FEASABILITY REPORT
FOR
PARADISE ESTATES-BAVARIAN ESTATES
CONSOLIDATION

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Project Number
210507

for
Paradise Estates Water System
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Contents

Paradise Estates-Bavarian Retreat
Consolidation Feasibility Report
Executive Summary

Objective

The objective of this study is to determine the feasibility of consolidating the Bavarian Retreat Water System (WSDOH ID#04785) into the Paradise Estates Water System (WSDOH ID#66090). It appears as though consolidation is feasible technically, financially, and managerially, provided both communities are willing to move forward with the consolidation project.

Consolidation

Consolidation of the two systems requires four primary parameters to be addressed: 1) Physical Connection, 2) Physical Capacity, 3) Legal/Community Aspects and 4) Costs

Physical Connection

From a technical aspect, physical consolidation of the Bavarian Retreat Water System into the Paradise Estates Water System is a very simple proposition. An absolutely minimal requirement would be the need for a single 4-inch line to cross Osborn Road and connect the Paradise Estates distribution with that of Bavarian Retreat; however, Bavarian Retreat's distribution system is aging. They have no service meters as required by Municipal Water Law, and the system is reported as having a history of leakage and high maintenance needs. Therefore, as a condition of consolidation, Paradise Estates would require replacement of the Bavarian Retreat distribution system.

Physical Capacity

The Paradise Estates Water System has the physical capacity necessary to serve all lots within the Paradise Estates and the Bavarian Retreat Water System service areas.

Legal, Regulatory, and Community Aspects

In order to consolidate, both communities must be willing to approve the consolidation. An informal preliminary survey of the communities indicates that if consolidation is affordable, that both communities are willing to go forward with the consolidation. Water rights must be transferred (or the Bavarian well incorporated), a water system plan and engineering report approved, and both communities' by-laws updated to allow for the consolidation.

Costs and Results

It is estimated the total cost of consolidation would be approximately $388,000. Some operating cost savings would be gained by the lot owners of Bavarian Retreat. The net cost of consolidation is estimated to be $0.48/month per lot for Paradise Estates and an increase of $13/month per lot ($156/yr) to the current water rates for Bavarian Retreat both for 20 years. Both systems will have a larger customer base to share in fixed expenses. Paradise Estates will have more secure water rights. Bavarian Retreat will have improved reliability and water quality. No significant disadvantages to consolidation were identified.

1.0 Background Information

Paradise Estates Paradise Estates was developed in the 1960's and Bavarian Retreat in the mid 1970's. While the Bavarian Retreat Water System was constructed approximately ten years after the Paradise Estates System, Bavarian Retreat still relies primarily on their original infrastructure, where Paradise Estates has replaced and/or upgraded the majority of their original infrastructure. Paradise Estates has 231 residential and 77 recreational connections, and is approved for 390 connections. Bavarian Retreat has 4 residential and 18 recreational connections and is approved for 44 connections.

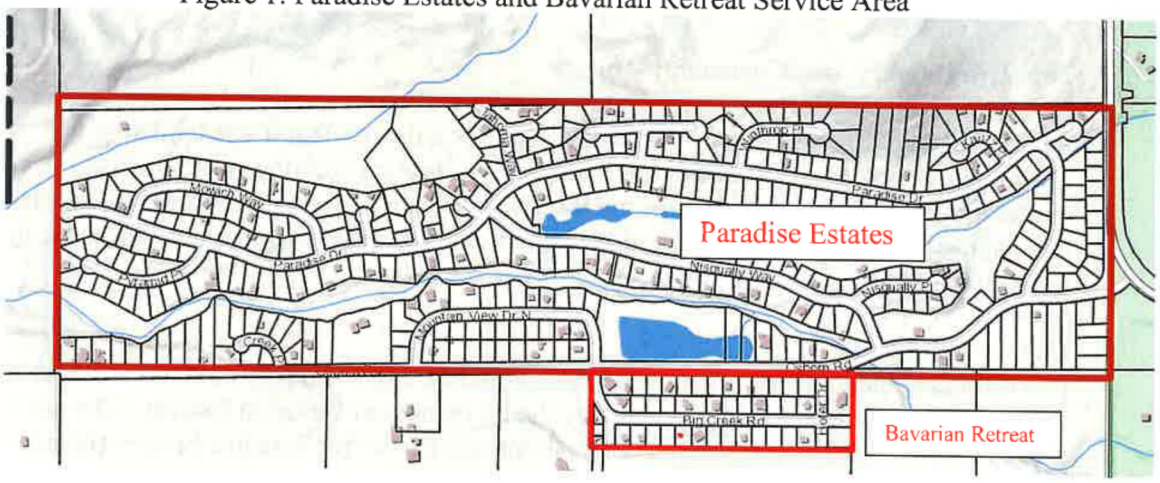
The following Table summarizes some of the major parameters for each water system.

Table 1. Infrastructure Summary

System	Number of Connections	Number Approved	Well Capacity	Water Rights	Treatment	Storage (gallons)
Paradise Estates	308	390	50 gpm 25 gpm ?? gpm 59 gpm	100 gpm 51 ac-ft/yr	Chlor. Ox Filt	120,000
Bavarian Retreat	22	44	60 gpm	100gpm 11 ac-ft/yr	Chlor	0
Total	416	434	194 gpm	200 gpm 62 ac-ft/yr		120,000

The Service Areas of the two water systems are immediately adjacent to each other sharing a common north/south border.

Figure 1: Paradise Estates and Bavarian Retreat Service Area



Demographics of the two communities are identical with the same range of lot sizes, types of homes, and types of uses (some full-time, some part-time, some vacation rentals).

2.0 System Demands

Bavarian Retreat has neither source nor service meters. However, the system is immediately adjacent to the Paradise Estates Water System. Lot sizes, home types, and all other socio-demographic features are indistinguishable from the Paradise Estates Water System.

The one anticipated difference between the systems is leakage. Where Paradise Estates System estimates 1-2% distribution system leakage in their Water Use Efficiency Reports, it is unknown what actual leakage is since the values in the WUE reports have been estimated. It is assumed distribution system leakage within Bavarian Retreat is much larger. However, if consolidation is able to occur, the Bavarian Retreat distribution system will be replaced, after which leakage should be at or very near 0%. Therefore, for the purpose of the analysis in this Consolidation Study, water use is assumed to be equivalent between Paradise Estates and Bavarian Retreat.

For the purposes of this analysis, it is assumed that Bavarian Retreat has identical water use parameters (average day demand, maximum day demand) as Paradise Estates.

The following capacity analysis uses data from the Paradise Estates Water System and is based on the Equivalent Residential Unit (ERU): the water used by one standardized residential connection. The water systems have full-time, part-time, and recreational connections. There are also a significant number of vacation rentals within the community.

System usage parameters are calculated based on Average Day Demand (ADD) and Maximum Month Daily Demand (MMDD – the average use per ERU during the peak month) as taken from source meters. Many of the radio-read service meters have reached the end of their useful life. Therefore, service meter data has been under-reading actual consumption. A program to replace the meters and or batteries has been on-going and is nearing completion.

The most significant challenge in determining usage parameters is determining the number of Equivalent Residential Units (ERU's). The Paradise Estates has the following mixture of connections:

Table 2. ERU Summary

Type of Connection	Number	Jun-Sep ERU	Oct-May ERU
Full-Time Single-Family Residence	154	154	154
Vacation Home	27	4	1
Vacation Rental	50	20	10
RV	61	3	0
Campsite	16	0	0
Vacant Lot	84	0	0
Water System Lots	3	0	0
Total	395*	181	165

*Not all lots within the community are in need of a water connection.

The exact type and occupancy of connections has not been closely tracked on a year-by year basis. Therefore, it is likely that over the last three years, occupancy patterns have changed. However, with the COVID pandemic, most similar communities have seen increases in usage over the last two years. Much of the vacation use is associated with Mt Rainier National Park, which like other parks has seen an increase in visitors over the past two years.

Therefore, water system usage in 2020-2021 is likely as high or higher than it has ever been.

Source meter data is available in the appendix and summarized here:

Table 3. Summary of ADD and MMDD

Year	ADD (gpd/ERU)	MMDD (gpd/ERU)
2019	88	129
2020	103	169
2021	113	181

The three-year ADD is 101 gpd/ ERU. To this a safety factor of 1.15 is applied. Normally, a safety factor of 1.1 would be applied; however, 1.15 has been chosen for several reasons:

1. There is not a reliable record of service meter data.
2. There appears to be an upward trend in ADD; however, it is likely that this upward trend is likely temporary as a result of the pandemic.
3. Actual occupancy rates for vacation homes and vacation rentals is unknown. The estimated rates of 10-20% is conservative based on subjective data from the community leaders; however, actual occupancy rates are unknown.
4. There is no data available for Bavarian Retreat

None of these factors are a reason for a high degree of uncertainty; however as a congregate they warrant a slightly higher safety factor.

Using a safety factor of 1.15, ADD for this report is calculated as follows:

ADD = 101*1.15 = **117 gpd/ERU**

The highest MMDD recorded was 181 gpd/ERU. The 1.15 Safety Factor is then applied as follows:

MMDD = 181*1.15 = 208 gpd/ERU

To calculate Maximum Daily Demand (MDD) a peaking factor of 1.65 is applied to MMDD. In addition, an assumed maximum leakage rate of 10% ADD is applied:

MDD = 208*1.65+10%*117 = **355 gpd/ERU**

The Peak Hourly Demand (PHD) is calculated using Equation 3-1 from the Design Manual (where C= 1.8, F=125) as shown below in Equation (Eq.) 1.

$$\text{PHD} = \left(\frac{\text{MDD}}{1{,}440}\right)((\text{C} * \text{N}) + \text{F}) + 18 \qquad (1)$$

We first calculate PHD assuming all 390 approved connections within the Paradise Estates Community are built upon. This is a significant over-estimation as it is very unlikely all lots will be developed.

$$PHD_{390\ ERU} = \left[\frac{355\ gpd/ERU}{1440 min/day}(1.8 * 390\ ERU + 125) + 18\right] = 222\ gpm$$

Next, we calculate PHD for a combined Paradise Estates-Bavarian Retreat water system with a total potential of 434 lots. Again, it is very unlikely full build-out of the entire community would ever be achieved.

$$PHD_{434\ ERU} = \left[\frac{355\ gpd/ERU}{1440 min/day}(1.8 * 434\ ERU + 125) + 18\right] = 241\ gpm$$

3.0 Water Quality

The Paradise Estates wells and the Bavarian Retreat well have similar water quality. The Paradise Estates well S01 has similar iron levels while other dissolved minerals are generally lower than those of the other wells. Paradise Estates well SO2 is reported as having been discontinued as a result of poorer water quality, presumably iron and manganese being the primary offenders.

Improved water quality is a significant reason for the members of Bavarian Retreat community to consolidate with the Paradise Estates community. The aesthetic quality of the water will improve dramatically and residents and guests will also have reduced exposure to Arsenic.

Both water systems chlorinate their water; therefore, there is no significant change anticipated to chlorine concentrations.

The most recent IOC's for Bavarian Retreat also detected Arsenic at 0.014 mg/L, a primary contaminant with an MCL of 0.0104 mg/L.

Table 4. Water Quality Data

	Paradise S01	Paradise S03	Bavarian
Hardness (mg/L)	47	91	73
Conductivity (umhos/cm)	93	254	206
Iron (mg/L)	**0.44**	0.05	**0.48**
Manganese (mg/L)	<0.01	**0.29**	**0.36**
Sodium (mg/L)	5.4	20.0	22.3
Nitrate (mg/L)	0.68	<0.2	<0.2
Arsenic (mg/L)	<0.001	0.008	**0.0144**
Chloride (mg/L)	2.9	29.0	18.4
Flouride (mg/L)	<0.2	0.30	0.28

***Bold** results indicate MCL exceedance*

If the consolidated system decided to retain the Bavarian Retreat Well. A transmission line from the Bavarian Retreat Well to the Paradise Well 4 treatment plant would be approximately 1,000 feet long. Of this length, approximately 350 feet would already be trenched for the Bavarian Retreat distribution system replacement. The remainder of the line would primarily be along a private access road, with no driveways, pavement, or other obstacles. The existing treatment plan at Well 4 has adequate capacity to treat both Well 4 and the Bavarian Retreat Well. It is anticipated that the water chemistry between the two systems is similar enough that it would adequately treat the water. A small amount of ferric chloride injecction might be required at the Bavarian Well to remove all the arsenic.

4.0 System Capacity

The capacity of the future consolidated system is based on water right capacity, source capacity, storage capacity, booster capacity, distribution capacity and treatment capacity.

4.1 Water Right Capacity

Both Paradise Estates and Bavarian Retreat have active water rights, summarized as follows:

Table 5. Water Rights Summary

System	Water Right	Instantaneous (gpm)	Annual (ac-ft)	Well Capacity (gpm)
Paradise Estates	G2-22269 P	100	51	134
Bavarian Retreat	G2-22228 C	100	11	60
Total		200	62	194

If the Bavarian well is not retained, the Bavarian Retreat Water Right would need to be transferred to the Paradise Estates Water System. It is unknown if in the transfer process some of the inchoate (unused) water rights would be lost since Bavarian Retreat does not meet the definition of a Municipal Water Supplier. It is possible the Bavarian Retreat water right Certificate could be reverted back to a Permit. In this case, it would not have

been fully put to beneficial use yet, and therefore not subject to relinquishment. Conversely, if the Bavarian Retreat Well was to be retained and a transmission line constructed, the entire water right is anticipated to be retained. However, in order to complete a conservative capacity analysis, it shall be assumed that the entire annual withdrawal will be transferred, but only the current pump capacity of 60 gpm would be transferred.

Using the instantaneous and annual water rights for the two systems, the capacity was calculated below in Equations (Eq.) 2 and 3. The existing instantaneous water right (the rate at which you are allowed to pump water from the wells) can supply 649 ERU and the annual water right (the total volume allowed to be withdrawn over the course of a year) can supply 473 ERU.

$$N_{wr,instant} = \frac{Q_{wr,instant} * 1440}{ERU_{MDD}} = \frac{160\ \frac{gal}{min} * 1{,}440 \frac{min}{day}}{355 \frac{gpd}{ERU}} = \mathbf{649\ ERU} \qquad (2)$$

$$N_{wr,\text{annual}} = \frac{Q_{wr,annual}}{ERU_{ADD} * 365} = \frac{62\ afy * 325{,}851 \frac{\frac{gal}{yr}}{afy}}{117\ \frac{gpd}{ERU} * 365 \frac{days}{year}} = \mathbf{473\ ERU} \qquad (3)$$

Without consolidation, Paradise Estate's annual water right of 51 ac-ft/yr limits them to 389 connections, one less than their current approval level.

$$N_{wr,\text{annual}} = \frac{Q_{wr,annual}}{ERU_{ADD} * 365} = \frac{51afy * 325{,}851 \frac{\frac{gal}{yr}}{afy}}{117\ \frac{gpd}{ERU} * 365 \frac{days}{year}} = \mathbf{389\ ERU}$$

Therefore, consolidation with Bavarian Retreat will provide Paradise Estates with some additional "wiggle room" in the event water usage in the community continues to increase.

4.2 Source Capacity

There are four drinking water wells within the Paradise Estates Community, three of which are in use; and there is one well in the Bavarian Retreat Community. Upon consolidation it is likely that the Bavarian Retreat well would be incorporated into the Paradise Estates system, primarily to protect water rights. Nevertheless, in order to complete a conservative capacity analysis, it will be assumed that only the active three Paradise Estates Wells would be used.

The three active Paradise Estates wells have a combined capacity of 134 gpm. Assuming the wells are pumped no more than 20 hours per day, this limits the water system to 453 ERU as follows:

$$N_{source,day} = \frac{Q_j t_j}{ERU_{MDD}} \quad (4)$$

$$N_{source,day} = \frac{(134\ gpm) * \left(20 \frac{hr}{day}\right)\left(60\ \frac{min}{hr}\right)}{355\ \frac{gpd}{ERU}} = \mathbf{453\ ERU}$$

4.3 Treatment Capacity

The existing two treatment plants have capacities significantly greater than the that of the wells. The well 2 site treatment plant has capacity to treat approximately 120 gpm. The Well 4 site has capacity to treat approximately 200 gpm. This provides a total treatment capacity of approximately 320 gpm. The filters need to backwash approximately once per day. The total backwash cycle requires approximately 20 minutes. Therefore, treatment limits the system as follows:

$$N_{source,day} = \frac{(320\ gpm) * \left(1420 \frac{min}{day}\right)}{355\ \frac{gpd}{ERU}} = \mathbf{1,280\ ERU}$$

4.4 Storage Capacity

Paradise Estates has two, 26ft diameter, 25 ft tall concrete reservoirs, which provide a nominal volume of 60,000 gallons each for a total of 120,000 gallons. Each tank has approximately 4,000 gallons of storage per foot of reservoir height, or 8,000 gallons per foot total. Bavarian Retreat has no storage.

There are five components to the storage requirements: dead storage, operational storage, equalizing storage, standby storage, and fire suppression storage.

Dead Storage (DS) is the volume of storage unavailable as a result of the tank's geometry. In this case, there is approximately one foot of dead storage at the top of the tank and six inches at the bottom of the tank. This results in 12,000 gallons of dead storage.

Operational Storage (OS) is the volume needed to control the pump. Minimum OS is calculated as 2.5 times the largest source pump capacity, or 59 gpm*2.5 min =148 gallons. However, from a practical standpoint, the minimum amount of OS is approximately six inches of reservoir height. Therefore, OS is 4,000 gallons.

Fire Storage (FS) is the volume required to provide fire protection. Since the service areas of both water systems were platted prior to fire flow requirements, there is no fire storage requirement.

Equalizing storage (ES) is the required storage needed to supplement the well's capacity if the permanent wells are not able to meet the peak demand. Using the following equation (Eq 5), the required equalizing storage can be calculated.

$$ES = (PHD - Q_s) * 150 \quad (5)$$

Standby Storage (SS) is the volume to provide water in an emergency, such as a well pump failure. Since the system is still able to provide ADD flow with the largest source removed, SS is calculated as 200 times the number of connections.

$$SS = 200*ERU \quad (6)$$

Dead, Operational, and Fire Storage are all fixed volumes and/or based on the geometry of the tank. They have a combined volume of 16,000 gallons, leaving 104,000 gallons available for a combination of equalization and standby storage.

Table 6. Fixed Reservoir Parameters

Storage Category	Volume
Dead Storage	12,000
Operational Storage	4,000
Fire Storage	0
Total Fixed Required	16,000
Total Storage Available	120,000
Available for ES and SS	104,000

Equations 5 and 6 were entered into a spreadsheet as a function of the number of connections and solved iteratively until a combined volume of near 104,000 gallons was achieved. It was found that at 438 ERU the storage requirement for ES and SS would be 103,987 gallons.

ES = (243-134)*150 = 16,387
SS = 200*438 = 87,600
Total 103,987 gallons

Storage Limitation = 438 ERU

If the Bavarian well were to be incorporated into the system this would not only increase the source capacity, but would increase the storage capacity as well.

4.5 Booster Capacity

Paradise Estates has four VFD Grundfos CR16 booster pumps. These pumps can provide approximately 150 gpm at 50 psi, the pressure at which the hydraulic analysis was conducted. The booster station therefore has a total capacity of approximately 600 gpm.

By rearranging the PHD equation we can solve for the number of ERUs the booster station is able to support.

$$N = \frac{(PHD - 18) * \left(\frac{1440}{MDD}\right) - F}{C} = \frac{(600 - 18) * \left(\frac{1440min/d}{355gpd}\right) - 125}{1.8} = \mathbf{1,242\ ERU}$$

Therefore, the booster station limits the water system to 1,242 ERU.

4.6 Distribution System Capacity

The hydraulic analysis from the last water system plan demonstrated that the system is able to maintain over 30 psi with a PHD of 300 gpm. Rearranging equation 3.1 in the design manual we can determine the number of connections associated with a PHD of 300 gpm.

$$N = \frac{(PHD - 18) * \left(\frac{1440}{MDD}\right) - F}{C} = \frac{(300 - 18) * \left(\frac{1440min/d}{355gpd}\right) - 125}{1.8} = \mathbf{566\ ERU}$$

Therefore, the distribution system limits the water system to at least 566 ERU.

4.7 Capacity Summary

The following is a summary of the capacity limitations of a combined Paradise Estates-Bavarian Retreat Water System.

Table 7. Factors Limiting ERU's

Limitation	ERU Limit
Water Rights, Instantaneous	649
Water Rights, Annual	473
Source Capacity	453
Treatment Capacity	1,280
Reservoir Capacity	**438**
Booster Pump Capacity	1,242
Distribution Capacity	566

Storage Volume is the most limiting factor at 438 connections.

If the systems were to consolidate, 434 connections would be needed to maintain the total number of existing approved connections. Therefore, the system would have adequate capacity after consolidation. It is also worthy to note that it is extremely unlikely that the

consolidated system would ever achieve full build-out as some lots have already been combined, and some lots are likely to be unbuildable.

4.8 Effects of Consolidation on Capacity of the Paradise Estates Water System

Consolidation would affect the capacity of the Paradise Estates Water System primarily in two ways: water rights and storage capacity. Bavarian Retreat brings more water rights to the combined water system on a per-connection basis than Paradise Estates has. Therefore, Paradise Estates receives an overall benefit with more water rights available on a per-connection basis. This is true of both the instantaneous water right and annual appropriation water right.

The amount of storage based on a per-connection basis decreases with the addition of the Bavarian Retreat water system. This is somewhat compensated for with the increase in source capacity via additional water rights; however, the net effect is still a small decrease in the amount of storage available on a per-connection basis. If the Bavarian Well is incorporated into the consolidated system, then there would be no significant impact on the storage volume available.

Nevertheless, the consolidated system would have adequate capacity for more connections than the 434 combined existing approved connections. In addition, it is relatively easy to add additional source or storage capacity, whereas is would be a long and expensive process to increase water rights.

5.0 Existing System Assessment

As discussed elsewhere, the Bavarian Retreat Water System largely relies upon its original infrastructure. The well appears to be in good condition as do the hydropneumatic tanks; however, the system has no reservoir or treatment (other than disinfection). In addition, the distribution system is aging and is in need of replacement. Moreover, the source water has arsenic.

While the Bavarian Retreat system is not on the immediate horizon of becoming classified as a Community Group A water system, such classification is an eventual reality, and a matter of not if, but when. At the point of becoming a Community Group A Water System, treatment for arsenic (along with iron and manganese) and service meter installation will be required.

The remaining infrastructure analysis shall focus of the Paradise Estates Water System.

5.1 Wells

Drilled wells are generally long-lived. All four wells within the Paradise community appear to be in good condition; however, only two wells are in permanent operation. Well 2 could be returned to service relatively easily, but is not currently in use since well 1 has improved water quality and capacity. The following table summarizes the wells.

Table 8. Well Source Summary

Well	Source #	Depth to Open Int	Well Capacity	Pump Capacity	Well Installed
Well 1	S02	160	50?	50	1968?
Well 2	S01	142	25?	25	1967
Well 3			??	n/a	
Well 4	S03	144	100?	59	1992?
Bavarian	S01	60	200?	60	1974?

Multiple water well reports exist for these wells. Before consolidation, confirmation is needed in matching the original water well reports with the current wells.

5.2 Treatment

The Paradise Estates Water System has two treatment plants, one located near the Well 1/2 wellsite, and one located at the Well 4 well site. Both treatment plants utilize oxidation-filtration technology using chlorine as the oxidant, pyrolucite as the filtration media, and Atec brand filtration vessels. The following table summarized treatment:

Table 9. Water Treatment Plant Summary

Site	Capacity (gpm)	Filter Dia. (in)	Treatment rate (gpm/ft2)	Number of Vessels	Chlorine Residual (ppm,typ)	Run Time per Backwash	Fe/Mn inlet (mg/L)
Well 1/2	120	14	7.0	4	0.1-0.5	3 min	0.44/ND
Well 4	200	18	7.1	4	0.1-0.5	3 min	0.05/0.29

The treatment plants appear to be in very good condition with significant remaining useful life (greater than 10 years).

5.3 Existing Reservoirs

Paradise Estates has two, 60,000-gallon reservoirs for a total nominal volume of 120,000-gallons. The reservoirs are round, concrete reservoirs, approximately 26 ft in diameter and 25 feet tall.

The reservoirs were constructed in 2007. They are located at approximately 1,753 feet in elevation, which is approximately the mid-elevation location of the service area. The reservoirs are in excellent condition and likely have at least 100 years of remaining life.

5.4 Existing Booster Pumps

The existing booster pumps consist of a pre-manufactured sled of four-10 hp pumps. The booster pump station has a capacity for approximately 600 gpm at 50 psi. Some maintenance (pump motor replacement) has been necessary over the last few years. Fortunately, the booster station has a large degree of redundancy and can continue to provide full PHD flow even with one or two pumps out of service.

The booster station will need occasional ongoing replacement of motors, pumps and appurtenances as is the case with all booster pumps.

5.5 Existing Distribution System

The Paradise Estates Distribution System consists of primarily six and four inch C900 and schedule 80 pvc and 2 inch HDPE pipe with a short transmission main from the booster station of 8-inch C900 PVC pipe . The main trunks of the distribution system and many of the small branch lines have all been replaced in the last ten years. A few of the 2-inch dead-end lines remain to be replaced. These lines are being replaced a few at a time as funds allow. It is anticipated they will all be replaced within the next five years.

Because the Bavarian Retreat distribution system would loop with the Paradise Estates distribution system near their reservoirs, the hydraulic impact to the distribution system would be negligible. The looping benefit of the proposed Bavarian Retreat loop would improve the hydraulic characteristics of the water system over and above the additional demand incurred by the additional connections.

5.6 Backup Power

Backup power is located at both the well 1/2 well site and the well 4 site. The generators are summarized as follows:

Table 9. Back-up Power Summary

Generator	Size	Fuel	Operates	Installed
Well 1/2	20kW	Propane	Well 2, treatment lights and heat	2019
Well 4	50kW	Diesel	Well 4, treatment, boosters, lights and heat	2004

The back-up power provides the system with a high level of redundancy. The existing generators are capable of powering the consolidated system under ADD conditions.

6.0 System Connection Analysis

As discussed previously, physical connection of the water systems would be a very simple and straightforward process.

6.1 Pressure Zones

The entire system operates on one pressure zone with the highest connections experiencing approximately 32 psi and the lowest connections having a maximum pressure of approximately 55 psi. Headloss through the system is primarily driven by elevation.

The elevation of the Bavarian Retreat connections is in the mid-range of the Paradise Estates Service area, and are located very close to the reservoirs and booster station. Therefore, no additional pressure zone is needed to incorporate the Bavarian Retreat Water System.

6.2 Bavarian Retreat Well Options

There are three primary options regarding the Bavarian Retreat Well:

1. Dispose of the well either through decommissioning, or transferring to a private neighboring landowner.
2. Retain the well as an emergency only source.
3. Incorporate the well into the consolidated water system.

Decommissioning the well would cost approximately $5,000. Transferring ownership of the well to the neighboring parcel (who is willing to accept ownership) would cost approximately $500 in legal fees. This option removes any liability or hassle associated with the well, but also means losing any benefits associated with retaining the well.

Retaining the well as an emergency only source would have very little cost. As long as the well is physically disconnected from the water system and the wellhead is maintained such that it is sealed and in good condition, it can be retained as an emergency source. The primary expense would be property taxes associated with the lot upon which the well is situated, and maintaining the electrical connection, if such a connection to the emergency source was desired. The only benefit to such retention would be to have an additional potential point of withdrawal in the case of a major emergency. However, the Paradise Estates Water System already has four wells, one of which (well 2) is considered a back up source, and the other (well 3) is considered an emergency source (which has no pump or plumbing and would require considerable effort to activate); however, the Bavarian Retreat well is situated in a separate location.

The final option would be to incorporate the Bavarian Retreat Well into the Paradise Estates Water System. The primary disadvantage of this approach is cost. A transmission line from the Bavarian Retreat Well to the Well 4 treatment pumphouse would require approximately 1,000 feet of transmission main. Of that, the trenching for approximately 300 feet, including the road crossing would be included with the Bavarian Retreat distribution system replacement project. Cost for the transmission main is estimated as follows:

Table 10. Transmission Line Cost Estimate

Run	Length (ft)	Cost/ft	Cost
Well to Hofer Drive	100	50	5,000
Along Hofer and Cross Osborn	275	30	8,250
Along Osborn	350	80	28,000
Osborn to Pumphouse	400	50	20,000
Total	1,075		61,250

This assumes a source approval report and pump test would not be required, since the Bavarian Retreat Well is already an approved Group A source.

A treatment report and report describing the incorporation of the well into the Paradise Estates Water System would also be required. It is estimated that this would cost

approximately $10,000; although approximately $2,000 of that amount would be covered in the writing of this feasibility study and a Water System Plan. The Scope of Work based on the approach chosen by the community and confirmed with DOH will be necessary before an estimate could be finalized.

7.0 Water Rights Transfer

The Bavarian Retreat Well is located approximately 530 feet from Paradise Estates Well 4. It is completed to a similar depth as well 4 and has roughly similar water quality to the Paradise Estates Wells. It appears as though transferring the water right should be a relatively simple and straightforward process. Nevertheless, it would require a formal transfer process with the Washington State Department of Ecology and a report to be written by a licensed hydrogeologist. It is estimated that this process would cost approximately $15,000.

If this well is retained, changing the place of use rather than the point of withdrawal can be achieved through a water system plan, which is covered under the same grant as this feasibility study.

8.0 HOA Articles of Incorporation and By-Laws

Both communities are governed by Articles of Incorporation and By-Laws as non-profit corporations.

The primary physical asset of the Bavarian Retreat Association is the Water System. However, the association also includes covenants, rules and policies governing the improvements and use of members' property.

The Paradise Estates Association owns the water system as well as community properties and improvements thereupon (community park). As with Bavarian Retreat the Paradise Estates By-laws and Covenants govern the improvements and use of individual properties.

There are legally three potential paths for consolidating the water systems:

1) Each community could continue to maintain their separate homeowners' associations and create a 3rd non-profit corporation that would own and govern the water system. While this is technically possible, it would require a significant amount of "double effort" in the administrative functions of the associations.
2) The Bavarian Retreat Association could be dissolved and the members become full members of the Paradise Estates Association. It has been reported that it is very unlikely that the Bavarian Retreat membership would be interested in pursuing this option.
3) The Bavarian Retreat Association could be retained, turning over the water system only to the Paradise Estates Association, but retaining their independent community association. The Paradise Estates Association would need to amend their by-laws to create two classes of membership: full members and water system

members. The Bavarian Retreat property owners would be water system members only and have voting rights only in regards to business associated with the water system and water rates.

Therefore, if the communities approve consolidation, it is recommended that the Bavarian Retreat Association amend their by-laws to transfer responsibility of the water system to Paradise Estates, and the Paradise Estates Association Amend by-laws to create a "water system only" membership class, allowing Bavarian Retreat members to receive water and vote on water-related business only.

A lay-person's reading of the bylaws and articles of incorporation for both associations indicates that a simple majority of a quorum of members attending a general meeting, or a special meeting for said purpose is all that is required to amend the bylaws.

While this vote could be taken at any general meeting, for the sake of maintaining trust within the community, and for the sake of avoiding challenges to a decision, it is highly recommended that whether the vote is at a special meeting or general meeting, that the subject of consolidation is clearly communicated and aggressively advertised, so no one could say "No one told me; if I had known about this I would have . . ."

Bavarian Retreat also has a current obligation to serve water to one connection outside their original plat as long as the current owner continues to own that property. They currently pay all assessments and costs the same as all other lot owners. There are three potential resolutions to this situation:

1. The Bavarian Well could be deeded to the property owner outside the Bavarian plat, if the consolidated water system did not want to retain the Bavarian Well.
2. The outside property owner could become a member of the water system and continue to receive water; although, they would not be a member of either community association.
3. Service to this property could be terminated, and they would need to find an alternative source of water. A lay-person (non-attorney) reading of the Bavarian Retreat By-Laws would indicate that the Bavarian Retreat Association would have no obligation to continue providing water service to the neighboring parcel upon dissolution of the water system.

8.1 Mechanics

It is recommended that a simple vote for or against consolidation is held first. This vote would outline the terms and requirements of consolidation. It is further recommended the Bavarian Retreat community hold this vote first, and the Paradise Estates Community vote only if Bavarian Retreat votes in the affirmative. It is strongly recommended that an information meeting be held with each community with Northwest Water Systems, community leadership, and potentially the WSDOH attending to answer questions and provide clarifications.

If the votes are in the affirmative, then the actual changes to the by-laws can be drafted and subsequently voted upon. Obviously, the votes on the final acceptance of changes to the by-laws would need to be worded such that actual adoption of the amendments would be contingent upon acceptance of the amendments by the other party.

Because the SRF funding process can take a significant amount of time, upon approval of the consolidation, and concurrently with the by-law amendments, application for SRF loans/grants can be made to keep the process moving.

9.0 WSDOH Requirements

For the Bavarian Retreat Water System to consolidate with the Paradise Estates Water System, the following requirements must be met:

1. Water System Plan
2. Engineering Project Report (inter-tie, distribution replacement, and possibly Bavarian Well incorporation)

Much of the background for the Water System Plan is included in the development of this Feasibility Study; however, the final Water System Plan cannot be completed until it is known if consolidation will occur or not, since that will dictate the service area, capacity, and several of the narrative sections of the Water System Plan. In the event consolidation does not occur, a Small Water System Management Program would be a more appropriate planning document.

An engineering report must cover the inter-tie between the two systems, distribution system replacement within Bavarian Retreat, and any other upgrades required to facilitate consolidation as well as documenting what is to be done with the well, pumphouse, and associated equipment and lot associated with the Bavarian Retreat water system.

The Water System Plan (or the vast majority thereof) is included in the Feasibility Grant. The engineering for intertie and distribution replacement would be covered by Bavarian Retreat. The engineering for the Bavarian Well incorporation would benefit all and be covered by both communities.

10.0 Easements

All work necessary for the consolidation can be accomplished using existing easements and rights-of-way.

11.0 Required Upgrades to Paradise Estates For Consolidation

No Physical upgrades to the Paradise Estates water system were identified. The only upgrades identified would be updates to system by-laws. If the Bavarian Retreat well is not incorporated, water rights would need to be transferred to the Paradise Estates Water System.

12.0 Cost Estimates

The following are rough cost estimates for the various options discussed in this report. It should be noted that current shortages of PVC and construction-related inflation have made cost estimating for water main replacements very difficult.

12.1 Cost Distribution

The primary cost of the consolidation project would be the responsibility of the Bavarian Retreat lot owners since the majority of the expense that is required is a result of the need to replace the Bavarian Retreat distribution system (water mains, service meters, appurtenances) within the Bavarian Retreat service area. However, it should also be noted that the need to replace these water mains and service connections is an upcoming need, regardless of whether or not the consolidation project ever takes place.

However, transferring water rights and/or connecting the Bavarian Retreat well to the Paradise Estates Water System are improvements that are a benefit to both Paradise Estates and Bavarian Village. Therefore, the costs associated with incorporating the Bavarian Retreat well into the Paradise Estates water system are proposed to be shared by both communities.

Most options in favor of consolidation assume a State Revolving Fund loan/grant combination. This loan is repaid over a 20-year loan term. Therefore, the increases to water rates are proposed over this 20 year period only and are not permanent additional costs. A typical State Revolving Fund (SRF) loan charges 1.5% interest over a 20 year loan term.

12.2 Do Nothing Alternative

The first cost estimate is the "do nothing" alternative. In order to act on this alternative, either or both communities would vote against consolidation. This alternative would impact Paradise Estates very little, if at all. However, whether or not consolidation occurs, Bavarian Retreat will need to replace their distribution system. In addition, they are required to install a source meter.

Eventually, Bavarian Retreat will also be required to install service meters and arsenic treatment. This will be at the point when there are 15 or more full-time residences, or when there are 25 or more people living at the system 180 or more days per year. Therefore, the "do nothing" alternative means only doing nothing in regards to consolidation. Improvements and maintenance to the Bavarian Village water system will need to be completed either way.

The difference between distribution system replacement with and without consolidation is that without consolidation crossing Osborn Rd twice would not be required; however, an additional ~100 feet of main replacement to the well would be necessary. A project to replace the Bavarian Retreat distribution system without consolidation would have the following approximate costs:

Table 11. Non-Consolidation Bavarian Watermain Replacement, privately funded

Parameter	Number/unit	Cost
Distribution Engineering Report	1	$8,000
County Permits, WSDOH fees	1	$5,000
Construction of Inter-tie and new Waterline	1,700 ft	$85,000
Service Laterals same side rd	10	$10,000
Service Laterals opposite site rd	9	$31,500
Valves	2	$5,000
Road Crossing	2	$10,000
Construction Oversight (assumes significant oversite provided by community volunteers)		$8,000
Subtotal		$162,500
20% Contingency		$32,500
Source Meter		$1,000
	Total	$196,000

While this project does not need to be completed immediately, it is likely that waterline failures will become more expensive to repair than replacing the distribution system within the next 10 years. There are not now, nor are there likely in the future going to be grants for distribution system replacements.

The system will become a Community Group A water system when there are 15 or more full-time homes or 25 or more people living on the system 180 days/yr or more. At this point, the system will be required to provide treatment for arsenic. It is estimated that treatment would need to be supplied at approximately 60 gpm. This would incur the following costs:

Table 12. Non-Consolidation Bavarian Treatment Plant, privately funded

Parameter	Number/unit	Cost
Treatment Plant Engineering Report	1	$12,000
WSDOH fees	1	$1,000
Construction of the Treatment Plant	1	$90,000
Pumphouse addition	1	$10,000
Subtotal		$113,000
20% Contingency		$22,600
	Total	$135,600

These costs are in today's dollars, but would be incurred sometime in the more distant future. Based on past scenarios, it is possible a partial grant might be available. Arsenic treatment projects do score high however, when there is a competitive governmental loan situation. Nevertheless, as with other projects, in general, the project cost would increase by 25%-50% if the project were publicly funded.

12.3 Consolidation with Private Funding

The second alternative would be if the communities were to privately fund a consolidation project. In that case project costs are estimated as follows:

Table 13. Privately Funded Consolidation

Parameter	Number/unit	Cost
Water System Plan	1	Covered
Consolidation Engineering Report	1	$9,000
Water Right Transfer*	1	$15,000
Permits, WSDOH fees	1	$5,000
Construction of Inter-tie and new Waterline	1,600 ft	$80,000
Service Laterals same side rd	10	$10,000
Service Laterals opposite site rd	9	$31,500
Valves	2	$5,000
Road Crossing	4	$20,000
Construction Oversight (assumes community volunteers)	1	$8,000
Legal Costs	1	$4,000
	Subtotal	$178,500
	20% Contingency	$35,700
	Total	$214,200

*If the Bavarian Well is incorporated into the Paradise Estates Water System, no water right transfer is necessary.

If the Bavarian Well was incorporated into the Paradise Estates Water System, the cost of that project, if privately funded, would be approximately as follows:

Table 14. Bavarian Well Incorporation, privately funded

Parameter	Number/unit	Cost
Bavarian Well Transmission and Incorporation Engineering Report	1	$10,000
WSDOH fees	1	$1,000
Construction of the Transmission Line	1	$45,000
Treatment Modifications	1	$ 2,000
Subtotal		$ 58,000
20% Contingency		$11,600
	Total	$69,600
Engineering Covered in Grant		-$2,000
No need to transfer water right		-$15,000
	Total	$52,600

Assuming the Bavarian Retreat Well is incorporated into the Paradise Estates water system, we add the totals of both tables to achieve a total project cost of $266,800.

12.4 Consolidation with State Revolving Fund (SRF) Funding

The final alternative would be if the communities were to fund the consolidation project with a State Revolving Fund Loan and (likely) grant. Historically, consolidation construction projects have been eligible for 50% loan forgiveness, (grant). While a loan-grant combination spreads out the cost of the project over time and provides grant funds to cover part of the cost, the project as a whole is more expensive because of public funding requirements.

It appears as though in the future (starting in 2022) there will be more SRF funding available than has been available in the past, even though the WSDOH has not yet received guidance as to how those funds are to be distributed. Therefore, the project costs are anticipated as follows with SRF Funding:

Table 15. Consolidation, SRF Funded

Parameter	Number/unit	Cost
Water System Plan	1	Covered
SRF Funding Requirements (environmental, Sec 105, etc)	1	$18,000
Consolidation Engineering Report	1	$9,000
Water Right Transfer*	1	$15,000
Permits, WSDOH fees	1	$5,000
Public Bid Documents	1	$10,000
Bid Oversight and Contracting		$5,000
Construction of Inter-tie and new Waterline	1,600 ft	$100,000
Service Laterals same side rd	10	$15,000
Service Laterals opposite site rd	9	$36,000
Valves	2	$6,000
Road Crossing	4	$25,000
Construction Oversight (assumes community volunteers)		$10,000
SRF Auditing and Reporting		$5,000
Legal		$4,000
Subtotal		$263,000
20% Contingency		$52,600
Total		$315,600
Total with 50% Loan Forgiveness		$157,800

*If the Bavarian Well is incorporated into the Paradise Estates Water System, no water right transfer is necessary.

If the Bavarian Well was incorporated into the Paradise Estates Water System, the cost of that project, if publicly funded with an SRF loan and 50% grant would be approximately as follows:

Table 16. Bavarian Well Incorporation, SRF Funded

Parameter	Number/unit	Cost
Bavarian Well Transmission and Incorporation Engineering Report	1	$10,000
WSDOH fees	1	$1,000
Construction of the Transmission Line	1	$61,000
Treatment Modifications	1	$ 2,500
Subtotal		$ 74,500
20% Contingency		$14,900
	Total	$89,400
Engineering Covered in Grant		-$2,000
No need to transfer water right		-$15,000
	Total	$72,400
Total with 50% Loan Forgiveness		$36,200

As before, if we assume that the Bavarian Well is incorporated, the totals of Tables 15 and 16 are added for a total project cost of $388,000. If we assume 50% loan forgiveness, we find a total cost of $194,000.

12.5 Distribution of Project Costs

The Paradise Estates Community has made it clear that it will not subsidize the consolidation of the Bavarian Retreat Community. Therefore, all inter-tie and distribution system replacement costs must be paid for by the members of the Bavarian Retreat Community.

However, incorporating the Bavarian Retreat Well into the consolidated system brings significant value to the members of the Paradise Estates community as well as Bavarian Retreat members. Therefore, the well incorporation costs should be shared equally by all. From Table 16 above, assuming 50% loan forgiveness, the Bavarian Well Incorporation project would cost the communities approximately $36,200, divided by 434 lots is just $83.41 per lot. If this amount is financed over 20 years at 1.5% interest (typical SRF terms), it would only add $0.40 per month per lot ($4.80/yr). At such a low price it is assumed the communities would choose this option.

The remaining project amount of $155,400 (after 50% loan forgiveness) would need to be paid for by the Bavarian Retreat Community. With 44 lots and 1.5% interest over 20 years, this would require a sur-charge of $17.31/month ($208/yr) on their water bill.

Alternatively, a privately funded distribution system project would cost the community approximately $196,000, or $4,455 per lot for 44 lots. Or with a loan program, the extra loan requirements would increase the cost approximately 40% to $275,000, which with a SRF loan at 1.5% interest for 20 years would cost approximately $30/month ($360/yr) additional on the water bill. With a USDA rural development loan, the terms would be approximately 3.5% interest over 40 years, or $24.21 per month ($290/yr) extra on the water bill.

12.6 Operational Costs

It is not anticipated that there would be a significant change in operational costs for the Paradise Estates Community. However, the following operational costs would be reduced for the Bavarian Retreat community because the following expenses would either be spread out over 434 customers instead of just 44 customers, or would no longer be needed because these are already fixed expenses covered in the existing Paradise Estates budget:

Table 17. Bavarian Retreat Operational Cost Savings with Consolidation

Parameter	Savings per month
Certified Operator	$500
Coliform Sample	$25
Nitrate Sample	$3
Sanitary Survey	$8
Operating Permit	$12
Electrical Meter Base fee	$15
Other (billing efficiency, taxes, etc)	$15
Total	$578
Total Savings per month per lot	$13.14
Total Savings per year per lot	$157.64

Paradise Estates operating costs are assumed to be approximately the same with or without consolidation. All fixed costs would be shared equally be a larger number of connections, which would mean that consolidation would decrease all fixed operational costs for Paradise Estates, which are a majority of the costs. All "unit costs" would be shared equally such that there would be no change in operational costs unit costs. For example, the extra electricity caused by additional connections is covered in the normal rates paid by those connections. Assuming the Bavarian Estates well is incorporated into the consolidated system, there would be some small additional operating costs associated with that well; however, that cost comes with benefits of another source and water rights as well as being largely, if not entirely offset by the reduction in fixed costs.

13.0 Conclusions

Consolidation of the Bavarian Retreat water system with the Paradise Estates Water System has the following advantages for Bavarian Retreat:

1. Improved water quality
2. Improved reliability
3. The opportunity to have significant infrastructure replacement paid for partially with grant money
4. Operational savings

The primary disadvantage is that the community will need to spend the money immediately instead of seeing how many more years their distribution system replacement project can be delayed (if it can be delayed much at all).

The primary benefit to the Paradise Estates Water System is that adding the Bavarian Retreat Water Rights to their system will better secure the future of their water rights. This is especially valuable if community usage trends continue to increase in the future, and attractive since new water rights are very difficult and expensive to obtain, if they can be obtained at all. A secondary benefit is that adding 44 lots to the water system increases the customer base among which all costs can be shared.

There are no significant disadvantages to Paradise Estates in consolidating Bavarian Retreat into their water system.

Consolidation would cost Paradise Estates residents approximately $0.40 per month on their water bill; however, this is a small cost to pay for the additional water rights security provided by the consolidation.

If the communities choose to move forward, it is likely the construction projects will take place a year or so in the future. Inflation and product availability have hit the waterworks industry hard since not only have the normal supply chain logistics and governmental COVID response policies induced inflation and availability challenges, two of the three PVC resin plants in the US have been out of operation for extended periods of time. This has created a scarcity of pipe, as well as a "trickle down" effect with related products. Therefore, the following table presents not only an estimated "todays cost", but adds an inflation multiplier of 20% to try and cover some to the unpredictable risk that may be encountered in the future.

Parameter	$/mo/lot	$/mo/lot 20% inflation	Who Pays
Consolidation Project (distribution replacement)	$17.31	$20.77	Bavarian
Bavarian Retreat Well Incorporation	$ 0.40	$ 0.48	Everyone
Operational Cost Savings	($13.14)	($13.14)	Bavarian
Net Cost of Consolidation	$ 4.57	$ 8.04	Bavarian

It should also be noted that the additional consolidation project expenses are temporary costs to be paid by a surcharge on the water bills over the next 20 years, whereas the operational cost savings will last indefinitely.

In addition, the Operational Cost Savings are relative to the "do nothing" alternative. They are a relative need to not increase the existing rates, not a reduction in the consolidated water system rate. Bavarian Retreat members should anticipate a $17.71-$21.91 surcharge on their water bill over the next 20 years. For simplicity, we will call this a $20 surcharge.

Paradise Estates water bills could be increased by $0.48/ month (probably $0.50/month to round it); however, this small amount could probably also be absorbed in their current budget, or incorporated in the next regular rate increase. Increasing rates a little bit each year is generally a better practice than infrequent, larger rate increases.

Bavarian Retreat would be charged the Paradise Estates rates of $23/mo per lot ($276/year), plus a ~$20/month ($240/yr) surcharge. For empty and low use lots, this results in a $43/month ($516/yr) total water bill, or a net increase of $13/month ($156/yr). Lots that use more than 50 gallons per day on average would also have a usage charge; however, Paradise Estates has relatively low water consumption rates. The average full-time occupied home would have an additional $2/month from metered usage.

It appears that consolidation would be a significant advantage to all parties involved. Furthermore, it appears as though consolidation, while it has a cost, is affordable and is long-term, the least expensive alternative.

14.0 Report Preparation

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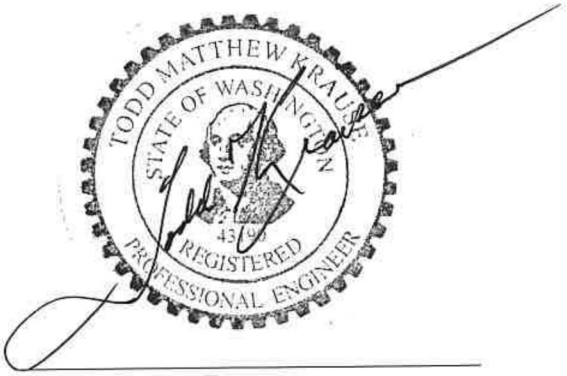

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