

**Basin Management Objective  
Butte County  
Sub-Inventory Unit – THERMALITO  
Thermalito Irrigation District**

**Butte County Water Advisory Committee Member** – Michael Edwards

**Contact Information**

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**Description of the Thermalito Sub-Inventory Unit –**

The Thermalito Sub-inventory Unit (SIU) covers an area of about 25,500 acres. It is bordered by foothills to the north, the Feather River to the south and east, and the SIUs of Western Canal, Richvale, and Biggs/West Gridley to the west. The northwestern portion of the Thermalito SIU consists primarily of the Thermalito Afterbay and the surrounding native vegetation. To the northeast, the SIU encompasses portions of Oroville and the Thermalito Irrigation District and is characterized by urban, rural, and agricultural land uses. Land use within the southern portion of the SIU is primarily agricultural, consisting of orchards and rice production supported predominantly by groundwater. In a normal year, about 17% of the Thermalito SIU is in summer agricultural production supported by groundwater.

**Management Objective –**

To maintain sufficient volumes of groundwater in storage within all aquifer systems to provide an adequate and affordable domestic water supply of adequate quality for consumption, including periods of extended drought and to assure that groundwater in storage is not depleted over time. It is the intent of this management objective to assure a sustainable domestic water supply now and into the future and to assure the water supply can be utilized without injuring groundwater quality or inducing land subsidence.

**Geologic Formations Identified In Sub-Inventory Unit:**

Geologic formations in the Thermalito SIU, from youngest (shallowest) to oldest (deepest), include:

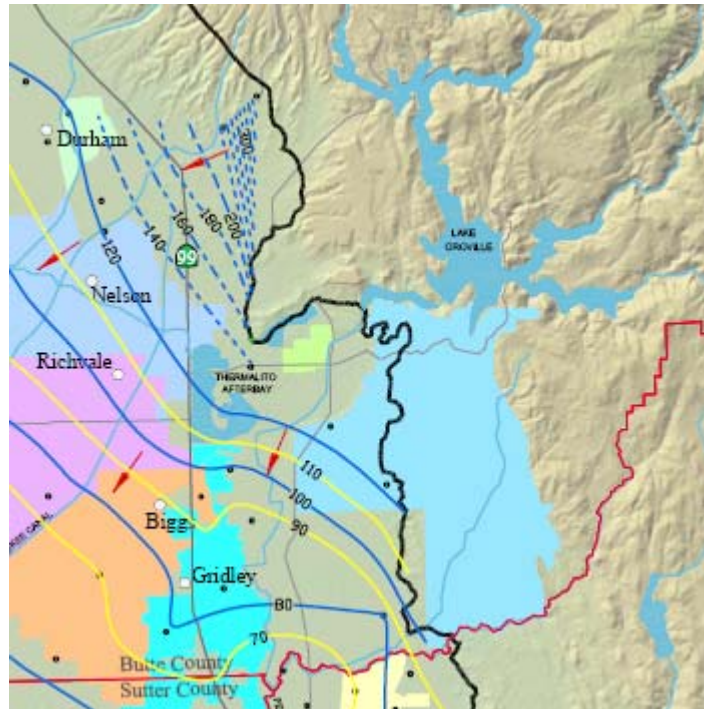
- Quaternary Alluvium
- Riverbank Formation
- Laguna Formation
- Tuscan Unit B (Lower Tuscan)

**Fresh Water-bearing Units.** In the Sacramento Valley Region of Butte County, fresh groundwater-bearing units include, from youngest (shallowest) to oldest (deepest), the Modesto, Riverbank, Laguna, Tehama and Tuscan Formations. Those included in the Thermalito SIU are:

- Riverbank Formation
- Laguna Formation
- Tuscan Unit B (Lower Tuscan)

**Groundwater Flow in the Thermalito Sub-Inventory Unit –**

The below figure is a cropped segment of a map prepared by DWR Northern District. It shows the groundwater elevation contours in your sub-inventory unit with arrows indicating the direction of groundwater movement. This graphic indicates that the regional pattern of spring groundwater movement in the Thermalito SIU is toward the south. Locally, groundwater mounding due to recharge from the Thermalito Afterbay causes groundwater to move in a southeasterly direction toward the Feather River and in a southwesterly direction toward the Butte SIU. The average groundwater gradient in the Thermalito SIU is about 5 feet per mile.



**Arrows show the direction of groundwater movement.**

2008 Groundwater contours were constructed using groundwater level measurements taken by the Department of Water Resources and Local Cooperators between March 1st and March 20th, 2008. Groundwater contours are based on groundwater level measurements taken from wells constructed within the middle portion of the aquifer system (100 to 400 feet deep). This portion of the aquifer supplies approximately 70% of all domestic, agricultural and municipal wells. Blue contour lines represent 20 foot intervals and yellow contour lines represent 10 foot intervals. Full size contour maps are included in the annual Groundwater Status Report posted on the Department of Water and Resource Conservation website.

**BMO Key Wells Selected for Groundwater Level Monitoring –  
SPRING**

| Well ID     | Well Type           | Aquifer    | Spring Stage 1 & 2 Alerts** |            | Stage 3 Alerts** |            |
|-------------|---------------------|------------|-----------------------------|------------|------------------|------------|
|             |                     |            | Elev. (ft)                  | Depth (ft) | Elev. (ft)       | Depth (ft) |
| 18N03E08B03 | Laguna              | Irrigation | 98.55                       | 12.86      | 98.0             | 13.4       |
| 18N03E21G01 | Modesto             | Irrigation | 84.23                       | 20.27      | 81.80            | 22.70      |
| 19N03E05N02 | Laguna/Upper Tuscan | Domestic   | 114.47                      | 27.03      | 105.60           | 35.90      |
| 19N03E16Q01 | Laguna              | Domestic   | 136.32                      | 41.68      | 135.50           | 42.50      |

## FALL

| Well ID     | Well Type           | Aquifer    | Spring Stage 1 & 2 Alerts** |            | Stage 3 Alerts** |            |
|-------------|---------------------|------------|-----------------------------|------------|------------------|------------|
|             |                     |            | Elev. (ft)                  | Depth (ft) | Elev. (ft)       | Depth (ft) |
| 18N03E08B03 | Laguna              | Irrigation | 94.45                       | 16.95      | 89.40            | 22.00      |
| 18N03E21G01 | Modesto             | Irrigation | 80.27                       | 24.23      | 78.90            | 25.60      |
| 19N03E05N02 | Laguna/Upper Tuscan | Domestic   | 112.73                      | 28.27      | 102.90           | 38.10      |
| 19N03E16Q01 | Laguna              | Domestic   | 134.60                      | 43.40      | 134.00           | 44.00      |

### BMO Key Wells Selected for Groundwater Quality Monitoring–

An additional domestic well in the Thermalito SIU was monitored during the 2008 annual trend monitoring sampling period. Results for this well will be published in future BMO documents when there is sufficient data for analysis.

#### Groundwater Temperature - 2002 through 2008

| Sub-area   | 2002 Temp °C | 2003 Temp °C | 2004 Temp °C | 2005 Temp °C | 2006 Temp °C | 2007 Temp °C | 2008 Temp °C |
|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Thermalito | 18.3         | 17.9         | 17.1         | 17.1         | 18.4         | 17.7         | 18.9         |

#### Groundwater pH - 2002 through 2008

| Sub-area   | 2002 pH | 2003 pH | 2004 pH | 2005 pH | 2006 pH | 2007 pH | 2008 pH |
|------------|---------|---------|---------|---------|---------|---------|---------|
| Thermalito | 7.0     | 6.5     | 7.1     | 7.1     | 7.9     | 7.4     | 7.4     |

#### Groundwater EC - 2002 through 2008

| Sub-area   | 2002 EC | 2003 EC | 2004 EC | 2005 EC | 2006 EC | 2007 EC | 2008 EC |
|------------|---------|---------|---------|---------|---------|---------|---------|
| Thermalito | 132.0   | 164.0   | 149.0   | 150.0   | 152.0   | 242.0   | 205.0   |

### BMO Key Well(s) Selected for Land Subsidence Monitoring–

Land Subsidence is continuously monitored by the Department of Water Resources at the closest extensometer in the Western Canal Water SIU at SWN 20N01E18L03M.

Butte County staff participated in the Sacramento Valley Height Modernization Project during March 2008 as a means to enhance the subsidence monitoring program in the county and the region. This cooperative project between the Department of Water Resources (DWR), the Bureau of Reclamation and local County agencies helped to establish baseline ground elevations in Butte County and other portions of the valley. Land elevations were measured using Global Positioning System (GPS) survey equipment and survey monuments located on an approximate three to five mile grid. Re-observations are to be done in approximately three years, and will give measurements to compare against the baseline data in order to determine whether or not any subsidence has occurred.

### BMO Alert Stage Definitions and Compliance Methodologies–

The Thermalito Sub-Inventory Unit will use the following guidelines in the management of the groundwater resources. The groundwater level and land subsidence management objectives

are intended to trigger predetermined voluntary Ground Water Management Actions, as defined in the accompanying Cover Report, to remedy declining ground water levels that are not recovering to compliance levels for the index well.

### **Groundwater Level – 20% of Range and Lowest Record**

Stage 1: The first year that spring groundwater levels fall below the average spring groundwater level of the data minus 20% of the range.

Stage 2: Stage 2 is reached if spring groundwater levels, for a second consecutive year, fall below the average spring groundwater level of the data minus 20% of the range yet remain above the lowest record spring level for the well.

Stage 3: Stage 3 is reached if the spring groundwater levels fall below the lowest historic water level on record for each respective well.

The methodology and Alert Stages will be set for any of the chosen Thermalito Irrigation District monitoring wells once the appropriate wells within the SIU have been selected.

### **Groundwater Quality –**

Any change that exceeds a 20 percent change from Butte County's 2008 water quality assessment done in August of each year will be cause for review and investigation by the Technical Advisory Committee.

### **Land Subsidence –**

Land Subsidence will be monitored at the closest extensometers located in the M&T and Western Canal sub inventory units. Maximum annual inelastic land subsidence shall not exceed 0.01 feet per year.

Stage 1: is reached when the annual elastic subsidence exceeds the average annual elastic subsidence measured over the period of record of the extensometer.

Stage 2: is reached when the annual elastic subsidence exceeds the maximum recorded elastic subsidence over the period of record for the extensometer.

Stage 3: is when inelastic subsidence is detected. Inelastic subsidence shall be detected by comparing reading from the extensometer taken on March 1 of each year against previous March 1 measurements.

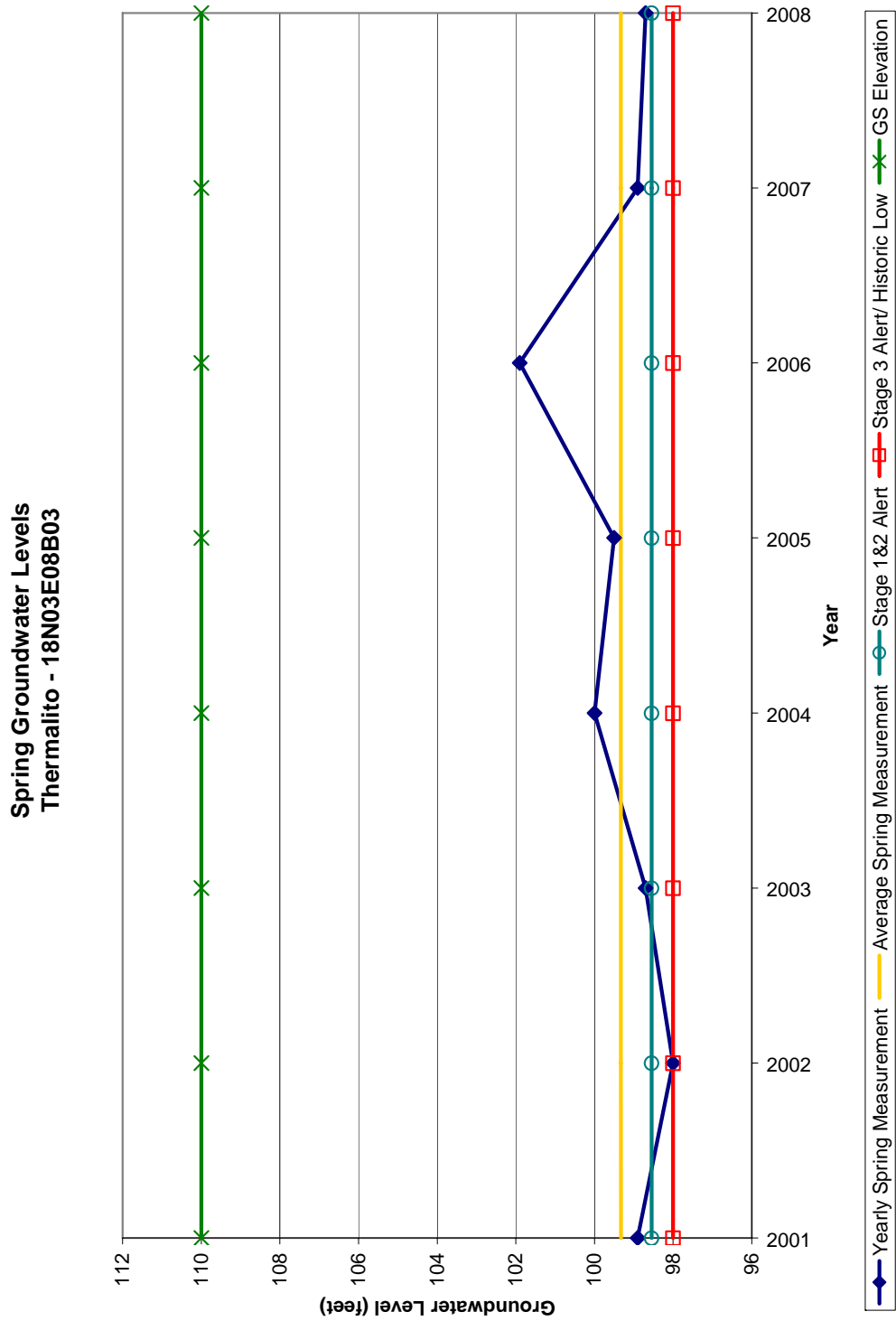
### **Future Monitoring Recommendations –**

Efforts will be made to identify additional wells within the SIU and Thermalito Irrigation District service area that could be added to the existing monitoring well network in the sub-inventory unit. Well level measurements will be taken throughout the year once the appropriate wells have been selected.

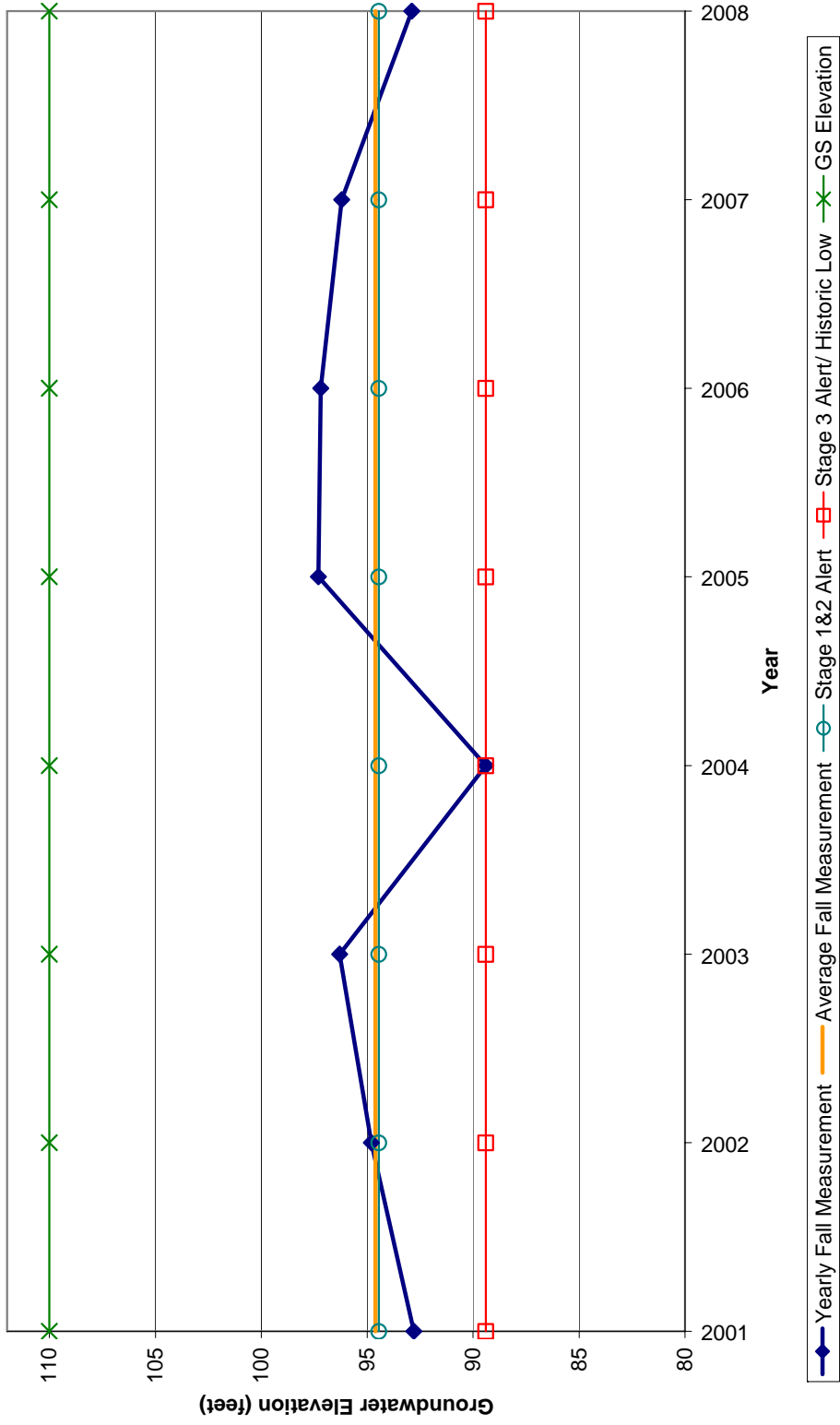
### **Supporting Data –**

Hydrograph depicting yearly spring level measurements, including 2008 data, with established alert levels.

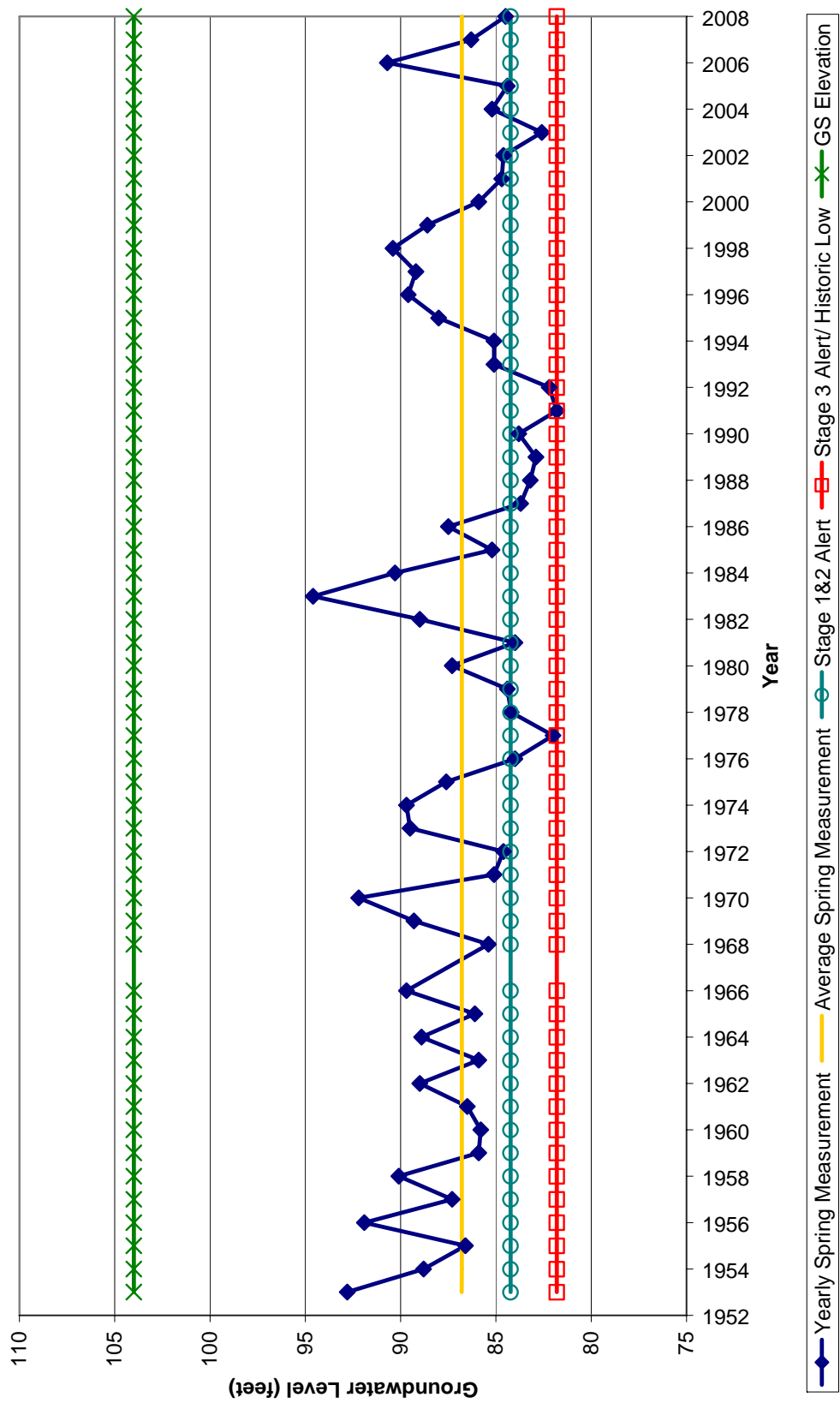
Summary charts of water quality monitoring.



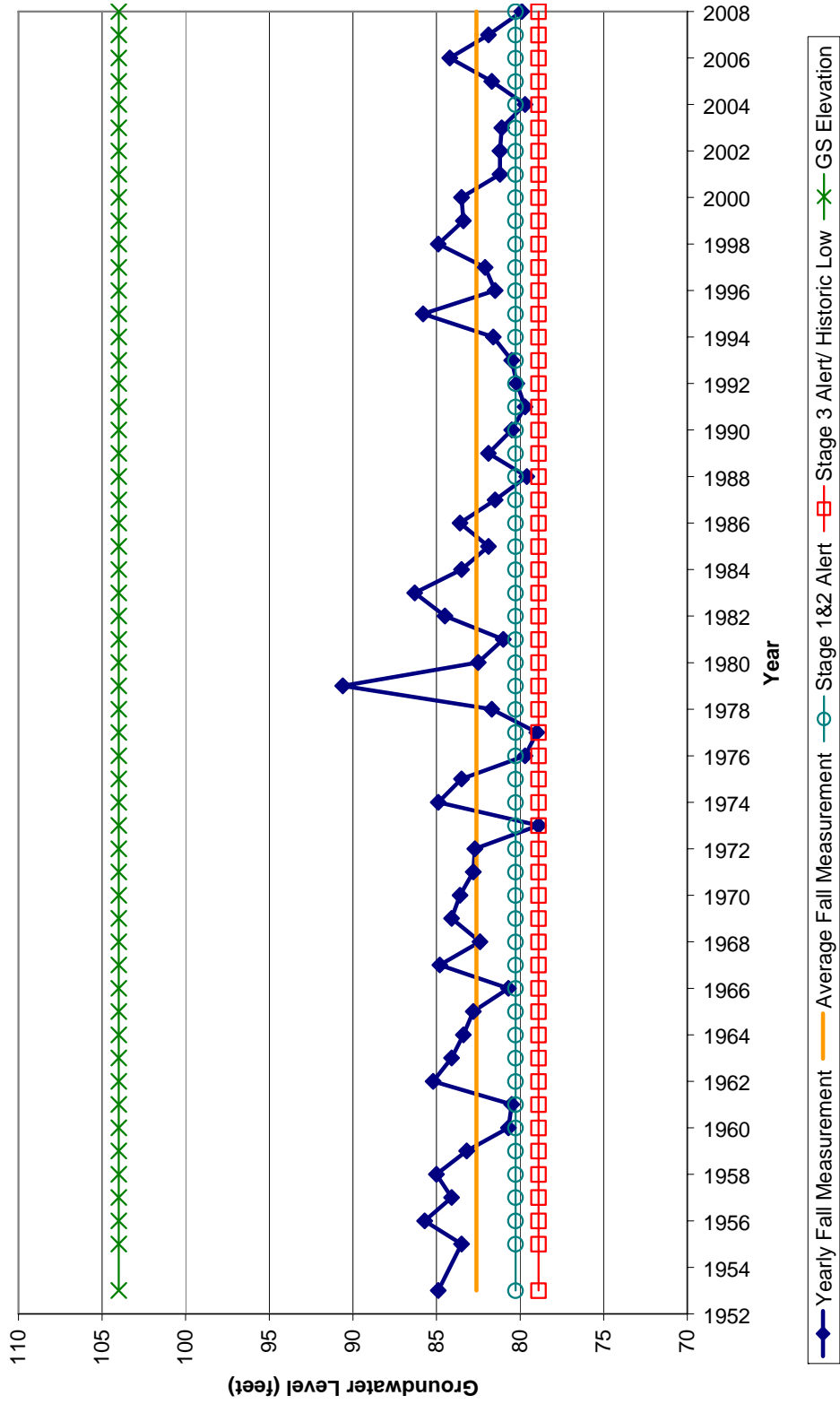
Fall Groundwater Levels  
Thermalito - 18N03E08B03



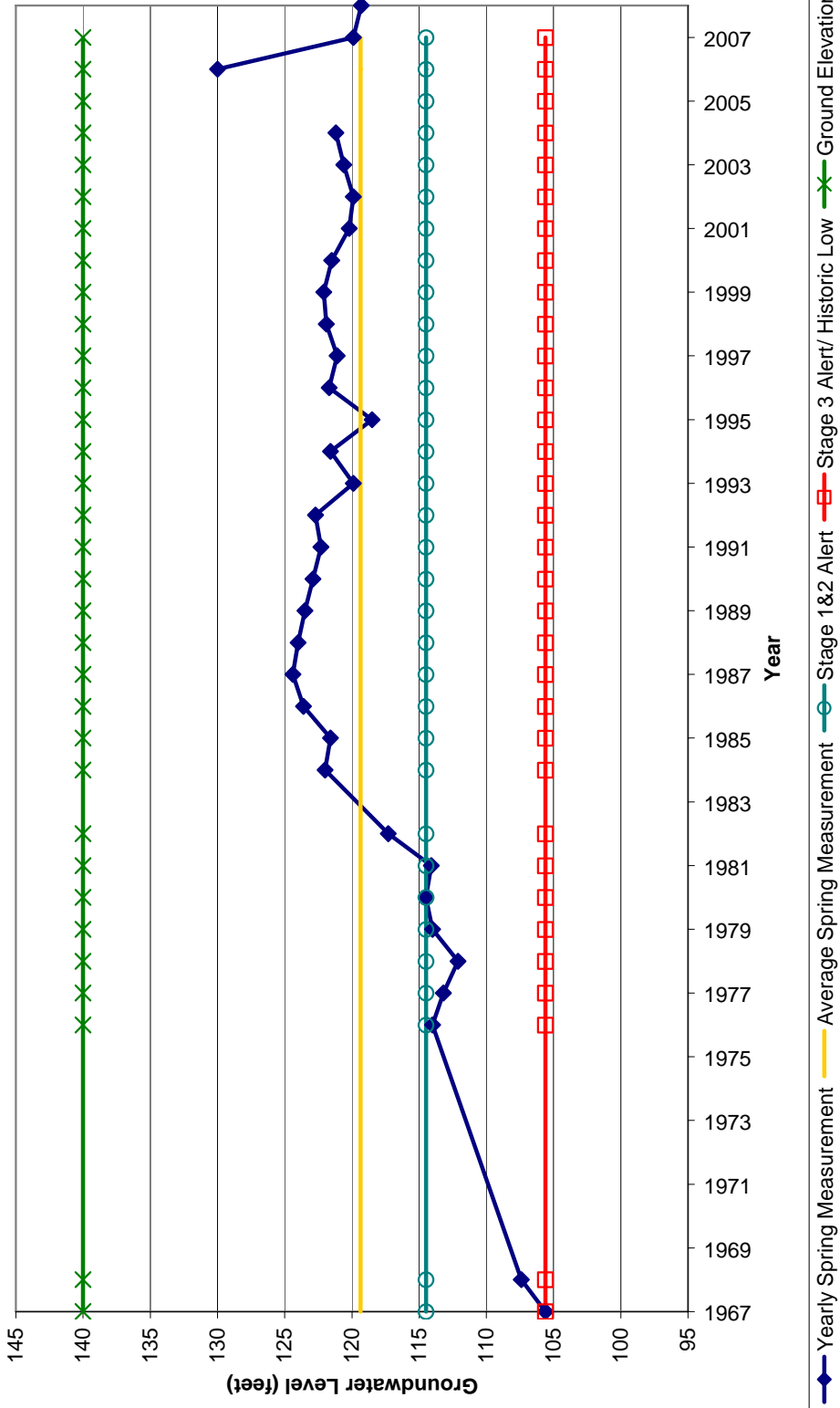
### Spring Groundwater Levels Thermalito - 18N01E21G01



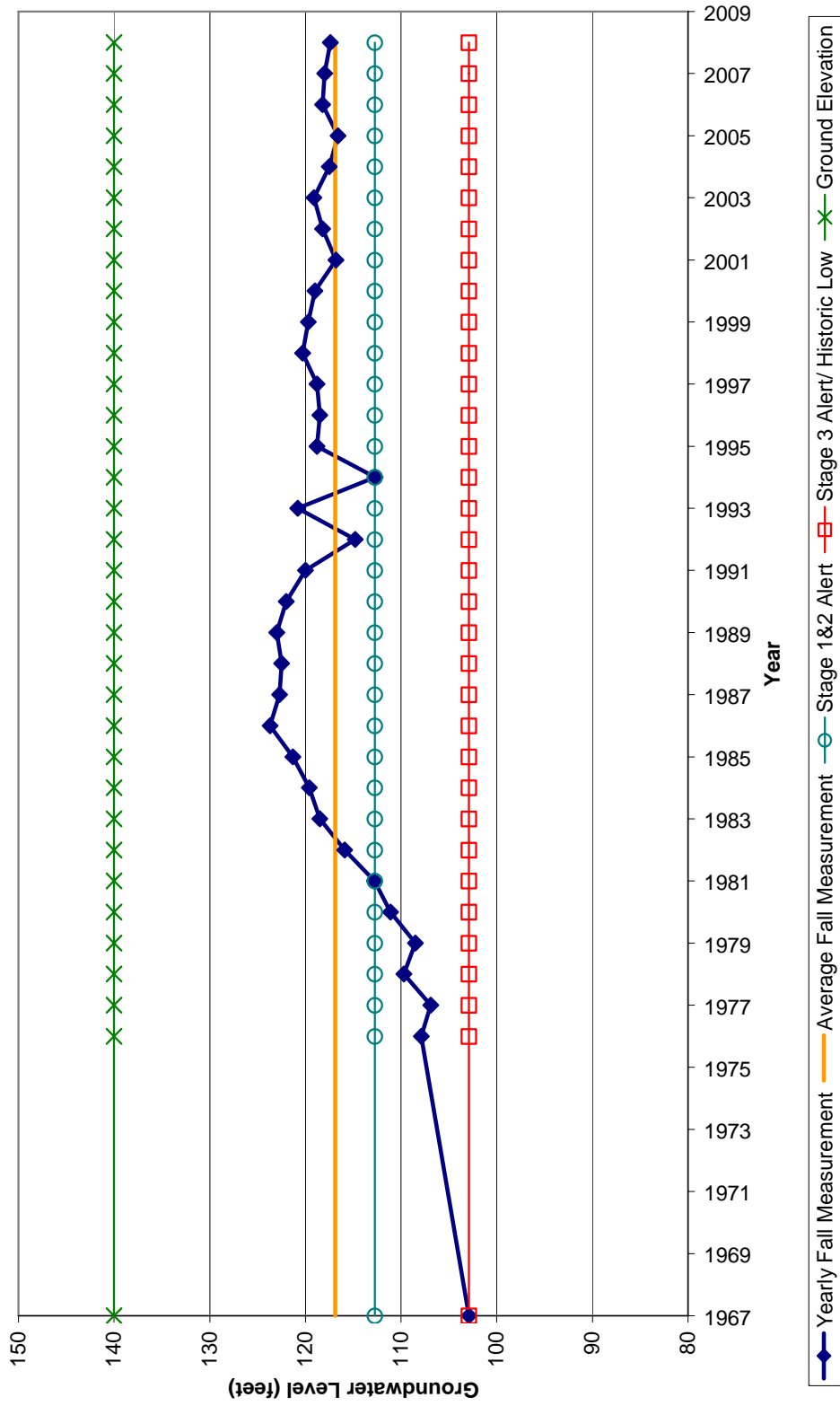
Fall Groundwater Levels  
Thermalito - 18N01E21G01



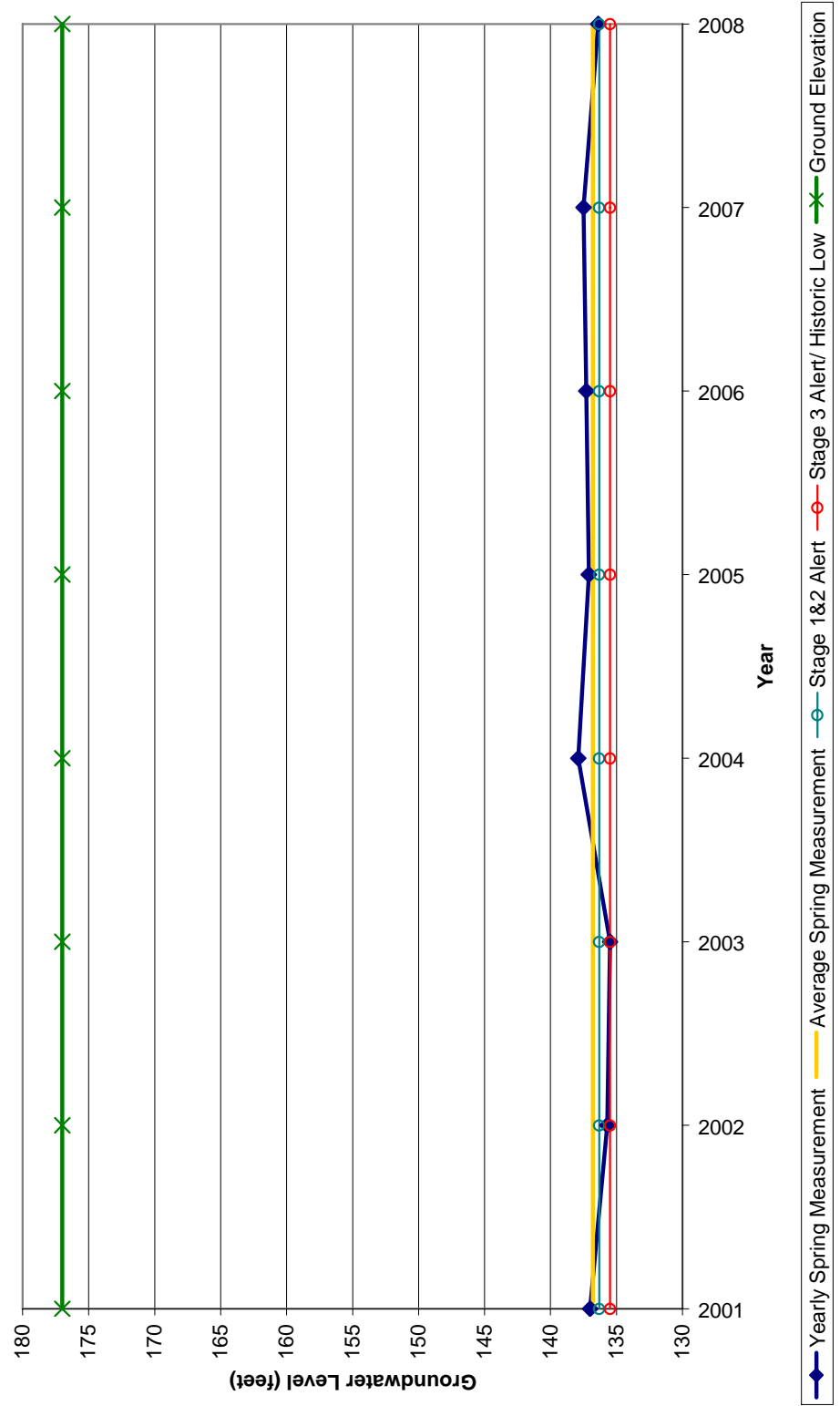
**Spring Groundwater Levels  
Thermalito - 19N03E05N02**



Fall Groundwater Levels  
 Thermalito - 19N03E05N02



### Spring Groundwater Levels Thermalito - 19N03E16Q01



**Fall Groundwater Levels  
Thermalito - 19N03E16Q01**

