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# SANITARY SURVEYS

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## **A Hornet in the Forest**

### **Acknowledgements:**

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### **Executive Summary:**

During this summer internship that consisted of completing a project within 360 hours with the Forest Service witch consisted of being expose to engineering work such as, surveying water systems and performing sanitary surveys. Working under the supervision of an Environmental Engineer, Edward Dietz and the Forest Engineer Antonio Cabrera was a great experience. In this summer internship a Trimble Geo7x device was use in order to take accurate data such as, taking GPS points of some locations of the Sierra National forest. The project consisted of surveying the well houses, storage tanks, valves, fire hydrants, pressure release valves and faucets. Surveying was necessary to update the locations of the water system of some forest stations such as Trimmer Fire Station, Clover Meadow and Jackass Meadow Station. The next step after surveying was to extract the data, in other words to extract the GPS points that were collected into ArcMap. As the internship went on, sanitary surveys need to be completed and with the help of the Environmental Engineer they were properly perform. The sanitary surveys are required by law and in order to properly perform them the environmental engineer was there to supervise the process. Lastly data were extracted from the water meter with a Trimble Ranger and this data helped the forest Engineer to keep track of the monthly use of the gallons that were been pump out of each well.

**Project Objectives:**

The objective of the project was to learn how water systems work and to conduct sanitary surveys. These sanitary surveys were required by law and needed to fulfill the criteria and the regulations that the state government requires. Sanitary surveys need to be done regularly because people working or living on the Sierra National Forest need access to tapping water free from any bacteria. Further more into the project, the water system needed updates of some locations such as valves and faucets.

**Project Approach:**

In this summer internship when conduct sanitary surveys; there was many things that have to consider such as check if the pump is working properly, that the chlorine is been added to the water when the well is being regularly use. During the process of the sanitary survey if there is a problem with the system such as contamination, the best solution is to add the right amount of chlorine to control the contamination. The ultimate goal of performing a sanitary survey is to check that the system is working properly in order for people to have safe drinking water. In order to have a well done sanitary survey; one of the requirements was to check for cross connections that might cause contamination. In the process of the survey, pressure was a concern in order to have a proper water system, enough chlorine in the mixed water and ask a lot of questions to the maintenance person. As a summer intern some duties consisted of how to take data point with a GPS system witch was Trimmer Geo7x. During the process of using this device the first step was to connect the antenna in order for it to have any signal form the satellite, once the first step was done data points could be taken with very good accuracy. Once the data was taken the following step was to extract the data points into a portable Forest Service laptop that had the appropriate programs. After transferring the data that was saved in the Trimble device that is saved as GIS. The following step was to convert the file that had all the point save as SSF (Standard Storage Format) file. Finally the last step was to correct the SSF files in order to locate there points on the forest service mapping program which is ArcMap. Another Trimble device call Ranger witch was use to collect the data of the water meters located in the well house, this data consisted of how much water was been pump from the well into the water system. During this summer internship it also consisted of checking chlorine levels in the water system using a digital chlorine-meter was a mandatory step

when the water was at risk of contamination. In order to keep the water safe, chlorine was added and in order to keep the chlorine under control week checking's were schedule.

### **Project Outcome:**

During the process of the internship many skills were gained such as surveying water systems, extracting data, writing reports and analyzing the data. An important aspect of this internship was to learn about conducting professional documents. Working with the Environmental Engineer on sanitary survey for the wells in different locations of the Sierra National Forest was the project of this summer internship. Some of the locations that were surveyed consisted of Pollard Camp, Clover Meadow Station, Douglas Station and Westfall Station. During these sanitary inspections the main concerned was the different types of contaminations, so when encountering a contamination, the best way to fix the contamination is to flux the water system and then add chlorine. During one of the sanitary surveys the environmental engineer encountered a potential contamination that were not harmful for the people but still needed treatment. Once the possible contamination was identify, the public that had access to the water needed to be notify and needed to boil their water before drinking for safety reasons. The notification was done with in the same week the problem was identify.

### **Conclusion:**

After working with the Forest Service and becoming familiar with a Trimble (Geo 7x) device that the forest service uses in order to take accurate GPS points. After taking the data points of the water system witch eventually will help Ed Dietz have better and accurate water plans of how the system runs. The data will help future Engineers and will make it easier to locate most of the valves, faucets and fire hydrants. When surveying the water system, finding the valves and faucets was not an easy task, in some occasions there were some irregularities but were easily corrected. Updating the water system is important but the most important process is to maintain it and for this water samples were required to in a monthly basis that also included to check the chlorine levels. Keeping monthly records of how much water passes by the well pump was important for the forest engineer for his report of the water use that is due every year. This summer internship was great, working for some great supervisors forest engineer Antonio Cabrera and environmental engineer Edward Dietz was perfect to grow as a professional.

**Appendix A:**

Figure 1

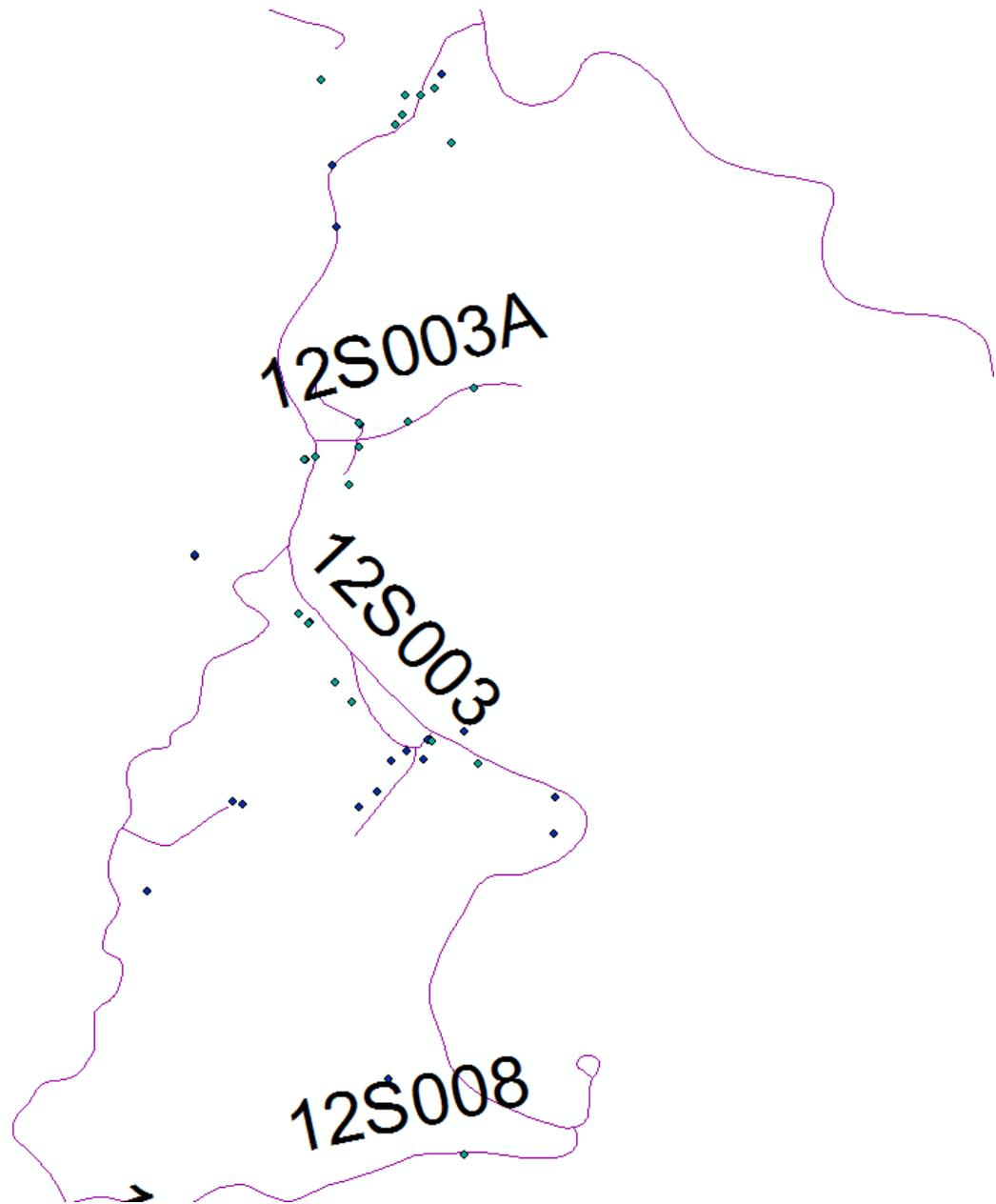


Figure 1. Trimmer Work Center is Located in the Sierra National Forest near Trimmer California. The points that we are able to see are GPS point that were survey, during the process of it, a Trimble device needed to be used. The program that was used to see the map and the data was ArcMap. The points that can be seen in the road are valves, fire hydrants, faucets and they are all part of the water system.

Figure 2

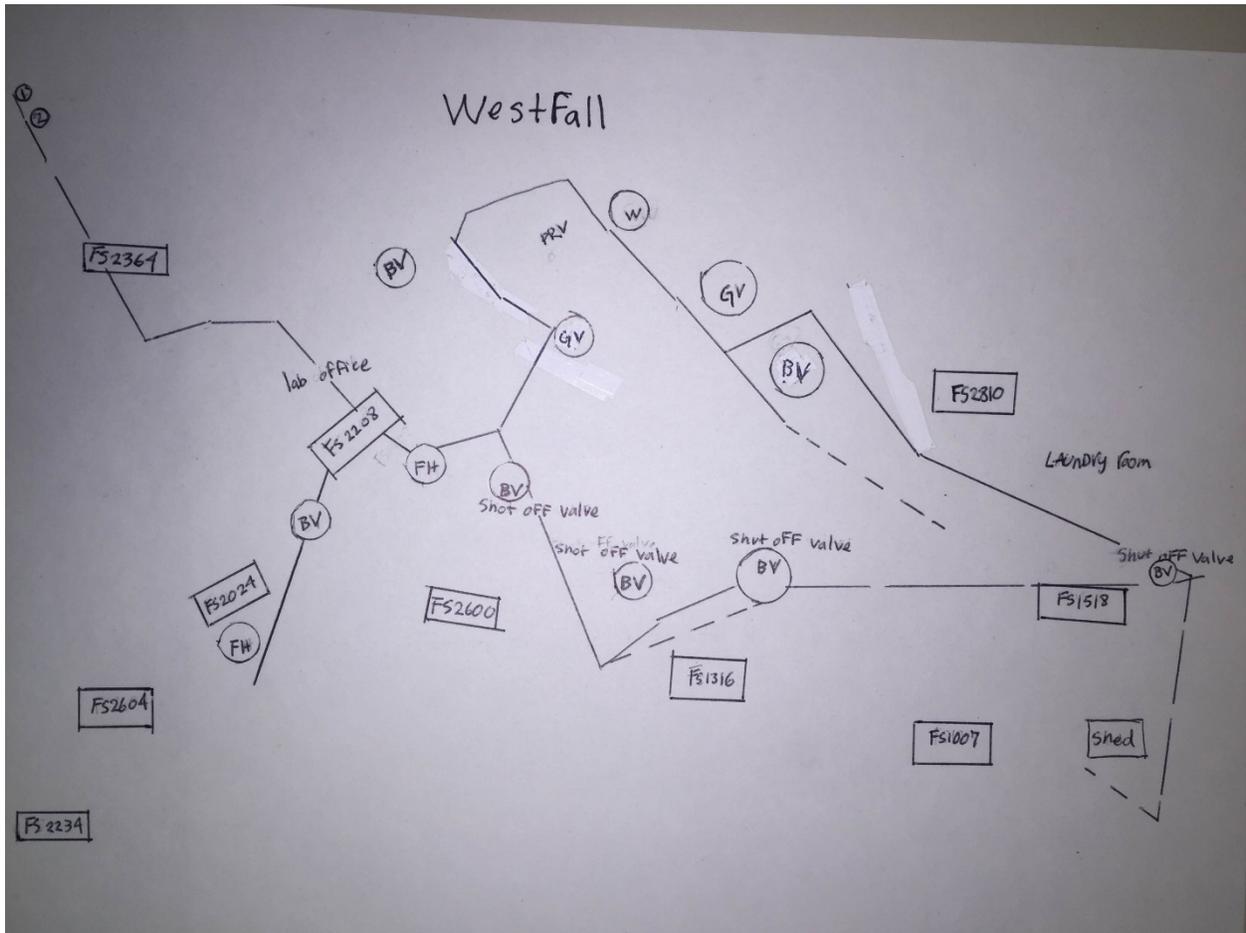


Figure 2 is a handmade sketch for the Westfall station located in the Madera County of the Sierra National Forest. The lines showing on the sketch are the water lines, the circle points are valves such as Butterfly Valve (BV) also the Well box (W). We also have the building numbers two tanks in the upper left corner and finally the Fire Hydrants (FH). Over all this is what a water system will look like.

## Appendix B:

Formulas

### Volume

Cylinder, Volume, Gal =  $(0.785) \times (\text{Dia,ft})^2 \times (\text{Height in ft}) \times (7.48 \text{ gal/ft}^3)$

Hrs to fill out a tank =  $\frac{\text{volume,gallons}}{(\text{Pumping Rate,GPM,x60min/Hr})}$

### Pressure

Pounds per Square Inch (PSI) =  $\frac{\text{Head,ft}}{2.31\text{ft/psi}}$   
= Head, ft x 0.433 PSI/ft

### Pumping

Pump's or Motor Theoretical Horse Power =  $\frac{(\text{GPM}) \times (\text{Total Head,ft})}{\{3,960 \text{ gal/(mi/ft)}\}}$

Motor Horse Power =  $\frac{(\text{GPM}) \times (\text{Total Head,ft})}{(3,960) \times \text{Pump \% efficiency}}$

### Flow, Velocity, Area

Flow (ft<sup>3</sup>/sec) = Area (ft<sup>2</sup>) x Velocity (ft/sec)

\*These formulas were used for the sanitary surveys. They were mainly used for the water tanks, pumps and the pipes. They calculated volume, pressure, power, flow, velocity and area.