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MEMORANDUM

TO: Dave Lohman, Manager, Blanchard Edison Water Association

FROM: Curt Schoenfelder, PE, and Ben Gibson, PE, Wilson Engineering

SUBJECT Blanchard Edison Water Association – System Capacity Analysis

JOB NO.: 2020-131

DATE: January 19, 2021

The purpose of this memo is to summarize the current capacity of the Blanchard Edison Water Association (BEWA) water system in order to determine the feasibility of a proposed system expansion to serve additional customers.

System Demands

Summary of Previous Analyses

A Capacity Analysis for the BEWA system was performed in February, 2006 by Semrau Engineering and Surveying and was partially re-evaluated by Semrau in 2008 as part of a hydraulic modeling effort. The system ERUs and demands (ADD,MDD, and PHD) were updated slightly. The system information presented in each of these reports is summarized in Table 1.

Table 1 – Historical System Data

Report	Memberships	ERUs	ADD (gpd/ERU)	MDD (gpd/ERU)	Peaking Factor
2006 - Semrau	439	759	205	400	1.95
2008 - Semrau	445	694	209	424	2.03

The hydraulic model was updated in 2017 by Wilson Engineering, but this effort relied on the system data from the 2008 report and only updated infrastructure improvements including storage tanks and distribution piping.

In 2009 the BEWA replaced their single 200,000 gallon storage tank with two new storage tanks which provide approximately 253,000 gallons of storage volume. Additionally, the number of service connections and water use has changed since the 2006 and 2008 reports were prepared. Therefore, in order to evaluate the current system capacity, updated system ERUs and demands are required and are included in the following sections of this memo.

Average Day Demand (ADD) and ERUs

The BEWA has three classes of members: single-family residential, multifamily residential, and non-residential. According to the BEWA, the total number of connections as of December, 2020 was 464. Of these, approximately 12 connections are considered to be inactive. This is an increase from the total

number of connections in 2008, which was reported at 445. This represents an annual growth rate of approximately 0.35%, which is quite low but typical of that experienced in the system.

All connections are metered, and water usage data was reviewed for a 4-year period, from 2017 through 2020. This data was analyzed to determine the number of ERUs for each member type.

Single-Family Residential Memberships

At the end of 2020, there were 380 active single-family residential connections, and 12 inactive single-family residential connections. An ERU is defined to be equal to an average single-family residence. As such, the active single-family residential memberships that are served by the water system represent 380 ERUs.

The customer meter data showed that not all of the memberships represented an average single-family residence. Of the 380 active single-family residential connections, 34 were determined to be non-representative for various reasons (vacant, known leaks, etc.) during the period from 2017 through 2020. Disregarding these non-representative memberships, the ADD for single-family residential connections for this period was found to be 167 gpd/ERU. This is about 19% less than in the previous analyses.

Multifamily Residential Memberships

Multifamily residential memberships consist of duplexes, triplexes, and quadraplexes, along with single-family residences that have accessory dwelling units (ADUs) such as an apartment or an additional trailer home. At the end of 2020 there were 28 active multifamily memberships (consisting of 58 units). Of these, 26 connections (consisting of 52 units) were determined to have representative water usage data. Based on the 26 active memberships with representative data, the ADD was 164 gpd per unit. This is approximately 98% of the single-family residential connection ADD. For this analysis, a multifamily residential unit is considered equal to one ERU.

Therefore, the number of ERUs for the multifamily memberships can be calculated from the following equation:

Multifamily Connections = (58 units) x (1) = 58 ERUs

Non-residential Memberships

Non-residential memberships within the BEWA typically consist of commercial and public facilities such as farms, an elementary school, a post office, and restaurant type establishments. At the end of 2020 there were 44 active non-residential memberships. All 44 non-residential memberships were determined to have representative data. Based on this, the ADD was 1,418 gpd per membership. This is approximately 849% of the single-family ADD.

The number of ERUs for the non-residential memberships can be calculated from the following equation:

Non-residential connections = (44 units) x (8.49) = 374 ERUs

It is worth noting that seven connections (agricultural) represent approximately 304 ERUs, with the largest two connections (dairy farms) representing 220 ERUs. Large agricultural operations, and particularly dairy farms, typically have operational characteristics that may reduce peak demands on the system, primarily: a) having peaks in water use during times that do not intersect with peak residential water use, and b) filling their own tanks at a lower constant rate all day and using their own boosters to meet their peak demands (thus reducing peak effects on the system).

Summary

Based on the 2017-2020 water usage data, the total number of ERUs for the system is 812 active ERUs plus 12 inactive ERUs for a total of 824 ERUs. The ADD based on metered consumption data as noted above is 167 gpd/ERU (for 812 active ERU), however this does not include distribution system leakage (DSL). The system's 2019 reported 3-yr annual average DSL is 4.1%, which has shown a decreasing trend as water main improvement projects are completed. The ADD including DSL is calculated as:

167 gpd/ERU x 1.041 (leakage rate) = 174 gpd/ERU.

This matches very closely to the source master meter data which yields ADD = 171 gpd/ERU (average of 2017-2020). **ADD = 175 gpd/ERU** is used for determining the system capacity in this analysis.

Maximum Day Demand

The BEWA maximum day demand was determined by evaluating the daily master meter data from 2017 to 2020 for 812 active ERUs. The average day demand and maximum day demands for each year are summarized in Table 2.

Table 2 – Summary of MDD, years 2017-2020

Year	Date of Maximum	Maximum Daily Demand (gallons)	MDD (gpd/ERU)
2017	August 8	331,176	408
2018	June 20	317,205	391
2019	July 27	232,410	286
2020	August 18	248,819	306

The average MDD for 2017 through 2020 is MDD = 348 gpd/ERU. For purposes of this analysis, the largest of the four years evaluated is used and rounded up slightly: **MDD = 410 gpd/ERU**. The ratios of MDD to ADD is (410 gpd/ERU) / (175 gpd/ERU) = 2.34. This is higher than the 2006 and 2008 reported ratios of 1.95 and 2.03, respectively.

Peak Hour Demand

The peak hour demand, for 824 ERUs, can be calculated from Equation 3-1 of the *Water System Design Manual*:

$$PHD = (ERU_{MDD}/1440) * (\mathrm{C} * \mathrm{N} + \mathrm{F}) + 18$$

$$PHD = \left(\frac{410}{1440}\right) * (1.6 * 824 + 225) + 18$$

$$PHD = 457\ gpm$$

System Capacity

Storage Tank Capacity

Using the updated system 824 ERUs, ADD = 175 gpd/ERU and MDD = 410 gpd/ERU, the maximum number of ERUs that the existing storage tank can support is 971. The storage component of the BEWA system has an excess capacity of 147 ERUs. Calculations for storage capacity are shown in the attached BEWA Storage Table for reference.

Well Pump Capacity

The well pumps are capable of supplying a maximum rate of 260 gpm (with any single well out of service) x 1440 minutes/day = 374,400 gpd, less 4,500 gpd for treatment backwash = 369,900 gpd. The number of ERUs represented by the well source capacity of 369,900 gpd is calculated as follows:

$$N_{wells} = \frac{well\ capacity}{MDD}$$

$$= \frac{369{,}900\ gpd}{410\ \frac{gpd}{ERU}}$$

$$N_{wells} = 902\ ERUs$$

The wells currently have an excess capacity of 78 ERUs.

Water Rights Capacity

Annual
The BEWA well field has an annual withdrawal allowance of 216 acre-ft, or 70,379,000 gallons. The number of ERUs that can be supported by the water rights can be calculated as follows:

$$N_{water\ rights,annual} = \frac{annual\ withdrawal\ limit}{ADD * 365}$$

$$= \frac{70{,}379{,}000\ gallons}{175\ \frac{gpd}{ERU} * 365}$$

$$= 1{,}101\ ERUs$$

The BEWA's water rights have an excess capacity of 277 ERUs from an annual allowance perspective.

Instantaneous
The BEWA well field has an instantaneous water right of 455 gpm. Based on the MDD of 410 gpd/ERU the instantaneous water right can supply the following number of ERUs:

$$N_{water\ rights,instantaneous} = \frac{instantaneous\ withdrawal\ limit * 1440\ min/day}{MDD}$$

$$= \frac{455\ gpm * 1440\ min/day}{410\ gpd/ERU}$$

$$= 1{,}598\ ERUs$$

The BEWA's water rights have an excess capacity of 774 ERUs from an instantaneous withdrawal limit perspective.

Treatment System Capacity

The iron and manganese treatment system has a maximum capacity of approximately 270 gpm. The number of ERUs that can be supported by the treatment system can be calculated as follows:

$$N_{treatment} = \frac{treatment\ capacity * 24 * 60}{MDD}$$

$$= \frac{270\ gpm * 24 * 60}{410\ \frac{gpd}{ERU}}$$

$$= 948\ ERUs$$

The treatment system has an excess capacity of 124 ERUs.

Distribution System Capacity

Although BEWA is not a fire rated water system due to the predominant use of 4-inch and 6-inch diameter distribution pipe, BEWA continues to improve the ability to provide fire flow throughout the system by upgrading distribution pipes to at least 8-inch diameter as funding allows.

Capacity of the distribution system is evaluated based on the ability to provide the peak hour demand (PHD) with a minimum service pressure of 30 psi. Previous modeling efforts performed by Semrau in 2006 and 2008 identify the distribution system having a capacity of 2,760 ERUs.

In 2017, Wilson Engineering updated the model with improvements installed after the previous modeling efforts, including replacing the storage tanks with larger capacity and higher elevation, and several water main improvements increasing the hydraulic capacity. The 2017 model analysis showed PHD condition pressures well above the minimum 30 psi. It also showed significant improvement to the number of hydrants able to provide the fire flow goal of 500 gpm (while maintaining 20 psi minimum

throughout the system). In the 2008 analysis there were 6 of 23 hydrants able to provide at least 500 gpm. In the 2017 analysis there were 18 of 25 hydrants able to provide at least 500 gpm.

Because of the improvements to the distribution system since 2008, as supported by the improvements to fire flow capabilities as shown in the 2017 model update, the distribution system capacity is taken to be at least 2,760 ERUs.

Summary

Table 3 shows the current capacity for each component of the BEWA water system, as well as the current connection and demand data. The limiting component is the capacity of the well pumps.

Table 3 – BEWA Demand and Capacity Summary

Water System Demand Data				
Average Day Demand	175 gpd/ERU			
Maximum Day Demand	410 gpd/ERU			
Peak Hour Demand	457 gpm			
Water System Service Connections and ERUs				
Membership Type	**Number of Connections**	**Equivalent Residential Units**	**Average Day Demand**	**Maximum Day Demand**
Single Family Residential	380 active + 12 inactive	392	68,600 gpd	160,720 gpd
Multifamily Residential	28	58	10,150 gpd	23,780 gpd
Non-residential	44	374	65,450 gpd	153,340 gpd
Totals	464	824	144,200 gpd	337,840 gpd
Specific System Capacity in Equivalent Residential Units				
Water System Component		**Current ERUs served**	**Maximum ERU Capacity**	**Excess Capacity**
Water Rights Capacity (annual/instantaneous)		824	1,101 / 1,598	277 / 774
Well Pumps Capacity		824	902	78
Treatment Capacity		824	948	124
Capacity Related Storage		824	971	147
Distribution System Capacity		824	>2,760	>1,936

Proposed Service Area Expansion

The BEWA has been approached by a group of property owners (developers) who have requested water service to their parcels. BEWA requested Wilson Engineering perform a hydraulic analysis to evaluate the feasibility of their request and water main extension alternatives. The findings of this hydraulic analysis were summarized in a technical memorandum, which is attached to this memo for reference

(*Flinn Rd Extension – Hydraulic Analysis*). The hydraulic analysis considered three scenarios for build-out flow projections for the expansion area, and ultimately determined that a "moderate" flow projection represented a reasonable forecast that would meet the BEWA's planning objectives. In short, this scenario consists of updating the existing main and extending the main to support a build-out of 19 ERUs. The proposed service area expansion to support the new group of parcels along the main extension represents 9 ERUs (of the 19 ERU total), one of which is already served by BEWA. The service area expansion is currently within the Colony Mountain Community Club (CMCC) service area. CMCC has agreed to relinquish the service area to the BEWA, which consists of five parcels. See the attached BEWA-CMCC Relinquishment Letter Agreement.

Based on the findings of this technical memorandum, which shows a minimum excess system capacity of 78 ERUs, the proposal to provide service to the additional 9 ERUs in the expanded service area is acceptable from a capacity standpoint.

Attachments:

- BEWA Storage Table
- *Flinn Road Extension – Hydraulic Analysis*, Wilson Engineering, June, 2020.
- BEWA-CCMC Service Area Relinquishment Letter Agreement

Blanchard Edison Water Association
Storage Table
1/19/2021

Year	Equivalent Residence Units (ERU)*	Maximum Daily Demand (gpd per ERU)	Maximum Daily Demand (gpd)	Maximum Daily Demand (gpm)	Peak Hourly Demand (gpm)	Operational Storage (gal), *1.3-ft tank ht*	Equalizing Storage Required (gal)	Standby Storage Criteria #1	Standby Storage Criteria #2	Standby Storage Required (gal), Max. Criteria #1 or #2	Fire Storage (gal)	Dead Storage (gal) (6" silt stop)	Total Storage Required (gal)	Total Storage Available (gal)	
2021	824	410	337,840	235	457	13,746	29,616	164,800	0	164,800	60,000	5,287	213,449	253,000	
2022	840	410	344,400	239	465	13,746	30,709	168,000	0	168,000	60,000	5,287	217,742	253,000	
2023	857	410	351,370	244	472	13,746	31,871	171,400	0	171,400	60,000	5,287	222,304	253,000	
2024	874	410	358,340	249	480	13,746	33,033	174,800	0	174,800	60,000	5,287	226,866	253,000	
2025	892	410	365,720	254	488	13,746	34,263	178,400	0	178,400	60,000	5,287	231,696	253,000	
2026	910	410	373,100	259	497	13,746	35,493	182,000	0	182,000	60,000	5,287	236,526	253,000	
2027	928	410	380,480	264	505	13,746	36,723	185,600	0	185,600	60,000	5,287	241,356	253,000	
2028	947	410	388,270	270	513	13,746	38,021	189,400	0	189,400	60,000	5,287	246,454	253,000	
2029	965	410	395,650	275	522	13,746	39,251	193,000	0	193,000	60,000	5,287	251,284	253,000	Interpolate
2030	985	410	403,850	280	531	13,746	40,618	197,000	0	197,000	60,000	5,287	256,651	253,000	971
2031	1,004	410	411,640	286	539	13,746	41,916	200,800	0	200,800	60,000	5,287	261,749	253,000	
2032	1,025	410	420,250	292	549	13,746	43,351	205,000	0	205,000	60,000	5,287	267,384	253,000	
2033	1,045	410	428,450	298	558	13,746	44,718	209,000	0	209,000	60,000	5,287	272,751	253,000	
2034	1,066	410	437,060	304	568	13,746	46,153	213,200	0	213,200	60,000	5,287	278,386	253,000	
2035	1,087	410	445,670	309	577	13,746	47,588	217,400	6,050	217,400	60,000	5,287	284,021	253,000	
2036	1,109	410	454,690	316	587	13,746	49,091	221,800	13,750	221,800	60,000	5,287	289,924	253,000	
2037	1,131	410	463,710	322	597	13,746	50,594	226,200	21,450	226,200	60,000	5,287	295,827	253,000	
2038	1,154	410	473,140	329	608	13,746	52,166	230,800	29,500	230,800	60,000	5,287	301,999	253,000	
2039	1,177	410	482,570	335	618	13,746	53,738	235,400	37,550	235,400	60,000	5,287	308,171	253,000	
2040	1,200	410	492,000	342	629	13,746	55,309	240,000	45,600	240,000	60,000	5,287	314,342	253,000	
2041	1,224	410	501,840	349	640	13,746	56,949	244,800	54,000	244,800	60,000	5,287	320,782	253,000	
2042	1,249	410	512,090	356	651	13,746	58,658	249,800	62,750	249,800	60,000	5,287	327,491	253,000	
2043	1,274	410	522,340	363	662	13,746	60,366	254,800	71,500	254,800	60,000	5,287	334,199	253,000	
2044	1,299	410	532,590	370	674	13,746	62,074	259,800	80,250	259,800	60,000	5,287	340,907	253,000	
2045	1,325	410	543,250	377	686	13,746	63,851	265,000	89,350	265,000	60,000	5,287	347,884	253,000	
2046	1,352	410	554,320	385	698	13,746	30,709	270,400	98,800	270,400	60,000	5,287	320,142	253,000	

Formulas & Definitions

Peak Hourly Demand (PHD)

N	C	F
0	3	0
51	2.5	25
101	2	75
251	1.8	125
501	1.6	225

PHD=MDD/1440[C*N+F]+18

Average Daily Demand (ADD) & Maximum Daily Demand (MDD)

average of 2017-2020	ADD =	138,601	gpd for	812	ERU's	
	ADD =	171	gpd per ERU	USE	**175**	gpd per ERU
2017	MDD =	331,176	gpd for	812	ERU's	
	MDD =	408	gpd per ERU	USE	**410**	gpd per ERU

Source

Source	Status	Q, gpm	Q, gpd	
Well 1	Active	75	108,000	
Well 3	Active	250	360,000	
Well 4	Active	130	187,200	
Well 5	Active	180	259,200	
TOTAL		400	576,000	Wellfield Capacity per WFI
TOTAL		260	374,400	Operating Capacity of 1/3 & 4/5 combinations

Standby Storage (SB)

Criteria #1: ***If SB<0 then use 200 gallons per ERU minimum***

Criteria #2: ***SB=(2 days)*(ADD)(N)-1,440(Qtot-Qmax)***

N=# ERUs
Qtot=Sum of all sources 400 gpm
Qmax=rate of largest source 140 gpm **represents supply of 260 gpm with any well out

Maximum Capacity Based on Water Rights

Instant.= 455.0 gpm, Capacity= 1598 ERU's
Annual= 216.0 ac-ft Capacity= 1101 ERU's

Fire Suppression Storage (FSS)

FSS = Fire Flow Rate (500 gpm)*Duration (120 min.)

Equalizing Storage (ESS)

ES=(PHD-Q)(150 min)
where Q is the Total Flow rate of all active sources = 260 gpm

*Reflects 2.0% growth rate in accordance with Skagit County Coordinated Water System Plan (yr-2000) utilized 2.0% medium projection growth rate. Note this is much higher than the actual growth rate typical of BEWA.

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MEMORANDUM

TO: Blanchard Edison Water Association

David Lohman, Manager

FROM: Curt Schoenfelder, PE, and Melanie Mankamyer, PE, Wilson Engineering

SUBJECT Flinn Road Extension – Hydraulic Analysis

JOB NO.: 2017-028

DATE: June 26, 2020

This memo presents the analysis and other considerations for the recent developer inquiry regarding the Flinn Road Developer Extension. The analysis presents three scenarios for build out flow projections. The moderate flow projection is ultimately determined to be the scenario that the Blanchard Edison Water Association (BEWA) Board believes represents a reasonable forecast that meets planning objectives.

Service Areas

For the following discussion of service areas, reference Attachment 1 Area Map.

Expanded Area A

The expanded area A served by the potential main extension is zoned Rural Reserve (RRv) and is about 70 acres (this includes the upper 7.5 acres of Gerrits property that is within the existing BEWA Retail Service Area). Skagit County Code 14.16.030 Table indicates densities of 1/10 acres, but 2/10 acres is possible with CaRD (Conservation and Reserve Development) and impervious/stormwater design considerations. Also one (1) auxiliary dwelling unit (ADU) per dwelling is possible in this area. The maximum build-out for expanded area A is:

(70 acres) / (2 units/10 acres) = 14 units PLUS 14 ADUs = 28 units

If we conservatively assume each ADU is an equivalent residential unit (ERU), the total is 28 ERUs.

Expanded Area B

The expanded area B, served by the Flinn Road main, is zoned mostly RRv at about 30 acres, and about 10 acres zoned Agricultural Natural Resource Lands (Ag-NRL). Per the above referenced code table the density of Ag-NRL is 1/40 acres, and ADU's are possible here. Maximum build-out for expanded area B:

RRv: (30 acres) / (2 units/10 acres) = 6 units PLUS 6 ADUs = 12 units
Ag-NRL: (10 acres) / (1 unit/40 acres) = 0.25 unit, say 1 unit PLUS 1 ADU = 2 units

Again, if we assume each ADU is an ERU, the total is 14 ERUs.

Existing Service Area (along Flinn Rd)
The existing service area along this main is zoned Agricultural Natural Resource Lands (Ag-NRL) and is about 20 acres. Per the above referenced code table the density is 1/40 acres with ADU's possible. The maximum build out is:

(20 acres) / (1 unit/40 acres) = 0.5 units, say 1 unit PLUS 1 ADU = 2 units
2 units per existing lots (2) = 2 units x 2 lots = 4 units

Again, if we assume each ADU is one ERU, the total is 4 ERUs.

Total Maximum Build-Out
The total maximum build-out for the developer extension analysis is:

28 (expanded area A) + 14 (expanded area B) + 4 (existing area) = 46 ERU.

Analysis

Scenario 1, System Booster Pump & Maximum Build Out
This scenario assumes a typical design where each service in the extension was within the same pressure zone as the distribution main and served as a group/whole. This flow would be appropriate if the extension areas were supplied by a single booster station.

For 46 ERU at the water system's MDD = 424 gpd/ERU, say 450 gpd/ERU, the Peak Hour Demand (PHD) flow rate based on the DOH Water System Design Manual equation 3-1 is 61.1 gpm. Rounding up, the distribution mains need to be able to supply 65 gpm for this Scenario.

Scenario 2, Residential Booster Pumps & Maximum Build Out
As described in the Flinn Road Water Supply Issue Planning Memo by Semrau Engineering & Surveying dated February 19, 2014, it is possible that each service would have their own private booster stations. These individual booster stations would likely be sized for 1 or 2 ERU's at around 20 gpm each, assuming no flow limitations at the service connection. If we assume that there are ultimately 21 booster stations (assuming booster "sharing" of 1 per lot with an ADU) in both expanded areas (14 in expanded area A and 7 in expanded area B) the resulting PHD is:

21 booster stations x 20 gpm/each = 420 gpm
PLUS
22 gpm (4 ERU along Flinn (DOH Equation 3-1) = 420 gpm + 22 gpm = 442 gpm

Rounding up, the distribution mains need to be able to supply 450 gpm for this Scenario.

Scenario 3, Residential Booster Pumps & Moderate Build Out
This scenario assumes a middle ground build-out forecast. It represents a less conservative, but more likely build-out scenario, and also considers potential water quality concerns that can arise from dead end mains not being utilized to their full capacity while the growth occurs longer term. The significant assumptions used in this scenario are as follows:

- Build out consists of:
    - Expanded Area A: 7 lots are possible based on standard zoning density, 14 lots possible with CaRD densities. Assume approximately half of the lots are CaRD developed, say 11 lots total for build-out.
    - Expanded Area B: 4 lots are possible based on standard zoning density, 7 lots possible with CaRD densities. Assume approximately half of the lots are CaRD developed, say 6 lots total for build-out.
    - Existing Area: 2 lots.
    - Total Lots, or ERUs = 11 + 6 + 2 = 19 ERU
- Booster station connections will be installed with an air gap type cross-connection control (CCC) method, including private storage tanks, with a flow rate limited to 10 gpm each (see Miscellaneous Considerations, CCC section for additional discussion).
- Any ADUs would be served by the primary lot water service, and would share the 10 gpm maximum flow.

The design flows are:

- Expanded Area A: 11 ERUs x 10 gpm/ERU = 110 gpm
- Expanded Area B: 6 ERU x 10 gpm/ERU = 60 gpm
- Expanded Areas A and B: 17 ERUs x 10 gpm/ERU = 170 gpm

The 1500-ft main extension to the expanded area A is subjected to 110 gpm. The 830-ft Flinn Road main is subjected to 170 gpm plus the lower 2 ERU at 20 gpm for a total of 190 gpm.

Hydraulic Analysis

The elevations (approximate per Google Earth and Association hydraulic model) and pressures (approximate per model) for the Expanded Area A where the main extension is being considered:

- Static pressure at Legg Rd / Flinn Rd intersection = 63 psi, elevation 8 ft.
- High point along extension route, at the southeast end, along the main = 60 ft.
- Elevation difference = 60 ft - 8 ft = 52 ft / (2.31 ft/psi) = 23 psi
- Static Pressure at high point along proposed main = 63 psi - 23 psi = 40 psi.
- Mains must deliver at pressure 30 psi, so 40 - 30 psi = 10 psi pressure loss surplus.

The analysis will consider 10 psi allowable for line losses for the entire approximate 2,330 LF main replacement (830 LF) and extension (1,500 LF). Different pipe size combinations are presented below for the Scenario 3, which represents a reasonable forecast meeting planning objectives without being overly conservative. Reference Attachment 2 Headloss Calculations for detailed calculations. The headlosses are summarized as follows:

- 4-inch diameter pipe for the entire 2,330 LF = 34.15 ft, or 14.8 psi – NOT OK
- 6-inch diameter pipe for the entire 2,330 LF = 4.8 ft, or 2.1 psi – OK
- 6-inch diameter pipe along Flinn (830 LF) and 4-inch diameter pipe along along Extension (1,500 LF) = 16.4 ft, or 7.1 psi – OK

Conclusions and Recommendation

The Scenario 3 presented above is believed to be a reasonable forecast meeting planning objectives, which falls between maximum and minimum potential build out scenarios. Based on the analysis above it is recommended that the 830 LF Flinn Road main be upgraded to 6-inch (inside) diameter pipe, and

the 1,500 LF extension to expanded area A be 4-inch (inside) diameter pipe (nominal pipe size may be larger for HDPE pipe).

Miscellaneous Considerations

Service Area and Expansion
The properties in the expansion areas are currently within the Colony Mountain Community Club (CMCC) service area. The properties could be served by gravity from the CMCC water system. There are no easements in place to get from CMCC water lines to Flinn Road. CMCC has not been approached recently for service by anyone in the Flinn Road area. CMCC has indicated, unofficially, that they will relinquish the area if BEWA wants to provide service to the Flinn area properties.

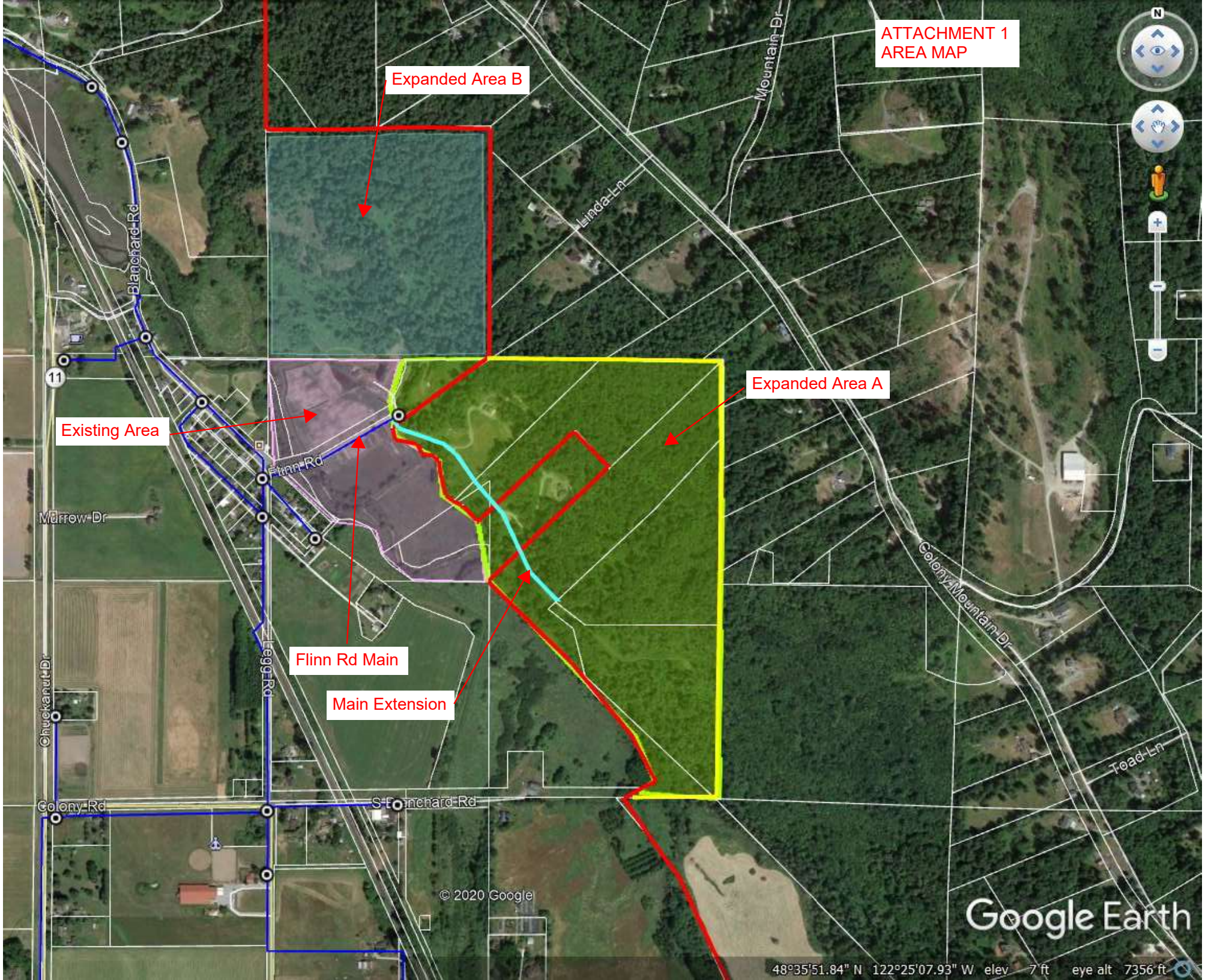
Fire Flow
At this time fire flow is not required to be provided by BEWA to the developed area based on zoning requirements. We understand that BEWA does not plan to provide fire flow beyond their existing water main along Legg Road, which currently has fire hydrants. Should fire flow be required in the subject development area in the future, an 8-inch main would be required. This analysis does not consider residential sprinkler systems and any potential impacts from them.

Latecomer Reimbursement
The developer(s) could be eligible for Latecomer Agreement reimbursement to collect from future properties that connect to the extension. BEWA could decide that they want to enter into a Latecomer Agreement with the Developer, and then BEWA would collect a Latecomer fee from those future connections and pass it on to the Developer (minus BEWA administration fees). A benefitting area would need to be defined in order to determine the number of connections the main would serve, including the Developer's property. Then the construction costs would be reviewed to determine "allowable" costs that can be recovered, then divide costs by connections and record it in a document. Latecomer Agreements typically have an expiration date (15 years typical). As a corporation, BEWA can implement this any way they wish.

Cross-Connection Control (CCC)
CCC methods for the development properties could consist of an air gap backflow prevention installation. There are benefits to this method for both the Association and the property owner; 1) removes multiple devices (i.e. RPBA, DCVA) requiring annual testing, 2) removes reliance on mechanical devices that could fail, and 3) allows for flow limiting and lower impact to main pressures.

Flows could be limited through the service connections discharging into individual storage tanks. Individual residences could then boost from their storage tanks at higher flows to ensure their peak water uses are met. This would ensure that pressures in the main are not at risk and will not hinder the properties by limited supply pressure and flow rate, if they have properly designed storage and booster systems.

Easements
It is recommended that BEWA obtain a 20-ft wide access and utility easement along the developer extension.


ATTACHMENT 1
AREA MAP
Expanded Area B
Expanded Area A
Existing Area
Flinn Rd Main
Main Extension
Blanchard Rd
Mountain Dr
Linda Ln
Flinn Rd
Marrow Dr
Legg Rd
Chuckanut Dr
Colony Rd
S Blanchard Rd
Colony Mountain Dr
Toad Ln
11
© 2020 Google
Google Earth
48°35'51.84" N 122°25'07.93" W elev 7 ft eye alt 7356 ft

Hazen Williams Head Loss Spreadsheet

ATTACHMENT 2
HEADLOSS CALCULATIONS

6/26/2020
Blanchard Edison Water
FLINN ROAD EXTENSION - SCENARIO 3 - MEDIUM

Headloss - Pipe	Flow, gpm	Pipe Dia., in	Area, sf	Velocity, fps	Quantity / Length, ft	Roughness C	Headloss (ft)	Pressure Loss (psi)
4"	190.0	4	0.09	4.86	830	130	20.60	8.92
6"	190.0	6	0.20	2.16	830	130	2.87	1.24
8"	190.0	8	0.35	1.21	830	130	0.71	0.31
4"	110.0	4	0.09	2.81	1500	130	13.55	5.86
6"	110.0	6	0.20	1.25	1500	130	1.88	0.82
8"	110.0	8	0.35	0.70	1500	130	0.46	0.20

Static Pressure at Legg/Flinn =	63	psi	
elev =	8	ft	
highest elev along extension route =	60	ft	at end
static pressure at high/end =	40	psi	
minimum provided at main =	30	psi	
available pressure loss =	10	psi	
pressure loss w/ 4-inch whole way =	14.78	psi	34.15 ft
pressure loss w/ 6-inch whole way =	2.06	psi	4.75 ft
pressure loss w/ 6-inch then 4-inch =	7.10	psi	16.41 ft

Blanchard Edison Water Association Inc.

David Lohman, Manager
P.O. Box 38
Bow, WA 98232

Phone/Fax (360) 766-8900
Emergency (360) 391-6542
www.BlanchardEdisonWater.com
Manager@BlanchardEdisonWater.com

January 5, 2021

Colony Mountain Community Club
Mark Jacobsen, President, Board of Directors
PO Box 91
Bow, WA 98232

Re: Service Area Relinquishment Request

Dear Mr. Jacobsen:

Blanchard Edison Water Association (BEWA) has been approached many times in the past, and most recently in May 2020, by property owners at the end of Flinn Road inquiring about providing water service. The properties are currently located in the Colony Mountain Community Club (CMCC) water service area. Informal discussions with CMCC representatives concluded that extending the water main(s) to provide service to these properties would require procuring private easements, and that CMCC would likely relinquish this portion of their service area to BEWA. In December 2020 BEWA entered into a Developer Extension Agreement to provide water service to the subject properties at the end of Flinn Road.

This letter is to establish a formal agreement in which CMCC relinquishes the portion of their water Service Area defined by the subject parcels to BEWA. The attached Figure 1a shows the current and proposed Service Area boundary of BEWA. The attached Figure 1b shows the current and proposed Service Area boundary of CMCC. If CMCC agrees to this change in Service Area, please have authorized persons accept by signing at the bottom of this letter.

BEWA will follow up with approvals of the Service Area change with Washington State Department of Health and Skagit County Planning and Health Departments.

Sincerely,

David Lohman, Manager

Tom Pasma, President

BEWA Board of Directors

Tom Pasma, President
Oscar Graham, Vice President
Barbara Leander, Secretary
Ken Deering
Steve Wright
Sarah Smith

Enclosures:

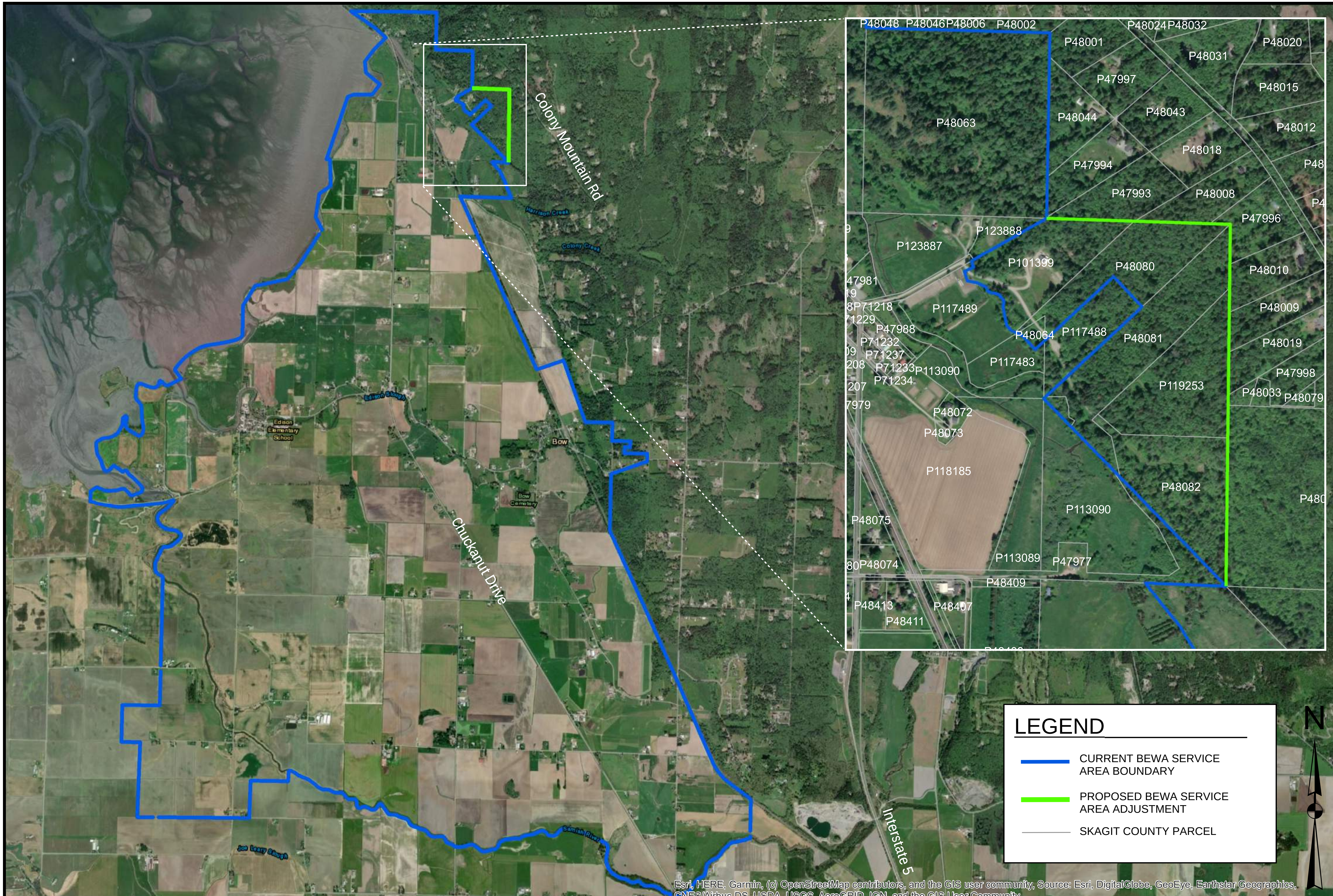
- Figure 1a Proposed Service Area Blanchard Edison Water Association
- Figure 1b Proposed Service Area Colony Mountain Community Club

cc: Curt Schoenfelder, PE, Wilson Engineering, LLC

Agreed to this 9th day of January, 2021.

By: Mark Jacobsen

MARK JACOBSEN Pres. CMCC BOD
(Print or Type Name and Title)



SHEET 1 OF 1

DATE DEC 2020

SCALE AS SHOWN

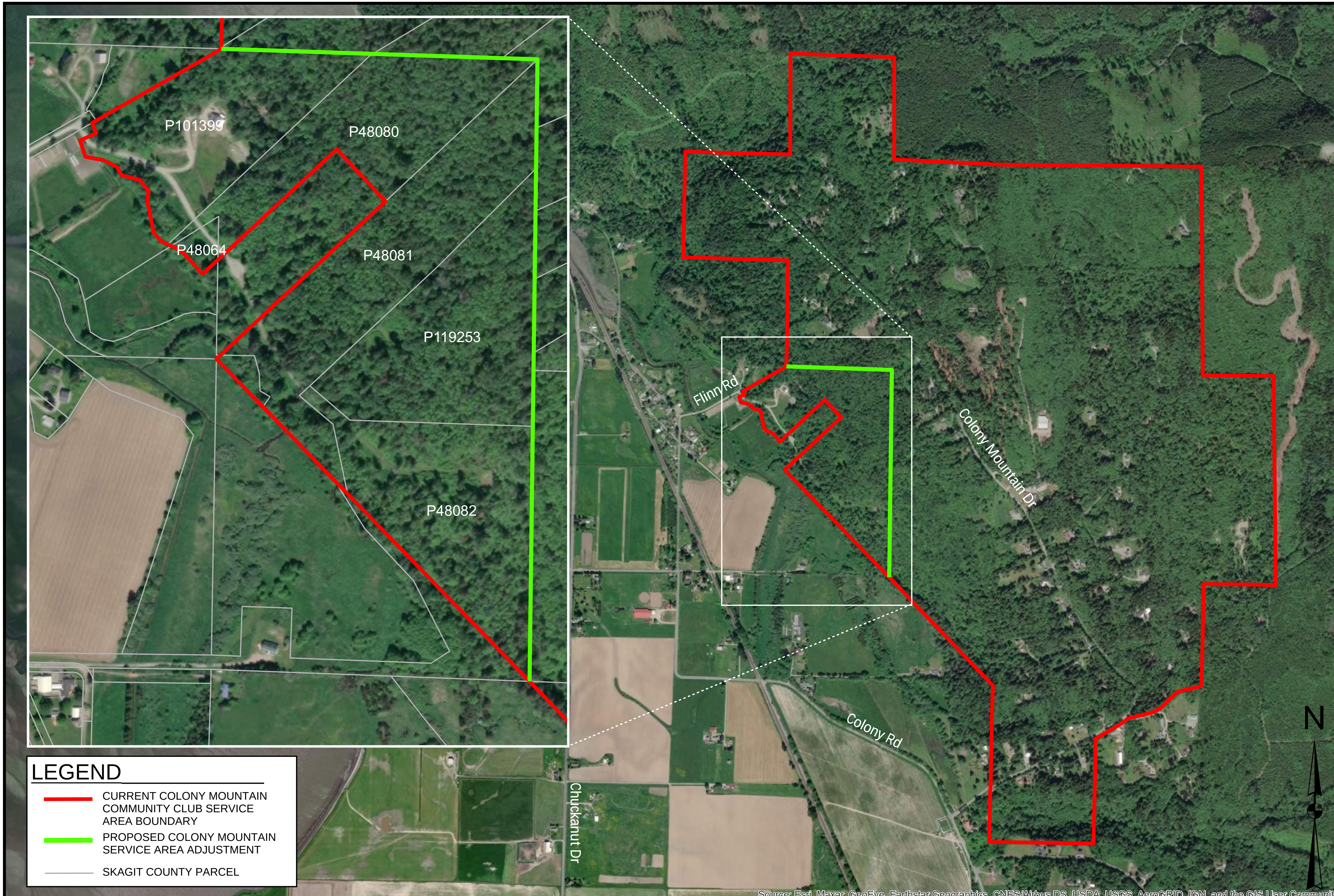
PROJECT 2020-131

BLANCHARD EDISON WATER ASSOCIATION

SKAGIT COUNTY WASHINGTON

FIGURE 1a - PROPOSED SERVICE AREA BEWA

WILSON ENGINEERING



SHEET 1 OF 1

DATE DEC 2020

SCALE AS SHOWN

PROJECT 2020-131

BLANCHARD EDISON WATER ASSOCIATION

SKAGIT COUNTY WASHINGTON

FIGURE 1b - PROPOSED SERVICE AREA

COLONY MOUNTAIN COMMUNITY CLUB

WILSON ENGINEERING

Water Right Self-Assessment Form for Water System Plan

Mouse-over any link for more information. Click on any link for more detailed instructions.

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				Current Source Production – Most Recent Calendar Year Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold **				20-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold **			
		Primary Qi Maximum Rate Allowed	Non-Additive Qi Maximum Rate Allowed	Primary Qa Maximum Volume Allowed	Non-Additive Qa Maximum Volume Allowed	Total Qi Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
1 G1-25802 C	Well #3 (AER330) Well #5 (ALA608)	250 gpm		216 ac.ft/yr		129 gpm	121 gpm	89 ac.ft/yr	54 ac.ft/yr	145 gpm	105 gpm	100 ac.ft/yr	34 ac.ft/yr	164 gpm	86 gpm	113 ac.ft/yr	10 ac.ft/yr
2 G1-26577 C	Well #1 (AER331)	75 gpm			216 ac.ft/yr	39 gpm	36 gpm	27 ac.ft/yr		44 gpm	31 gpm	30 ac.ft/yr		49 gpm	26 gpm	34 ac.ft/yr	
3 G1-26578 C	Well #4 (AER333)	130 gpm			216 ac.ft/yr	67 gpm	63 gpm	46 ac.ft/yr		75 gpm	55 gpm	52 ac.ft/yr		85 gpm	45 gpm	59 ac.ft/yr	
4																	
5																	
6																	
	TOTALS =	455 gpm		216 ac.ft/yr		235 gpm	220 gpm	162 ac.ft/yr	54 ac.ft/yr	264 gpm	191 gpm	182 ac.ft/yr	34 ac.ft/yr	298 gpm	157 gpm	206 ac.ft/yr	10 ac.ft/yr
Column Identifiers for Calculations:		A		B		C	=A-C	D	=B-D	E	= A-E	F	=B-F	G	=A-G	H	=B-H

PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.

Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa

INTERTIES: Systems receiving wholesale water complete this section. Wholesaling systems must include water sold through intertie in the current and forecasted source production columns above.

Name of Wholesaling System Providing Water	Quantities Allowed In Contract		Expiration Date of Contract	Currently Purchased Current quantity purchased through intertie				10-Year Forecasted Purchase Forecasted quantity purchased through intertie				20-Year Forecasted Purchase Forecasted quantity purchased through intertie			
	Maximum Qi Instantaneous Flow Rate	Maximum Qa Annual Volume		Maximum Qi Instantaneous Flow Rate	Current Excess or (Deficiency) Qi	Maximum Qa Annual Volume	Current Excess or (Deficiency) Qa	Maximum Qi 10-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 10-Year Forecast	Future Excess or (Deficiency) Qa	Maximum Qi 20-Year Forecast	Future Excess or (Deficiency) Qi	Maximum Qa 20-Year Forecast	Future Excess or (Deficiency) Qa
1															
2															
3															
TOTALS =															
Column Identifiers for Calculations:	A	B		C	=A-C	D	=B-D	E	=A-E	F	=B-F	G	=A-G	H	=B-H

INTERRUPTIBLE WATER RIGHTS: Identify limitations on any water rights listed above that are interruptible.

Water Right #	Conditions of Interruption	Time Period of Interruption
1		
2		
3		

ADDITIONAL COMMENTS:

**** Growth Rate for 10-yr and 20-yr forecasts conservatively assume the average of the Skagit County CWSP medium projection of 2.0% growth rate and the water systems actual growth rate of 0.35% over the last 13-yr period, or a forecast growth rate of 1.2%.**