliability levels. CCE analyzed the Out Valley project. The Out Valley project will provide adequate and dependable service for up to 6.0MW of electric load at Kirkwood. The Out Valley project can dependably serve up to 10MW of load in Kirkwood with the addition of voltage regulating equipment. Such voltage regulating equipment is not assessed in this report.

With peak loads less than 5.0MW, and with the capacity of the powerhouse and redundancy with the additional power source from Out Valley, and a looped underground distribution network, the District consumers can expect electric reliability to continue to exceed typical rural electric power providers. With peak loads exceeding 5.0MW and without further upgrades to the powerhouse, the District's resilience will be reduced since the backup powerhouse would not be able to serve the entire Kirkwood load during a sustained Out Valley outage.

The projected loads that were assessed in this report were derived as described herein. No other load forecast data was considered. Under this approach, CCE assessed a doubling of peak electric demand in Kirkwood from 3.0MW to 6.0MW. CCE asserts that such a growth scenario represents a conservative method for analyzing the electrical system.

I certify that I am a duly registered professional engineer under the laws of the State of California.

10-24-24

Date

By:

David H. Rightley, P.E.

Cross Canyon Engineering

California P.E. # E 22938

LICENSED PROFESSIONAL ENGINEER
DAVID H RIGHTLEY
10-24-24
E 22938
ELECTRICAL
STATE OF CALIFORNIA

APPENDIX A

KMPUD In Valley Electric System Map - Current System

LEGEND:

- THREE PHASE XFMR
- LD J ENCLOSURE (LJEXXX)
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	WEM	DHR

CROSS CANYON
engineering
CCE - Cortez
215 N. Linden St., Ste B
Cortez, CO 81321

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APPROVED	DHR
DATE	01-25-23
PROJ CODE	KMPUD-1004
FILE NAME	MPA-B

KMPUD IN-VALLEY ELECTRIC SYSTEM

CURRENT SYSTEM MAP
APPENDIX A

SCALE	DRAWING NUMBER
NONE	MP-A

APPENDIX B

KMPUD In Valley Electric System Field Investigation Notes

LEGEND:

- THREE PHASE XFMR
- LJEXXX LD J ENCLOSURE
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	WEM	DHR
B	10-17-24	RE-ISSUE WITH UPDATES	NRB	WEM	DHR

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CHECKED WEM
APPROVED DHR
DATE 03-16-23
PROJ CODE KMPUD-1004
FILE NAME MP-A-B

KMPUD IN-VALLEY ELECTRIC SYSTEM

FIELD INVESTIGATION NOTES
APPENDIX B 1

SCALE NONE
DRAWING NUMBER MP-B1

LEGEND:

- THREE PHASE XFMR
- LJEXXX — LD J ENCLOSURE
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REVIEW	NRB	WEM	DHR
B	10-17-24	RE-ISSUE WITH UPDATES	NRB	WEM	DHR

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DATE 03-16-23
PROJ CODE KMPUD-1004
FILE NAME MP-A-B

KMPUD IN-VALLEY ELECTRIC SYSTEM

FIELD INVESTIGATION NOTES
APPENDIX B2

SCALE: NONE
DRAWING NUMBER: MP-B2

LEGEND:

- THREE PHASE XFMR
- LJEXXX LD J ENCLOSURE
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	WEM	DHR
B	10-17-24	RE-ISSUE WITH UPDATES	NRB	WEM	DHR

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CHECKED WEM
APPROVED DHR
DATE 03-16-23
PROJ CODE VAIL-1001
FILE NAME MP-A-B

KMPUD IN-VALLEY ELECTRIC SYSTEM

FIELD INVESTIGATION NOTES
APPENDIX B3

SCALE NONE
DRAWING NUMBER MP-B3

LEGEND:

- THREE PHASE XFMR
- LJEXXX LD J ENCLOSURE
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	WEM	DHR
B	10-17-24	RE-ISSUE WITH UPDATES	NRB	WEM	DHR

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DATE 03-16-23
PROJ CODE KMPUD-1004
FILE NAME MP-A-G

KMPUD IN-VALLEY ELECTRIC SYSTEM

FIELD INVESTIGATION NOTES
APPENDIX B4

SCALE NONE
DRAWING NUMBER MP-B4

APPENDIX C

KMPUD In Valley Electric System Feeder map

LEGEND:

- THREE PHASE XFMR
- LD J ENCLOSURE (JEXXX)
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
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CHECKED WEM
APPROVED DHR
DATE 06-21-23
PROJ CODE KMPUD-1004
FILE NAME MP-C

KMPUD IN-VALLEY ELECTRIC SYSTEM

FEEDER MAP
APPENDIX C

SCALE NONE
DRAWING NUMBER MP-C

APPENDIX D

KMPUD In Valley Electric System Map - Level 4 EV Car Charging Locations

LEGEND:

AVAILABLE LEVEL 4 EV CAR CHARGING LOCATIONS

- THREE PHASE XFMR
- LD J ENCLOSURE
- SWITCH
- EQUIPMENT
- XFMR A - SINGLE PHASE
- XFMR B - SINGLE PHASE
- XFMR C - SINGLE PHASE
- XFMR UNK - SINGLE PHASE
- PRIMARY-RESIDENTIAL
- PRIMARY-COMMERCIAL
- PRIMARY-LIFTS
- PRIMARY-VAIL OWNED
- 35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	WEM	DHR

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CHECKED	WEM
APPROVED	DHR
DATE	06-21-23
PROJ CODE	KMPUD-1004
FILE NAME	MP-D

KMPUD IN-VALLEY ELECTRIC SYSTEM

LEVEL 4 EV CAR CHARGING LOCATIONS
APPENDIX D

SCALE	DRAWING NUMBER
NONE	MP-D

APPENDIX E

KMPUD In Valley Electric System Map - System Improvements

LEGEND:

(cloud)	INDICATES RECOMMENDED 10-YEAR MASTER PLAN SYSTEM IMPROVEMENTS
(blue triangle)	THREE PHASE XFMR
LJEXXX	LD J ENCLOSURE
(star)	SWITCH
(black rectangle)	EQUIPMENT
(red triangle)	XFMR A - SINGLE PHASE
(cyan triangle)	XFMR B - SINGLE PHASE
(orange triangle)	XFMR C - SINGLE PHASE
(black triangle)	XFMR UNK - SINGLE PHASE
(green line)	PRIMARY-RESIDENTIAL
(purple line)	PRIMARY-COMMERCIAL
(orange line)	PRIMARY-LIFTS
(yellow line)	PRIMARY-VAIL OWNED
(dashed black line)	35kV LINE

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	WEM	DHR

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Cortez, CO 81321

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CHECKED	WEM
APPROVED	DHR
DATE	06-21-23
PROJ CODE	KMPUD-1004
FILE NAME	MP-E

KMPUD IN-VALLEY ELECTRIC SYSTEM

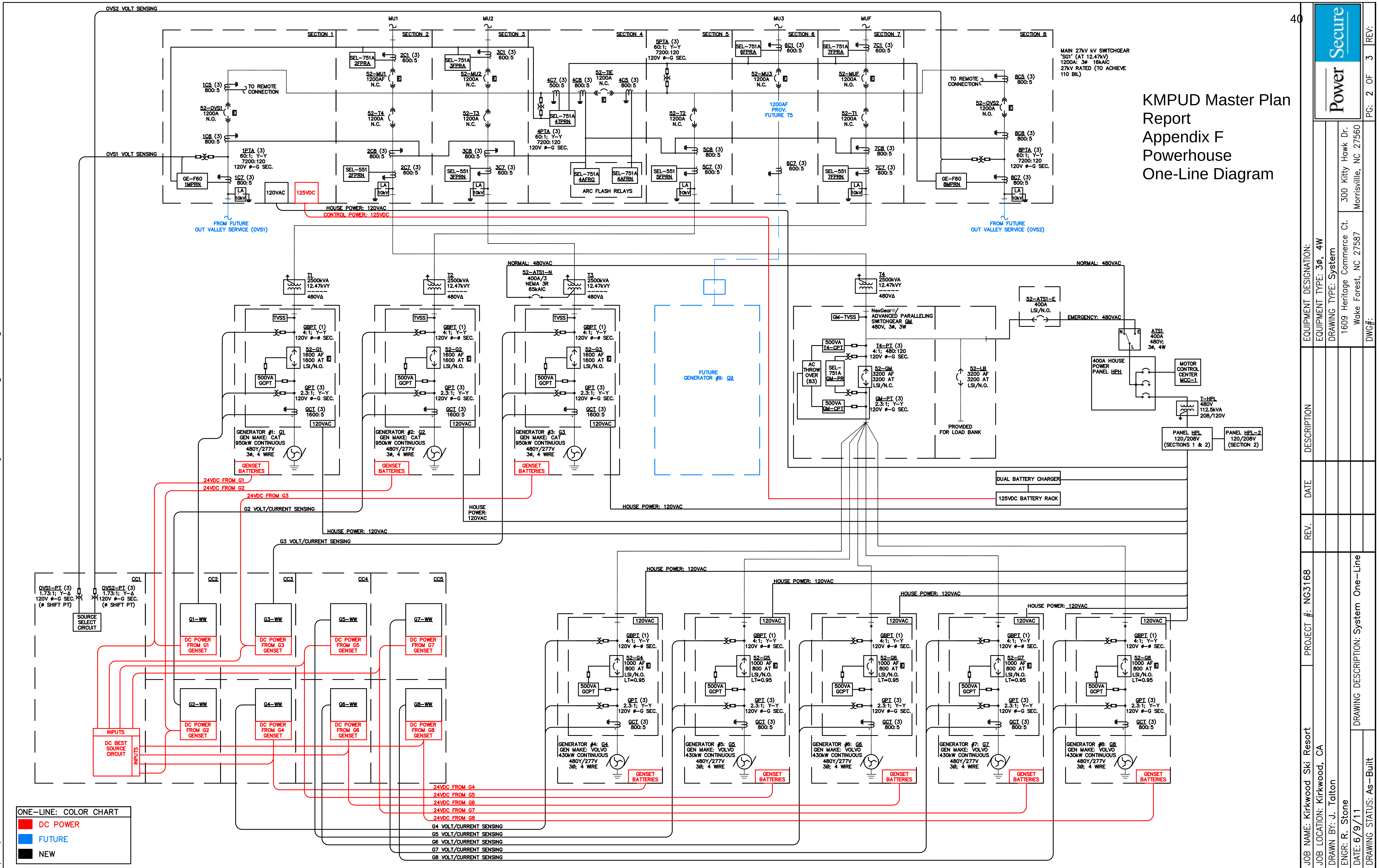
SYSTEM IMPROVEMENTS
APPENDIX E

SCALE	DRAWING NUMBER
NONE	MP-E

APPENDIX F

Powerhouse One-Line Diagram

KMPUD Master Plan Report
Appendix F
Powerhouse
One-Line Diagram



APPENDIX G

KMPUD Electrical System One-Line Diagram

REV	DATE	REVISIONS	DWN	CHK	APV
A	06-21-23	ISSUE FOR REPORT	NRB	DHR	DHR

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CHECKED DHR
APPROVED DHR
DATE 04-04-23
PROJ CODE KMPUD-1004
FILE NAME APP G

KMPUD IN-VALLEY ELECTRIC SYSTEM

ELECTRICAL
ONE-LINE DIAGRAM

SCALE NONE

DRAWING NUMBER APPENDIX G

APPENDIX H

Recommended 10-Year Capital Plan

	5 Yr Total	Cycle	Priority	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030	2030-2031	2031-2032	2032-2033
Capacity Component			**Scale 1~5 1=Critical**										
	0												
	0												
	0												
	0												
	0												
	0												
Total Electric Capacity Expense	0			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Replacement Component													
Replace Direct Bury Primary Line (Lifts Feeder) in meadow	500,000	One Time	4		500,000								
Miscellaneous Underground Cable Replacements	100,000	Two Years	3	20,000		20,000		20,000		20,000		20,000	
Miscellaneous Underground Service Line Replacements	20,000	Two Years	3		4,000		4,000		4,000		4,000		4,000
Replace switch at the Lodge	45,000	One Time	4					45,000					
Replace damaged LJEs In-Valley	40,000	Four Years	2	20,000			20,000						
Fault indicators	12,500	One Time	4				12,500						
Fault indicator wireless system	3,000	One Time					3,000						
Transformer replacements	18,000	Four Years	1		6,000			6,000			6,000		
Transformer Retaining Walls	6,000	One Time	1	6,000									
Meter replacements	30,000	One Year	2	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Caples Lake transformer oil containment	20,000	One Time	3			20,000							
Replace Damaged Out Valley Sectionalizing Cabinets	24,000	Four Years			8,000			8,000			8,000		
Upgrade powerhouse relays OVS1 and OVS2	20,000	One Time					20,000						
Total Electric Replacement Expense	**838,500**			**49,000**	**521,000**	**43,000**	**62,500**	**82,000**	**7,000**	**23,000**	**21,000**	**23,000**	**7,000**
Total Electric Capital Expense	**838,500**			**49,000**	**521,000**	**43,000**	**62,500**	**82,000**	**7,000**	**23,000**	**21,000**	**23,000**	**7,000**

Drafted: 11/25/85
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Modified: 2/25/88, 3/25/99
Deleted:

REGULATION NO. 620.03
KIRKWOOD MEADOWS PUBLIC UTILITY DISTRICT
CONDITIONS FOR USE OF PUBLIC SEWERS

A. GENERAL

1. No person shall discharge or cause to be discharged any storm water, surface water, ground water, roof runoff, subsurface drainage, cooling water, garbage, or polluted industrial wastes to any sanitary sewer.

2. The owner of any parcel or lot who discharges, or causes to discharge, any storm water, surface water, ground water, or roof runoff into any sanitary sewer of the District shall pay an additional charge to the District in accordance with this paragraph. The amount of the charge shall equal the amount of drainage water, or portion thereof, in cubic feet per month, which is discharged, or caused to be discharged, into the District's sanitary sewer multiplied by the applicable sewer consumption rate for the particular use on the property (i.e., domestic or, commercial/Timber Creek Lodge, commercial/Main Lodge, commercial/Inn and Ski Touring Center, or commercial/Whiskey Run Restaurant and Bar, see Regulation No. 610.01). The District Manager shall calculate the amount of drainage water, in cubic feet per month, that is discharged, or caused to be discharged, into the District sanitary sewer from a particular parcel or lot based on the size and slope of the parcel or lot and the roof or roofs, other impervious surfaces, and unimproved land, the amount of precipitation, and generally accepted engineering practices.

3. No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer:
   a. Any liquid or vapor having a temperature higher than 150 140 degrees Fahrenheit.
   b. Any water or waste which may contain more than 100 parts per million by weight of fat, oil, or gas.
   c. Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas.
   d. Any noxious or malodorous gas or substance capable of creating a public nuisance.

e. Any bleach, paint, or hazardous chemicals.

~~d.~~f. Any garbage resulting from the preparation of food that has not been properly ground to a fineness sufficient to pass through a 3/8-inch screen~~shredded~~.

~~e.~~g. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, ropes, towels, rags, baby/personal wipes, paper towels, tissues, menstrual products, diapers, Q-Tips, cotton products, dental floss, hair, medication, cigarette butts, animals, feathers, tar, plastics, wood, or any other solid or viscous substance capable of causing obstruction to the flow in the sewers, or other interference with the proper operation of the sewer works.

~~f.~~h. Any waters or wastes having a pH lower than 5.5 or higher than 9.0, or having any other corrosive properties capable of causing damage or hazard to structures, equipment, and personnel of the sewage works.

~~g.~~i. Any waters or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process or constitute a hazard ~~in the receiving waters~~in the effluent of the sewage treatment plant.

~~h.~~j. Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant.

~~i. Any noxious or malodorous gas or substance capable of creating a public nuisance.~~

B. OIL AND SAND INTERCEPTORS AND GREASE INTERCEPTORS (AKA GREASE TRAPS), ~~OIL, AND SAND INTERCEPTORS~~

1. When in the opinion of the District~~ Engineer~~, grease, oil, and sand interceptors are necessary for the proper handling of liquid wastes containing fats, oils, or grease in excessive amounts, liquid wastes containing sand or~~,~~ grit~~,~~ in excessive amounts, or any flammable wastes, hydraulic fluids, oils, and other harmful ingredients~~, or any flammable wastes, sand and other harmful ingredients~~, the same shall be installed. Grease~~, oil, and sand~~ interceptors are required for all ~~garages, service stations,~~ restaurants~~,~~ or retail establishments selling prepared foods and drinks for consumption on the premises, except with respect to those facilities whose owners can demonstrate to the satisfaction of the District that wastewater introduced into the District's sewage collection system will not cause or contribute to line stoppage or otherwise adversely affect sewage treatment~~and day lodges~~. Oil and sand interceptors are required for all commercial garages, vehicle maintenance shops, and service stations. These interceptors shall not be required for family dwelling units or structures, unless so determined~~designated~~ by the District. Mixed-use facilities may still be subject to these provisions. All interceptors shall be of a type and capacity ~~approved by the District~~

Manager in accordance with District Standard Design and Construction Specifications for Wastewater SystemsStandards, and shall be constructed as follows:

a. They shall be of impervious materials capable of withstanding abrupt and extreme changes in temperature.
b. They shall be of substantial construction and, watertight, and equipped with easily removable covers, which, when bolted in place, shall be gastight and watertight.
c. They shall be located where readily accessible for cleaning and inspection in a location subject to approval by the District Manager.
d. Except for cleaning by the District as provided in subsection B(2), an interceptor Interceptors shall be maintained by the owner, or occupant of the premises, at his/her expense, in continuously efficient operation at all times.
e. A reproducible as-built map shall be filed with the District office within 5 days after completion of construction of an interceptor.
f. Interceptor to be so located and constructed as to permit intervening inspection by the District.

1. Interceptors shall be pumped and cleaned out by the District on an as neededat least a quarterly basesbasis, or more frequently as determined to be necessary by the District Manager, subject to reimbursement of the District's costs by the owner or occupant. The District shall contract with an independent contractor vendor to provide the interceptor cleaning and pump out service. These costs, along with the inspection fees as adopted by the District Board annually, shall be billed to the owner contractor shall bill the District on a per interceptor basis, each interceptor requesting payment of the cleaning cost for the customer's interceptor, plus an additional sum not to exceed 10% to cover the District staff time in interceptor inspection and contract administration. The bill shall be due payable within 30 days. The billing may be collected in the same manner as their regular sewer service charges. Failure to timely pay the billing shall be grounds to terminate water service to the subject premises.