Appendix G Lake Camanche Groundwater Study: Extracted Pages

GROUNDWATER SUPPLY STUDY AND INTEGRATED REGIONAL GROUNDWATER MANAGEMENT PLAN

for the

LAKE CAMANCHE
WATER IMPROVEMENT DISTRICT NO. 7

prepared for

AMADOR WATER AGENCY
LOCAL GROUNDWATER ASSISTANCE PROGRAM GRANT AGREEMENT NO. 4600008731

JUNE 2012
DE Project No.: 104-11
Revision 0

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0 EXECUTIVE SUMMARY

Per an approved management work plan for a groundwater supply study and management plan, investigation and planning efforts have been conducted in phases as proposed in the Amador Water Agency (AWA) grant application. The phases included development of a conceptual model, extensive geologic and hydrogeolgic investigations, and collaborative formulation of a regional groundwater management plan. The work plan in the AB-303 grant agreement between the California Department of Water Resources (DWR) and AWA was fully implemented, culminating with preparation of this study and plan.

Dunn Environmental, Inc. (DE) developed and refined the data investigation objectives and project goals. The data objectives and plan steps were detailed in the approved work plan as follows:

Step 1 – Identify work plan and Integrated Regional Groundwater Management Plan (IRGMP) goals

Step 2 – Data compilation

- The regional, physical hydrogeological setting was demonstrated through the use of previously published study reports, geologic mapping, and area knowledge

Step 3 – Conceptual model development and source sufficiency analyses

- Basin hydrogeology and hydrochemistry was demonstrated through the use of existing well log review, beneficial use study, surface geophysics, drilling, sampling, and individual well testing and aquifer properties characterization

Step 4 – Technical components of basin management objectives (BMOs) and identified gaps

- BMOs and identified data gaps were used to refine the program.

Step 5 – Determine plan and monitoring programs

- Develop groundwater management alternatives to protect groundwater resources

Step 6 – Plan implementation and outreach

- Draft outreach components were developed and vetted with the local community

Step 7 – Finalize and adopt the IRGMP

The key finding statements used to prove the groundwater source sufficiency and management plan objectives are as follows:

- Conceptual model definition
- Sustainable well yields and future well development area
- No overdraft conditions: a sufficient source is achievable given good management practices
- Measurable groundwater management components

HYDROGEOLOGIC CONCEPTUAL MODEL DEFINITION

The following methods were used to confirm the hydrogeologic model:

- Review of previously published geological documents
- Compilation of DWR Well Completion Reports to confirm the beneficial use of wells and was used to select wells for long-term monitoring
- Geologic reconnaissance and natural spring mapping of the study area to confirm published geologic maps
- Surface geophysics to demonstrate areas and depths of favorable hydrostratigraphy with significant recharge and storage components
- Installation of three monitoring wells to assess hydrogeologic conditions
- Identification of favorable groundwater quality, with low concentrations of metals and general minerals, within the three project-installed monitoring wells and other selected wells used as a monitoring well network

PROVEN SUSTAINABLE WELL YIELDS AND FUTURE WELL DEVELOPMENT AREA

Groundwater supply sustainability was assessed by identifying the areal extent of hydrostratigraphic units and faults that help define preferred well development areas. The presence of Tertiary gravels within specific localities and depths was an important condition associated with favorable groundwater production. Buried basement rock topography and lower Ione Formation composition appeared to limit meaningful groundwater resources with depth.

Based on the investigation findings, two distinct hydrogeologic areas were defined in the study area and became the focus of groundwater BMO development. A general

east-to-west groundwater basin separation was influenced by the presence of north-to-south basement rock highs and faults in the approximate middle of the study area that moderately truncated the in-filled valley features, resulting in a conceptual hydrogeologic model with limited through basin flow. The study area was separated into two surface area zones to characterize recharge sources and the presence of permeable sediments.

- Zone 1 - Eastern study area characterized by limited, fine-grained deposits
- Zone 2 – Western study area characterized by thick Mehrten and Tertiary permeable sediments and future well development area - a preferred hydrostratigraphic setting with sediments suitable for aquifer recharge (recharge potential map) and storage.

Soils and near-surface geology were critical in determining where preferred groundwater recharge and storage areas exist. Groundwater recharge from precipitation and leakage from Camanche Reservoir is strongly influenced by soil types and near-surface geology. Specifically, the Mehrten Formation and overlying coarse-grained soils represent favorable recharge and storage conditions. Lower recharge potential is anticipated from the Valley Springs and Ione Formations. Sparse vegetation, gentle slopes, and limited land use typical in the western study area also facilitate aquifer recharge potential.

Water well step-drawdown and long-term, constant-rate pump tests results were used to estimate aquifer properties for the two zones. The calculated transmissivity for zone 1 ranged from 941 to 1,130 gallons per day per foot (gpd/ft). For zone 2, transmissivity ranged from 8,487 to 91,254 gpd/ft and storage coefficients (storativity) ranged from 2.0×10^{-3} to 1.4×10^{-2} (unitless). Well specific capacities were used to assess individual well performance and indicate aquifer characteristics. Well specific capacities ranged from less than two gallons per minute for every foot of drawdown (gpm/ft) to over 30 gpm/ft. Zone 2 wells had the highest specific capacities.

NO OVERDRAFT, SUFFICIENT SOURCE GIVEN MANAGEMENT PRACTICES

Groundwater overdraft conditions or areas of decrease in groundwater levels have not been observed for the study area. Comparison of precipitation values and groundwater level responses in wells during single dry years, multiple dry years, and wet years demonstrated a lack of dry-year effect on groundwater levels. Slight seasonal variations were observed.

Groundwater demand does not exceed effective precipitation (or recharge factors) during these drought periods. The available water supply exceeds the demand by over 8,000 acre-feet.

MEASUREABLE GROUNDWATER MANAGEMENT COMPONENTS

The existing groundwater monitoring system and future added monitoring locations will be used to collect, graph, assess, and identify water level changes and water quality concerns in the basin. Groundwater management alternatives are detailed within.

The primary goal of the IRGMP is to provide background and guidance that will enable sustainable, beneficial use of groundwater within the basin. The BMOs were developed to support this goal. BMOs include:

- Maintaining or improving groundwater quality
- Maintaining or improving groundwater levels
- Protecting against inelastic land subsidence and managing groundwater resources to protect against impacts to and from surface water
- Educating the public on basin sustainability, including protecting groundwater recharge areas
- Maintaining groundwater resources for protection against drought conditions through cooperation and collaboration with stakeholders.