

To: Weber County Engineering  
From: Talisman Civil Consultants  
Subject: Nordic Valley Ski Resort Base Development Feasibility Study: Wastewater Mitigation  
Date: 2021-10-06  
Attachments: Nordic Valley Ski Resort DRR2 Master Plan

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## **1.0 - Introduction**

On behalf of Skyline Mountain Base, Talisman Civil Consultants (TCC) has prepared a feasibility study to discuss the treatment of wastewater for two phases of future development at Nordic Valley Ski Resort. For the Rezone Application that is submitted with this cover a feasibility letter is requested. However, there is currently a regional sanitary sewer study that is being performed by Weber County that will dictate which future methods will be used for sanitary sewer for the proposed development. The intent of this feasibility study is to explore possible options for Weber County with calculations that will ultimately serve as an aid when the regional sewer study is concluded. Skyline Mountain Base has been directed by the County to coordinate with the regional sanitary sewer study, which is currently on going.

## **2.0 - Existing Conditions**

Nordic Valley Ski Resort Base currently has a small number of buildings for ski resort and maintenance use. Therefore, the existing sanitary sewer infrastructure at the resort is limited. Wastewater is currently treated and disposed via a septic system. Wolf Creek, the water and sewer improvement district in the region have ceased any new connections into their existing system until further notice. Because of this, it is recommended that Skyline Mountain Base pursue alternative means of treatment and disposal for the proposed development at Nordic Valley Ski Resort Base for their immediate Phase 1 needs.

## **3.0 - Methodology**

The base unit of wastewater analysis is the Residential Equivalent (RE). An RE is defined as a volume of wastewater per residential connection. Per Utah Administrative Code R317-3, an average peak daily loading of 100 gallons per day per capita per Residential Equivalent should be used for sizing new sewer systems. The average mountain residence is estimated to house 3.2 people, such that 1 RE is equal to 320 gallons of wastewater per day. Condominium, Townhome, Cabins, and Mountain Chalet's are all given a value of 1 RE per Unit.

Restaurant and retail demands were estimated by estimating the number of people that would occupy a restaurant or retail space per square foot and applying a culinary water demand. It is then conservatively estimated that wastewater out is 100% of culinary water in.

- For restaurants, it is assumed that there is 12 sf allocated per seat, and there is a demand of 35 GPD per seat.
- For Retail space, it is assumed that there is 300 sf allocated per person, and the associated demand

is 10 GPD per person.

**4.0 – Estimated Future Demand**

The anticipated Phase 1 development at Nordic Valley consists of 320 single/multi-family units, 2 restaurants (8,000 sf total) and 18,320 sf of retail space. This equates a total of 497 RE’s, or approximately 113,500 gpd of wastewater. Please refer to Table 1

*Table 1 – Phase 1 Wastewater Demand Summary*

| <b>Phase 1</b>                 |                   |   |                                   |   |
|--------------------------------|-------------------|---|-----------------------------------|---|
| <b>Residential</b>             | <b>Unit Count</b> | <b>Residential<br/>Equivalents<br/>(RE)</b> |                                   |   |
| Single/Multi Family            | 320               | 320   |                                   |   |
| <b>Retail &amp; Restaurant</b> | <b>Unit Count</b> | <b>Demand<br/>(GPD)</b>                     | <b>Total<br/>Demand<br/>(GPD)</b> | <b>Residential<br/>Equivalents<br/>(RE)</b> |
| Restaurant (Seats)             | 666.67            | 35  | 23,333                            | 72.92                                       |
| Retail (People)                | 59                | 10  | 591                               | 103.69                                      |
| <b>Total</b>                   |                   |   |                                   | <b>177</b>                                  |
| <b>Total REs</b>               | 497               |   |                                   |   |
| <b>Total GPD</b>               | 158,915           |   |                                   |   |
| <b>Total Acre-ft/Year</b>      | 178.12            |   |                                   |   |

The anticipated Phase 2 development at Nordic Valley consists of 443 single/multi-family units, and 11,880 sf of retail space, for a total of 487 RE's, or approximately 155,712 gpd of wastewater. Please refer to *Table 2*.

*Table 2 – Phase 2 Wastewater Demand Summary*

| <b>Phase 2</b>                 |                   |                                     |                           |                                     |
|--------------------------------|-------------------|-------------------------------------|---------------------------|-------------------------------------|
| <b>Residential</b>             | <b>Unit Count</b> | <b>Residential Equivalents (RE)</b> |                           |                                     |
| Single/Multi Family            | 443               | 443                                 |                           |                                     |
| <b>Retail &amp; Restaurant</b> | <b>Unit Count</b> | <b>Demand (GPD)</b>                 | <b>Total Demand (GPD)</b> | <b>Residential Equivalents (RE)</b> |
| Restaurant (Seats)             | 0                 | 35                                  | 0                         | 0.00                                |
| Retail (People)                | 38                | 10                                  | 383                       | 44                                  |
| <b>Total</b>                   |                   |                                     |                           | <b>44</b>                           |
| <b>Total REs</b>               | 487               |                                     |                           |                                     |
| <b>Total GPD</b>               | 155,712           |                                     |                           |                                     |
| <b>Total Acre-ft/Year</b>      | 174.53            |                                     |                           |                                     |

The total estimated demand for the Phase 1 and 2 developments are 984 Residential Equivalents (RE) or 314,627 gpd. Please see *Table 3* Below.

*Table 3 – Phase 1 and Phase 2 Demand Summary*

|              | <b>RE</b>  | <b>GPD</b>     | <b>Acre-ft/year</b> |
|--------------|------------|----------------|---------------------|
| Phase 1      | 497        | 158,915        | 178.12              |
| Phase 2      | 487        | 155,712        | 174.53              |
| <b>Total</b> | <b>983</b> | <b>314,627</b> | <b>352.66</b>       |

### **5.0 - Conveyance Infrastructure**

Per Utah Administrative Code R317-3, no gravity sewer shall be of less than 8” in diameter. Specifically sizing the diameter of the sewer drain lines at Nordic Valley is infeasible for this level of analysis. However, based on sanitary sewer infrastructure we designed in similar mountainous developments such as Powder Mountain (Eden, Utah), Snowbasin (Huntsville, Utah), 8” will be adequate for most of the Nordic Valley’s wastewater demands. Line sizes may need to up sized to 10” or 12” near the terminus of the system, but will be assessed in greater detail as design develops.

## **6.0 – Disposal**

Because of the current limitations of connecting to an existing sewer district and the pending conclusion of the regional sewer study, it is recommended that Nordic Valley pursue Rapid Infiltration Basins as an alternative means of disposal for Phase 1. For the purpose of this study, Phase 2 is anticipated to have a connection to a regional sewer system pending the results of the regional sewer study.

Rapid Infiltration Basins are permeable earthen basins that mitigate wastewater by repetitive cycles of flooding, infiltration, and drying. Rapid infiltration of wastewater is based on a relatively high rate of wastewater infiltration into the soil, followed by rapid percolation, either vertically, or laterally away.

A geotechnical analysis must be conducted to adequately assess the viability of RIBs as a disposal method. The following assumptions have been made to size the ponds needed for RIB disposal:

- Percolation rate of 120 minutes per inch – this is the slowest allowable rate that can be used for drain fields.
- A drainage basin area of 2.5 acres (24,200 CY) per 100,000gpd of wastewater demand.
- A basin depth of 7' that is excavated in natural ground because RIBs cannot be built on fill.
- Safety factor of 8X the percolation rate for sizing.

For the purpose of this study, RIB disposal capacity will be based upon Phase 1 Demands only.

Skyline Mountain Base is also open to utilizing treated waste water for snowmaking purposes as an alternative means of disposal. However, this strategy is unprecedented in the state of Utah, and must be further investigated.

## **6.1 – Treatment**

Wastewater disposal methods determine the level of treatment required. Both rapid infiltration and snowmaking reuse requires the water to be treated to a high quality before disposal. Thus, the recommended treatment technology for Phase 1 is a Membrane Bioreactor (MBR). The main benefits are as follows:

- High water quality. Water is filtered through a 0.04-micron filter. The filter is small enough to filter bacteria and will meet the high-water quality requirements for re-use and rapid infiltration applications.
- The footprint is small and can be constructed in a building. This will allow the facility to resemble other buildings in the area.
- MBR facilities can easily be expanded accommodate to additional treatment capacity as required.

MBR treatment will be required until a connection has been made to the new regional sanitary sewer system.

At this time, MBR treatment capacity will be based upon Phase 1 Demands only.

**6.2 – Phase 1 Treatment and Disposal Summary**

Based on the Phase 1 Demands estimated in Section 4.0, and the assumptions made to size the RIBs in Section 6.0, please see *Table 4* for the estimated treatment and disposal capacities required to mitigate the wastewater demands for Phase 1.

*Table 4 – Phase 1: Estimated Treatment and Disposal Capacity*

| <b>Phase 1: Treatment and Disposal Summary</b> |                   |             |
|--|-------------------|-------------|
| <b>Item</b>                                    | <b>Unit Count</b> | <b>Unit</b> |
| <b>MBR Treatment Capacity</b>                  | 158,915           | gpd         |
| <b>RIB Area</b>                                | 3.97              | Ac          |
| <b>RIB Storage Capacity</b>                    | 38,457            | CY          |

It is anticipated that by the time Phase 2 goes into development, Nordic Valley Ski Resort Base will be able to discharge its wastewater by connecting to a regional sewer system.

**7.0 - Conclusion**

Skyline Mountain Base is prepared to invest in wastewater infrastructure to meet its own needs for Phase 1. As discussed above, this could be accomplished by means of an MBR treatment and RIB disposal method. The capacity of the MBR can be scaled up relatively easily as demand increases. An early investment of MBR on-site provides Nordic Valley allows the future possibility of wastewater reuse for snowmaking in the future.

As conclusions are drawn from the Weber County regional sanitary sewer system study, Skyline Mountain Base will adapt its approach to treatment of sanitary sewer for the Nordic Valley Ski Resort Base Development. At that time, the sanitary sewer feasibility letter will be pursued.



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