Northeast Napa Area: Special Groundwater Study

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Overview

• Background
• NE Napa Study
• Findings
• Recommendations

Acknowledgements LSCE Staff:
• Reid Bryson
• Barb Dalgish
• Jeevan Jayakody
• Ken Utley
• Andrew Francis
Background: Northeast Napa Area

- **Dec 2015:** Review of GW data shows area of interest near MST Subarea
  - Historical declines in 2 wells
  - Levels stabilized since 2009
  - Petra Drive well replacements
- Several winery permit applications received by PBES in this area
- **April 5, 2016:** BOS Annual Report on the GW Monitoring Program
  - Recommends Northeast Napa Special Study Area
Northeast Napa Study

Study and GW Model to Evaluate:

- Historical WL declines local area east of Napa River
- Mutual well interference
- Potential for affect from MST Subarea
- Potential effects of pumping on streamflow
- GW availability (esp. east of Napa River)
Land and Water Use
1987 and 2011 Land Use
1987 and 2011 Land Use and Irrigation

1987

2011

Legend
- Active Model Area
- Irrigation Status:
  - Irrigated
  - Not Irrigated
  - City of Napa
  - Napa Valley Subbasin Boundary
Permitted and Proposed Wineries
Groundwater Flow Model
Geologic Setting

- Develop Hydrogeologic Conceptualization
Geologic Cross Section E-E’
Geology and Layers 1-6

- Hydrogeologic Conceptualization
- Physical Basis for Model Structure
- Important Structural Features
Model Features:
Detail Near Petra Drive

Petra Drive Area
Alluvium Thickness: Layers 1-3
Thickness of Older Formations

Tertiary/Quaternary Deposits: Layers 4-5

Sonoma Volcanics: Layer 6
Permitted Surface Water Diversions
Well Locations: Actual and Inferred
Groundwater Demand: Example July 2003
Water Level Targets for Calibration (examples)
Select Average Baseline Water Budget Components (AFY)

- **INFLOW**
  - Western Tributaries: 645
  - Napa River: 3,129
  - Eastern Tributaries: 712
  - Pumping: 1,308
  - Recharge: 1,774

- **OUTFLOW**
  - EAST: 7,775
  - WEST: 1,774

(Not to scale)
Average Annual Water Budgets: Baseline and 3 Scenarios

Discharge to Napa River:
- Baseline Pumping
- Double Pumping
- No Pumping
- 1988 Amt of Pumping
Comparison of Water Budget

Average Stream Leakage (GW Discharge to Streams) Only About 5% Different for Double Pumping Compared to Baseline Pumping

Average Change in Groundwater Storage About in Balance
Simulated SW Flow: Baseline Model
Gaining & Losing

- Gaining Stream
- Losing Stream

- Total SW Flow to Aquifer (Western Tributaries) (AFY)
- Total SW Flow to Aquifer (Eastern Tributaries) (AFY)
- Total SW Flow to Aquifer (all Napa River) (AFY)
- Total SW Flow to Aquifer (Entire Model Domain) (AFY)

Years:
- Drier Years
- Wetter Years
- Drier Years
Surface Water – Groundwater Interactions Near Petra Drive

Row 111, Column 62
Profile X – X’ Near Petra Drive

10/1/2004 Wet Year

Water Table — Ground Surface — Napa River Stage — Soda Creek Stage

10/1/2013 Dry Year

Water Table — Ground Surface — Napa River Stage — Soda Creek Stage
Napa River Stage at Row 111, Col. 62
Baseline vs. No Pumping

**Wet Years**
- Diff. ~0.01 ft in Sept.

**Dry Years**
- Diff. ~0.014 ft in August
Water Table at Row 111, Col. 62
Baseline vs. No Pumping

**Wet Years**
- Diff. ~0.048 ft in August

**Dry Years**
- Diff. ~0.057 ft in August
The small variations between these scenarios indicates the primary role of climate-driven effects.
Proposed Management Area

- Conditions different than overall Napa Valley Subbasin
- Management Area = NE Napa Area/ East of Napa River
GW storage change is ~ net-zero annually.

Pumping is relatively small part of water budget.

Recharge is 2nd largest water budget component.

Within the model, GW discharge into the Napa River dominates the GW budget.

Tributaries in the area most often recharge the GW on a seasonal basis. Tributaries east of Napa River consistently show net losing stream conditions. Soda Creek is more affected by climate, than pumping in determining the rate of stream leakage to GW.
• Starting in the late 1990s, a decrease in GW discharge to streams occurs. This recent trend can be attributed to less precipitation (climatic effects), including reduced recharge and subsurface lateral flows, rather than to pumping.

• Geologic faulting in the model area is important to the overall behavior of water levels east of Napa River. Additional concealed faults may be present, which may affect water levels in deeper wells in the Petra Drive area.
The modeling scenarios indicate the primary role of climate–driven effects.

Statistical analyses of model recharge, lateral flows and pumping relative to baseflow in Napa River show climate effects contribute to 87 to 92% of the effect on baseflow in Napa River, while pumping contributes to 8 to 13% of the effect on baseflow.

Some drawdown in the Petra Dr. area is associated with mutual well interference (compounded by high well density). The lowered GW levels near Petra Dr. are not as significant as the regional influence of GW movement away from Petra Dr. towards the MST Subarea.
Report: Recommendations

A. Surface Water/Groundwater Monitoring Facilities
   - Construct shallow nested MWs (like LGA SW/GW) east of Napa River near Petra Drive

B. SGMA Management Area Designation
   - Management Area = Northeast Napa Area/East of Napa River
   - Meets criteria for designation due to geologic features and aquifer parameters distinct from the Napa Valley Subbasin

C. Discretionary Project WAA Review in Management Area
   - For discretionary projects, recommend additional project-specific analyses (WAA Tier 2) be conducted to ensure that proposed project location or planned GW use does not cause an undesirable result (i.e., may include water use criteria)
D. New Well Tracking in the Management Area
   – Track new non-discretionary groundwater wells constructed in the Management Area, including planned usage and location.

E. New Well Pump Testing
   – Management Area, and also deeper geologic units in Napa Valley Subbasin

F. Groundwater Flow Model Development
   – Develop model for entire Napa Valley Subbasin

G. Increased Water Conservation and Recharge
   – Promote sustainable water use, including maintain/improve ecosystem health.
   – Evaluate approaches stormwater management and increase water conservation, create additional climate resiliency through targeted recharge strategies.
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<thead>
<tr>
<th>RECOMMENDATIONS</th>
<th>Management Area (NE Napa/East of River)</th>
<th>All Napa Valley Subbasin</th>
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<tbody>
<tr>
<td><strong>A</strong> Add SW/GW Monitoring Wells</td>
<td>X</td>
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<td><strong>B</strong> Management Area Designation</td>
<td>X</td>
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<td><strong>C</strong> Discretionary Projects – Additional WAA Review (Tier 2)</td>
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Thank You