



## EXTERNAL MEMORANDUM

**To:** Desi Santerre  
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**cc:** Leslie Ann Klusmire, ICMA-CM – Town of Crestone

Project Central File W0317.22006.001 — External Memorandum

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**Date:** September 4, 2022 - revised

**Subject:** Town of Crestone – Service Consolidation Feasibility Evaluation and Alternatives Analysis

### TOWN OF CRESTONE – WATER AND WASTEWATER CONSOLIDATION ANALYSIS

#### PROJECT BACKGROUND

JDS-Hydro, a Division of RESPEC, provides technical assistance to small communities through the Colorado Department of Local Affairs Small Communities Water and Wastewater Project Development program. Through this program, JDS has been able to assist small communities (i.e., at populations of 10,000 or less) by providing third party evaluations of engineering design documents, planning documents, engineering evaluations, or masterplans associated with water and wastewater facilities. In addition, JDS has assisted similar municipalities by providing prioritization of capital improvements projects, planning assistance in developing master plans, evaluation of utility rate studies, and developing opinions or recommendations of engineering principals to help move advance planning efforts. In the case of the Town of Crestone, town administration approached the Colorado Department of Local Affairs Regional Manager for the South Central Region, Christy Doon, regarding technical assistance in support of the Town of Crestone. Currently, the Town of Crestone is the water provider for the Town of Crestone, as well as the sewer collections provider. Wastewater flows from the Town of Crestone have historically been measured at a master meter located on the interconnecting interceptor at the intersection of Birch Street and Camino Baca Grande. Flow readings are recorded automatically at the master meter location by the Baca Grande Water and Sanitation District (BGWSD) and have been documented and recorded since at least 2018. BGWSD monitors these flows through a small



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Parshall flume embedded at the bottom of a large cast-in-place vault, with flow level readings being taken continuously through an ultrasonic level monitor device (and subsequently converted to flow through the BGWSD SCADA). This master meter was constructed and is owned and operated by the District. BGWSD has only recently begun taking Biological Oxygen Demand (BOD) samples at the master meter location, starting at the beginning of 2021. These BOD readings are taken manually at the master meter location.



**Figure 1 – BGWSD / Crestone Wastewater Master Meter**

The Baca Grande Water and Sanitation District (BGWSD) serves as the wastewater treatment provider through a recently executed Intergovernmental Agreement (IGA) with the Town of Crestone. In 2021, BGWSD charged Town of Crestone customers \$5.25 per 1,000 gallons of wastewater at the master meter. BGWSD has stated that the cost of providing all Town of Crestone wastewater customers ran around \$77,644 in 2021, though BGWSD only collected \$37,921 in revenue from the Town, resulting in a \$39,723 deficit in the year 2021. Revenues from BGWSD residential and non-residential customers in 2021 made up the shortfall, allowing BGWSD to run a balanced budget on the wastewater side. January through September 2021 readings at the master meter and Aspen WWTP indicate that wastewater collected from Crestone can make up anywhere from 24% to 40% of the influent hydraulic loading, and 13% to 60% of the influent organic loading. While revenues from Crestone represent approximately 10% of the overall income to treat wastewater at the WWTP, Crestone wastewater represented 30% of



influent organic loadings and 22% of influent hydraulic loadings at the Aspen wastewater treatment plant according to master meter readings through this period. In a subsequent rate analysis of service by Baseline Engineering for BGWSD completed on March 14, 2022, the Technical Memorandum indicated that the Town of Crestone contributes approximately 32% of the average day hydraulic loading to the AWWTF between the years of 2018 through 2021. In addition, organic concentrations of BOD measured at the master meter were found to be 408 mg/L on average, with a maximum concentration of 731 mg/L. Consequently, the District has raised the Town of Crestone’s rates to \$7.90 per 1,000 gallons, with an additional \$0.991 lb/BOD per month (i.e. taking the average BOD reading for the month and then multiplying it by the number of days in the billing month). The District also charged an \$10 flat rate per month to cover BOD costs.

Because of the current rate increase, the Town of Crestone has reached out to DOLA South Central Regional Manager Christy Doon to review the Town of Crestone’s wastewater service situation with BGWSD. As part of the review, the Town of Crestone also asked JDS to consider water service alternatives as well. The attached memorandum provides a summary of JDS-Hydro’s opinions on the wastewater collections arrangement with BGWSD as well as potential alternatives and recommendations for current and future water and wastewater service for the Town.

**TOWN OF CRESTONE LOADING EVALUATION**

**HYDRAULIC LOADING**

As mentioned above, the Town of Crestone has been documented as sending elevated levels of wastewater to the AWWTF as measured at the BGWSD interconnect located at the intersection of Birch Street and Camino Baca Grande. To analyze the plausibility of these meter readings to the BGWSD wastewater treatment plant, JDS-Hydro reviewed the following information provided by the town of Crestone and Baca Grande Water and Sanitation District.

- / Well Production Meter Readings – 2019 and 2020
- / Individual Customer Meter Readings - 2019
- / Water Treatment Plant Production Readings – 2019 through 2021
- / Baca Grande Interconnect Meter Readings - 2018 through 2021

Between the years of 2018 to 2021 the average day flow reading over this period was 21,162.22 gallons per day (gpd) as recorded at the Birch Street mater meter. The average inflow to the Aspen Wastewater Treatment Facility (AWWTF) over this four-year period was 67,990.16 gpd. This equates to essentially 31.23% of the hydraulic loading at the AWWTF being attributed to the Town of Crestone collections system. A summary of these four years of flow data is summarized below:

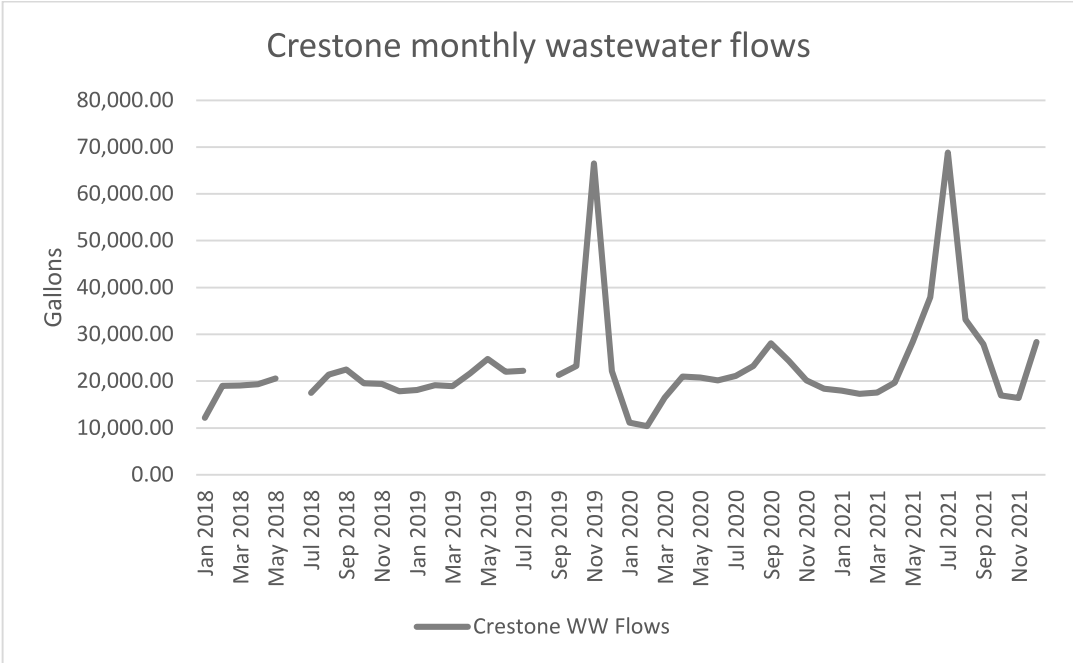
**Table 1: Wastewater Hydraulic Loadings**

<u>Year</u>	<u>Town of Crestone (gpd)</u>	<u>AWWTF (gpd)</u>	<u>% Flows by TOC</u>
2018	18,927.99	62,408.60	30.33%
2019	23,440.81	71,984.24	32.56%
2020	17,909.05	71,885.48	24.91%
2021	24,371.03	65,682.31	29.92%
Average	21,162.22	67,990.16	31.23%



The 2020 census estimated the Town of Crestone population at 141 individuals. The population of Crestone should be considered fluid at any time, given how many transient residents are present within the town limits, especially over the summer. In addition, there are a few commercial taps on the Town of Crestone collections system, including some restaurants, cafes, and hotels. Generally, a transient community can lead to larger wastewater loadings in the summer and lower wastewater loadings in the winter. However, this phenomenon is not completely evident as shown in **Figure 2** below:

**Figure 2: Town of Crestone Wastewater Flows**



From the chart, flows remain relatively consistent in the 18,000 gpd to 22,000 gpd range. There are some observed spikes and valleys, specifically in November 2019 (66,474 gpd), July 2021 (68,856 gpd), January 2020 (11,118 gpd), and February 2020 (10,438 gpd). When estimating the average wastewater flow generated per capita, the following values are developed assuming an average population of 141 people in town:

**Table 2: Monthly wastewater production per capita – average day – Town of Crestone**

<u>Year</u>	<u>per capita WW production (gpdpc)</u>
2018	134.24
2019	166.25
2020	127.02
<u>2021</u>	<u>172.84</u>
Average	150.09

As shown in **Table 2** average day per capita wastewater generation has ranged between 127 gpdpc to 173 gpdpc, resulting in an average day per capita wastewater generation of 150 gpdpc. Generally, the accepted maximum per capita wastewater generation value is around 120 gpdpc as estimated by the Colorado Department of Health and Environment (CDPHE). After that point, CDPHE generally assumes that the collection system is subject to inflow and infiltration (I/I), which can introduce additional stormwater or background water into the collections system. This can be due to broken clay collection pipes, old brick manholes, loose or ill-fitting pipe penetration boots into manholes, or open manhole lids. Initially, given the elevated average day wastewater flows measured at the master meter, potential I/I would seem to be a plausible explanation for the elevated wastewater flows observed at the master



meter. This is especially true when considering some of the manholes exist adjacent to North Crestone Creek, which could be considered a prime candidate for groundwater infiltration. However, after digging a bit more into the available information, and then reviewing the results of the Town of Crestone's recent inflow and infiltration reporting and jetting, I/I became a less likely cause for the large wastewater volumes being generated by the Town of Crestone's collection system. The following list provides information that may point to a reason other than I/I to explain the high wastewater volumes being observed at the Birch Street master meter:

- / Age of Collections System – the Town of Crestone's collection system was constructed in 2003 as part of a Community Development Block Grant Program. The \$478,621 project was professionally designed by Davis Engineering and built by Timberline Excavating. Construction observation and reporting was provided by Davis Engineering, with monthly reporting submitted to the Colorado Development Block Grant program. The collections system included over 11,440 LF of 8" SDR 35 PVC pipe, 1,200 LF of 4" and 6" SDR PVC service lines, thirty-six (36) 4' ID precast concrete manholes complete with rubber boot gaskets and non-shrink grout to seal sewer penetrations into each manhole. The 8" SDR 35 PVC pipe featured gasketed push-on bell connections which are designed to seal each connection upon installation. All proposed materials and methods should be considered within accepted municipal industry standards. In addition, the construction observation provided by Davis Engineering to support the CDBG funding should have ensured that all the construction was conducted according to the stamped and sealed construction drawings. While all construction drawings may have issues during construction, and the construction inspectors may not have observed every single linear foot of pipe installed during construction, it is likely that the collection system was installed according to industry standards. That being said, the age of the system and materials used in the construction (i.e., pvc pipe vs. clay tile pipe, and precast concrete manholes with boot penetrations vs. brick manholes) would make the collection system an unlikely candidate to experience I/I.
- / Wastewater flow profile – as shown in **Figure 2** above, the observed flows do not depict any seasonal trends. Generally, I/I due to natural conditions manifests in two ways when observing hydraulic flow profiles.
  - 1) Thunderstorms – if surface infiltration were occurring, elevated flow incidents would manifest seasonally. Generally, thunderstorm events occur during the summer months when surface water runoff from rain events enter open cisterns or poorly sealed manhole lids into the collections system. If this were the case, spikes in wastewater flows observed at the master meter would be evident in summer months. This does not appear to be the case in **Figure 2**.
  - 2) Groundwater infiltration – being that the Town of Crestone sanitary sewer collection system features manholes adjacent to North Crestone Creek, infiltration into the collections system might seem plausible. This would manifest in the hydraulic wastewater profile in the form of elevated flows during the spring months of March through May. This would be due to either groundwater levels rising with the discharge of snowmelt into North Crestone Creek, causing creek levels to rise, or the melting of frozen subsurface groundwater as temperatures rose from April into June. **Figure 2** does not appear to support this phenomenon as there does not seem to be a seasonal pattern as to when the master meter observes elevated flows or spikes in flows from the Crestone collection system.
- / BOD concentrations – as noted in the Baseline Rate analysis report to BGWSD, BOD concentrations measured at the Birch Street master meter were noted as "both high and highly variable, with an average BOD for 2021 of 408 mg/L, but a maximum observed BOD of 731 mg/L". Please see the next section of this report for a summary of BOD concentrations measured for the Town of Crestone at the Birch Street master meter. Recorded BOD concentrations observed at the



Birch Street master meter have been noted to be significantly higher than industry documented residential wastewater strength. Generally, residential wastewater features a BOD concentration anywhere from 250 mg/L to 300 mg/L. The observed average BOD concentration of 408 mg/L is considered much higher than normal residential strength wastewater. While there may be many explanations for the higher strength wastewater being generated by the Town of Crestone, one phenomenon that would not create higher strength wastewater would be excessive I/I as assumed to be generating the elevated wastewater flows observed at the master meter. In theory, the elevated wastewater flows observed at the master meter should be reducing BOD concentrations to below the accepted 250 mg/L to 300 mg/L, especially if that additional water generated from I/I was from surface water or groundwater sources. These sources are generally low in BOD concentrations and should be diluting the strength of Crestone’s wastewater should they be entering the collections system on a continual basis.

/ Produced water vs. measured wastewater flows – generally, observed wastewater flows to a certain point in the collections should ultimately be some factor of the water produced by the distribution system. The accepted industry assumption is that generated wastewater from domestic uses is estimated to be around 90% of metered domestic use, depending upon irrigation, household consumption, etc. In the case of Crestone, generated wastewater measured at the Birch Street master meter can range anywhere from +38% to 337% over produced water. I/I contributions would definitely create this range of fluctuations in measured wastewater flows, especially if there were observed seasonal groundwater infiltration or surface water inflows. However, if there were seasonal I/I, it would be assumed that observed wastewater flows would slowly return to the baseline metered well production or metered usage at each household. Or, if there were a consistent source of domestic water discharging into the collections system that was not metered at the water treatment plant, the elevated levels of measured wastewater would be consistently higher than the baseline production or usage of potable water. In the case of Crestone, neither one of these situations is the case.

As shown in **Figure 3** below, water production and usage numbers are compared to measured wastewater flows from the Town of Crestone between the months of January 2019 to December 2021. This figure depicts metered water production of all the Town of Crestone’s raw water wells, raw water coming into the Crestone water plant, leaving the Crestone water tank, and documented residential and commercial meter usage vs. observed wastewater flows from the Town of Crestone. **Figure 4** compares Town of Crestone water production out of the Crestone water tank vs. wastewater flows generated by the Town of Crestone. Overall, wastewater flows correlate with produced water by the Town of Crestone’s potable water system, minus some significantly exaggerated flow events in November of 2019 and the summer of 2021. While the wastewater flows do follow the same trend as the baseline water production (which should be the case), the excess in flows above and beyond baseline water production does not follow a season trend. This would tend to support a conversion error in the endpoint device monitoring at the master meter rather than an I/I phenomenon.

**Table 3: Difference in Crestone wastewater flow vs. metered water plant production**

<u>Year</u>	<u>WTP Production (MGal)</u>	<u>Observed WW (MGal)</u>	<u>% Difference</u>
2019 <sup>1</sup>	2.95	8.47	188%
2020	3.12	7.18	130%
2021	3.47	10.09	191%
Avg.	3.18	8.58	169%



Figure 3: Produced Water vs. Observed Wastewater Flows

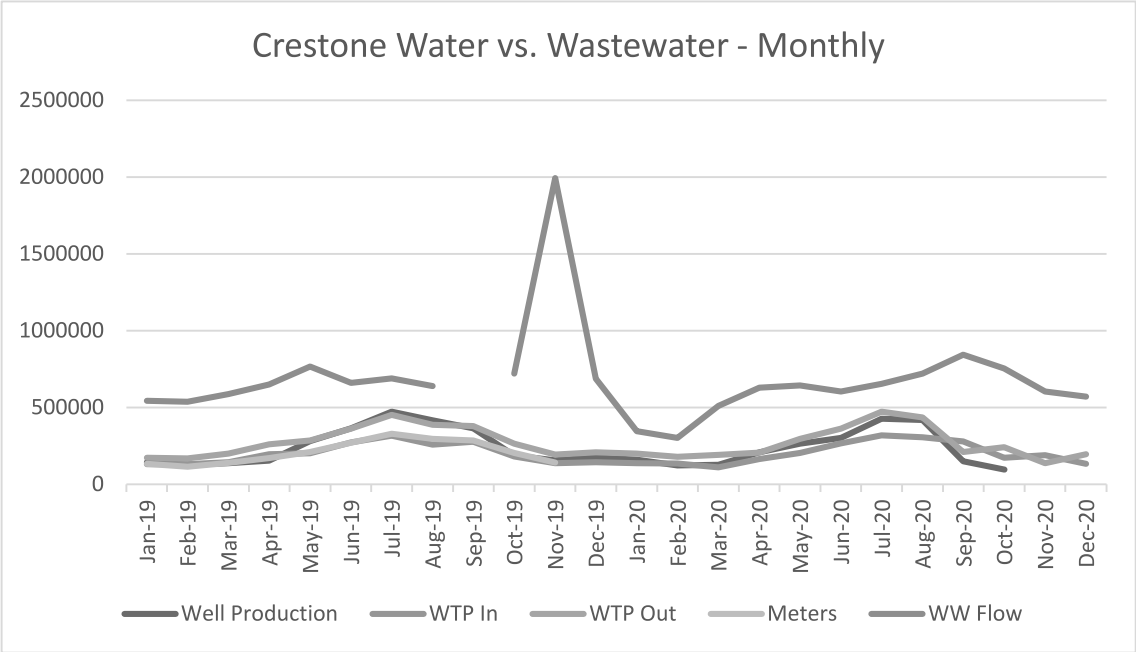
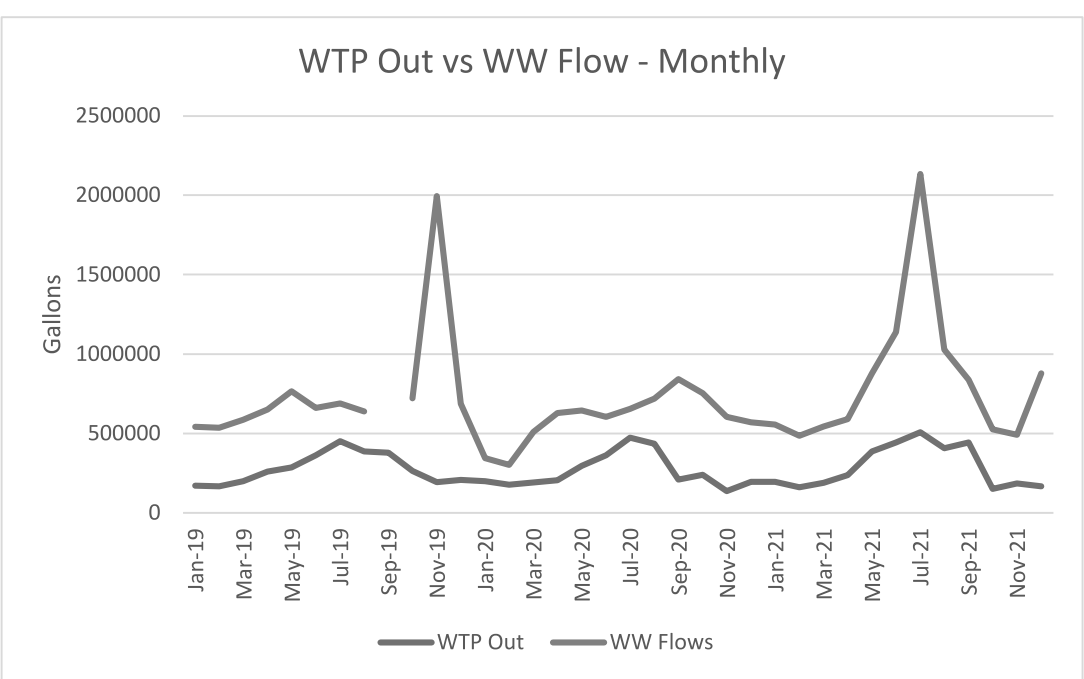


Figure 4: Water Treatment Plant Production vs. Observed Wastewater Flows



/ Results of I/I evaluation – as part of the 2022 Colorado Department of Local Affairs (DOLA) Energy Impact and Assistance Fund (EIAF) grant, which was secured to expand the Town of Crestone’s collection system, the Town elected to conduct an I/I evaluation of its collection system. The evaluation was in response to the observed elevated wastewater flows at the Birch Street master meter. The evaluation occurred over the first few weeks of June 2022, with the results indicating that no leaks or damage was observed in the collections system, and no readily apparent inflow or infiltration points could be identified. The findings of the evaluation would tend to support the



opinions generated in this report, following the review of the data and information made available by the Town of Crestone and BGWSD.

Assuming that Inflow and Infiltration are not the causes of the elevated wastewater flows observed at the Birch Street master meter, the cause of the elevated flows may lie in one of the following:

- / Un-monitored discharge into the collections system – this could be a result of a water tap unknowingly discharging into a privately owned cleanout in the collections system. A discharge such as this could be located by reviewing water meter records to see if there is a tap that continues to flow at high volumes, even if the customer is not present. While discharge from a fixture such as a hose bib may not result in much instantaneous volumes, it could add up to quite a bit of water. However, a privately owned cleanout accepting a fixed amount of volume may not explain the higher flow months as observed in November 2019 or the summer of 2021. This cause would only be plausible, however, if the source of the water was from an unmetered residential well that was not captured by a residential meter, water plant meter, or well meter.
- / Issues with the Parshall flume – if there is debris depositing downstream of the Parshall flume, it could be backing flow up through the flume causing the flume to erroneously read higher flows. This may explain why the flume may be reading a consistently higher volume in most months, with periods of extremely high flows when additional debris may collect upstream of the flume following weather events. This also may be plausible given the higher BOD concentrations coming from the restaurants within the Town of Crestone collections basin. Given that the restaurants do not have grease interceptors on them, it is possible that FOG (Fats, Oils, and Grease) as well as sediment may be collecting downstream of the flume, thus backing up wastewater through the flume and erroneously reading and recording higher flows.
- / Ultrasonic Level Monitor recalibration – the last potential issue that may be leading to higher recorded flows may be that the level monitor may need to be recalibrated, or the software responsible for converting flows may need to be verified. Assuming that there is no debris upstream or downstream of the flume which may be interfering with how the flume is reading flow, the accuracy of the ultrasonic level monitor can be verified by reading the staff gauge flow in the flume vs. the recorded flows read by the ultrasonic level monitor. Either way, the ultrasonic level monitor should be recalibrated and checked for accuracy as part of any subsequent evaluation.

Assuming that water production readings from the water tank are accurate, average daily potable water production and estimated wastewater production is summarized in **Table 4** below. Note that these estimated wastewater production values should be seen as conservative as they are developed from water treatment plant production, not from summarized customer metered usage. Also note also that the estimated wastewater flow volumes do not include those customers who are on their own private wells, but discharge into the collections system (the exact number of these wells is not known by Crestone at this time):

**Table 4 – Town of Crestone Estimated Wastewater production using WTP Production**

<u>Year</u>	<u>WTP Production (gpd)</u>	<u>WW Production (gpd)<sup>1</sup></u>
2019	9,105	8,194
2020	8,877	7,990
<u>2021</u>	<u>9,722</u>	<u>8,750</u>
Avg.	9,234	8,311

Note 1 – WW production was estimated to be 90% of water plant production





**ORGANIC LOADING**

Organic loading is a function of two variables: Influent flow and influent concentrations of Biological Oxygen Demand (BOD). As described above, influent flow loadings as recorded at the Birch Street master meter are suspect at best and unreliable at worst. As recommended above, further investigations of the operations of the master meter should be undertaken. Actual organic loadings may be lower than reported if actual measured flows at the master meter are lower as well. However, unlike hydraulic flow measurements at the master meter, BOD concentrations are measured a bit differently. Organic concentrations are actually sampled in the field at the master meter and then analyzed at a laboratory to obtain concentration results. BGWSD has only recently begun taking BOD concentration readings (i.e., November 2020) in an attempt to estimate organic loadings contributed by the Town of Crestone at the WWTP. As indicated in the Technical Memorandum by Baseline Engineering, recorded average BOD concentrations as measured at the Birch Street master meter have been noted as high as 408 mg/L with instantaneous readings being as high as 731 mg/L. Please see **Table 5** as this is the only full year of BOD data available for the Town of Crestone through calendar year 2021. BOD information for 2022 was not provided for the Town of Crestone.

**Table 5 – BOD Loading Data and Estimates for the Town of Crestone**

	Average Monthly BOD Conc. (mg/l)	Maximum Monthly BOD Conc. (mg/l)	Master Meter WW Flow (gpd)	Estimated WW Flow - WTP (gpd)	Organic Loading Measured lb/day	Organic Loading Estimated lb/day
Nov-20	207	207	20,139	5,677	35	10
Dec-20	207	207	18,372	5,856	32	10
<b>AVG.</b>	<b>207</b>	<b>207</b>	<b>19,255</b>	<b>5,767</b>	<b>33</b>	<b>10</b>
Jan-21	261	393	17,957	5,868	39	13
Feb-21	332	631	17,319	4,807	48	13
Mar-21	384	524	17,544	5,655	56	18
Apr-21	380	396	19,649	7,124	62	23
May-21	388	434	28,353	11,623	92	38
Jun-21	347	416	37,937	13,256	110	38
Jul-21	410	490	68,856	15,232	235	52
Aug-21	402	424	33,161	12,209	111	41
Sep-21	592	680	27,903	13,286	138	66
Oct-21	378	378	16,975	4,523	54	14
Nov-21	641	731	16,407	5,524	88	30
Dec-21	689	689	28,328	5,015	163	29
<b>AVG.</b>	<b>434</b>	<b>516</b>	<b>27,532</b>	<b>8,677</b>	<b>100</b>	<b>31</b>

Note that the estimated organic loading for the Town of Crestone would be considerably lower if estimated hydraulic loadings from the town more closely resembled documented flows from the water treatment plant. **Table 6** below depicts the percentage of documented AWWTP organic loadings that are constituted by Crestone organic loadings. Note the difference between percent organic loadings at the AWWTP using observed flows at the Birch Street master meter vs. estimated flows from the Crestone WTP. When comparing the two sources, there is a significant reduction in percent organic loading contributions when using estimated wastewater flows derived from water treatment plant production.



**Table 6: Comparison of Organic Loading Percentages at the AWWTP**

	Organic Loading AWWTF	Crestone Organic Loading Measured	Crestone Organic Loading Estimated	% Measured Crestone BOD Loading vs. AWWTF BOD Loading	% Estimated Crestone BOD Loading vs. AWWTF BOD Loading
	lb/day	lb/day	lb/day	(gpd)	lb/day
Nov-20	130	35	10	26.80%	7.56%
Dec-20	188	32	10	16.91%	5.39%
<b>AVG.</b>	<b>159</b>	<b>33</b>	<b>10</b>	<b>21.86%</b>	<b>6.28%</b>
Jan-21	185	39	13	21.11%	6.90%
Feb-21	161	48	13	29.73%	8.25%
Mar-21	159	56	18	35.25%	11.36%
Apr-21	101	62	23	61.88%	22.44%
May-21	186	92	38	49.33%	20.22%
Jun-21	231	110	38	47.58%	16.63%
Jul-21	232	235	52	101.58%	22.47%
Aug-21	189	111	41	58.82%	21.66%
Sep-21	193	138	66	71.22%	33.91%
Oct-21	164	54	14	32.63%	8.69%
Nov-21	183	88	30	47.98%	16.15%
Dec-21	119	163	29	136.79%	24.22%
<b>AVG.</b>	<b>175</b>	<b>100</b>	<b>31</b>	<b>57.83%</b>	<b>17.78%</b>

Organic loadings derived from use of hydraulic loadings at the Birch Street master meter can certainly be disputed. Using master meter flows in 2021, there are two months where organic loadings emanating from the Crestone collections system exceed the measured BOD loadings at the AWWTP, which is difficult to support. Also, as mentioned previously, it would be safe to assume that measured BOD concentrations at the Birch Street master meter would be reading much lower than observed if measured hydraulic flows at the master meter were actually occurring. As noted above, the data does not trend in this direction. Because of these discrepancies, the data would support further investigations into the accuracy of the Birch Street master meter.

**BOD CONCENTRATIONS**

However, measured BOD concentrations as documented in 2021 do tend to support a very strong wastewater load from the Town of Crestone. Residential strength wastewater tends to run around 100 mg/L to 300 mg/L. As noted above, BOD concentrations measured at the Birch Street master meter average around 434 mg/L, with high readings averaging around 516 mg/L. It is noted that the Town of Crestone features three (3) restaurants that are open year-round (Food for Life, Mystic Rose, and the Elephant Cloud). The Town also featured a brewery (Crestone Brewery) which was open year-round from 2017 through May of 2021 (in which the brewery closed). Later in 2022, the T-Road Brewery will be opening year-round to customers. Given the relatively small residential population of Crestone (approximately 141 individuals), three restaurants and a year-round brewery will have a significant impact on the wastewater strength being discharged to the BGWSD AWWTF. Though no wastewater sampling of the restaurants or brewery has been conducted, there is information available on the average strength of wastewater coming from commercial establishments such as these. On average,



raw wastewater emanating from typical restaurants can feature BOD as high as 1,000 mg/L to 2,000 mg/L. Brew waste can be even higher, ranging from 3,200 mg/L to 28,900 mg/L, depending upon which part of the brew process is generating the waste. While these concentrations can be intimidating, the actual loading from brew waste is relatively low because the flows from the brewery are sporadic during the brewing process. That being said, because the BOD concentrations, fats, and greases, from restaurants and breweries are so high, these establishments generally feature some type of pretreatment before wastewater enters the collections system. Commercial pretreatment can consist of the traditional grease and oil interceptors for restaurants to something more exotic such as brew waste solids sedimentation or side stream secondary treatment to remove soluble BOD. These alternatives are discussed in more depth in the subsequent sections. It should be noted that the Town of Crestone has stated that two of the restaurants (Food for Life and Mystic Rose) have grease traps, while the third (Elephant Cloud) does not wash their food waste down their sinks and instead composts their food waste. The brewery does not feature brew waste pre-treatment, though the new brewery (T-Road Brewery) is very cognizant of the brew waste situation and plans to construct its own brewery pre-treatment program.

### **TOWN OF CRESTONE WATER/WASTEWATER OPTIONS OVERVIEW**

In light of the potential increase in wastewater services fees proposed for the Town of Crestone by the Baca Grande Water and Sanitation District, the Town of Crestone is interested in considering alternative service arrangements for both water and sewer compared to what they currently employ. While the scope of DOLA's Small Communities Water and Wastewater Project Development program does not allow for a full alternatives engineering study, it does allow for the preliminary evaluation of alternatives and what Crestone may want to consider as it moves forward with potential service options. For preliminary consideration, the Town of Crestone would like to review the following options:

- 1) Do nothing (maintain current IGA with Crestone) – this option essentially keeps the water and sewer service as it currently stands, including water service provided to residents using its existing four municipal wells and water treatment plant, while wastewater service continues to be provided by the Baca Grande Water and Sanitation District.
- 2) Build own wastewater treatment facility – in this option, the Town of Crestone would continue to provide potable water service to those entities who are connected to their distribution system. On the wastewater side, the Town of Crestone would construct its own wastewater treatment facility and treat wastewater as its own municipality.
- 3) Turn over operations to Baca Grande Water and Sanitation District – this option would include suspension of all collections and water supply by the town and turn over all municipal operations to the BGWSD. This would include continued treatment of wastewater by BGWSD while either operations of the potable water system, or integration of the potable water system into BGWSD would occur.
- 4) Integrate all Town of Crestone residents into distribution and collections system – currently, there are residents who either are not on municipal water (i.e., have their own residential wells) or are not on the collections system (i.e., are on septic). The intent of this option is to “force” or recommend all residents to tie-in to the distribution and collections system. It is assumed under this scenario that the Town of Crestone would remain in control of its own water system, and then either continue to use BGWSD for its wastewater treatment or construct its own WWTP.



### ALTERNATIVE 1 – MAINTAIN CURRENT IGA WITH BGWSD

As described above, the Town of Crestone may wish to do nothing with its current water and wastewater arrangement and continue its wastewater service agreement with BGWSD. In addition, the Town of Crestone may also wish to continue providing water service to its existing customers as it currently does now. Selecting this option would essentially keep water and wastewater service as is. This would mean utilizing the same infrastructure in place, run and managed by the same entities. On the water side, this would mean the following:

- / Town of Crestone would continue to own and operate the water system. As documented during the March 15, 2022, site visit by JDS-Hydro, the water system is comprised of the following:
  - 1) Five municipal wells drilled into the alluvium of Crestone creek, with one well designated as a part-time well. Though these wells are alluvial and should be considered shallow, the currently are not classified as Groundwater Under the Direct Influence of Surface Water (GWUDI). Overall, there are seven wells that comprise the town's water supply. Of those seven wells, only five are active.
  - 2) Potable Water Tank constructed in 2009. Tank is sized for 114,000 gallons.
  - 3) Potable Water Treatment Plant. Plant employs liquid chlorine for disinfection and a recirculation pump to promote mixing, mitigate freezing, and reduce formation of TTHM's. The water treatment plant is not designed for surface water or GWUDI treatment. However, does have backup power generation, automatic transfer switch, sample ports, production metering, and a booster pump to provide service pressure and fire flows back into town. Water treatment plant was constructed in 2009 with the potable water storage, so the facility should not be considered old.
  - 4) Treatment plant site. Is encircled on two halves by a security fence but is also open on the other two sides.
  - 5) Distribution system serving 61 taps within town. Distribution system also includes fifteen (15) fire hydrants. The distribution system consists of 14,020 LF (3.655 miles) and was constructed in 2008. Most residential and commercial taps are metered.
  - 6) As described above, the water treatment plant has produced on average 3.18 million gallons per year over the past three years, or 9,234 gpd on average. While the distribution system only serves three year-round restaurants (including one brewery) its largest customer is the Crestone Charter Academy.
  - 7) Age and condition of distribution lines are not readily known.
  - 8) Overall max day capacity of the water system is 76,320 gallons per day.

Overall, the potable water system appears to be in good condition considering its location and resources. The water plant and storage tank are fairly new, and the ability for the water plant to provide fire flows is a benefit that many towns of this size do not enjoy. The Town is well staffed, has an attentive administrator, and administration staff which allows for meticulous meter reading and record keeping. However, there are a few tasks in which JDS would recommend that the Town pursue in regard to its water system to ensure that it remains without issues:

- 1) Complete installation of security fence. If it is not already, this will become a Sanitary Survey issue at some point.
- 2) Review screening tools for alluvial wells. Given the shallow depths of the five alluvial wells it is a surprise that these wells have not been classified as GWUDI wells. If CDPHE does elect



to classify the wells as GWUDI wells, it will require expensive improvements to the water treatment plant in the form of pre-filtration and micro-filtration equipment to remove more robust contaminants and reduce turbidity.

- 3) If not already done, JDS would recommend that the Town employ a water accountability endeavor where water produced is compared to water sold. If the percent losses are anywhere from 5% to 20%, the percent losses should be considered acceptable within the industry according to AWWA. If documented losses are above 20%, then the accountability percentages should be considered excessive and water loss mitigation measures should be employed.
- 4) Inventory of distribution system. It is recommended that the Town of Crestone inventory its 2.16 miles of distribution mains to accurately gauge the age, material, size, and quality of the pipes. This inventory should be conducted as a response to the water accountability evaluation as suggested above. If the water inventory reflects losses above 20%, then the Town should conduct the inventory sooner than later to identify locations within the distribution system which may be conducive to leakage.

/ Wastewater Collections System: as described above, the Town of Crestone employs a relatively new sewer collections system which was constructed in 2003. Previously, Town residents all had Onsite-Wastewater Treatment Systems (OWTS) that individually treated each houses wastewater. However, because the OWTS systems and respective leach fields were contaminating the shallow Crestone Creek aquifer, which was serving as the water supply for the residents of the Town of Crestone (as well as the Baca Grande Water and Sanitation District), the Town opted to construct a wastewater collections system and send wastewater to the Aspen Wastewater Treatment Plant, which is owned and operated by the Baca Grande Water and Sanitation District. The existing collections system includes the following:

- 1) Approximately 11,440 LF of 8" SDR 35 pvc sewer mains
- 2) Approximately thirty-six (36) 4' I.D. precast concrete manholes with rubber boots at all pvc pipe penetrations.
- 3) Approximately eighty-three (83) 4" or 6" sewer taps

As mentioned above, there has been a significant question as to whether the system has been experiencing Inflow / Infiltration issues. For more information on these issues, please see the first portion of this report. In response to the aforementioned Inflow / Infiltration (I/I) issue the Town conducted a video survey of its collections system in June of 2022. Video clips of the video of each segment of its collection system were sent to JDS-Hydro, which were reviewed by JDS. The videos revealed that there were no noted issues with the collections system, especially in the form of line breaks, root balls, underground infiltration or above ground inflow. Overall, the video substantiated that the collections system was still in very good condition and most likely not the cause of the discrepancies noted at the Birch Street master meter. However, the collections system does collect wastewater from three (3) year-round food establishments, one of which is a brewery which began full time operations in May of 2022. As observed, none of these establishments had a grease / oil interceptor to provide fat / oil / grease (FOG) pretreatment before the wastewater from these establishments entered the collections system. So while the collections system in itself is in very good condition, it is advised that the Town employ the following to assist with the reduction of FOG or elevated BOD concentrations from the permanent (or even temporary) restaurants in town:



- 1) Fat / Oil / Grease (FOG) interceptors: Most communities that employ a central sewer collections system to send raw wastewater to a wastewater treatment facility require restaurants to construct a FOG interceptor on their sewer service before it enters the collections system. This is to reduce the delivery of fats, oils, and grease into the collections system and ultimately to the wastewater treatment plant. Introduction of fats, oils, and greases into the collections system can create maintenance issues in the collections system, while increasing organic loading to the wastewater treatment plant in the form of elevated BOD concentrations. As noted above, this appears to be occurring at the Birch Street master meter and Aspen WWTP. While interceptors cannot settle out the soluble BOD from its raw wastewater, they can settle out particulate BOD, solid waste, and food waste from the waste stream coming from the establishment. As noted above, the Town of Crestone believes that all three of its active restaurants employ grease-interceptors or do not wash food waste down its drains..
- 2) Brew Waste Control: Because of the processes involved with brewing beer, the waste streams generated by a brewery (even microbrewery) can produce extremely strong wastewater. Through the brewing process, there are multiple locations within brewery that can produce high strength waste. A sample of these locations include the following:
  - Spent grains
  - Mash out
  - Rinse mash tun
  - Boil kettle "sludge"
  - Rinse boil kettle
  - Boil kettle clean
  - Heat exchange sanitizer
  - Fermenter yeast cake – generally the highest BOD concentration comes from here
  - Fermenter rinse
  - Fermenter clean
  - Server tank rinse
  - Cask steaming (if necessary)

All of these processes can contribute to extremely high TSS, BOD, phosphorus, and TKN concentrations leaving the brewery (see page 11 above). If these individual waste streams cannot be segregated out of the normal waste stream (i.e., most of the time, all of these waste streams are washed down the floor drains and into the collections system) then some sort of sedimentation process is recommended to settle out solids from the brew waste from the remainder of the soluble waste. While BOD concentrations in the wastewater from the brewery would still be high in the sedimentation basin filtrate, it would not be as high as unsettled wastewater coming directly from the establishment. Regardless, some type of pre-treatment should be employed at the brewery, whether that is separating out the brew waste streams from the normal waste streams or employing some type of sedimentation basin on the sewer service (similar to a Grease and Oil Interceptor described above).

- 3) Pre-Treatment Basin: If constructing oil / grease interceptors or brew waste sedimentation basins is too difficult or costly for the Town to construct, another alternative might be to construct a pre-treatment sedimentation basin just upstream of the master meter. Essentially, this basin would be a synthetically lined, engineered, hole in the ground. The basin would need to be sized for the maximum day flows accurately recorded for the town. The basin would also need to be aerated to control odors. The biggest challenges to constructing and maintaining a facility such as this would be the following:



- Cost: this structure would not be small as it would need to adequately provide sufficient detention time to settle out solids from the waste stream. Also, synthetically lining a structure such as this tends to be expensive.
- Operating cost: Aerators require energy. Depending upon the horsepower of the aerators, they could be quite expensive. However, it may be possible to provide surface aerators that are solar powered.
- Location: Because exposed wastewater can be unsightly, the Town would need to select a location that is not within public view, if at all possible.
- Odors: While it is recommended that a sedimentation pond such as this control odors with the use of surface aerators, it is still possible for odors to escape the pond if there are a lot of high organic loadings experienced at the pond (i.e., high restaurant traffic and brew waste days). The higher the use, the higher the waste, and the higher the public traffic in and around town to experience the odors.
- Security: A structure such as this will need security fencing all around it for liability purposes, as well as to keep out wildlife.

/ Wastewater Treatment Plant: As noted above, all wastewater is collected within the Town of Crestone collections system, and then sent to the Aspen Institute WWTP. The Aspen Institute WWTP is owned and operated by the Baca Grande Water and Sanitation District and has a hydraulic design capacity of 0.15 MGD with an organic design capacity of 300 lb BOD/day. The facility features a surface outfall that discharges to an unnamed dry wash tributary to South Crestone Creek. This facility provides primary wastewater treatment through its headworks facility, which features a mechanical fine screen, vortex grit collector, grit decanter dewatering bin, and an equalizing basin. Secondary wastewater treatment occurs in the form of a sequencing batch reactor (SBR) process. Disinfection is achieved through UV disinfection, while sludge generated from the SBR process is dried and stored in two new sludge drying beds. The facility has generally had an acceptable performance history, with its last cease-and-desist occurring in 2014. That case was subsequently closed. The facility has had subsequent exceedances of E. coli (3) and Total Residual chlorine (8) prior to its last discharge permit issuance in 2019. The plant did experience an exceedance in 7-day acute BOD in 2021, but that exceedance was found to be laboratory error. Overall, the facility has performed well since its cease-and-desist order was issued in 2016. The plant has undergone to significant upgrades in the past four years in the form of improvements to the headworks facility as well as construction of two new sludge drying beds. Overall, the facility is more than adequate to treat residential and small commercial flows, though it may struggle to adequately treat elevated BOD loadings should commercial establishments (especially the brewery) continue to go without pretreatment. Hydraulically, the facility is still below its rated hydraulic design capacity. Maximum average day flows were around 66% of the rated hydraulic capacity by the end of 2021. Of note, a facility must begin planning for expansion once it reaches 80% of design capacity. So while 66% is still less than the 80% design capacity threshold, BGWSD still may begin looking at what it may take to expand the facility in the future if necessary.

As of the end of 2021, BGWSD was charging the Town of Crestone \$5.25 / 1,000 gallons of wastewater as measured at the master meter. In order to cover this expense, as well as operations and maintenance of the collections system, the Town of Crestone was charging its customers \$40 / month. As noted in the beginning of this report, the Baca Grande Water and Sanitation District raised its sewer rates to cover perceived discrepancies in hydraulic and organic loadings generated from the Town of Crestone to \$7.90 / 1,000 gallons with an



additional \$0.991 lb/BOD per month (i.e. taking the average BOD reading for the month and then multiplying it by the number of days in the billing month). The District also charged an \$10 flat rate per month to cover BOD costs. Conversely, it is assumed that the Town of Crestone would need to increase its sewer rates to roughly between \$60.00 to \$82.00 per month, depending upon what BGWSD elected to do. Because the increase was proposed to cover perceived discrepancies as to how much hydraulic loadings are being contributed at the Aspen Institute WWTP, additional investigations of the accuracy of the master meter should be considered before the proposed rate increases are introduced. As recommended above, actual flows measured at the Birch Street master meter are probably less than what are being measured. This opinion is somewhat corroborated by the findings from the I/I evaluation conducted by the Town of Crestone in June of 2022. Reduced flows result in reduced hydraulic loadings, which also result in reduced organic loadings to the Aspen Institute WWTP. Conversely, the proposed rate increases suggested by BGWSD’s consultants should be appropriately revised to reflect actual hydraulic and organic loadings observed at the master meter. The Town of Crestone should still pay for representative services at the WWTP. The organic concentrations being generated by the brewery in the past can be considered a burden on the wastewater treatment plant. If pretreatment is not instituted at the brewery in the future, then the Town of Crestone should pay for that burden, given that the majority of BGWSD are normally residential or camps. While it is likely that organic loading from the BGWSD becomes elevated when their spiritual camps are active, they probably do not contribute the same levels of organic loading that the brewery does on a year-round basis. One item which the Town may wish to consider in the future is to construct its own flow monitoring and BOD monitoring station in the future in an attempt to corroborate BOD and low monitoring conducted by BGWSD. While this may be considered an additional expense, it may serve as a second check to the readings taken by BGWSD, especially if rates charged to the Town of Crestone are contingent on flow and BOD readings in the wastewater. Overall, though, the user rates that Crestone currently pays are in-line with other wastewater municipal rates in the San Luis Valley and southern front range communities. A representation of these rates is shown below in **Table 7**.

**TABLE 7: REGIONAL MONTHLY WASTEWATER RATES – FOR ¾" TAP**

*\*All rates are for in-town residents unless stated otherwise*

- Town of Crestone: \$40.00 / month base rate
- Baca Grande Water and Sanitation District: \$37.03 / month base rate
- East Alamosa Water and Sanitation District: \$25.00 / month base rate
- Monte Vista Outside Residential: \$20.40 / month base rate + \$7.80/1000 gallons
- Town of Saguache: \$35.00 / month base rate
- Town of Rye – IGA with Colorado City Metro District: \$29.64 / month base rate +0.005/gallon
- Round Mountain Water and Sanitation District (Westcliffe and Silver Cliffe): \$33.50 / month base rate + \$3.80/1000 gallon in District or \$5.50 / 1000 gallon outside of District
- Creede: \$20 / month base rate

One item which Crestone may wish to consider is future operations at the Aspen Institute WWTP. As noted above, hydraulic loadings at the facility are increasing, and have reached 66% of the design hydraulic capacity. It is likely that an expansion of the facility will need to occur within the next 10 to 20 years. BGWSD has at least master planned what an expansion might look like for its current SBR process. In addition, this master plan for the WWTP will also need to account for process improvements that can meet future effluents limits





assigned to the Rio Grande Basin. These proposed effluent limits for nutrients (i.e., phosphorus, nitrogen, and other constituents) are anticipated to be incorporated into respective discharge permits in each basin at the end of 2027. The current effluent limits being proposed for some of these constituents (particularly nitrogen) are especially restrictive and may require particularly expensive treatment technologies to enable facilities to meet these limits. In fact, the current effluent limits being proposed by the EPA and CDPHE for nitrogen are not technologically feasible in most instances at this time. So while the SBR process currently employed by BGWSD is better situated to meet these proposed limits than a lagoon system, the facility will still require some level of improvement and potentially need to employ tertiary treatment to meet these limits in the future. Overall, any expansion to the facility in the future will need to consider additional treatment to meet proposed Regulation No. 31 effluent limits for nutrients as part of the overall package. Thus, the overall impact to the Town of Crestone, should it continue to send wastewater to the BGWSD, is that it should expect to see wastewater rate increases in the future to cover potential expansion and improvement initiatives at the Aspen Institute WWTP. All wastewater treatment facilities should expect to undergo some sort of improvement to meet these potential changes to effluent limits as a result of Regulation No. 31, unless Discharger Specific Variances (DSV) are pursued and issued. But even obtaining a DSV for effluent limits should only be seen as a temporary solution, as the ultimate goal of a DSV is to postpone the construction of necessary improvements and technologies until they become more affordable to disadvantaged communities.

Overall, the Town of Crestone has a positive situation in regard to its water and wastewater services, especially given its location and available resources. The Town has adequate support staff, which is commendable given how difficult it is to bring quality municipal expertise to small, rural establishments like Crestone. It has relatively new water infrastructure given the construction of a new water treatment plant and water tank in 2009. Its collection system is also relatively new with its construction in 2003 and has been confirmed through its recent I/I evaluation to still be in good shape. In addition, wastewater treatment is provided via a consecutive facility that is owned and operated by a qualified municipality with qualified operators and management. Being able to spread the responsibilities of owning and operating a wastewater treatment facility is a benefit that a lot of small communities under 500 people do not have. While owning and operating a water system in a small community is more traditional, owning an operating an SBR wastewater treatment system within a community of 140 people is not. Planning, financing, permitting, designing, constructing, owning, and operating a fully functional wastewater treatment facility in the state of Colorado in 2022 is a very difficult proposition. The next section of this report will provide more information as to what the Town will need to consider if it wishes to construct its own wastewater treatment facility.

#### **ALTERNATIVE 2 - BUILD WASTEWATER TREATMENT PLANT AND PROVIDE BOTH WATER AND WASTEWATER SERVICES**

If the Town of Crestone is not satisfied with its current (or future) IGA with the BGWSD, it could consider the construction of its own WWTP to treat all wastewater generated by the Town. This section will focus on the permitting requirements, design requirements, planning considerations, capital costs, operations considerations, maintenance commitments, and other requirements necessary to operate a wastewater facility that will treat wastewater effluent to the new stream standards according to the requirements of Colorado Regulation 31.17. The following is a summary of items which the Town will



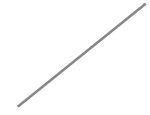
need to consider as it evaluates whether it wants to undertake the permitting, design, construction, operations, and ultimately ownership of a new wastewater treatment facility:

- / Planning: even before the Town begins permitting and design tasks, it will need to begin the planning process. The planning process to design and permit a new wastewater treatment facility generally will include the following steps:
  - 1) Estimating how large the facility must be. This would involve calculating how much average day, max day, and peak hour flows which the facility would need to be sized to treat. In the case of the Town of Crestone, the facility would be quite small. Probably around 25,000 gpd to 50,000 gpd to accommodate future growth.
  - 2) Effluent targets: An initial planning stage would be the application for Preliminary Effluent Limits (PEL's) or Water Quality Planning Target Worksheet (if it wanted to streamline the process). These planning targets would identify what the perceived effluent limits would be, and how proposed treatment plant would need to be designed to meet them. Currently, any new facility would need to meet the proposed effluent limits contained in Regulation No. 31. A good indicator as to what the facility would need to meet can be gleaned from the BGWSD most recent discharge permit, issued in 2019. Some of the parameters which the facility needs to meet are presented in **Table 8** below:

**Table 8: Select Effluent Limits from the BGWSD 2019 Discharge Permit**

Effluent Parameter	30-Day Avg.	7-Day Avg.	Daily Max	2-year Avg.
pH (su)	-	-	6.5-9.0	
E. coli (#/100 ml)	64	128	-	
TRC (mg/L)	0.011		0.019	
Total Ammonia (mg/L)				
January	5.0	-	28	
February	4.1	-	27	
March	4.4	-	24	
April	3.9	-	26	
May	3.3	-	32	
June	3.4	-	37	
July	3.0	-	32	
August	2.2	-	32	
September	2.6	-	30	
October	2.5	-	30	
November	3.8	-	29	
December	4.0	-	27	
BOD5 (mg/L)	30	45	-	
BOD5 (% removal)	85% min	-	-	
TSS (mg/L)	30	45	-	

Note that these effluent limits are only an example of what the Town of Crestone may need to meet should it decide to apply for PEL's or Planning Effluent Targets. It is very possible that because the Town of Crestone is a new facility that it will need to meet more stringent effluent requirements as mandated as part of Regulation No. 31. In the future, much like BGWSD, Crestone will need to plan for meeting these effluent limits by 2027. Being that the Town of Crestone is small and most likely below the MHI, this may help the Town obtain more feasible effluent limits. However, because the receiving stream (South Crestone Creek) has periods where its low flow is zero, it will not receive a favorable dilution factor.



This will encourage CDPHE to issue more protective (low) effluent limits as there will be times that the WWTP discharge will comprise the entire stream.

- 3) Treatment processes: Given the size of the small discharge generated by the Town of Crestone, it is likely that some type of packaged wastewater treatment plant would be recommended by CDPHE or a licensed engineer. These typically employ a secondary process such as a Sequencing Batch Reactor (SBR), especially for small basins such as Crestone with high BOD concentrations. This process is similar to what BGWSD employs. An SBR may work well if proposed effluent limits remain more traditional to the ones which were assigned to BGWSD. However, if more stringent effluent limits are assigned (i.e., low nitrogen or phosphorus limits) that require tertiary treatment for removals, then an SBR may not be the best alternative. It is very possible that the Town may be forced to consider a non-discharging alternative, such as an evaporative non-discharging lagoon. While this alternative will certainly save on treatment costs such as chemicals, energy, and operations, it will be expensive to retain sufficient land to evaporate and to construct large, synthetically lined ponds.
- 4) Land planning: The Town will need to consider the following when selecting a location for a wastewater treatment facility:
  - The facility will need to be located downstream of the entire Town, most likely near Crestone Creek.
  - The facility will need to be located away from existing and future development to protect the community from odors and poor aesthetics
  - The facility will need to be fenced in for protection
  - Depending upon the treatment process, the community may need to purchase considerable land for construction
  - Who may be willing to sell land to the community? Is there interest in reuse? What other stakeholders may wish to participate in the locating of the facility?
  - Will power be required? Is there single-phase or three phase power nearby?
  - Are other utilities nearby? Will a water service need to be constructed from the distribution system? How far will the collections system need to be extended to connect to the wastewater treatment facility?
  - Is the facility located within a floodplain?
- 5) Financing: Involving potential funding agencies early will be very important. Given that the proposed construction costs may be spread over a very small contingent, identifying potential funding sources early is imperative. Given Crestone's perceived low MHI, it may be eligible for potential grants, matching grants, or low interest loans through the following agencies:
  - Colorado Department of Local Affairs (DOLA)
  - Energy Impact and Assistance Fund (EIAF)
  - Water Pollution Control Revolving Fund
  - Water Quality Impact Fund (WQIF)
  - Small Communities Grant Program
  - United States Department of Agriculture Rural Development Program (USDA RD)
  - Community Development Block Grant Program (CDBG)There is the potential that Crestone may be eligible for planning, engineering, and construction financing. However, given Crestone's small constituency, obtaining loan



financing may be difficult if the loan were to be repaid through user fees spread out over a population of 140 people and 52 sewer taps.

- 6) Professional engineering: It is recommended that the Town consider employing a professional engineer early in the planning process. Other professional services that the Town may need to employ may be the following:
    - Attorneys (i.e., bond attorney, environmental attorney, small district attorney)
    - Surveyor
    - Soils engineer
    - Environmental engineer
  
  - 7) Intergovernmental Agreement Planning: How is the current IGA written between Crestone and BGWSD? Are there certain requirements that need to be met before Crestone can be released from its IGA? Will BGWSD continue to treat Crestone wastewater during the planning, design, permitting, and construction process?
- / Permitting: Ultimately, any wastewater treatment facility will need to go through the site location application permitting process through the Colorado Department of Public Health and Environment (CDPHE). However, there are other permits in which the Town would need to obtain as it navigates through the environmental, engineering, and operational requirements to build its own WWTP:
- 1) Site location approval: After going through the preliminary effluent limit phase, the next document that would be required for submittal to CDPHE would be the preparation of a site location approval according to Regulation No. 22. This document includes all preliminary design information (including preliminary construction documents) required for review by CDPHE. This document would include information such as site location of the proposed facility, design information, loading information, adjacent well location, proximity to the community, basis of design report, proposed chemicals, process design calculations, soils conditions, discussion of preliminary effluent limits, discussion of adjacent treatment facilities, and discussion of consolidation (among other considerations). It is this last element, consolidation alternatives, which may prove to be the most difficult for Crestone to overcome. CDPHE is a proponent of consolidation of facilities, better known as regionalization. If CDPHE sees an opportunity where an existing treatment plant or lift station can be removed in favor of combining resources, it will absolutely rule in favor of that configuration. Rarely will CDPHE encourage the addition of a new WWTP or lift station when service consolidation had already been accomplished and would prefer to encourage centralization of wastewater treatment. In the case of Crestone requesting the construction of a new WWTP, it is unlikely that CDPHE would look favorably upon the approval of a site location application to construct a new WWTP.
  - 2) Environmental permitting: It is likely that at least an environmental review of the proposed site would need to occur as part of any loan or grant review, if not a full 404 environmental permit, depending upon the location and application.
  - 3) Review of Construction Drawings and Specifications: Generally, occurs after the approval of the site location approval. These need to be prepared by a professional engineer. Note that the construction drawings will need to be developed according to CDPHE's Design Criteria for Domestic Wastewater Treatment Works (Policy WPC-DR-1).
  - 4) Discharge permit application: Would need to be obtained through the application process before the facility could start discharging.



- 5) Regional Building Permits: These are required if any of the proposed treatment processes require a superstructure.
  - 6) Floodplain permitting: If the proposed location of the facility lies within a floodplain, the Town may need to apply for a floodplain permit. In addition, if the construction of the WWTP modifies the floodplain of Crestone Creek in any way, it may need to apply for a CLOMR or LOMR.
- / Construction: Most small communities that are installing new wastewater treatment systems are installing mechanical plants at a cost of \$3 - \$10 million which includes engineering, permitting, equipment, and construction expenses. A non-discharging evaporative lagoon system may be constructed for between \$2 million to \$5 million, depending upon how large the required evaporative ponds are, and how expensive it is to line these ponds.
- / Operating costs: If a mechanical plant is employed by the Town of Crestone, there will be increased operational costs. For most WWTP's, the largest expense is the energy required to aerate the wastewater. For an evaporative lagoon system, energy required for aspiration or odor control would also be the largest expense. Other expenses such as chemical costs, solids disposal costs, sampling costs, repair costs, monitoring costs, and staff costs must also be considered. It is very likely that the community will need to plan to increase rates to not only cover potential construction loan repayments, but also to cover increased expenses that it had not had to address in the past.
- / Staffing: Attracting qualified wastewater operators will be a major consideration if the Town of Crestone were to operate its own wastewater treatment facility. If the Town were to construct an evaporative pond facility, or any other type of lagoon facility, it would likely only need to retain a Level D operator. However, if Crestone were to construct a mechanical type of facility, it would need to retain a Level C or higher. It is very possible that Crestone would either contract an operator or share a licensed operator with BGWSD. Either way, given Crestone's location and resources, sharing a contract or local operator with neighboring communities would probably be Crestone's best alternative.
- / Future Planning: Even after the successful construction of a wastewater treatment facility, the Town will always be in planning mode in conjunction with the wastewater treatment facility. There will be equipment upkeep, site maintenance, discharge permit renewals, continued sampling, regulatory changes, monitoring changes in impaired streams, stakeholder processes within the San Luis Basin, changes in chemical costs, changes in power costs, variances in wastewater profiles, etc. The wastewater plant will always require attention, and it will be the responsibility of the Town of Crestone to stay at least two steps ahead of the changing wastewater environment.

### **ALTERNATIVE 3 - BACA GRANDE WATER AND SANITATION DISTRICT ASSUME OPERATIONS OF ALL WATER AND WASTEWATER SERVICES FOR THE TOWN OF CRESTONE**

This option would result in Baca Grande Water and Sanitation District assuming the operations of the existing water treatment plant and distribution system for the Town of Crestone, as well as the current wastewater collections system. The Town of Crestone would no longer in any way be responsible for providing potable water or wastewater collections to its residents. All water and wastewater payments for the Town of Crestone's residents would be paid directly to Baca Grande Water and Sanitation District, and operations, management, and maintenance for both would also be the responsibility of BGWSD. Of special note, the Town of Crestone should consult with a Small District or Special District



attorney before approaching the BGWSD about the concept of annexing into the District. To consider BGWSD taking over water and wastewater operations will require a lot of work and communication between the two entities, and an overture like this should be approached in complete seriousness. Understanding what it means to turn over all utility operations to the District would be highly recommended, and consulting with an attorney specializing in Special Districts issues is strongly encouraged. However, the bullet list below provides a first blush view of what annexation of the Town of Crestone into the BGWSD might look like:

/ Wastewater System

- 1) Overall operations at the WWTP would not change.
- 2) Master meter would probably remain in place. However, because BGWSD could charge homeowners according to their water meter now, the master meter would probably remain in place for monitoring purposes.
- 3) Residents would be charged a flat fee and possibly an additional per gallon fee according to residential water meter usage.
- 4) It is possible that BGWSD would require all residents to be connected to the collections system rather than rely upon OWTS systems.
- 5) BGWSD may require a second inspection of the collections system prior to annexation
- 6) BGWSD would most likely assume operations and maintenance of the collections system
- 7) Installation of grease traps / interceptors would be required on all restaurants. Additional sedimentation or segregation of heavy brew waste would probably be considered at the brewery.
- 8) BGWSD would require a complete inspection of all sewer mains, manholes, interceptors, and residential services
- 9) BGWSD would probably also require an audit of the collections system finances
- 10) Providing information on potential areas of expansion for the collections system, a proposed CIP list, maintenance records, and potential master plan or collections system evaluation (i.e., assessing capacity of mains vs. future expansion at full buildout) would probably be required.

/ Water System

- 1) BGWSD would need to assess the best manner to assume operations of the water system. This would include an evaluation of how the water system operates, system capacity analysis, source evaluation, quality evaluation, assessment of the existing distribution system, service pressures, fire flows, etc. Would it be better if BGWSD served Crestone directly out of its existing potable water system, or would it be better if Crestone's potable system were to operate in its current manner?
- 2) Would it be prudent to connect the two systems with at least a transmission line, allowing for the potential to share water resources through the interconnect in the event of an emergency?
- 3) Crestone would need to conduct a capacity analysis for future buildout, and if the system needed to be expanded in any manner to meet future demands (i.e., treatment capacity, storage capacity, source capacity).
- 4) BGWSD would need to consider the possibility that Crestone's wells may ultimately be considered GWUDI in the future. Undertaking the risk of upgrading the plant to meet



GWUD requirements and spreading across the existing BGWSD may be difficult to substantiate.

- 5) Any issues with the wells or distribution system that Crestone identified during the evaluation process or diligence process would most likely need to be addressed prior to any annexation procedures. This would probably include the completion of the security fence around the water treatment plant site.
- 6) It may be likely that all individual well users may be required to connect to the distribution system prior to annexation.
- 7) BGWSD would probably also require an audit of the distribution system finances.
- 8) Fire hydrants, services, meters, water mains, etc. would all need to meet BGWSD regulations.
- 9) BGWSD would likely read all meters in the Town of Crestone.
- 10) All residential and commercial water bills would come from the BGWSD.
- 11) BGWSD would be responsible for all water quality sampling within the Town of Crestone, including lead and copper sampling, raw water sampling, disinfection byproduct sampling, fecal sampling. BGWSD would assume responsibility for taking over execution of the monitoring plan and preparing the Consumer Confidence Reports (both of which would essentially be one monitoring plan and one CCR for the entire annexed district).

Ultimately, CDPHE would be in favor of regionalization. All water and wastewater services would be provided by one entity and costs could be share across the two services. The perspective from the state would be that the larger the entity, the more solvent and responsible that entity would remain. In addition, the perspective is that combining all water and wastewater service under one District would spread out responsibility over a larger base, and increasing resources would enable the District to accomplish more in regard to Capital Improvements, future planning, funding necessary system improvements, etc. However, getting to that point may prove difficult. Along with the political challenges of overcoming perceived public perception among some constituents (on both sides) would be BGWSD assuming responsibility of taking on infrastructure that it does not know a lot about. Prior to any potential regionalization efforts, the Town would need to make a thorough inventory of all infrastructure, especially its potable water system. While the water plant, water tank, and collections system were all recently constructed, the condition of the wells and distribution system is not readily known. Significant planning would need to take place in regard to how BGWSD might serve water to the Town of Crestone. Would it simply “take over” the water system and assume responsibility for the existing source water, or would it extend service from its own distribution system. Initial opinions would be that BGWSD could extend at least a transmission line from BGWSD to the Town of Crestone to connect the water sources. But essentially, BGWSD would probably run the two communities almost independently. It is highly unlikely that BGWSD would abandon any reliable water sources and would most likely utilize them to their fullest extent. It is also likely that the existing distribution system would remain in place, and overall operations of both the water system and wastewater system would not change (at least in the eyes of the public). The largest change would be in administration, where water and wastewater rates would be established by the District, becoming in-District charges. The Town itself would have no direct input on the rates or operations, except through a public meeting process. However, the Town would also see itself “getting out of the utility business” if that is what it so desired. If the Town of Crestone were to more fully investigate this alternative, it is recommended that they seek council from a reputable Small District’s attorney, which JDS can provide contacts for.

In the end, the Town of Crestone will need to directly communicate with BGWSD about what it would require if it were to annex the Town into its water and sanitation district. The above assessment



represents the consultants' opinions based upon prior experience as to what an annexation process with the BGWSD may look like. Again, consulting with a small district / special district attorney is strongly encouraged if the Town of Crestone is serious about moving forward with any annexation process into the District.

#### **ALTERNATIVE 4 - TOWN OF CRESTONE REQUIRES ALL RESIDENCES WITHIN THE TOWN BOUNDARIES TO CONNECT TO WASTEWATER COLLECTIONS AND POTABLE WATER DISTRIBUTION SYSTEM**

Currently, some properties within the Town limits are not connected to the central wastewater collections or potable water distribution system. Some homes within the Town's boundaries are served by well water while others are connected to the Town's water service. Conversely, some residences within the Town's boundaries are on OWTS systems for wastewater disposal while other properties within City limits are connected by the Town's wastewater collection system. Because a property is on its own well does not necessarily mean that they are on septic, and vice versa. Administratively, it makes sense to have all properties within the Town of Crestone's City Limits to be connected to the wastewater collections and potable distribution system. However, it is a common occurrence in small communities for some select towns to have water service provided with no wastewater connection, or vice versa. Overall, JDS would encourage the Town of Crestone to investigate what it would take to physically and administratively to bring all customers into its service area. Generally, having central water and sewer as a homeowner or commercial property is seen as a benefit in most cases. However, there may be some political hurdles to encouraging homeowners to connect to its potable water or wastewater collections system. Some concepts which the Town of Crestone may wish to consider as it contemplates connecting customers to its potable water system and wastewater collection system are provided below:

##### **/ Potable Water System:**

- 1) Cost:** it will be costly to extend mains and services to all customers not currently served by the potable water system. It is assumed that most of the citizens within Crestone city limits that are not currently on the potable water system are on the perimeter of the system. Making that assumption, it is likely that Crestone would need to extend a considerable amount of main or service line to bring in all customers that are currently on private wells.
- 2) Cost sharing:** A discussion with each individual homeowner will need to be broaches as to who would be responsible for sharing the costs for extending these mains and services. In most cases, the property owner would generally be required to connect to the potable water or distribution system as having central water and sewer is seen as a benefit to most. However, in some small communities, being required to tie-on to the central services can be seen as an imposition of requirements, and not something that they would want to entertain, especially if they have never had any issues with their wells or septic system. The Town may wish to consider extending water mains to near each homeowner's property lines and then providing the service tap, and then having the homeowner pay for the construction of the service line. However, whatever Crestone elects to do for one property owner, they should do for all homeowners.
- 3) Service evaluation:** Before committing to bringing on all homeowners into its potable water system, it is advised that the Town evaluate the theoretical service pressures and flows that would be available to each homeowner. If the Town is trying to convince homeowners to connect to its water system, it should evaluate whether their will be an improvement or reduction in service quality.





- 4) Capacity evaluation: Before discussing the possibility of brining all citizens of Crestone into the potable water system, the Town should evaluate whether the wells, water treatment plant, and storage tank have the capacity to connect all current and future homeowners. Preliminarily, it does look like the Town of Crestone can serve all current homeowners. However, JDS would recommend that Crestone evaluate its current capacities at the water plant, wells, and tank as to whether it can serve current and future demands.
  - 5) Education: As mentioned above, having central water and sewer is generally seen as a benefit for residential and commercial property owners. Not having to maintain well and septic infrastructure can be a burden that most property owners do not wish to undertake. In addition, being served central water provides certain advantages regarding how the water can be used. For example, most individual wells are actually exempt wells which only allows for household uses and a little bit of outdoor watering. Having central water can expand uses at each residence beyond typical domestic uses, such as outdoor irrigation, stock watering, landscaping, etc. However, in many small communities, being encouraged (or even forced) to connect to municipal infrastructure can seem like an over-reach. Especially if the property owner has never had any issues with their current water and sewer infrastructure. Educating the community on the benefits of having central water and sewer would be recommended if the Town were to pursue this concept any further. But one of the biggest challenges to convincing homeowners who have previously had individual wells to tap into the central water system is that they now have to pay for a service that they previously had not had to pay for. Additionally, the costs for that service could go up at any time.
  - 6) Administration: The Town should verify that it has the staff capacity to read additional meters and prepare additional billings for added constituents.
  - 7) Water rights: The Town should also investigate the existing water rights for each individual well to ensure that the property can be connected to the water system. Most residential wells, as mentioned above, are classified as exempt wells with the Division of Water Resources. However, some wells may be covered by a specific augmentation plan, especially considering the shallow alluvial sources that proliferate the San Luis Valley. There may be an opportunity for the Town of Crestone to utilize the rights or physical structure of one of these wells in the future.
  - 8) Constituent base: though not a benefit to the homeowners, having additional constituency within its service area makes it easier to spread any debt service for CIP projects over a larger base. Even for grant applications, showing a larger constituency can help prioritize the Town higher for competitive grants.
- / Wastewater Collections System:
- 1) Cost: much like the potable water system, the Town of Crestone will need to extend the collections system to the perimeter properties in order to provide service to additional customers. Given the Town's situation, it sounds like it has already pursued funding to extend the collections system to accommodate potential customers to the north. So the assumption is that the Town has already taken the burden of extending the collection mains to potential customers on the north side of the Town, so it is aware of these potential costs. As mentioned above, the Town may wish to consider having each resident pay for the service line from the home to the sewer main tap.
  - 2) Planning: unlike the potable water system, the layout and design of the collections system can be subject to changes in topography. These changes in topography can impact capacity of the proposed mains by reducing or increasing slope, as well as whether or not



a certain basin may need a lift station. This is especially worth considering in a relatively hilly area such as the foothills of the Sangre de Cristo mountains. So as Crestone considers whether to serve certain customers or not that lie on the edge of the City limits, an evaluation of the topography between the existing collections system and potential customers should be undertaken.

- 3) Associated water service: in most instances, if a customer is connected to the municipality's water system, it will usually also be connected to the municipality's collection system. This is because most municipalities in Colorado require some type of return agreement back to the alluvium (shallow groundwater) through a court case to replace alluvial water in some fashion. While this can be achieved through septic systems, it is much easier to account for if it is metered through a wastewater treatment plant or master meter. While JDS did not perform a comprehensive evaluation of the Town's water rights, JDS is making the assumption that there is some form of return flow requirement from the Town's alluvial well water that requires the Town to return most flows back to the South Crestone Creek alluvium. Thus, in the case of Crestone, it is recommended that if it agrees to provide water service to a certain residence that it also provides sewer service as well.
- 4) Public perception: As mentioned above, most property owners would view the provision of central sewer a benefit over the use of a septic system for wastewater treatment. However, because of the current arrangement with the BGWSD, and its desire to raise user rates, this might be a difficult sell to those constituents still on septic and on fixed incomes. And as mentioned before, homeowners who have previously been on septic and have not had to pay for sewer service would now need to pay for this service. In addition, the costs that they have to pay for this service could go up at any time with no input from the homeowner.
- 5) Constituent base: see item #8 above.

## CONCLUSIONS

The Town of Crestone is currently dependent on Baca Grande Water and Sanitation District (BGWSD) to provide the community appropriate wastewater treatment. This investigation and evaluation was intended to provide the Town with a review of its current wastewater interconnect and intergovernmental agreement with BGWSD in light of its current measurement discrepancies at the Birch Street master meter. In addition, the evaluation also provides a planning level presentation and analysis of alternatives associated with potential options of water and wastewater service for the community. JDS would like to conclude by recommending the Town of Crestone focus on the following key considerations for each alternative as the Town contemplates its path forward:

### ALTERNATIVE 1 – MAINTAIN CURRENT IGA WITH BGWSD

Following the results of the sewer cleaning and video of the Town's sewer collections system, it is apparent that the reason for the large discrepancy in flow readings vs. water usage is not a symptom of inflow and infiltration, as suggested by the BGWSD. It is the opinion of this evaluation that the cause of the discrepancy more likely lies in the calibration and maintenance of the measuring flume located at the Birch Street master meter. Given that the proposed increases in rates being contemplated by BGWSD to the Town of Crestone has its foundation in the large hydraulic flows contributions read at the master meter, further investigation into the causes of the elevated flow readings at the master meter should be initiated. JDS has provided some potential ideas as to the cause of the flow reading discrepancies, and BGWSD (with cooperation with the Town of Crestone) may wish to employ a third-



party integrator or calibration entity to inspect the flume, level sensor, telemetry, and master meter installation all together. Investigating these issues could range in costs from \$5,000 to \$10,000, depending upon the integrator retained. Solving the flow reading issue is imperative to the successful execution of the Intergovernmental Agreement between BGWSD and the Town of Crestone. In regard to the BOD contributions by the Town of Crestone, there is some merit to the elevated BOD loadings experienced at the Aspen Institute WWTP. While elevated loadings due to increased flow is most likely not the cause of any elevated BOD loadings, elevated concentrations certainly can be a contributor. With no pretreatment available at the brewery establishment, the installation of sedimentation tanks at the brewery is strongly recommended. Otherwise, some type of comprehensive settling pond which could be used to settle out all particulate BOD from the Town of Crestone before it reaches the WWTP would be suggested. Also, in an effort to corroborate flow and BOD readings at the Birch Street master meter, it is recommended that the Town of Crestone in the future consider constructing its own wastewater flow metering and BOD measuring station on its wastewater interceptor to the BGWSD collections system.

Otherwise, the current utility service arrangement that the Town of Crestone incorporates is a very common arrangement in Colorado. Many communities provide their own water, and then exist as a consecutive wastewater system to an adjacent sanitation district. Given the current condition of the potable water distribution system and collections system, leaving the wet utility administration and operations as currently employed should be seen as viable should the master meter situation be resolved.

#### **ALTERNATIVE 2 - TOWN OF CRESTONE BUILD ITS OWN WASTEWATER TREATMENT PLANT**

The process to build a new wastewater plant is extremely resource intensive. If the Town were to pursue the planning, financing, design, permitting, and construction of a wastewater treatment plant it should expect to spend an immense of resources in the form of time and money. Small community mechanical wastewater plants are estimated to cost between \$3 – \$10 million, while non-discharging evaporative lagoons could cost between \$2 - \$5 million. Some grant money is available now through state and federal programs, especially with the recent approval of the Bipartisan Infrastructure Law (BIL). However, the community could still be responsible for the majority of capital costs for a new WWTP as there still are not ample grant funds available for wastewater projects through the common funding avenues. CDPHE may also be unfavorable to the Town of Crestone building its own wastewater facility when there is already a consolidation plan in place, given CDPHE's propensity to favor regionalization. Once the plant is built, operation requirements will increase, and the level of operator certifications required to run a mechanical plant is higher than the level of operator that is currently required to operate the lagoon system for BGWSD. It has been increasingly difficult to find such operators willing to move to small towns, and it would be likely that the Town would need to share operations of the facility with another community (i.e., BGWSD). Note that a standard lagoon wastewater treatment plant would likely not be approved by CDPHE, and would not be a consideration for construction. Overall, the construction of a new wastewater treatment facility by the Town of Crestone would not be feasible.

#### **ALTERNATIVE 3 - BACA GRANDE WATER AND SANITATION DISTRICT ASSUME OPERATIONS OF ALL WATER AND WASTEWATER SERVICES FOR THE TOWN OF CRESTONE**

Before the Town of Crestone considers annexing into the BGWSD and turning over all utility administration to the District, it should review internally what it would take to accomplish this. Handing all operations responsibility to BGWSD for water and wastewater services would remove any responsibility from the Town of Crestone for these services. However, this option would eliminate Crestone's ability to manage any of the essential Public Works' services for the Town. Unless there is an excellent relationship between the two entities, turning over facilities and operations to an adjoining



district can be difficult. While BGWSD is certainly open to the idea of assuming all water and sewer operations for the town, it would want a full commitment from the Town that this was the road that they were pursuing. A lot of preliminary groundwork would be required before the Town would approach BGWSD to take over its water and sewer operations. A discussion with a special districts attorney by the Town of Crestone is strongly encourages before the Town pursue this alternative further.

#### **ALTERNATIVE 4 - TOWN OF CRESTONE REQUIRE ALL RESIDENCES WITHIN THE TOWN BOUNDARIES TO CONNECT TO MUNICIPAL WATER AND WASTEWATER SERVICES**

The benefits that the Town may experience by extending water and sewer service to all residents within the Town of Crestone City limits merit further investigation of this alternative. Though there may be obstacles in the form of elevated capital costs and political resistance from those not currently incorporated into the central municipal systems, it is recommended that the Town pursue this alternative in a bit more depth. However, the Town should expect significant pushback from those residents who currently are not currently provided water and sewer service from the Town.

### **RECOMMENDATIONS**

The Town of Crestone has already employed one of the biggest recommendations from this report, which was to engage in the inspection and cleaning of the existing collections system. Because the results of the inspections confirmed that the relatively new collections system was still in very good shape, the likelihood of Inflow and Infiltration influencing readings at the master meter is very low. Following the completion of the collections system inspections, JDS-Hydro provides the following recommendations:

- / Investigate potential causes for elevated flow readings at the Birch Street master meter in conjunction with the BGWSD.
- / Construct its own flow and BOD monitoring station in the future to measure flows and BOD concentrations prior to entering the BGWSD collections system.
- / Investigate brew waste segregation at the brewery or construct particulate settling basin to intercept high strength particulate brew waste from entering the collections system.
- / Consider construction of new wastewater treatment facility for the Town of Crestone a last resort should continue negotiations with BGWSD fail to secure wastewater rates that are amicable to both municipalities.
- / Thoroughly investigate the plausibility of BGWSD assuming operations of Crestone's water and wastewater facilities and administration before approaching BGWSD with this proposal. This would include consultation with a small district / special district attorney
- / Cautiously pursue the potential of incorporating all constituents within the Town of Crestone's City Limits into its potable water and wastewater collections system.

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