



MEMORANDUM

TO: George Williamson, Humboldt LAFCo **Sent Via Email Only**

FROM: Rebecca Crow, P.E.

DATE: April 6, 2009

RE: **Preliminary Feasibility of Connecting**

JOB #: 10951-10-001-11001

Introduction

The purpose of this memo is to evaluate the feasibility of connecting the Cal-Fire Trinidad Station (fire station) to the City of Trinidad's water system. Currently the fire station uses a well to supply drinking water, irrigation water, and fire suppression. The well water is contaminated and the fire station is looking for an alternative potable water supply. This memo evaluates the potential demand from the fire station, available water supply from the City of Trinidad, and the infrastructure necessary to make the connection.

Estimated Fire Station Water Demand

Historic fire station water use is not available, so demand was estimated based on facility use. The facility consists of a 2,500 square foot operations building, a 1,500 square foot foresters building, and a 2,100 square foot engine bay. Altogether there are 2 bathrooms, 1 shower facility, and 1 washing machine (used weekly for linens) located at the site.

Peak summer staffing includes 6 fire staff who are onsite 24 hours per day 7 days per week. There are also 2 foresters that staff the forester building for 8 hrs per day 5 days per week. Visitors to the facility are rare. If potable water can be extended to the site, the station would continue to use the existing onsite well for irrigation, fire suppression, and fire truck tank fill-up and truck maintenance, thus limiting the potable water demand to indoor water use.

Table 1 below shows the estimated water demand of the fire station under average conditions and peak demand conditions expected to occur during the summer months. Water use estimates were taken from published literature as cited below.

The total peak daily water demand is estimated at 800 gallons per day. The water demand varies during the day with peaks in the morning and evening and lows during the middle of the night. For calculating the instantaneous hourly water demand, a peaking factor of 4 was used, which is common for small facilities. This results in a peak hourly demand of 133 gallons per hour or approximately 2.2 gallons per minute (gpm) for a period of one-hour. These figures will be compared to the available Trinidad Water Supply in the last section of this memo to determine if the City can supply the fire station demand. The next section presents the City of Trinidad's available supply.

| Description | Number of Persons | Estimated Demand (gpcd ¹) | Estimated Average Daily Demand (gpd ²) | Peaking Factor ³ | Daily Peak Demand (gpd ⁴) |
|----------------------|-------------------|---------------------------------------|--|-----------------------------|---------------------------------------|
| Cal-Fire Staff | 6 | 59.8 ⁵ | 358.8 | 2 | 717.6 |
| Forester Staff | 2 | 16.0 ² | 32.0 | 2 | 64.0 |
| Total | - | - | 390.8 | - | 781.6 |
| TOTAL Rounded | | | 400 | | 800 |

1) GPCD: Gallon per capita per day
 2) GPD: Gallon per day
 3) Peaking Factor: Accounts for increased daily use during warm dry summer months
 4) Peak Daily demand equals average daily demand time the peaking factor
 5) Average day indoor water demand based on a 1999 study by the American Water Works Association Research Foundation
 6) Indoor water use for office staff estimated from Wastewater Engineering Treatment and Reuse, Metcalf & Eddy Inc., 2003.

City of Trinidad Water Supply System

The City's water system consists of an infiltration gallery located 10 feet below Luffenholtz Creek connected to a wet well. Pumps in the wet well supply pressure to move water through three parallel sets of roughing and polishing filters then after chlorination onto the City's two 150,000 redwood water storage tanks.

The City maintains three wet well pumps capability of delivering 120 gallons per minute individually. The City typically only operates one of the three pumps, however during peak demand periods, the City must run two pumps with a combined flow rate of 220 gpm. The City's pressure filters have a combined filtration area of 59.8 square feet (sqft). When the City has two pumps operating, the flow rate exceeds the California Code of Regulations, Title 22 filtration rate standard of 3.2 gpm/ sqft. In order to stay under the allowed filtration rate when operating two pumps, the pumps must be metered down by partially closing the pump discharge valves until the flow rate drops lower than 176 gpm. At this flow rate the City can produce 253,440 gpd. The practice of closing the discharge valves is not recommended for long term operation as the operating pressure exceeds the design pressures of the pumps. The City also has difficulty treating high turbidity during storm periods, and must shut the plant down and rely on storage during these periods.

The City is currently pursuing funding for an improvement project to construct a new membrane filtration system which would address both the high filter loading rate and turbidity issues. The proposed new system would be capable of filtering up to the maximum flow rate with two pumps running of 220 gpm or the equivalent of 316,000 gpd.

Current City Water Use

The City of Trinidad currently supplies an average of 100,000 gallons of potable water per day to meet the demands of the City's water service area. The peak demand during the summer period reaches approximately 150,000 gpd, corresponding to a peak hourly demand of 25,000 gallons per hour or 416 gpm for a period of one-hour. Peak demand was estimated from July and August 2009 peak day water production records with a small factor of safety.

Water Storage

The City currently operates two 150,000 gallon storage tanks, for a total of 300,000 gallons of storage. Out of the total storage, approximately 180,000 gallons is reserves for fire flows (estimated as 2 hours of supply at 1500 gpm). Ideally, this volume would be kept in storage for availability during a fire.

During peak water use in the summer, demands are higher than the maximum feed rate supplied by the pumps. Additional water to meet peak demands is supplied from storage. This results in decreased stored water availability. However, the peak summer demand is less than the available system pumping capacity. And thus storage used during the day can be replenished during the night, and it is not anticipated that storage would be a limited factor to connection of the fire station to the City’s system.

Luffenholtz Creek Supply

The City sole raw water supply is Luffenholtz Creek. The City is allowed to extract a maximum of 0.56 cubic feet per second (cfs) (251 gallons per minute) from Luffenholtz Creek. The City’s water right permit stipulates that when the flow in Luffenholtz Creek is lower than 0.86 cfs, the City must leave at least 0.15 cubic feet per second in the creek, including enough for the 0.0054 cfs worth of water rights downstream from the City, resulting in a total of 0.1554 cfs or approximately 70 gpm that must bypass the City’s water intake.

During the drought period of 1977, the flow in Luffenholtz Creek was recorded to drop to 0.62 cfs (278 gpm). This is considered the lowest recorded flow conditions for Luffenholtz Creek. At this flow the City could still divert up to 208 gpm or 299,520 gpd, which is significantly less than the City’s current peak day demand.

Trinidad Water Supply Summary

Table 2 below presents a summary of the City of Trinidad’s water system capacity and estimate of available capacity beyond existing demands.

| Table 2: Summary of City Water Demands | | |
|--|--------------|---|
| Conditions | Flows | Comments |
| Current City Treatment System Capacity | 253,440 gpd | Current Maximum Production Capacity |
| Proposed City Treatment System Capacity (After Improvement Project) | 316,000 gpd | Proposed Future Production Capacity |
| Raw Water Available (worst case drought conditions) | 299,520 gpd | Maximum Diversion under Existing Water Rights |
| 2009 City Peak Day Demand | 150,000 gpd | Current Peak City Demand |
| Available System Capacity (Today) ¹ | 103,440 gpd | |
| Available System Capacity (Future) ² | 149,520 gpd | |
| 1) Available capacity today equals treatment capacity minus peak day demand 2) Available capacity in the future equals raw water available minus the peak demand. | | |



Potential for Trinidad Cal Fire Station to Connect to the City of Trinidad Water System

A comparison of the fire station water demand (Table 1) to the available Trinidad water system capacity (Table 2) shows that the fire stations’ estimated demand is less than 1% of the available capacity. Thus, the City has the capacity to provide potable water to the fire station.

A preliminary evaluation of the infrastructure needed to provide water was also conducted. The closest tie-in location for the fire station to the City’s distribution system is an existing 12-inch water main located at the intersection of Patrick’s Point Drive and Main Street approximately 1.05 miles from the fire station. The water system pressure at this point was estimated by the system operator to be 80 psi. To serve the fire station, a pipeline would likely be installed along Patrick’s Point Drive. Several pipe sizes were evaluated to determine the potential water pressure at the fire station. The minimum connection pressure is 20 psi per California Code of Regulations Title 22, Article 6, Section 64602(A). Table 3 summarizes the pressure for the three different pipe sized considered, including both friction losses and elevation losses. As can be seen in Table 3, all pipe sizes considered could provide the required pressure.

| Table 3: Fire Station Connection Pressures for Several Pipe Sizes | | | |
|---|----------|----------|----------|
| | 1-inch | 2-inch | 4-inch |
| Estimated Connection Pressure | 44.7 psi | 56.5 psi | 57.2 psi |
| Pressure losses estimated using Hazen- Williams equation with a 5,544 foot pipe, caring a maximum flow rate of 2.2 gpm, and a pipe roughness coefficient of 130 | | | |

Conclusions

Based on the preliminary analysis, it is currently feasible for the City of Trinidad to supply the Cal-Fire station with potable water. The peak fire station demand estimated at 800 gallons per day is approximately 1% percent of the available City supply. A 1-inch diameter supply line connected to the City’s main line at Patrick’s Point Drive and Main Street provides adequate service pressure. The pressure at the connection point should be verified before a project is pursued. Additionally, other factors such as environmental compliance for pipeline routing and water connection agreements should be addressed for impacts to project feasibility.

References

American Water Works Association Research Foundation (1999) *Residential End Uses of Water Study*, American Water Works Association Research Foundation, Denver, CO.

Metcalf and Eddy, Inc. (2003) *Wastewater Engineering: Treatment and Reuse*, 4th ed., McGraw-Hill, New York.

Personnel Communication Trinidad Water Plant Operator, Bryan Buckman, March and April 2010.

Winzler & Kelly (2009) *City of Trinidad Preliminary Engineering Report Membrane Treatment System Analysis Addendum*, Winzler & Kelly, Eureka, CA.

Winzler & Kelly (2003) *City of Trinidad Proposition 204 Water Supply Feasibility Study*, Winzler & Kelly, Eureka, CA.

- c: Stephen Albright, Trinidad City Manager
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