FINAL

Groundwater Monitoring and Mitigation Plan
Pine Valley Mutual Water Company
Pine Valley, San Diego County, California

Lead Agency:

County of San Diego
Planning and Development Services
5510 Overland Avenue
San Diego, California 92123
Contact: Ashely Gungle

Project Proponent:

Rugged Solar Farm LLC
c/o Soitec Development LLC
16550 Via Esprillo
San Diego, CA 92127
Contact: Dwain Boettcher, Soitec Solar, Inc.

Prepared by:

DUDEK
605 Third Street
Encinitas, California 92024

Stephen K. Dickey, PG, CHG, CEG

DECEMBER 2013

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1.0 INTRODUCTION

This Groundwater Monitoring and Mitigation Plan (GMMP) has been prepared by Dudek on behalf of Rugged Solar Farm, LLC (Rugged) and the Rough Acres Water Company, Inc. (Rough Acres) for submittal to County of San Diego Planning and Development Services (PDS; formerly DPLU). Rough Acres proposes purchasing up to a maximum of 16 acre feet of water from the Pine Valley Mutual Water Company (PVMWC) for use during the approximately 60 day peak construction phase of the Rugged Solar Farm Project, located north of Interstate 8, east of Ribbonwood Road and west of McCain Valley Road, near Boulevard, California. The requested 16 acre-feet of water to be supplied by the PVMWC is referred to herein as the "Project". This GMMP will outline monitoring and mitigation measures in order to provide protection of nearby groundwater dependent habitat and ensure adequate groundwater supply for other groundwater users in the area.

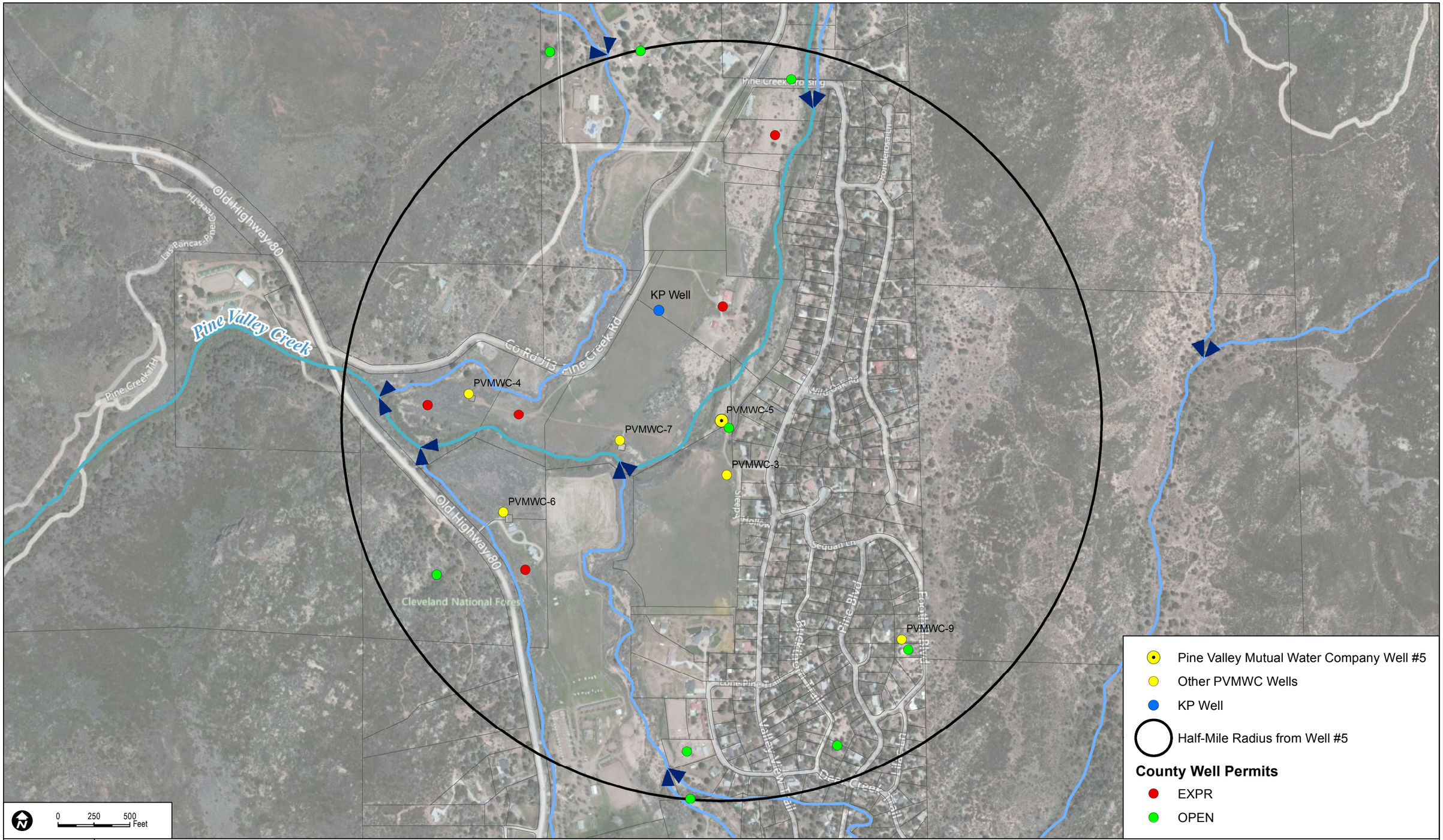
Several off-site water sources, including PVMWC Well No. 5, have been identified to supplement the construction water demands of the Rugged Solar Farm Project. The PVMWC has agreed to dedicate Well No. 5 to the Rugged Solar Farm Project. Well No. 5 is presently not used or certified as a potable water source by PVMWC. Historical production from Well No 5 has ranged from 0.5 to 22.7 acre-feet per water-year. Based on this historical production, the requested 16 acre-feet volume of water is within the historical production range from Well No. 5. Although the Project will require water for the 60 day peak construction period, production from PVMWC Well No. 5 may occur over a 90 day period to accommodate the storage limitations within the PVMWC system and potential trucking schedules to move the water from Well No. 5 to the Rugged Project site.

Results of the Groundwater Resources Investigation indicate that the short-term production of construction water from Well No. 5 would result in a less than significant impact to groundwater storage and groundwater levels at off-site wells. Potentially significant impacts may result to the groundwater dependent habitat (riparian forest associated with Pine Creek) located approximately 50 feet from Well No. 5. After 60 days of Project pumping, groundwater drawdown 50 feet from Well No. 5 is anticipated to be 26.2 feet.

Because actual conditions during groundwater extraction for the Project may vary from conditions assumed in the Groundwater Resources Investigation (Dudek, 2103) and the identified potential significant impacts to groundwater dependent habitat, this GMMP has been prepared for the Project. This GMMP establishes protective groundwater drawdown thresholds for off-site well interference and groundwater-dependent habitat and provides the technical basis for the application of water level (drawdown) thresholds.

On-site PVMWC Wells No. 3 and No. 7 located within 0.5 mile of Well No. 5 will be used as compliance wells for the groundwater monitoring program (Figure 1).

This GMMP also describes the monitoring, mitigation and reporting procedures by which the County of San Diego PDS can ensure that the conditions and criteria for the Project's groundwater extraction activities are continually being upheld. An 18 month monitoring period is proposed to assess the impact of the short-term construction water demand.



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SOURCE: Bing Maps, SanGIS 2013.
NOTE: KP Well location approximately located from Addendum to Well Testing Report Prepared for the County of San Diego Kenyon TPM 20857 on February 9, 2009, prepared by John Peterson

FIGURE 1
On-site and Off-site Well Locations

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2.0 ESTABLISHMENT OF GROUNDWATER THRESHOLDS

According to the County of San Diego Guidelines for Determining Significance and Report Format Content Requirements (County of San Diego, 2007), this Project-related groundwater extraction would incur a significant well interference impact if it results in a decrease in saturated thickness of 5% (20 feet or greater off-site groundwater drawdown in a fractured rock aquifer assuming 400 feet saturated thickness and a 5 foot or greater off-site groundwater drawdown in an alluvial aquifer assuming 100 feet of saturated thickness). Additionally, the County assigned a project specific threshold for determining significance to groundwater dependent habitat that differs from the standard significance threshold. The Project specific threshold was selected because of U.S. Fish and Wildlife Service (USFWS) concern for arroyo toad critical habitat in Pine Creek and the limited site specific biological data available to prepare this report. The Project specific threshold is:

> If drawdown as a result of pumping for this project would cause water levels to exceed historical low water levels from baseline conditions of pumping… this would be a potentially significant impact (County of San Diego 2013).

The thresholds established below incorporate these guidelines and represent a conservative basis for monitoring and mitigating potential groundwater impacts related to the Project.

2.1 Potential Off-Site Well Interference

Existing PVMWC Wells No. 3 and 7 are the nearest located public supply wells to Well No. 5 and will serve as the Well No. 5 monitoring points for compliance with groundwater drawdown guidelines established by the County (Table 1). These wells and Well No. 5 will be fitted with pressure transducers prior to the onset of Project pumping. The pressure transducers will record the water level in the wells at 15 minute intervals for approximately 1 month prior to the onset of Project related groundwater extraction. Transducer accuracy will be confirmed through manual water level measurements recorded with a sounder. Manual water levels will also be recorded for PVMWC Wells No. 4, No. 6 and No. 9 on a weekly basis during Project pumping. In addition, 12 private wells were identified from a search of the County's well permit database and are listed in Table 1. Only private wells that are located on parcels that are not members of the PVMWC will be eligible for potential monitoring.

Table 1
PVMWC Wells within 0.5 Mile Radius of Well No. 5

Well Number	Total Depth (feet)	Use	Distance from Well No.5 (feet)
PVMWC Wells			
Well No. 3	1,168	Public Supply	380
Well No. 4	916	Public Supply	1,750
Well No. 6	800	Public Supply	1,633
Well No. 7	1,000	Public Supply	720
Well No. 9	1,000	Public Supply	1,980
Private Wells			
KW Well	480	Private	885
5529	-	Private	2,231[a]
8814	-	Private	2,634[a]
9278	-	Pine Valley Bible Conference Center	1,940[b]
10041	-	Private	2,422[a]
10836	-	Private	1,911[a]
12650	-	Private	2,187[a]
14660	-	Private	2,395[a]
15117	-	Private	1,879[a]
16696	-	Private	1,398[a]
17766	-	Private	1,560[a]
18426	-	Private	1,230[a]
19971[c]	-	Private	793[a]

Source: PVMWC Water Well Driller Reports and County of San Diego Well Permit Database
Notes:
a. Distance is to the nearest parcel boundary as the exact well location is unknown.
b. Pine Valley Bible Conference Center is not a member of the PVMWC.
c. Well No. 19971 is likely the County well permit for the KW Well.

The measurements collected from the PVMWC wells and any private wells over this period will be used to establish a water level baseline and capture water level patterns generated by pumping of these wells. An understanding of these patterns will allow for their continued use as monitoring wells despite the possibility that they may be pumped over the duration of the Project. During pumping at Well No. 5, a maximum drawdown of 10 feet (rounded) below the water level baseline at Wells No. 3 and 7 will be allowed. This threshold is protective of a maximum drawdown of 10 feet at the closest property with a residential groundwater well located within 0.5 mile feet from the pumping well. This protective threshold will prevent drawdown at the nearest off-site wells, which are farther from Wells No. 3 and 7, from approaching the 10 feet threshold set forth by the County. The 10 feet limit is a hybrid of the 20

feet or greater off-site groundwater drawdown in a fractured rock aquifer and the 5 feet or greater off-site groundwater drawdown in an alluvial aquifer developed in consultation with the County Groundwater Geologist as both alluvial and fractured rock aquifers are present in the vicinity of Well No. 5.

As described in the Groundwater Resources Investigation Report (Dudek, 2013), the closest well to the pumping well (Well No. 5) is an irrigation well located approximately 620 feet north of Well No.5 (Figure 1). Although this well is not one of the PVMWC supply wells, it is also not technically an off-site well because the owners of the irrigation wells are members of the PVMWC. An additional 11 private wells are located within a 0.5 mile radius of Well No. 5.

2.2 Groundwater Dependent Habitat

The Groundwater Resources Investigation Report identifies three groundwater-dependent vegetation communities mapped near Well No. 5 that may depend on groundwater: mixed oak woodland, dense coast live oak woodland, and southern arroyo riparian forest. The closest groundwater dependent habitat to PVMWC Well No. 5 is riparian forest associated with Pine Creek approximately 50 feet to the west of the well based on review of aerial photography. Results of the Groundwater Resources Investigation Report indicate that Project-related groundwater production may potentially cause water levels to exceed historical low water levels from baseline conditions of pumping that would result in potentially significant impacts to groundwater dependent habitat.

However, as discussed in the Groundwater Resources Investigation Report, the water levels in PVMWC Well No. 5 are, in large part, controlled by the recharge from Pine Creek. Water levels in the habitat along the creek are also controlled by recharge along the creek. The estimated drawdown does not account for recharge from the creek, and is likely an overestimate of the actual drawdown in the riparian habitat. Based on the historical water levels in the well, it is anticipated that the water levels will recover from the proposed single, short term withdrawal within a year, as spring recharge from the Creek causes the water levels to rise.

Dudek recommends updating the baseline habitat data 1 month prior to the 60 day Project pumping period. Work performed will include updating the habitat map to include the areas around Well No. 5. No further mitigation is proposed at this time due to the estimated drawdown, the effects of Pine Creek on recharge in areas around Well No. 5, and the short-term nature of the production.

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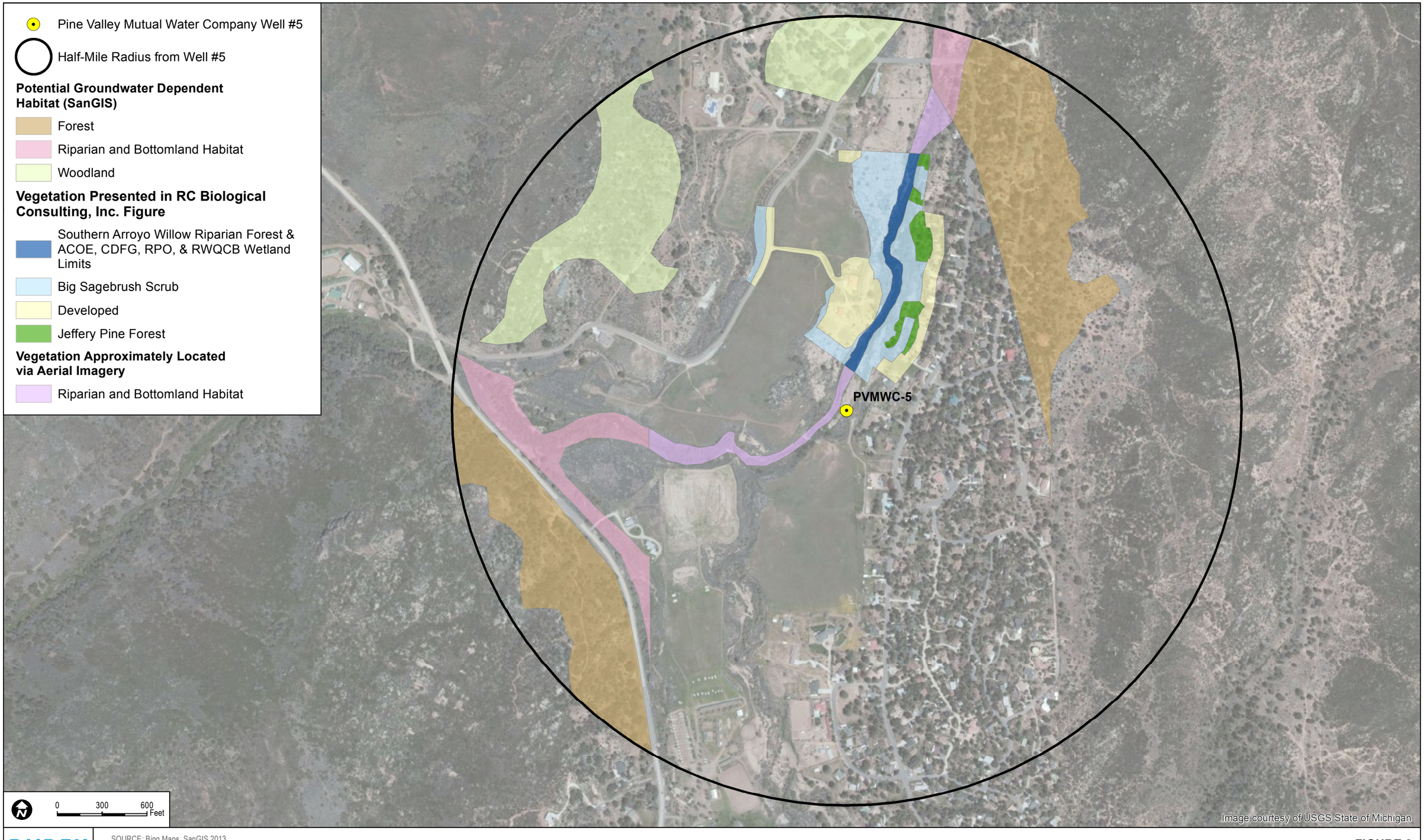

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SOURCE: Bing Maps, SanGIS 2013.
NOTE: Vegetation from RC Biological Consulting, Inc. was georeferenced from the Biological Resources Map for the Kenyon Property, Figure 4 in the Revised Biological Resources Report for the Kenyon Property, prepared by RC Biological Consulting, Inc. on July 9, 2010

FIGURE 2
Potential Groundwater-Dependent Vegetation

GROUNDWATER MONITORING AND MITIGATION PLAN - PINE VALLEY MUTUAL WATER COMPANY

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3.0 MONITORING PROCEDURES AND MITIGATION CRITERIA

The groundwater and biological monitoring procedures and mitigation criteria outlined below will be followed during the 60 day Project pumping period. The groundwater monitoring program defined herein will be carried out under the direction of a Certified Hydrogeologist registered in the State of California.

3.1 Groundwater Production and Water Level Monitoring

Pressure transducers will be maintained in a network of the 2 on-site PVMWC wells (Wells No. 3 and 7, Figure 1) closest to Well No. 5 as well as in Well No. 5. The pressure transducers will be programed to record the water level every 15 minutes. In addition, ambient barometric pressure and temperature will be recorded at 15 minute intervals with a barometric logger.

Transducer data will be downloaded weekly at the 5 on site PVMWC wells for 1 month prior to the onset of Project related groundwater extraction to establish baseline conditions for compliance monitoring of Well No. 5 pumping. Transducer data will be downloaded weekly during the approximately 60 day period of Project pumping at Well No. 5 and any additional monitoring wells. If not equipped, an instantaneous flow meter will be installed on Well No. 5 to monitor cumulative groundwater usage. Flow rate and volume measurements will be recorded daily during Project construction.

3.2 Groundwater Dependent Habitat Monitoring

The following monitoring program will establish the current status and health of the existing mixed oak woodland, dense coast live oak woodland, and southern arroyo riparian forest in the vicinity of Well No. 5.

3.2.1 Initial Monitoring

Baseline data will be collected within a 700 feet radius of Well No.5 and confined to groundwater dependent habitat; specifically the riparian corridor associated with Pine Creek. The 700 feet radius was selected based on the maximum distance drawdown estimated to result from Project pumping based on the Cooper-Jacob approximation of the Theis non-equilibrium flow equation analysis. Potentially affected native trees within the study area will be evaluated for overall physical condition and attributes. The trees shall be inventoried by an ISA Certified Arborist or Registered Professional Forester with specific experience evaluating native oak species, in particular coast live oaks. The baseline monitoring evaluations will include the following:

- Establishment of nine equidistant plots or transects within the riparian and bottomland habitat within 700 feet of Well No. 5 (Figure 3). Sample plots/transects

would include the range of existing habitat conditions, including elevation, slope and aspect, proximity to roads and other land uses.

- Tagging of trees and recording species, tag number, trunk diameter at breast height (dbh) (in.), height (ft.) and dominance (i.e., whether the tree is under the canopy of another tree or forms the uppermost canopy). Slope, aspect, and elevation of each tree location, existing understory species (including proportion of natives to exotics), presence of debris and litter, and soil type, depth, and parent material will be noted for each tree or plot/transect.
- Assessment of tree status, including documentation of:
  - Dbh measured at 4.5 feet above ground (according to standard practices)
  - Number of stems
  - Overall tree height (based on ocular estimates)
  - Tree crown spread (measurement in each cardinal direction, based on ocular estimate)
  - Overall tree health condition (Good, Fair, Poor, Dead)
  - Overall tree structural condition (Good, Fair, Poor, Dead)
  - Pest presence (Type, Extent – minimal, moderate, high)
  - Disease presence (Type, Extent – minimal, moderate, high)
  - Other specific comments
- Assessment of acorn production, seedling establishment and sapling tree densities and conditions
- The data collection procedure will include full data collection at each plot/transect so that consistency is maintained among sampling plots.
- Creation of database using GIS or similar application

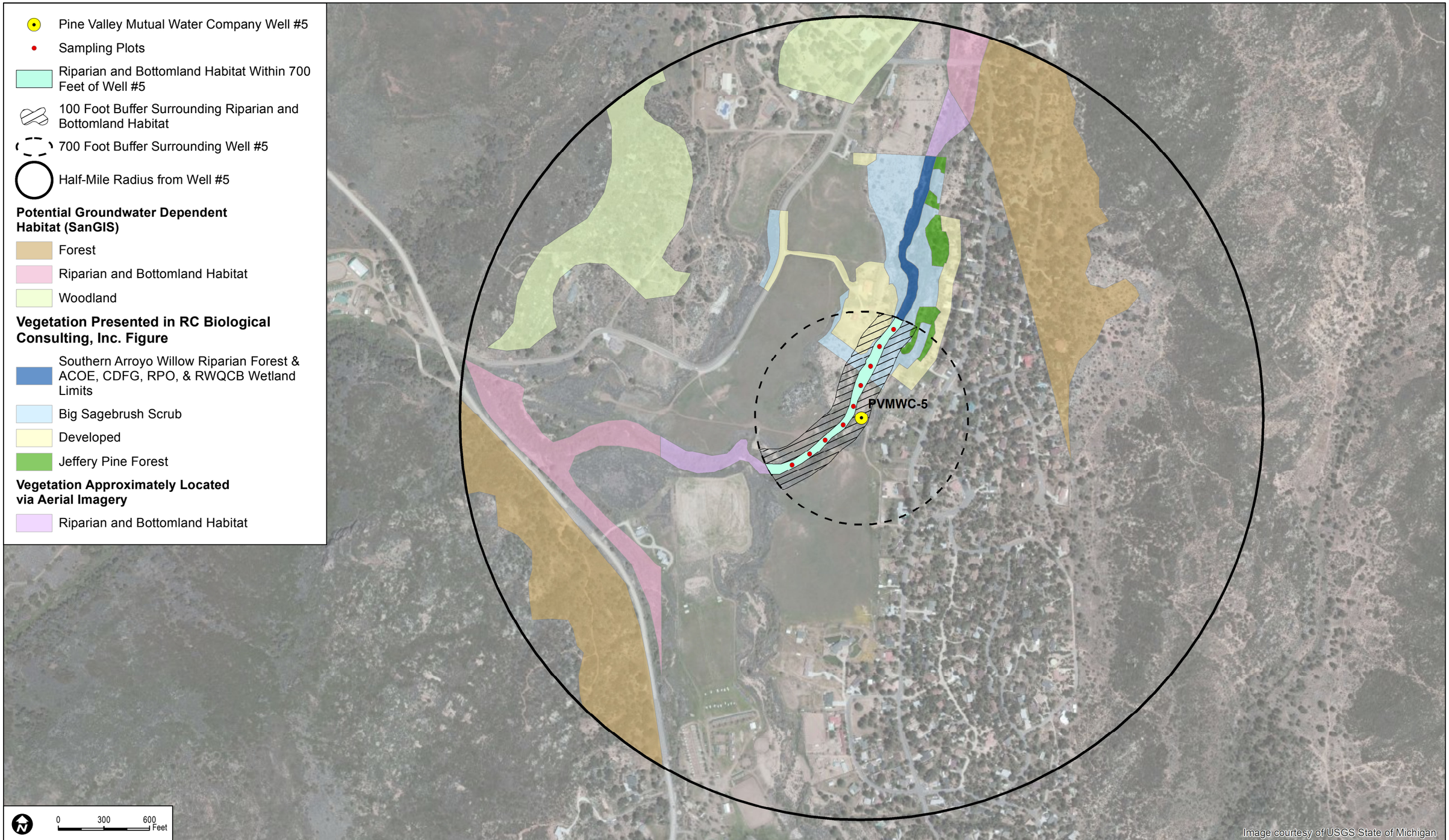

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FIGURE 3
Potential Groundwater-Dependent Vegetation Monitoring Locations

3.2.2 Ongoing Monitoring

Ongoing monitoring will be carried out quarterly during over an 18 month period. If the Certified Arborist or Registered Professional Forester observes an impact to the oak woodland after this period, monitoring will continue in years 2 through 5 following initiation of Project-related groundwater extraction. Monitoring will include the following components:

- Monitoring inspections will include re-evaluation of the baseline data.
- Monitoring will include re-evaluating the trees to determine if changes are occurring that may indicate ground water drawdown is having a deleterious effect on riparian habitat or individual trees. The following information will be recorded during each monitoring visit and the data will be compared to previous monitoring results:
  - Dbh, measured at 4.5 feet above ground (according to standard practices)
  - Number of stems
  - Overall tree height (based on ocular estimates)
  - Tree crown spread (measurement in each cardinal direction, based on ocular estimate)
  - Overall tree health condition (Good, Fair, Poor, Dead)
  - Overall tree structural condition (Good, Fair, Poor, Dead)
  - Pest presence (Type, Extent – minimal, moderate, high)
  - Disease presence (Type, Extent – minimal, moderate, high)
  - Analysis of leaf area index
  - Other specific comments

In particular, monitoring evaluations will focus on examining crowns for discoloration, loss of vigor, foliage curling, and/or pest presence; and trunks and root crowns for beetle/borer symptoms, bleeding cankers, or seeping areas (indicative of fungal infections). These and similar signs may indicate that a tree or a grouping of trees is experiencing stress.

3.3 Groundwater Mitigation Criteria

The following mitigation criteria will be established to protect groundwater resources and groundwater-dependent habitat in the Project area:

- During pumping at Well No. 5, a maximum drawdown of 10 feet below the water level baseline at Wells No. 3 and 7 will be allowed. If the groundwater levels at Wells No. 3 and 7 drops 10 feet below the baseline water levels, groundwater pumping at Well No. 5 will cease until the water level at the well that experienced the threshold exceedance has

increased above the threshold and remained there for at least 30 continuous days. Additionally, written permission from the County PDS must be obtained before production may be resumed.

- If the groundwater levels exceed historical low water levels in PVMWC Well No. 5 from baseline conditions of pumping (lowest recorded static water level in Well No. 5 was 50 feet below ground surface (bgs) in September 2004) and there is evidence of deteriorating riparian habitat health by the Arborist or Forester, there may be a temporary or permanent cessation of pumping at Well B. If evidence of deterioration persists after the 5 year period, mitigation will consist of offsite wetland/oak woodland credits at a 3:1 ratio.
- If an impact to the riparian habitat is observed by the monitoring Certified Arborist or Registered Professional Forester over the Project period, routine monitoring of the oak woodland will continue for a maximum up to 5 years following initiation of Project-related groundwater extraction. The monitoring Certified Arborist or Registered Professional Forester will base mitigation recommendations on the type and extent of tree issues observed. If groundwater drawdown is determined to be the cause of tree stress, resulting in the presence of secondary pests (insects and/or disease), halting groundwater extraction may be recommended.

4.0 REPORTING REQUIREMENTS

A groundwater monitoring report will be completed by a Certified Hydrogeologist registered in the State of California and submitted to the County PDS, no later than 28 days following the end of the 60 day Project pumping period. The report will include the following information:

- Water level hydrographs and tabulated water level data for each monitoring well.
- Tabulated groundwater production volumes from each production well.
- Documentation of groundwater drawdown at PVMWC monitoring Wells No. 3 and 7.
- Documentation of any threshold-included curtailment of groundwater production.
- Appendix documenting groundwater dependent habitat monitoring as described above.

If the baseline water levels at the PVMWC monitoring Wells No. 3 and 7 are exceeded by 5 feet, the County PDS will be notified via letter and electronic mail within five working days of the exceedance. Additionally, if water level thresholds at the off-site wells are exceeded by 10 feet, pumping of Well No. 5 shall cease and the County PDS notified via letter and electronic mail within five working days.

5.0 REFERENCES

County of San Diego. 2007 *County of San Diego, Guidelines for Determining Significance and Report Format and Content Requirements: Groundwater Resources*. Land Use and Environment Group, Department of Planning and Land Use, Department of Public Works. March 19, 2007.

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Dudek. 2013. *Pine Valley Mutual Water Company Groundwater Resources Investigation Report*. Prepared for County of San Diego Planning and Development Services. December 2013.

Peterson Environmental Services. 2010. *Addendum to Well Testing Report.* Prepared for the County of San Diego – Kenyon TPM 20857. August 26, 2010.

RC Biological Consulting, Inc. 2010. *Revised Report for the Kenyon Property*, Tentative Parcel Map 20857. July 9, 2010.

6.0 LIST OF PREPARERS

This GMMP was prepared by Dudek Hydrogeologists, Trey Driscoll, PG, CHG and Kayvan Ilkhanipour, PG, CHG. Dudek arborist, Michael S. Huff prepared the monitoring program for the groundwater dependent habitat. Dudek Hydrogeologist Stephen K. Dickey, PG, CHG, CEG, provided review assistance and coordination with the County as the County-approved hydrogeologist. Peter Quinlan, RG and principal-in-charge; and Jill Weinberger, PhD, PG, provided peer review of this GMMP.