



October 31, 2022

To: Members of the Seismic Monitoring Advisory Committee,
Southeast Geysers Effluent Pipeline Project (SEGEP)

Fm: Northern California Power Agency

Re: SEGEP Operation and Seismicity Report for April 1, 2022 to September 30, 2022

A. Pipeline Operations

The Southeast Geysers Effluent Pipeline (“SEGEP”) has been in operation since 1997 and has delivered a total 63.8 billion gallons of wastewater at an average rate of 4,850 gpm to the South East Geysers steam field for injection. **Figure 1** illustrates the daily delivery rates since the beginning of the project.

During the six-month period from April 1, 2022 through September 30, 2022, the SEGEP Pipeline was in operation 61.2% of the time (**Figure 2**). Pipeline delivery rates averaged 1.66 million gallons per day (MGD) or 1,150 gpm which is roughly 25% of the historical average noted above.

A major reason for the reduced flow is that California is experiencing drought conditions. The wastewater supplied by LACOSAN is composed of secondary treated wastewater and freshwater from Clearlake. Freshwater can make up between half to two thirds of the system volume but during drought years, freshwater extraction from Clearlake is not allowed. The loss of freshwater has resulted in the SEGEP pipeline operating at a reduced capacity and will remain in effect until May 1, 2023. Any lifting of the freshwater ban will be dependent on the lake level at that time.

B. Observed Seismicity

Seismic Activity in the Southeast Geysers

The USGS recorded 50 seismic events of magnitude 1.5 and greater within the SE Geysers area from April 1, 2022 through September 30, 2022. This is similar to the 51 seismic events over the previous six-month period. Historical trends and locations of the recent events are shown

respectively in **Figures 3 and 4**. There was one magnitude 3.0 or greater seismic events in the Southeast Geysers during this reporting period.

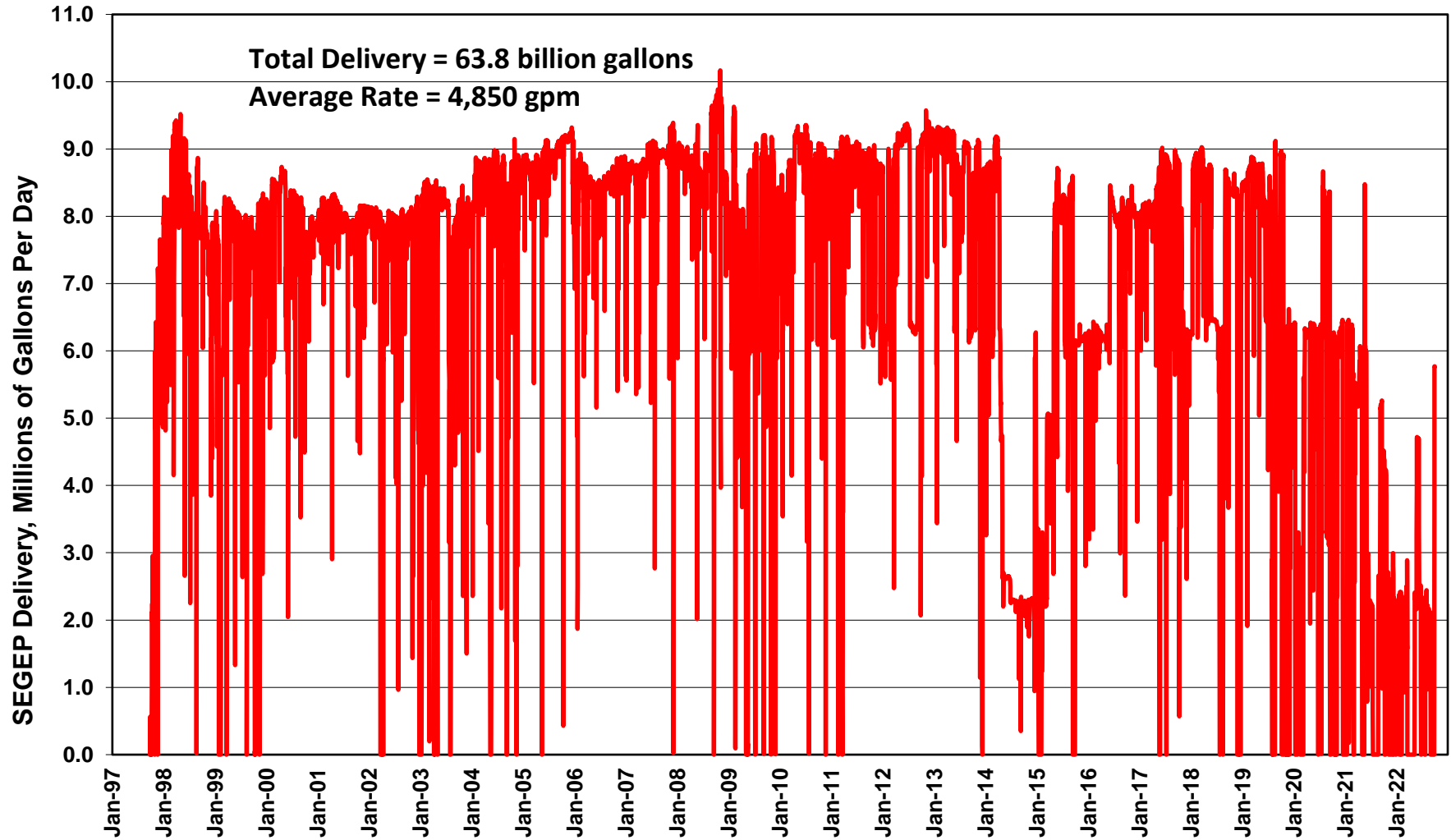
In combination with the seismic activity, steam production for the Southeast Geysers area was 17.5 billion pounds mass for the past six months while water injection was 4.24 billion pounds mass. The mass replacement was approximately 24% for the area. **Figure 5** shows the historical changes in steam production and water injection within the Southeast Geysers area.

Seismic Activity in The Geysers

Within the Geysers geothermal field, there have been 318 events of magnitude 1.5 and greater recorded from April 1, 2022 through September 30, 2022. There were five events of magnitude 3.0 or greater. The largest event was a magnitude 4.19 and occurred on June 28, 2022. **Figure 6** shows the trends of seismic events for the Geysers since 2010 while **Figure 7** shows the location of the events for the last six months.

Dylan Esquivel
Reservoir Engineer
NCPA Geothermal Facility

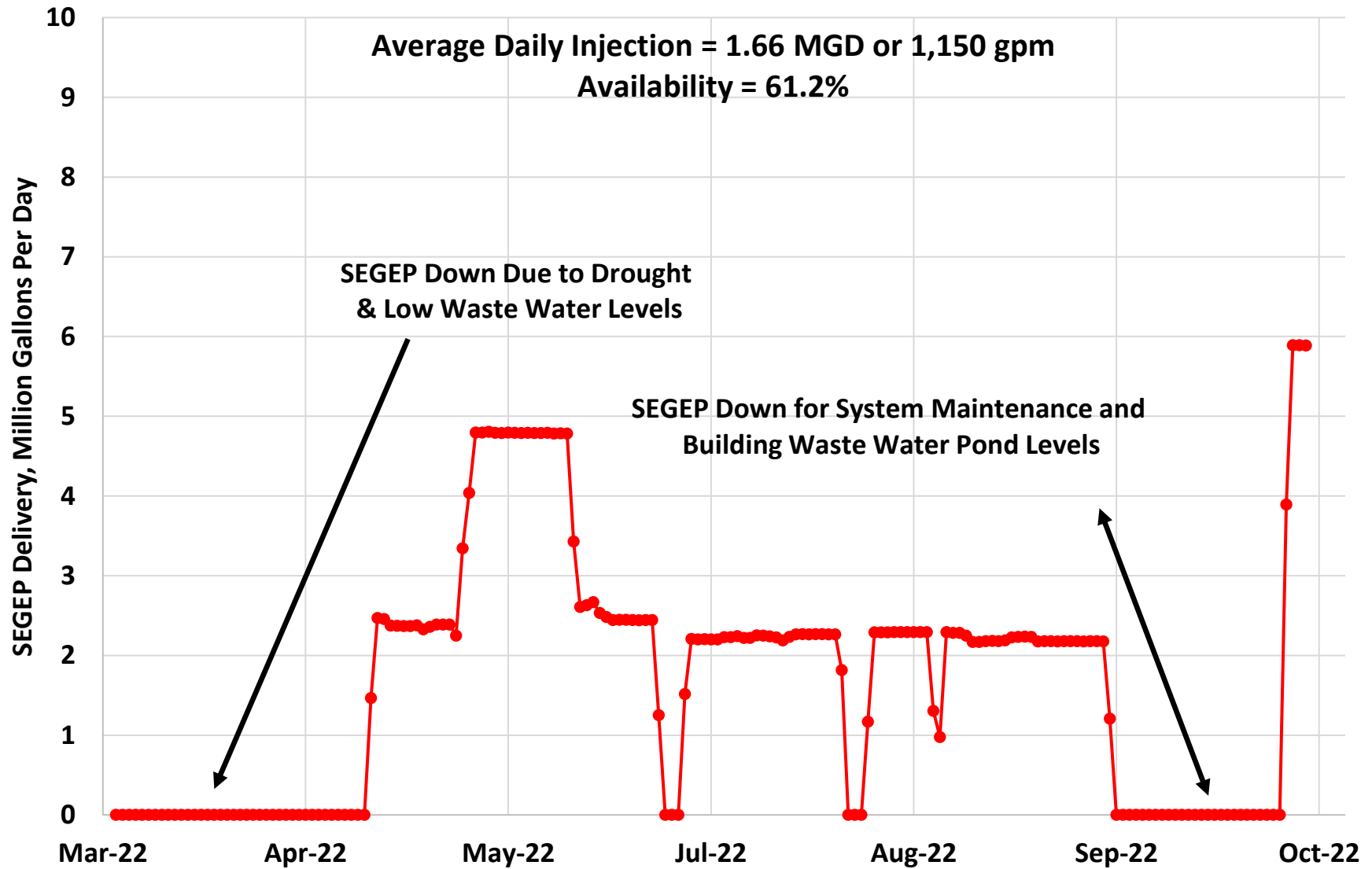
**Historical SE Geysers Effluent Pipeline Deliveries to The Geysers
Figure 1**



Southeast Geysers Effluent Pipeline Delivery

April 2022 - September 2022

Figure 2



Southeast Geysers - Historical Seismic Activity

Magnitude > 1.5

Figure 3

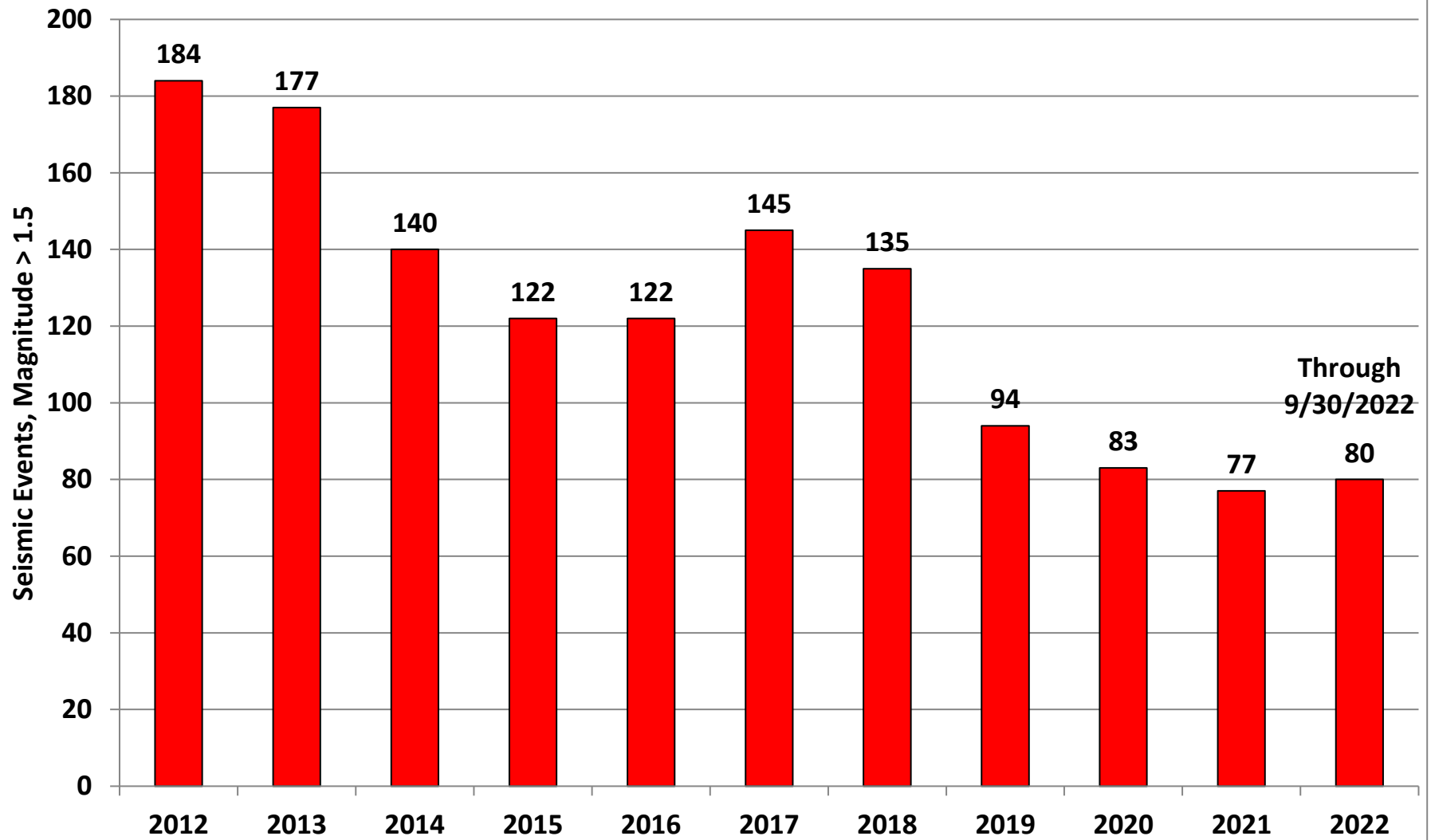
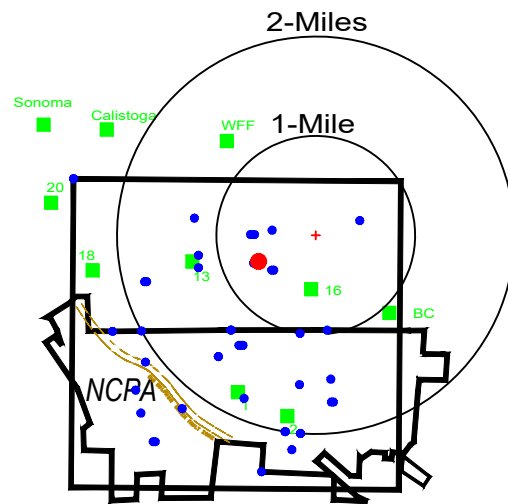


Figure 4



SOUTH EAST
GEYSERS
SEISMIC STUDY
AREA

Radial distances are
from Anderson Springs
Strong Motion
Instrument

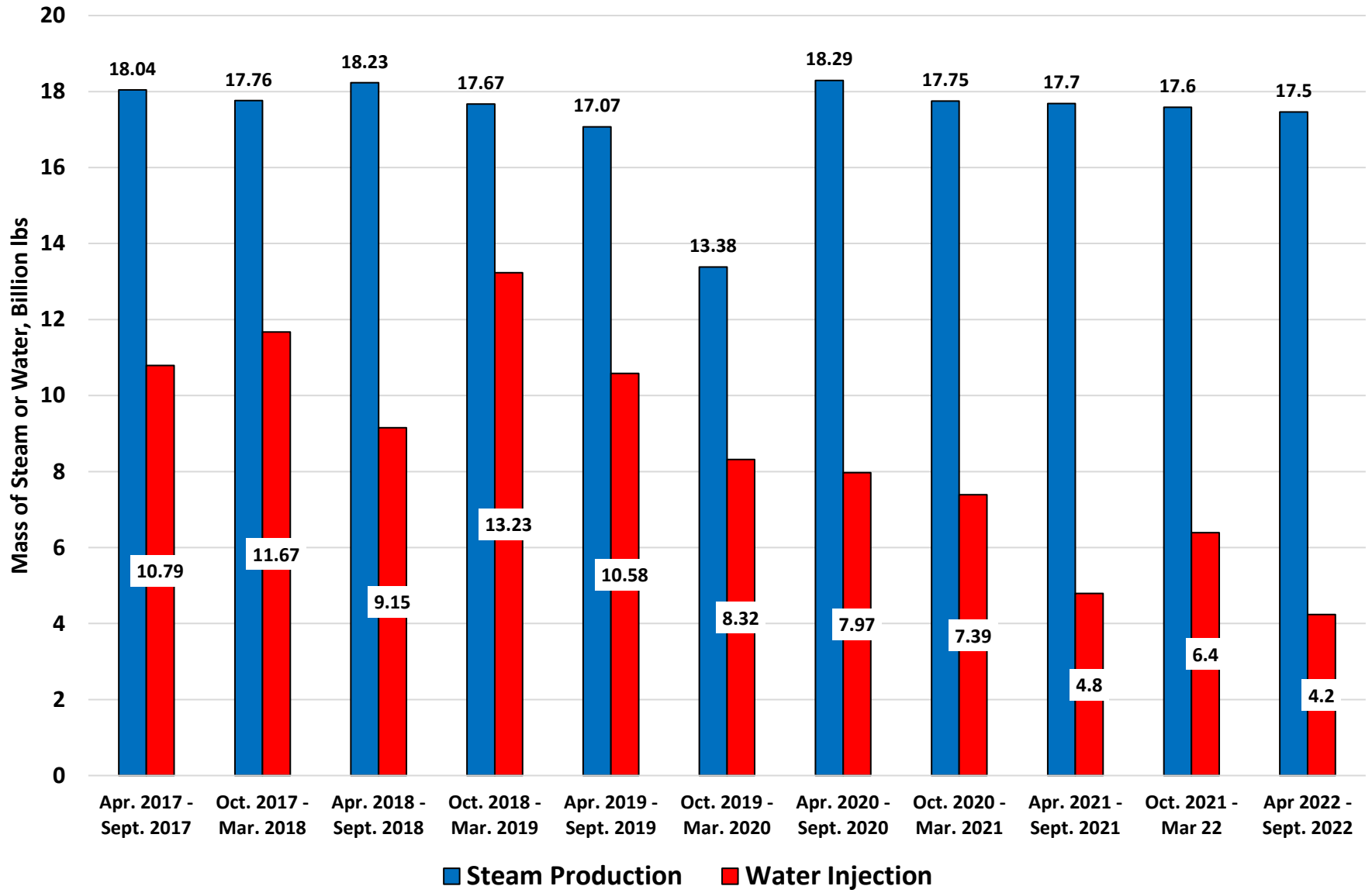
April 1, 2022 - Sep. 30, 2022

Magnitude > 1.5 - 50 Events

Magnitude > 3.0 - 1 Event

SEISMIC EVENTS
REPORTED BY THE USGS
(from U.C. Berkeley Catalog)

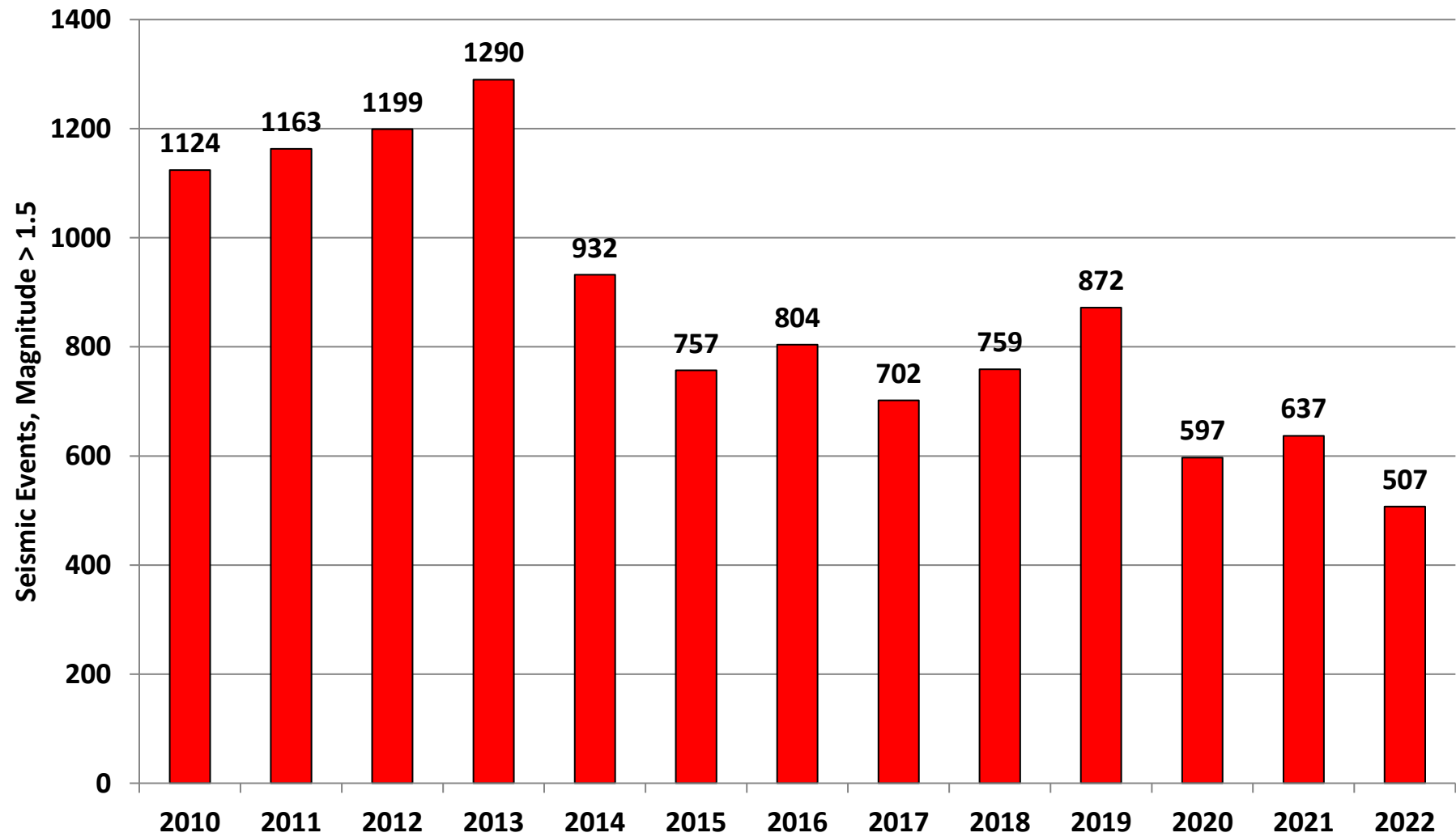
SE Geysers Production and Injection Figure 5

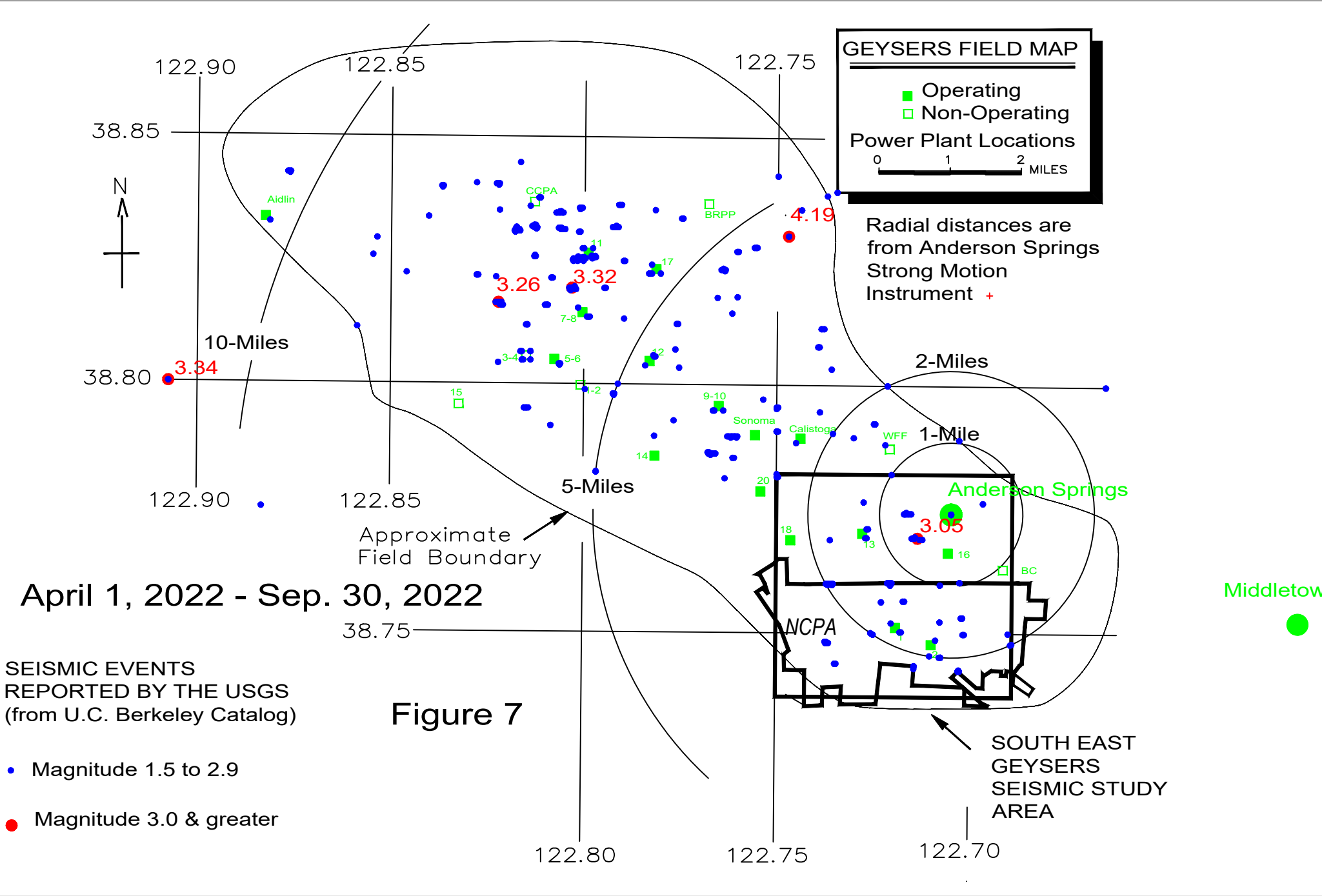


The Geysers (KGRA) - Historical Seismic Activity

Magnitude > 1.5

Figure 6







SMAC Report – Fall 2022

Dylan Esquivel
NCPA Reservoir Engineer
November 10, 2022

Lake County Wastewater Recycling System

A partnership of
Northern California Power Agency
Lake County Sanitation District
Calpine Corporation

- First phase operational 1997; second phase 2001
- Communities supplying effluent: 10
- Total countywide effluent recycled: 85%
- Effluent pipeline length: 50 miles
- Average flow rate: 5800 gpm
- Solar powered treatment & pumping: 3.4 MW
- Effluent-based geothermal power: 100 MW
- Avoided global warming CO₂ emissions: 8 billion lbs. (Jan. 08)



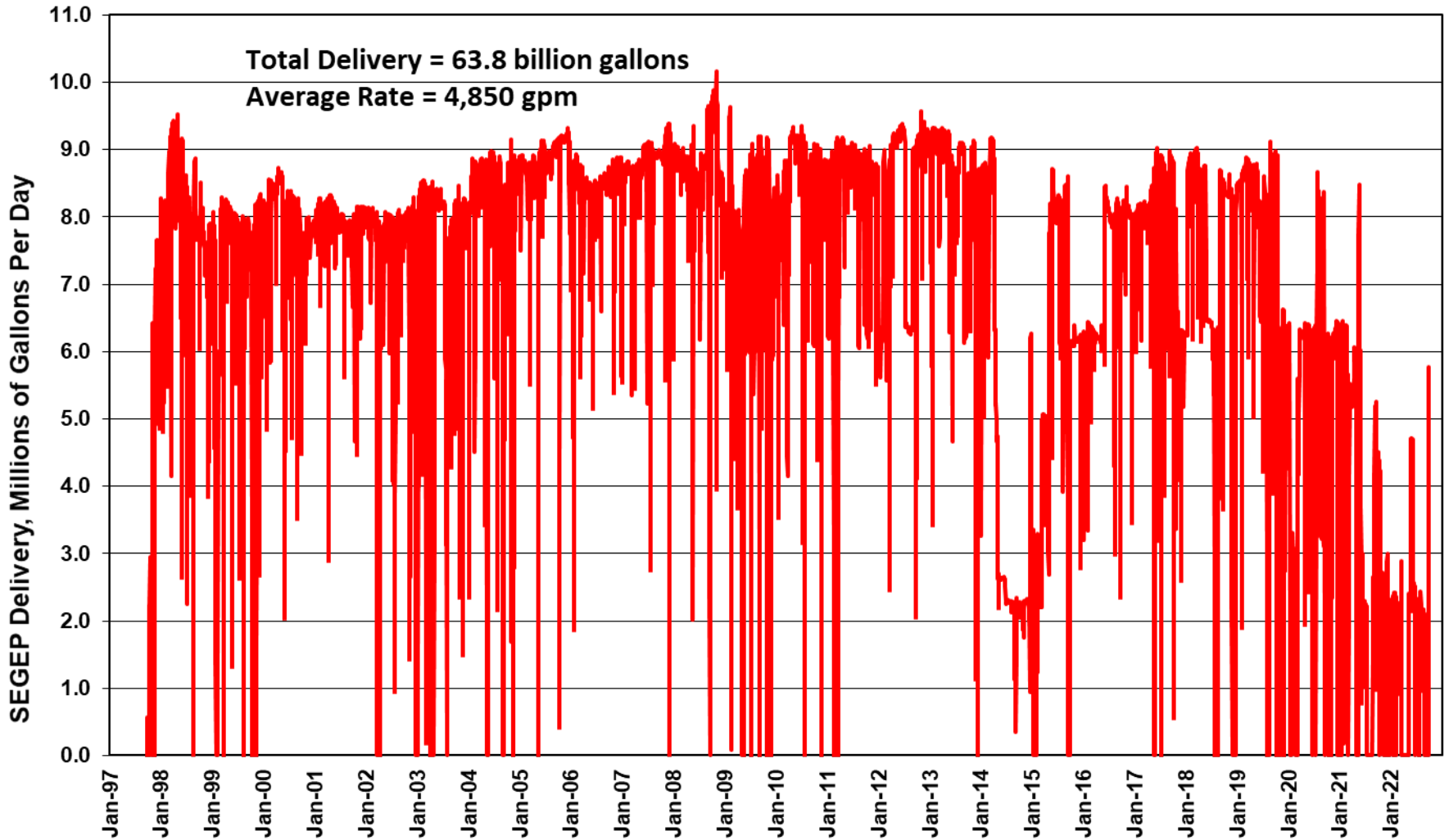
Bear Canyon #1 Pump Station



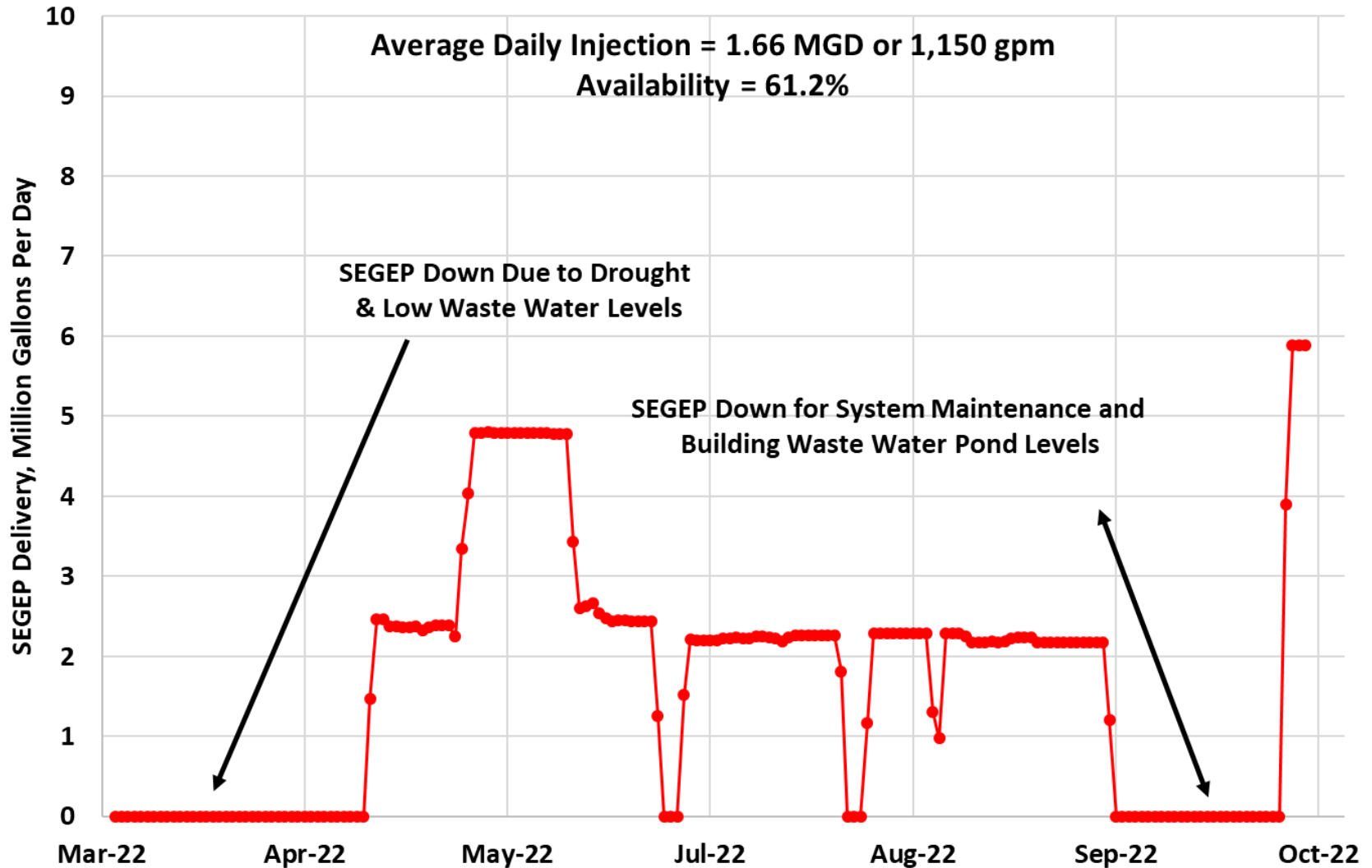
Bear Canyon Pumps



Historical SE Geysers Effluent Pipeline Deliveries to The Geysers
Figure 1



**Southeast Geysers Effluent Pipeline Delivery
April 2022 - September 2022
Figure 2**



**Southeast Geysers - Historical Seismic Activity
Magnitude > 1.5
Figure 3**

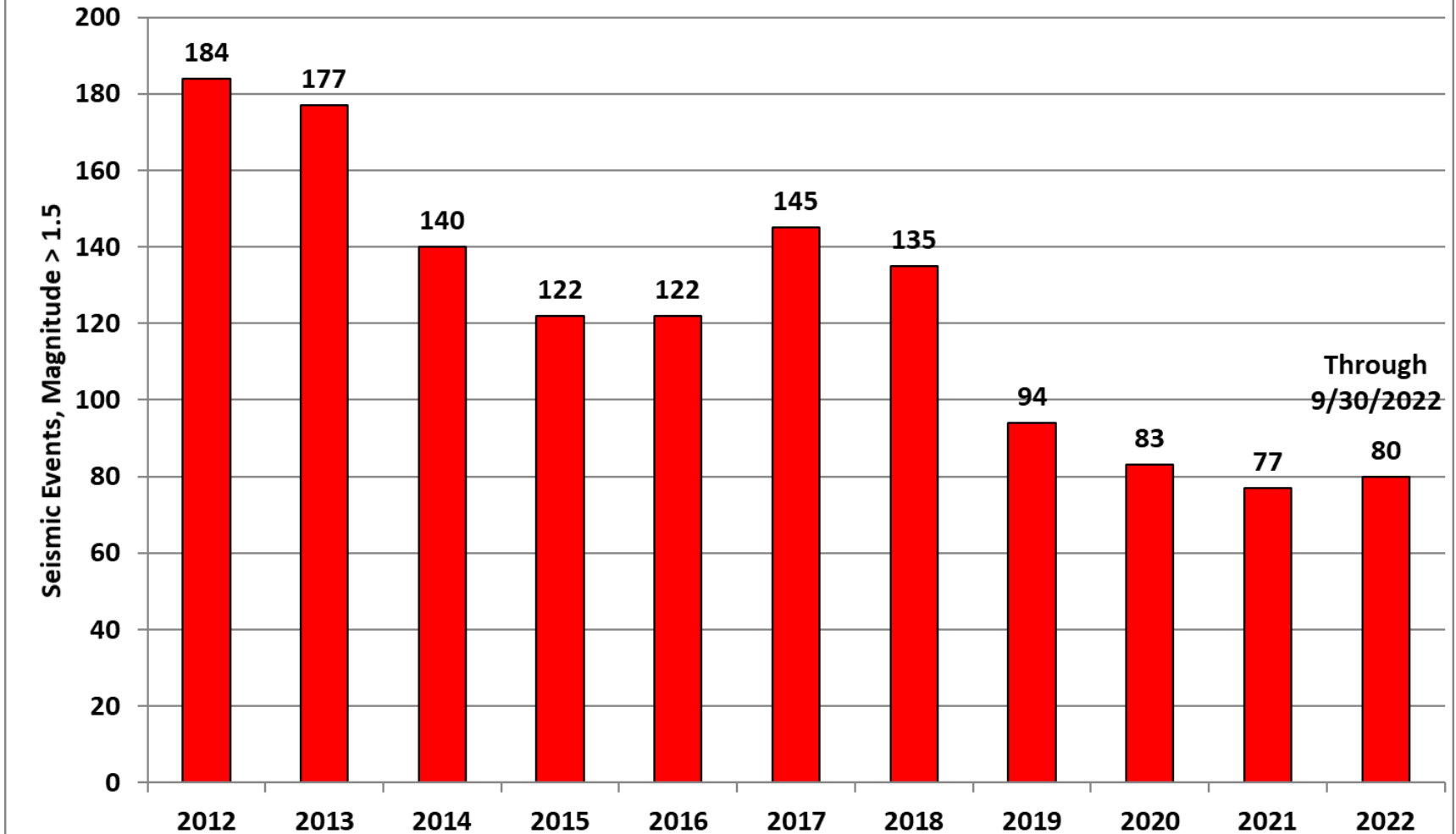
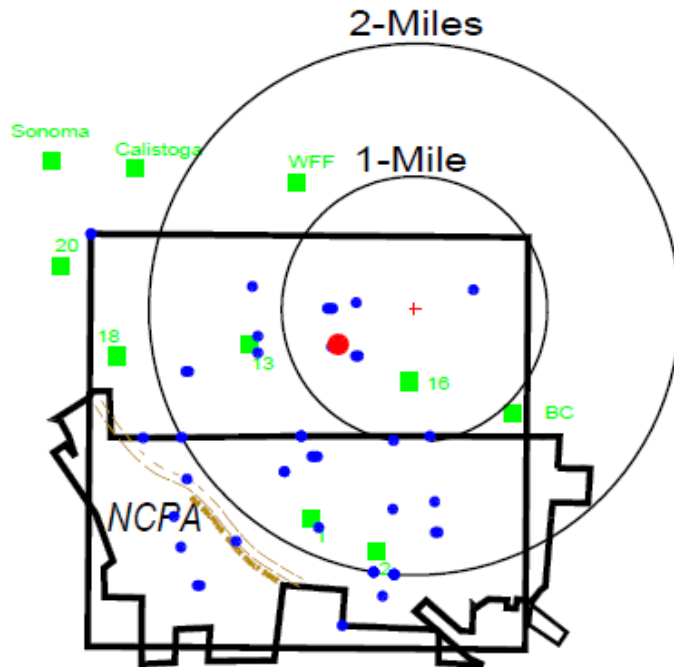


Figure 4



SOUTH EAST
GEYSERS
SEISMIC STUDY
AREA

Radial distances are
from Anderson Springs
Strong Motion
Instrument

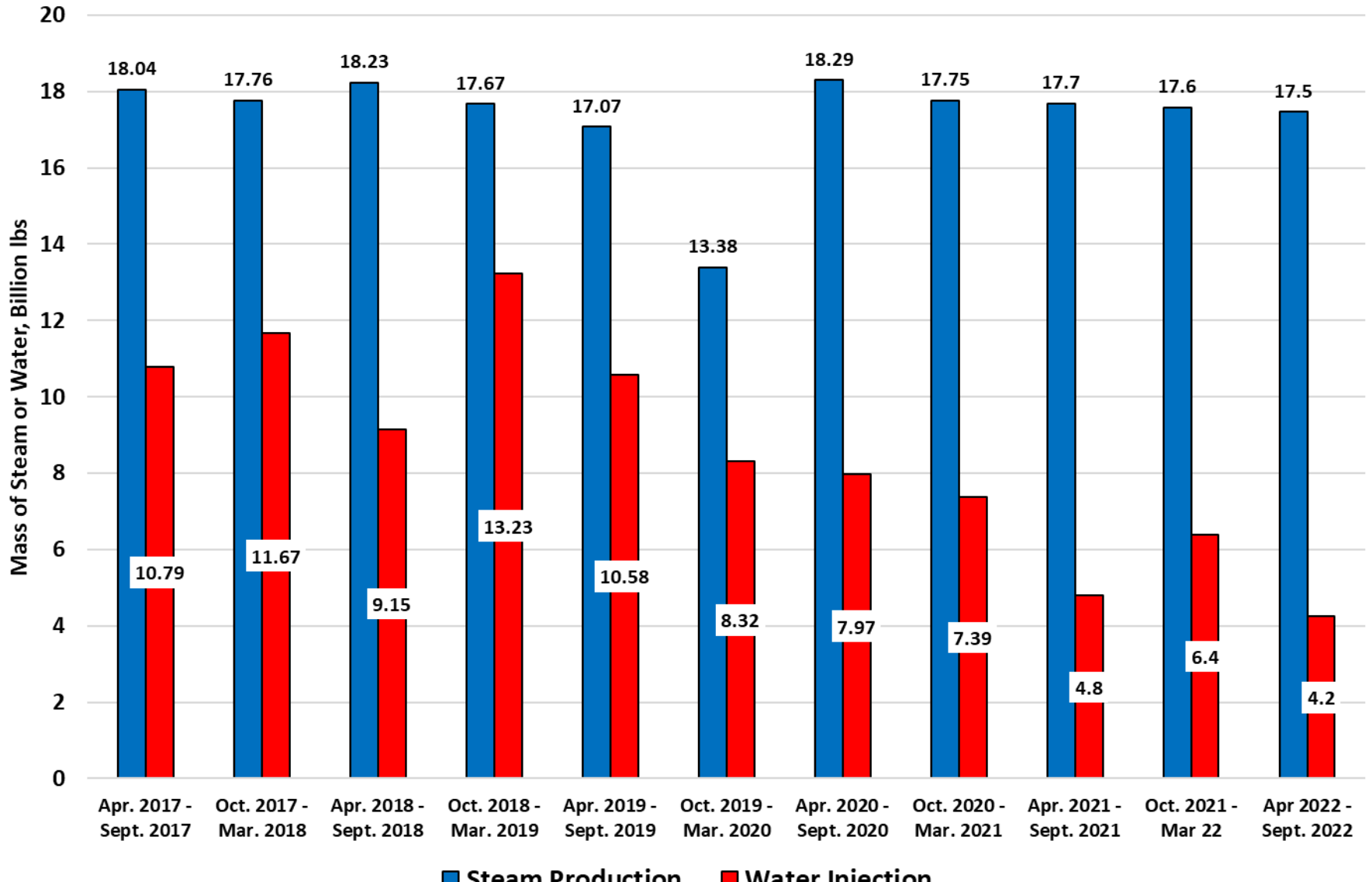
April 1, 2022 - Sep. 30, 2022

Magnitude > 1.5 - 50 Events

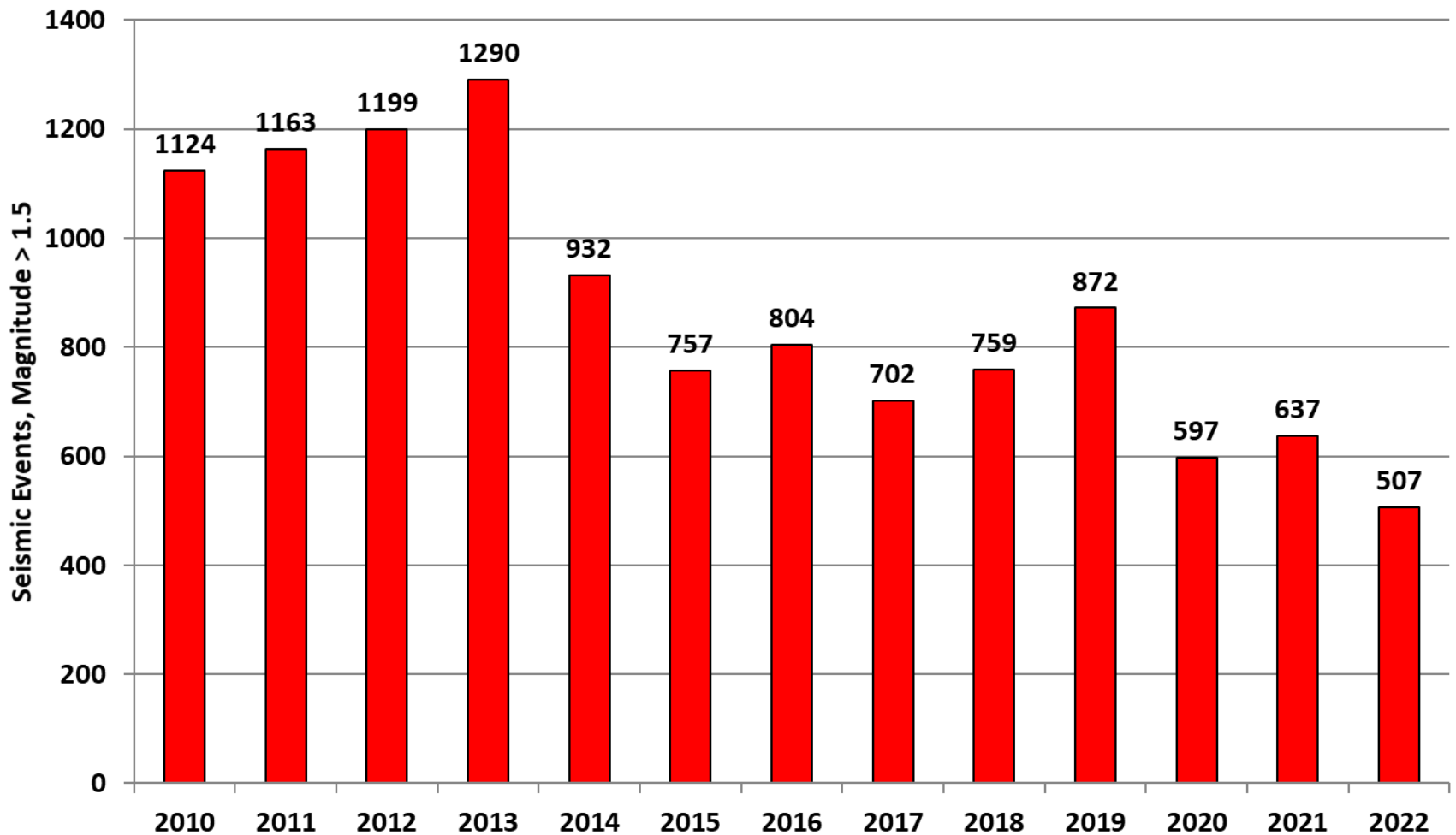
Magnitude > 3.0 - 1 Event

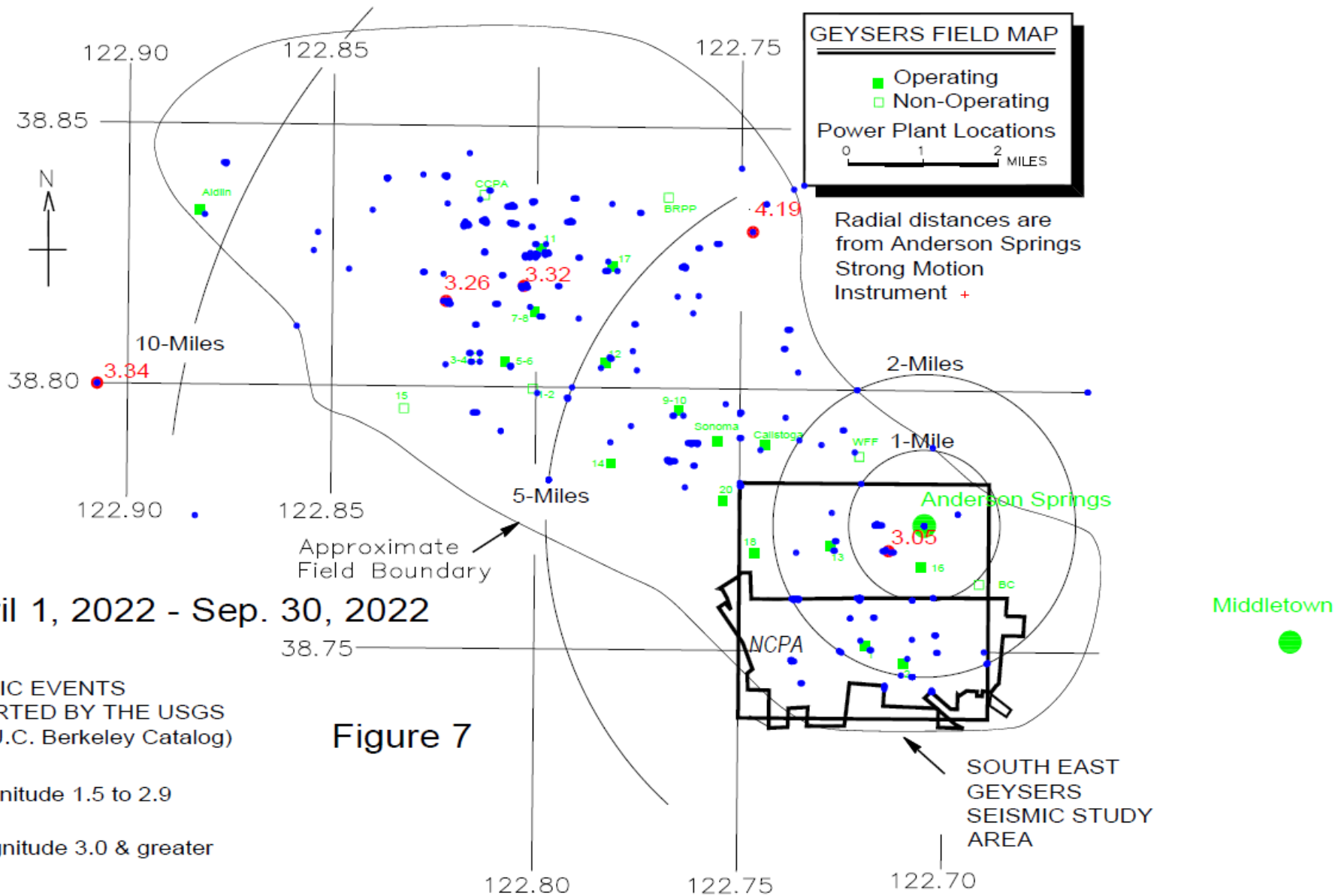
SEISMIC EVENTS
REPORTED BY THE USGS
(from U.C. Berkeley Catalog)

SE Geysers Production and Injection
Figure 5



The Geysers (KGRA) - Historical Seismic Activity
Magnitude > 1.5
Figure 6





Summary

- **SEGEP Operation**
 - Injection Rate – 1,150 gpm
 - Pipeline availability – 61.2%
 - Reduced injection due to drought
- **Southeast Production & Injection**
 - Production – 17.5 Glbs
 - Injection – 4.24 Glbs
- **Seismic Activity – SE Geysers**
 - 50 Events > Magnitude 1.5
 - 1 Events > Magnitude 3.0
- **Seismic Activity – Geysers**
 - 318 Events > Magnitude 1.5
 - 5 Events > Magnitude 3.0
 - Highest Event – Magnitude 4.19

Bear Canyon Pump Station #3

