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M E M O R A N D U M

DATE: May 28, 2021

TO: James Alarid, Los Alamos County

FROM: Nathan Roberts, PE
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SUBJECT: **Los Alamos County Power Study**

Summary

Bohannan Huston, Inc., (BHI) was contracted with Los Alamos County (LAC) to complete a Risk and Resilience Assessment (RRA) and Emergency Response Plan (ERP) to comply with America's Water Infrastructure Act of 2018. Part of the RRA is to find the critical dependencies in the system. Critical dependencies are major parts of the system in that if they were to fail, would put the system at high risk. A critical dependency to operate the wells and booster stations is power. The RRA concluded that providing a back-up generator would help reduce the risk and increase resiliency in the system. Back-up generators at every site may be cost prohibitive, but if strategically located, can play key roles in maintaining system operations during emergencies. This memorandum specifically reviews the criticality of placing a back-up generator at the Otowi Well 2 site.

Overview

As of 2019, Los Alamos County has an estimated population of 19,369 individuals. The County is also home to the Los Alamos National Laboratory (LANL), which is a government laboratory that operates under the Department of Energy. The Los Alamos Municipal Water System consists of 13 wells, 25 storage tanks, approximately 118 miles of water distribution lines, 44 miles of water transmission lines and valves, 18 booster stations, and numerous pressure reducing valves. See Figure 1 for an overview of the system with the wells and tanks highlighted for this analysis. There are three main well fields used for potable water supply; Guaje well field, Otowi well field, and Pajarito well field. The various facilities are said to be located on separate power grids. BHI has not received power grid information to verify that the fields run on separate grids. For this analysis, it is assumed that the Guaje, Otowi, and Pajarito wells, tanks, booster stations, and transmission lines are not on the same grid.

Water Demand and Storage

Based on historical ground water diversions between 2010 and 2016, the average day demand is approximately 3.5 million gallons per day (MGD). Utilizing a peaking factor of 2.5, the peak day demand is estimated to be 8.75 MGD. Assuming all wells are operational and continuously pumping, the production capacity is 11,256 gallons per minute (gpm) (16.21 MGD). Therefore, peak day demand requires 54% of the ground water production and average day only requires

22%. Table 1 shows the list of wells in the Los Alamos Water System. For the basis of this analysis, it is assumed that all wells are operational. Currently, Otowi Wells 1 and 2 and Guaje Well 1A are offline.

Table 1 – Groundwater Wells

NAME	INSTALL YEAR	WELL CAPACITY (GPM)
Guaje Well 1A	1998	600
Guaje Well 2A	1998	800
Guaje Well 3A	1998	585
Guaje Well 4A	1998	500
Guaje Well 5A	1998	364
Otowi Well 1	1990	585
Otowi Well 2	2020	1,350
Otowi Well 4	1990	1,370
Pajarito Well 1	1965	550
Pajarito Well 2	1965	1,185
Pajarito Well 3	1966	1,445
Pajarito Well 4	1981	910
Pajarito Well 5	1982	1,010
	TOTAL	**11,254**

There are 25 tanks in the Los Alamos Water System that have the capacity to hold approximately 37.5 million gallon (MG) of potable water. The County typically stores approximately 30 MG of water. At 30 MG, the County maintains almost 3.4 days of peak demands, or 8.5 days of average day demands. Table 2 shows the list of tanks in the Los Alamos Water System.

Table 2 – Water Tanks

NAME	INSTALL YEAR	TANK CAPACITY (MG)
Arizona Tank	2003	7.75
Barranca Tank 1	1958	0.10
Barranca Tank 2	1962	0.20
Community Tank	1947	1.00
Guaje Booster Station 1 Tank	1950	0.15
Guaje Booster Station 2 Tank 1	1948	0.10
Guaje Booster Station 2 Tank 2	1950	0.06
Guaje Booster Station 3 Tank 1	1964	1.00
Guaje Booster Station 3 Tank 2	1950	0.06
North Mesa Tank	2000	0.20
Otowi Booster Station 1 Tank 1	1947	0.06
Otowi Booster Station 1 Tank 2	1990	0.20
Otowi Booster Station 2 Tank	1947	0.06
Otowi Well 4 Tank 1	1992	0.25
Pajarito Booster Station 1 Tank	1966	1.50
Pajarito Booster Station 2 Tank 1	1966	1.50
Pajarito Booster Station 2 Tank 2	2012	0.25
Pajarito Booster Station 3 Tank	1966	1.00
Pajarito Tank 4	1966	1.50
Pajarito Tank 4A	1982	4.00
Pajarito Well 5 Tank	1984	0.10
Quemazon Tank	1999	0.75
Sycamore Tank	1950	7.75
Twin Tank	1949	7.75
Western Tank	1947	0.25
	TOTAL	**37.54**

Otowi Well Field Infrastructure

The Otowi well field consists of three wells; Otowi Well 1, Otowi Well 2, and Otowi Well 4. Currently, only Otowi Well 4 is online. Otowi Well 1 is out of service until the Otowi Booster Station 1 is constructed. Otowi Booster Station 1 is estimated to be completed by the end of 2028. Otowi Well 2 is estimated to be online by 2022. For this analysis, all Otowi Wells are assumed to be operational. Otowi Wells 2 and 4 are two of the County's largest pumps.

Under normal conditions, Otowi Well 1 and Well 4 serve Los Alamos. Otowi Well 2 serves White Rock and LANL as a compliment to the Pajarito well field. Based on the well capacity provided by the County's GIS data, the wells have a combined capacity of 3,305 gpm (4.76 MGD). This accounts for 29% of the total production capacity when all wells are operational and operating continuously. In the event that these wells lose power, they would be unavailable to supply the County.

However, without the Otowi well field, the Pajarito and Guaje well fields will have sufficient supply to serve County customers. The peak day demand requires 76% of the ground water production from the Pajarito and Guaje Wells, and 31% for average day, under continuous operations.

Condition A of the Curtailment Plan assumes the highest producing well is out of service and the firm capacity is limited to 70%. The sum of the Otowi well fields is greater than the largest producing well. Assuming the Otowi well field is out of service and Pajarito and Guaje well fields are limited to 70% capacity, the supply system will be unable to meet peak day demands under these conditions as peak demands are projected to be 109% of available supply. However, average day demands are projected to require 44% of the available supply. This scenario demonstrates additional capacity is needed with the loss of Otowi wells and partial loss of Guaje and Pajarito wells for peak day demands.

In order to manage supply versus demand for peak day under Condition A of the Curtailment Plan, the following controls are implemented:

- LANL reduces irrigation to two days per week;
- County and LANL discontinue vehicle washing;
- No fire hydrant testing on County and LANL distribution systems; and
- County informs Public of situation via media.

The intent of these controls would be to decrease peak day demand below the available supply. In the event that peak day supply is not adequately reduced, the Pajarito and Guaje wells would need to operate at 77% firm capacity.

In the event that the site loses power, tanks upstream of the facility which directly serve customers still hold about 3.4 days of peak demands, or 8.4 days of average day demands. Therefore, the remaining tanks still have capacity to maintain the system without putting strain on the system for the durations noted.

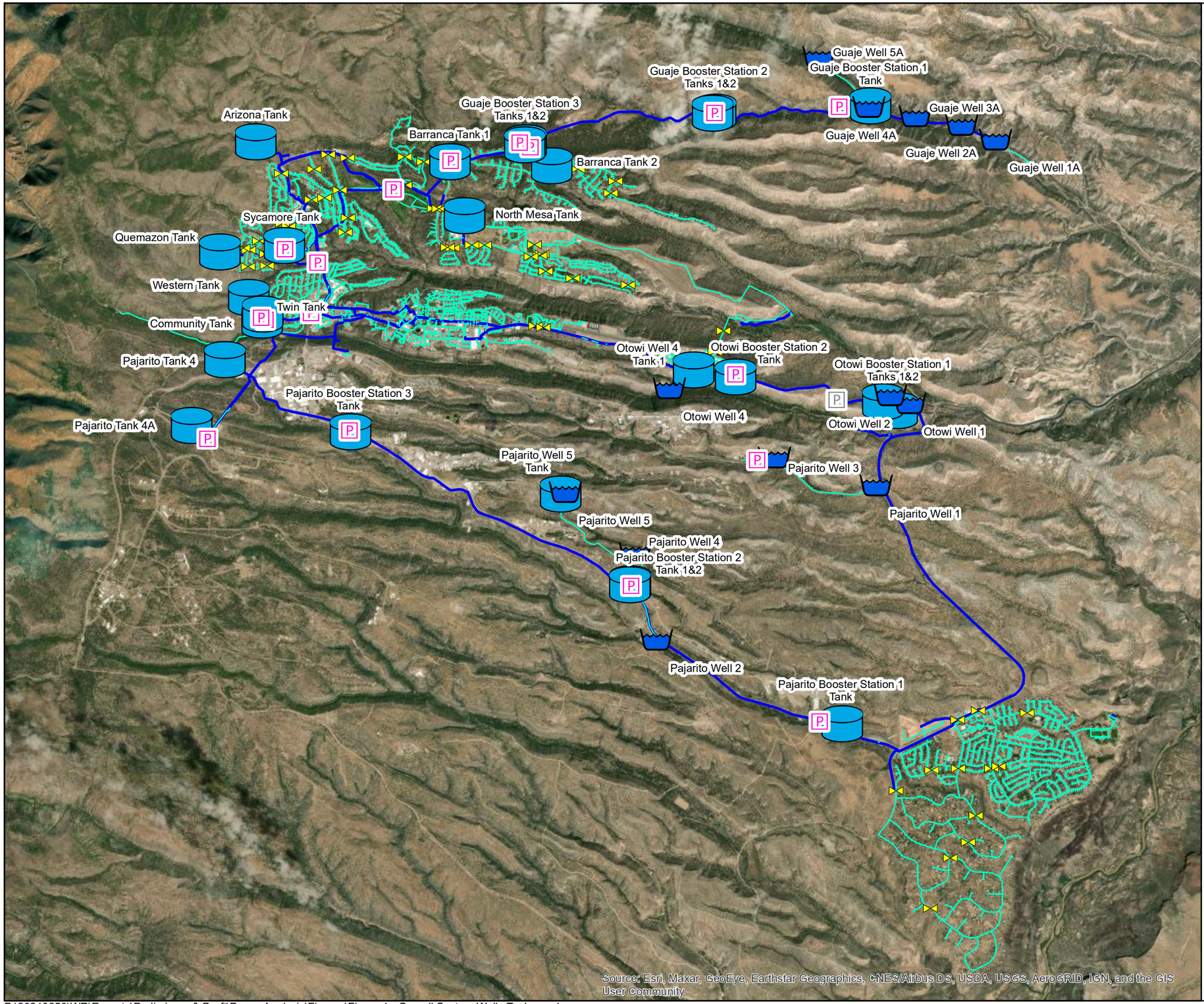
Conclusion

In the event that Otowi well fields, booster stations, and tanks are offline due to a power outage, there is still sufficient water supply and connectivity within the system to maintain service to customers. Under the Curtailment Plan Condition A, this is also true assuming the controls implemented reduce peak day demand by 9% or Guaje Wells and Pajarito Wells operate at 77% of their firm capacity. Therefore a backup generator is not recommended at this time

Currently Otowi Well 1 and Well 2 do not convey water into Los Alamos. A planned project to construct a replacement Otowi Booster Station 1 will be constructed in 2028. The Department of Public Utilities has, within its 10-year CIP and O&M project planning period, projects planned that will upgrade and replace the existing standby power generators at both the Los Alamos and White Rock wastewater treatment plants. Additionally, Otowi Well 2 well house will be built to accommodate a natural gas generator which may be equipped at the time of these improvements or in the future. As future planning for water system reliability and resiliency occurs, the possibility of utilizing these salvaged large scale generators should be evaluated for incorporation into the water system reliability and resiliency assessment. At the time of the Otowi Booster Station 1 project, an evaluation should be completed to conclude:

- Cost/benefit of adding a generator at Otowi Booster Station 1
- Cost/benefit of adding a generator at Otowi Well 2
- Cost/benefit of adding a generator at both locations
- Cost/benefit of using salvaged generators at these locations

NR/CPR/ab
Attachment



Legend

- Booster Station
- Booster Station Offline
- Well
- Well Offline
- Water Storage
- PRV

Pipe Diameter (inches)

- <= 10"
- > 10"

0 5,000 10,000 Feet

1 inch = 5,000 feet

LOS ALAMOS
Department of Public Utilities

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Los Alamos County Power Study

Figure 1
Los Alamos County Water System Wells and Tanks

P:\20210250\WR\Reports\Preliminary & Draft\Power Analysis\Figures\Figure 1 - Overall System Wells Tanks.mxd
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