Project Specific
Water Quality Management Plan

For: **Vista Del Agua**

Tyler St. and 48th Ave, Coachella, CA

DEVELOPMENT NO. **VISTA DEL AGUA SPECIFIC PLAN**
DESIGN REVIEW NO.

Prepared for:

CVP Palm Springs, LLC
145 E Warm Springs Road
Las Vegas, NV 89119
Telephone: (858) 523-0761

Prepared by:
Christopher Lenz, PE
United Engineering Group
10602 Trademark Pkwy, Suite 509
Rancho Cucamonga, CA 91730
Telephone: (909) 466-9240

Original Date Prepared: 1-18-16

Revision Date(s): 8-29-16

OWNER'S CERTIFICATION

This project-specific Water Quality Management Plan (WQMP) has been prepared for:

CVP Palm Springs, LLC
by **United Engineering Group**
for the project known as **Vista Del Agua** at **Tyler and 48th in Coachella, CA**.

This WQMP is intended to comply with the requirements of **City of Coachella and Riverside County** for the **Vista Del Agua Specific Plan**, which includes the requirement for the preparation and implementation of a project-specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity.

The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under **Riverside County** Water Quality Ordinance (Municipal Code Section).

If the undersigned transfers its interest in the subject property/project, the undersigned shall notify the successor in interest of its responsibility to implement this WQMP.

"I, the undersigned, certify under penalty of law that I am the owner of the property that is the subject of this WQMP, and that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

_____
Owner's Signature

_____
Owner's Printed Name

_____
Owner's Title/Position

_____
Date

145 E Warm Springs Rd
Las Vegas, NV 89119
(858) 523-0761

ATTEST

_____
Notary Signature

_____
Printed Name

_____
Title/Position

_____
Date

THIS FORM SHALL BE NOTARIZED BEFORE ACCEPTANCE OF THE
FINAL PROJECT SPECIFIC WQMP

Contents

TABLES

APPENDICES

I. Project Description

Project Owner: CVP Palm Springs, LLC
145 E Warm Springs Rd
Las Vegas, NV 89119
858-523-0761

WQMP Preparer: United Engineering Group – Chris Lenz
10602 Trademark Pkwy, Suite 509
Rancho Cucamonga, CA 91730
909-466-9240

Project Site Address:	**Tyler Street and 48th Avenue Coachella, CA**
Planning Area/ Community Name/ Development Name:	**Vista Del Agua Specific Plan**
APN Number(s):	**603-150-005, 006, 007, 008, 009, 010, 011-1, 012-2, 008-9, 603-130-003-3, 003-2, 009-8, 603-122-05-9, 603-150-004-5**
Latitude & Longitude:	**33d 42' 15"N - 116d 09' 14"W**
Receiving Water:	**Coachella Valley Stormwater Channel**
Project Site Size:	**275.4 Acres**

Standard Industrial Classification (SIC) Code: **Insert SIC, code, if applicable**

Formation of Home Owners' Association (HOA) or Property Owners Association (POA): Y ☒ N ☐

Additional Permits/Approvals required for the Project:

AGENCY	Permit required
State Department of Fish and Wildlife, Fish and Game Code §1602 Streambed Alteration Agreement	Y ☐ N☒
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Certification	Y ☐ N☒
US Army Corps of Engineers, CWA Section 404 permit	Y ☐ N☒
US Fish and Wildlife, Endangered Species Act Section 7 biological opinion	Y ☐ N☒
Statewide Construction General Permit Coverage	Y ☐ N☒
Statewide Industrial General Permit Coverage	Y ☐ N☒
Other *(please list in the space below as required)*	

The Vista Del Agua Specific Plan project includes approximately two hundred seventy-five point thirty eight acres (275.38 ac.) located south of Interstate 10 and Vista Del Sur, east of Tyler Street and north of 48th Avenue in the City of Coachella, CA

Appendix A of this project-specific WQMP includes a complete copy of the final Conditions of Approval. Appendix B of this project-specific WQMP includes:

a. A Vicinity Map identifying the project site and surrounding planning areas in sufficient detail; and

b. A Site Plan for the project. The Site Plan included as part of Appendix B depicts the following project features:

- Location and identification of all structural BMPs, including Source Control, LID/Site Design and Treatment Control BMPs.
- Landscaped areas.
- Paved areas and intended uses (i.e., parking, outdoor work area, outdoor material storage area, sidewalks, patios, tennis courts, etc.).
- Number and type of structures and intended uses (i.e., buildings, tenant spaces, dwelling units, community facilities such as pools, recreation facilities, tot lots, etc.).
- Infrastructure (i.e., streets, storm drains, etc.) that will revert to public agency ownership and operation.
- Location of existing and proposed public and private storm drainage facilities (i.e., storm drains, channels, basins, etc.), including catch basins and other inlets/outlet structures. Existing and proposed drainage facilities should be clearly differentiated.
- Location(s) of Receiving Waters to which the project directly or indirectly discharges.
- Location of points where onsite (or tributary offsite) flows exit the property/project site.
- Delineation of proposed drainage area boundaries, including tributary offsite areas, for each location where flows exit the project site and existing site (where existing site flows are required to be addressed). Each tributary area should be clearly denoted.
- Pre- and post-project topography.

Appendix I is a one page form that summarizes pertinent information relative to this project-specific WQMP.

II. Site Characterization

Land Use Designation or Zoning:	**Current Designation: CE, Entertainment Commercial** **Proposed Condition: Specific Plan**
Current Property Use:	**Farmland and Vacant Undisturbed**
Proposed Property Use:	**Specific Plan; Residential, Multifamily, and Commercial**
Availability of Soils Report:	Y ☒ N ☐ *Note: A soils report is required if infiltration BMPs are utilized. Attach report in Appendix E.*
Phase 1 Site Assessment:	Y ☒ N ☐ *Note: If prepared, attached remediation summary and use restrictions in Appendix H.*

Receiving Waters for Urban Runoff from Site

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use Designated Receiving Waters
Coachella Valley Stormwater Channel	Pathogens ; Source unknown; TMDL completion 2010; Dillon Rd to Salton Sea	FRSH; RECI; RECII; WARM; WILD; RARE	4,400 FT
Salton Sea	Arsenic TMDL Comp 2021; Chlorpyrifos TMDL Comp 2021; DDT TMDL Comp 2021; Enterococcus TMDL Comp 2021; Nutrients (Agri runoff, Industrial, out of state) TMDL Comp 2019; Salinity (Agri, out of state, Point Source) TMDL Comp 2021;	AQUA, IND, RECI, RECII, WARM, WILD, RARE	14 Miles

III. Pollutants of Concern

Table 1. Pollutant of Concern Summary

Pollutant Category	Potential for Project and/or Existing Site	Causing Receiving Water Impairment
Bacteria/Virus	Potential	Potential Pathogens (CVSD)
Heavy Metals	Potential (Commercial)	Potential Arsenic (Salton)
Nutrients	Potential	Potential (Salton)
Toxic Organic Compounds	Potential (Commercial)	Potential DDT (Salton)
Sediment/Turbidity	Potential	
Trash & Debris	Potential	
Oil & Grease	Potential	
Other (specify pollutant):		Potential Chlorpyfiros (Salton)
Other (specify pollutant):		Potential Enterococcus (Salton)

IV. Hydrologic Conditions of Concern

Local Jurisdiction Requires On-Site Retention of Urban Runoff:

Yes ☒ The project will be required to retain urban runoff onsite in conformance with local ordinance (See Table 6 of the WQMP Guidance document, "Local Land use Authorities Requiring Onsite Retention of Stormwater"). This section does not need to be completed; however, retention facility design details and sizing calculations must be included in Appendix F.

No ☐ This section must be completed.

This Project meets the following condition:

☐ **Condition A**: 1) Runoff from the Project is discharged directly to a publicly-owned, operated and maintained MS4 or engineered and maintained channel, 2) the discharge is in full compliance with local land use authority requirements for connections and discharges to the MS4 (including both quality and quantity requirements), 3) the discharge would not significantly impact stream habitat in proximate Receiving Waters, **and** 4) the discharge is authorized by the local land use authority.

☐ **Condition B**: The project disturbs less than 1 acre and is not part of a larger common plan of development that exceeds 1 acre of disturbance. The disturbed area calculation must include all disturbances associated with larger plans of development.

☐ **Condition C**: The project's runoff flow rate, volume, velocity and duration for the post-development condition do not exceed the pre-development condition for the 2-year, 24-hour and 10-year 24-hour rainfall events. This condition can be achieved by, where applicable, complying with the local land use authority's on-site retention ordinance, or minimizing impervious area on a site and incorporating other Site-Design BMP concepts and LID/Site Design BMPs that assure non-exceedance of pre-development conditions. This condition must be substantiated by hydrologic modeling methods acceptable to the local land use authority.

☐ **None:** Refer to Section 3.4 of the Whitewater River Region WQMP Guidance document for additional requirements.

Supporting engineering studies, calculations, and reports are included in Appendix C.

	2 year – 24 hour		10 year – 24 hour	
	Precondition	**Post-condition**	**Precondition**	**Post-condition**
Discharge (cfs)				
Velocity (fps)				
Volume (cubic feet)				
Duration (minutes)				

V. Best Management Practices

This project implements Best Management Practices (BMPs) to address the Pollutants of Concern that may potentially be generated from the use of the Choose one: 'project site' or 'project site plus existing site area(s)'. These BMPs have been selected and implemented to comply with Section 3.5 of the WQMP Guidance document, and consist of Site Design BMP concepts, Source Control, LID/Site Design and, if/where necessary, Treatment Control BMPs as described herein.

V.1 Site Design BMP Concepts, LID/Site Design and Treatment Control BMPs

Local Jurisdiction Requires On-Site Retention of Urban Runoff:

Yes ☒ The project will be required to retain Urban Runoff onsite in conformance with local ordinance (See Table 6 of the WQMP Guidance document, "Local Land use Authorities Requiring Onsite Retention of Stormwater). **The LID/Site Design measurable goal has thus been met (100%), and Sections V.1.A and V.1.B do not need to be completed**; however, retention facility design details and sizing calculations must be included in Appendix F, and '100%' should be entered into Column 3 of Table 6 below.

No ☐ Section V.1 must be completed.

This section of the Project-Specific WQMP documents the LID/Site Design BMPs and, if/where necessary, the Treatment Control BMPs that will be implemented on the project to meet the requirements detailed within Section 3.5.1 of the WQMP Guidance document. Section 3.5.1 includes requirements to implement Site Design Concepts and BMPs, and includes requirements to address Pollutants of Concern with BMPs. Further, sub-section 3.5.1.1 specifically requires that Pollutants of Concern be addressed with LID/Site Design BMPs to the extent feasible.

LID/Site Design BMPs are those BMPs listed within Table 2 below which promote retention and/or feature a natural treatment mechanism; off-site and regionally-based BMPs are also LID/Site Design BMPs, and therefore count towards the measurable goal, if they fit these criteria. This project incorporates LID/Site Design BMPs to fully address the Treatment Control BMP requirement where and to the extent feasible. If and where it has been acceptably demonstrated to the local land use authority that it is infeasible to fully meet this requirement with LID/Site Design BMPs, Section V.1.B (below) includes a description of the conventional Treatment Control BMPs that will be substituted to meet the same requirements.

In addressing Pollutants of Concern, BMPs are selected using Table 2 below.

Table 2. BMP Selection Matrix Based Upon Pollutant of Concern Removal Efficiency (1)

(Sources: Riverside County Flood Control & Water Conservation District Design Handbook for Low Impact Development Best Management Practices, dated September 2011, the Orange County Technical Guidance Document for Water Quality Management Plans, dated May 19, 2011, and the Caltrans Treatment BMP Technology Report, dated April 2010 and April 2008)

Pollutant of Concern	Landscape Swale[2, 3]	Landscape Strip[2, 3]	Biofiltration (with underdrain)[2, 3]	Extended Detention Basin[2]	Sand Filter Basin[2]	Infiltration Basin[2]	Infiltration Trench[2]	Permeable Pavement[2]	Bioretention (w/o underdrain)[2, 3]	Other BMPs Including Proprietary BMPs[4, 6]
Sediment & Turbidity	M	M	H	M	H	H	H	H	H	Varies by Product[5]
Nutrients	L/M	L/M	M	L/M	L/M	H	H	H	H	
Toxic Organic Compounds	M/H	M/H	M/H	L	L/M	H	H	H	H	
Trash & Debris	L	L	H	H	H	H	H	L	H	
Bacteria & Viruses (also: Pathogens)	L	M	H	L	M	H	H	H	H	
Oil & Grease	M	M	H	M	H	H	H	H	H	
Heavy Metals	M	M/H	M/H	L/M	M	H	H	H	H	

Abbreviations:

L: Low removal efficiency M: Medium removal efficiency H: High removal efficiency

Notes:

(1) Periodic performance assessment and updating of the guidance provided by this table may be necessary.

(2) Expected performance when designed in accordance with the most current edition of the document, "Riverside County, Whitewater River Region Stormwater Quality Best Management Practice Design Handbook".

(3) Performance dependent upon design which includes implementation of thick vegetative cover. Local water conservation and/or landscaping requirements should be considered; approval is based on the discretion of the local land use authority.

(4) Includes proprietary stormwater treatment devices as listed in the CASQA Stormwater Best Management Practices Handbooks, other stormwater treatment BMPs not specifically listed in this WQMP (including proprietary filters, hydrodynamic separators, inserts, etc.), or newly developed/emerging stormwater treatment technologies.

(5) Expected performance should be based on evaluation of unit processes provided by BMP and available testing data. Approval is based on the discretion of the local land use authority.

(6) When used for primary treatment as opposed to pre-treatment, requires site-specific approval by the local land use authority.

V.1.A SITE DESIGN BMP CONCEPTS AND LID/SITE DESIGN BMPS

This section documents the Site Design BMP concepts and LID/Site Design BMPs that will be implemented on this project to comply with the requirements detailed in Section 3.5.1 of the WQMP Guidance document.

- Table 3 herein documents the implementation of the Site Design BMP Concepts described in sub-sections 3.5.1.3 and 3.5.1.4.
- Table 4 herein documents the extent to which this project has implemented the LID/Site Design goals described in sub-section 3.5.1.1.

Table 3. Implementation of Site Design BMP Concepts

Design Concept	Technique	Specific BMP	Included			Brief Reason for BMPs Indicated as No or N/A
			Yes	No	N/A	
Site Design BMP Concept 1	**Minimize Urban Runoff, Minimize Impervious Footprint, and Conserve Natural Areas (See WQMP Section 3.5.1.3)**	Conserve natural areas by concentrating or clustering development on the least environmentally sensitive portions of a site while leaving the remaining land in a natural, undisturbed condition.	☐	☐	☐	
		Conserve natural areas by incorporating the goals of the Multi-Species Habitat Conservation Plan or other natural resource plans.	☐	☐	☐	
		Preserve natural drainage features and natural depressional storage areas on the site.	☐	☐	☐	
		Maximize canopy interception and water conservation by preserving existing native trees and shrubs, and planting additional native or drought tolerant trees and large shrubs.	☐	☐	☐	
		Use natural drainage systems.	☐	☐	☐	
		Where applicable, incorporate Self-Treating Areas	☐	☐	☐	
		Where applicable, incorporate Self-Retaining Areas	☐	☐	☐	
		Increase the building floor to area ratio (i.e., number of stories above or below ground).	☐	☐	☐	
		Construct streets, sidewalks and parking lot aisles to minimum widths necessary, provided that public safety and a walkable environment for pedestrians are not compromised.	☐	☐	☐	
		Reduce widths of streets where off-street parking is available.	☐	☐	☐	
		Minimize the use of impervious surfaces, such as decorative concrete, in the landscape design.	☐	☐	☐	
		Other comparable and equally effective Site Design BMP concept(s) as approved by the local land use authority (Note: Additional narrative required to describe BMP and how it addresses site design concept).	☐	☐	☐	

Table 3. Site Design BMP Concepts (continued)

Design Concept	Technique	Specific BMP	Included			Brief Reason for Each BMP Indicated as No or N/A
			Yes	No	N/A	
Site Design BMP Concept 2	**Minimize Directly Connected Impervious Area (See WQMP Section 3.5.1.4)**	Design residential and commercial sites to contain and infiltrate roof runoff, or direct roof runoff to landscaped swales or buffer areas.	☐	☐	☐	
		Drain impervious sidewalks, walkways, trails, and patios into adjacent landscaping.	☐	☐	☐	
		Incorporate landscaped buffer areas between sidewalks and streets.	☐	☐	☐	
		Use natural or landscaped drainage swales in lieu of underground piping or imperviously lined swales.	☐	☐	☐	
		Where soil conditions are suitable, use perforated pipe or gravel filtration pits for low flow infiltration.	☐	☐	☐	
		Maximize the permeable area by constructing walkways, trails, patios, overflow parking, alleys, driveways, low-traffic streets, and other low-traffic areas with open-jointed paving materials or permeable surfaces such as pervious concrete, porous asphalt, unit pavers, and granular materials.	☐	☐	☐	
		Use one or more of the following:				
		Rural swale system: street sheet flows to landscaped swale or gravel shoulder, curbs used at street corners, and culverts used under driveways and street crossings.	☐	☐	☐	
		Urban curb/swale system: street slopes to curb; periodic swale inlets drain to landscaped swale or biofilter.	☐	☐	☐	
		Dual drainage system: first flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder; high flows connect directly to MS4s.	☐	☐	☐	
		Other comparable and equally effective Site Design BMP concept(s) as approved by the local land use authority (Note: Additional narrative required to describe BMP and how it addresses site design concept).	☐	☐	☐	
		Use one or more of the following for design of driveways and private residential parking areas:				
		Design driveways with shared access, flared (single lane at street), or wheel strips (paving only under the tires).	☐	☐	☐	
		Uncovered temporary or guest parking on residential lots paved with a permeable surface, or designed to drain into landscaping.	☐	☐	☐	

Table 3. Site Design BMP Concepts (continued)

Design Concept	Technique	Specific BMP	Included			Brief Reason for Each BMP Indicated as No or N/A
			Yes	No	N/A	
Site Design BMP Concept 2 (cont'd)	**Minimize Directly Connected Impervious Area (See WQMP Section 3.5.1.4)**	Other comparable and equally effective Site Design BMP concept(s) as approved by the local land use authority (Note: Additional narrative required to describe BMP and how it addresses site design concept).	☐	☐	☐	
		Use one or more of the following for design of parking areas:				
		Where landscaping is proposed in parking areas, incorporate parking area landscaping into the drainage design.	☐	☐	☐	
		Overflow parking (parking stalls provided in excess of the Permittee's minimum parking requirements) may be constructed with permeable pavement.	☐	☐	☐	
		Other comparable and equally effective Site Design BMP (or BMPs) as approved by the local land use authority (Note: Additional narrative required describing BMP and how it addresses site design concept).	☐	☐	☐	

Project Site Design BMP Concepts:

Insert text here briefly describing how each included Site Design BMP concept will be implemented.

Alternative Project Site Design BMP Concepts:

Insert text here describing any other comparable and equally effective Site Design BMP concept(s) as approved by the local land use authority, or indicate N/A.

Table 4. LID/Site Design BMPs Meeting the LID/Site Design Measurable Goal

(1) DRAINAGE SUB-AREA ID OR NO.	(2) LID/SITE DESIGN BMP TYPE* (See Table 2)	(3) POTENTIAL POLLUTANTS OF CONCERN WITHIN DRAINAGE SUB-AREA (Refer to Table 1)	(4) POTENTIAL POLLUTANTS WITHIN SUB-AREA CAUSING RECEIVING WATER IMPAIRMENTS (Refer to Table 1)	(5) EFFECTIVENESS OF LID/SITE DESIGN BMP AT ADDRESSING IDENTIFIED POTENTIAL POLLUTANTS (U, L, M, H/M, H; see Table 2)	(6) BMP MEETS WHICH DESIGN CRITERIA? (Identify as V_{BMP} OR Q_{BMP})	(7) TOTAL AREA WITHIN DRAINAGE SUB-AREA (Nearest 0.1 acre)
TOTAL PROJECT AREA TREATED WITH LID/SITE DESIGN BMPs (NEAREST 0.1 ACRE)						

*** LID/Site Design BMPs listed in this table are those that completely address the 'Treatment Control BMP requirement' for their drainage sub-area.**

Justification of infeasibility for sub-areas not addressed with LID/Site Design BMPs

Insert text here listing each drainage sub-area wherein the design criteria of VBMP and/or QBMP are not treated using LID/Site Design BMPs as required in WQMP Guidance Section 3.5.1.1, and provide justification of infeasibility for each.

V.1.B TREATMENT CONTROL BMPS

Conventional Treatment Control BMPs shall be implemented to address the project's Pollutants of Concern as required in WQMP Section 3.5.1 where, and to the extent that, Section V.1.A has demonstrated that it is infeasible to meet these requirements through implementation of LID/Site Design BMPs.

☐ The LID/Site Design BMPs described in Section V.1.A of this project-specific WQMP completely address the 'Treatment Control BMP requirement' for the entire project site (and where applicable, entire existing site) as required in Section 3.5.1.1 of the WQMP Guidance document. Supporting documentation for the sizing of these LID/Site Design BMPs is included in Appendix F. ***Section V.1.B does not need to be completed**.

☐ The LID/Site Design BMPs described in Section V.1.A of this project-specific WQMP do **NOT** completely address the 'Treatment Control BMP requirement' for the entire project site (or where applicable, entire existing site) as required in Section 3.5.1.1 of the WQMP. ***Section V.1.B must be completed.**

The Treatment Control BMPs identified in this section are selected, sized and implemented to treat the design criteria of V_{BMP} and/or Q_{BMP} for all project (and if required, existing site) drainage sub-areas which were not fully addressed using LID/Site Design BMPs. Supporting documentation for the sizing of these Treatment Control BMPs is included in Appendix F.

Table 5: Treatment Control BMP Summary

(1) DRAINAGE SUB-AREA ID OR NO.	(2) TREATMENT CONTROL BMP TYPE* (See Table 2)	(3) POTENTIAL POLLUTANTS OF CONCERN WITHIN DRAINAGE SUB-AREA (Refer to Table 1)	(4) POTENTIAL POLLUTANTS WITHIN SUB-AREA CAUSING RECEIVING WATER IMPAIRMENTS (Refer to Table 1)	(5) EFFECTIVENESS OF TREATMENT CONTROL BMP AT ADDRESSING IDENTIFIED POTENTIAL POLLUTANTS (U, L, M, H/M, H; see Table 2)	(6) BMP MEETS WHICH DESIGN CRITERIA? (Identify as V_{BMP} OR Q_{BMP})	(7) TOTAL AREA WITHIN DRAINAGE SUB-AREA (Nearest 0.1 acre)
	TOTAL PROJECT AREA TREATED WITH TREATMENT CONTROL BMPs (NEAREST 0.1 ACRE)					

V.1.C MEASURABLE GOAL SUMMARY

This section documents the extent to which this project has met the measurable goal described in WQMP Section 3.5.1.1 of addressing 100% of the project's 'Treatment Control BMP requirement' with LID/Site Design BMPs. Projects required to retain Urban Runoff onsite in conformance with local ordinance are considered to have met the measurable goal; for these instances, '100%' is entered into Column 3 of the Table.

Table 6: Measurable Goal Summary

(1) **Total Area Treated with LID/Site Design BMPs** (Last row of Table 4)	(2) **Total Area Treated with Treatment Control BMPs** (Last row of Table 5)	(3) **% of Treatment Control BMP Requirement addressed with LID/Site Design BMPs**
		100%

V.2 SOURCE CONTROL BMPS

This section identifies and describes the Source Control BMPs applicable and implemented on this project.

Table 7. Source Control BMPs

BMP Name	Check One		If not applicable, state brief reason
	Included	Not Applicable	
Non-Structural Source Control BMPs			
Education for Property Owners, Operators, Tenants, Occupants, or Employees	☒	☐	
Activity Restrictions	☒	☐	
Irrigation System and Landscape Maintenance	☒	☐	
Common Area Litter Control	☒	☐	
Street Sweeping Private Streets and Parking Lots	☐	☐	Unknown at Prelim
Drainage Facility Inspection and Maintenance	☒	☐	
Structural Source Control BMPs			
Storm Drain Inlet Stenciling and Signage	☒	☐	
Landscape and Irrigation System Design	☒	☐	
Protect Slopes and Channels	☒	☐	
Provide Community Car Wash Racks	☐	☐	Unknown at Prelim
Properly Design*:			
Fueling Areas	☐	☐	
Air/Water Supply Area Drainage	☐	☐	
Trash Storage Areas	☐	☐	
Loading Docks	☐	☐	
Maintenance Bays	☐	☐	
Vehicle and Equipment Wash Areas	☐	☐	
Outdoor Material Storage Areas	☐	☐	
Outdoor Work Areas or Processing Areas	☐	☐	
Provide Wash Water Controls for Food Preparation Areas	☐	☐	

*Details demonstrating proper design must be included in Appendix F.

Source Control BMP's are designed as part of the Specific Plan and Tentative Tract Map, and should be included in the Conditions of Approval. The project proposes an HOA to manage and operate the open space. Detail of maintenance, landscaping, uses, etc. will be provided to the HOA.

Appendix D includes copies of the educational materials (described in Section 3.5.2.1 of the WQMP Guidance document) that will be used in implementing this project-specific WQMP.

V.3 EQUIVALENT TREATMENT CONTROL BMP ALTERNATIVES

Not applicable, project utilizes on-site LID/Site Design and Treatments Control BMPs.

V.4 REGIONALLY-BASED BMPS

Not applicable, project utilizes on-site LID/Site Design and Treatments Control BMPs.

VI. Operation and Maintenance Responsibility for BMPs

Appendix G of this project-specific WQMP includes copies of CC&Rs, Covenant and Agreements, BMP Maintenance Agreement and/or other mechanisms used to ensure the ongoing operation, maintenance, funding, transfer and implementation of the project-specific WQMP requirements.

The project proposes infiltration basins in common landscape tracts that will be managed by the proposed HOA. Details and CC&R's to be provided at final design.

VII. Funding

The open space and basins will be managed and funded through the HOA.

Appendix A

Conditions of Approval

Planning Commission Resolution _____

Dated _____

Appendix B

Vicinity Map, WQMP Site Plan, and Receiving Waters Map

Vista Del Agua

City of Coachella & Project Site

Figure 1-3

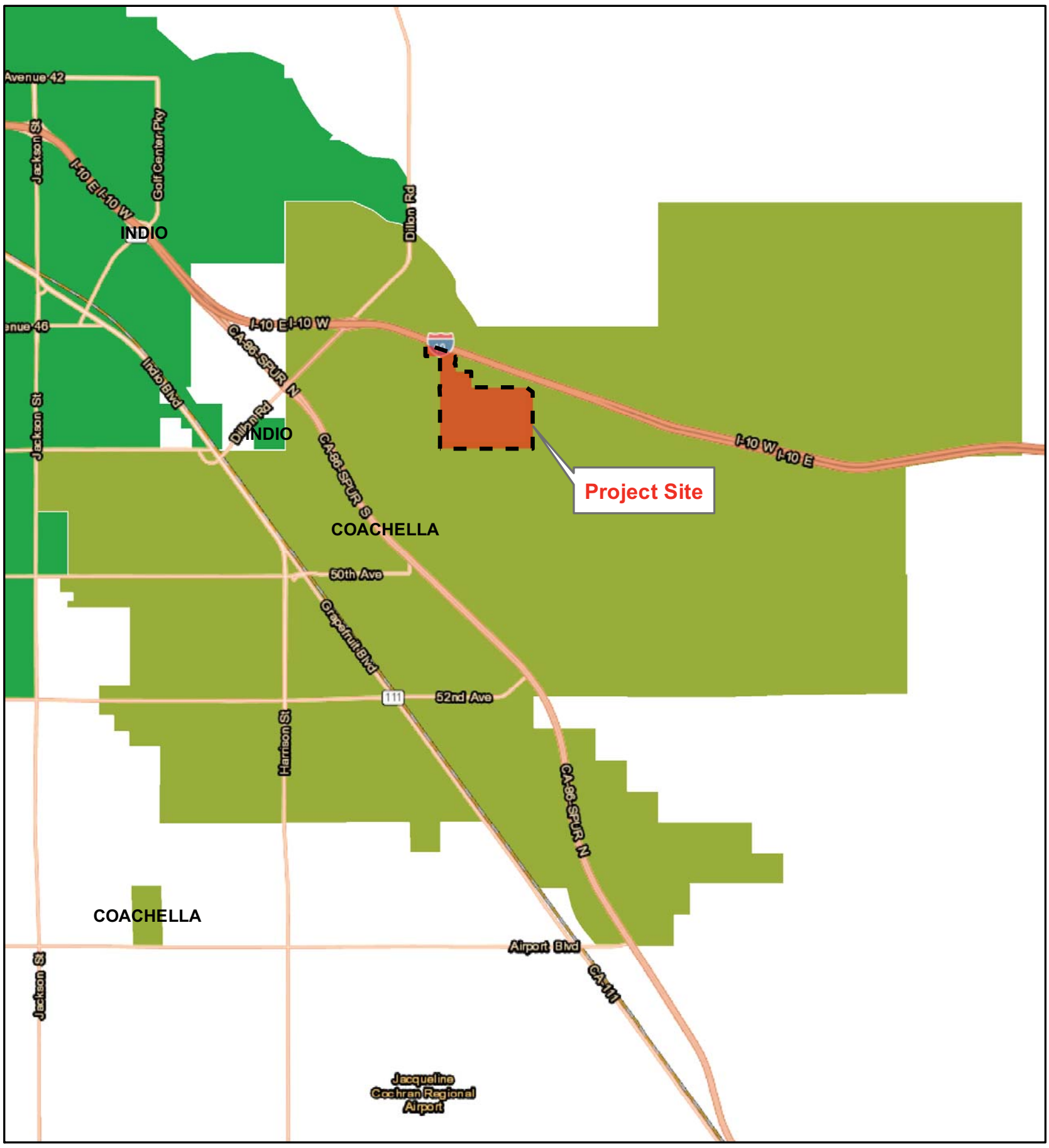
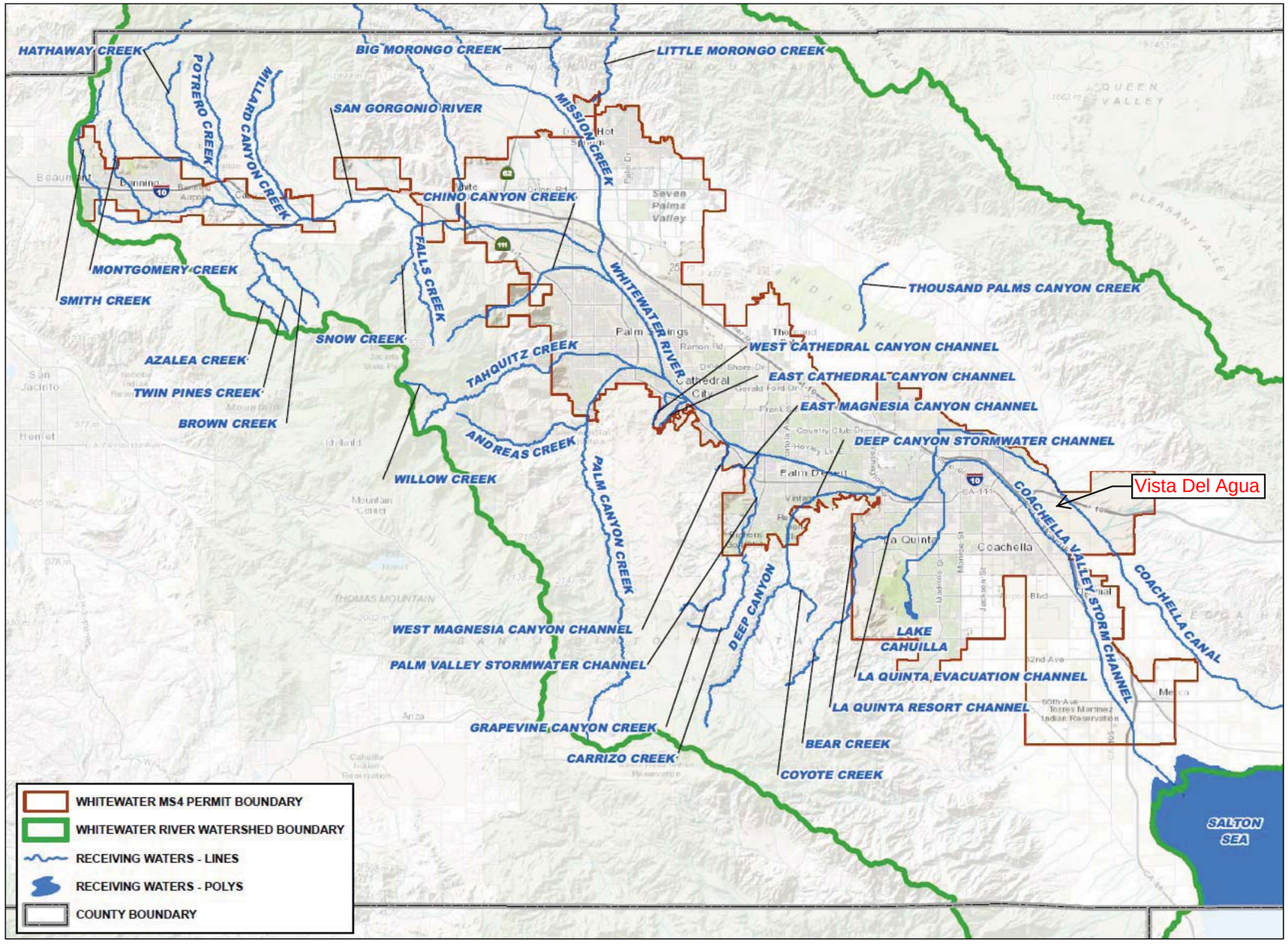


Figure 2. Whitewater River Region Receiving Waters Map



Land Use Plan
Figure 4-1

PA	LAND USE	ACRES	UNITS	DENSITY
1	General Commercial	16.80	-	-
1	Open Space	0.81	-	-
2	Multi Family Residential	7.33	146	20.0
3	Multi Family Residential	10.10	201	20.0
4	Multi Family Residential	21.94	263	12.0
5	Single Family Residential	43.03	250	5.0-6.0
6	Single Family Residential	71.65	460	6.0-7.0
7	Single Family Residential	46.89	260	5.0-6.0
8	Single Family Residential	14.82	60	4.0-5.0
9	Park	13.82	-	0.0
10	Neighborhood Commercial*	8.27	-	0.0
	Backbone Streets	19.92	-	0.0
TOTAL		275.38	1,640	7.6

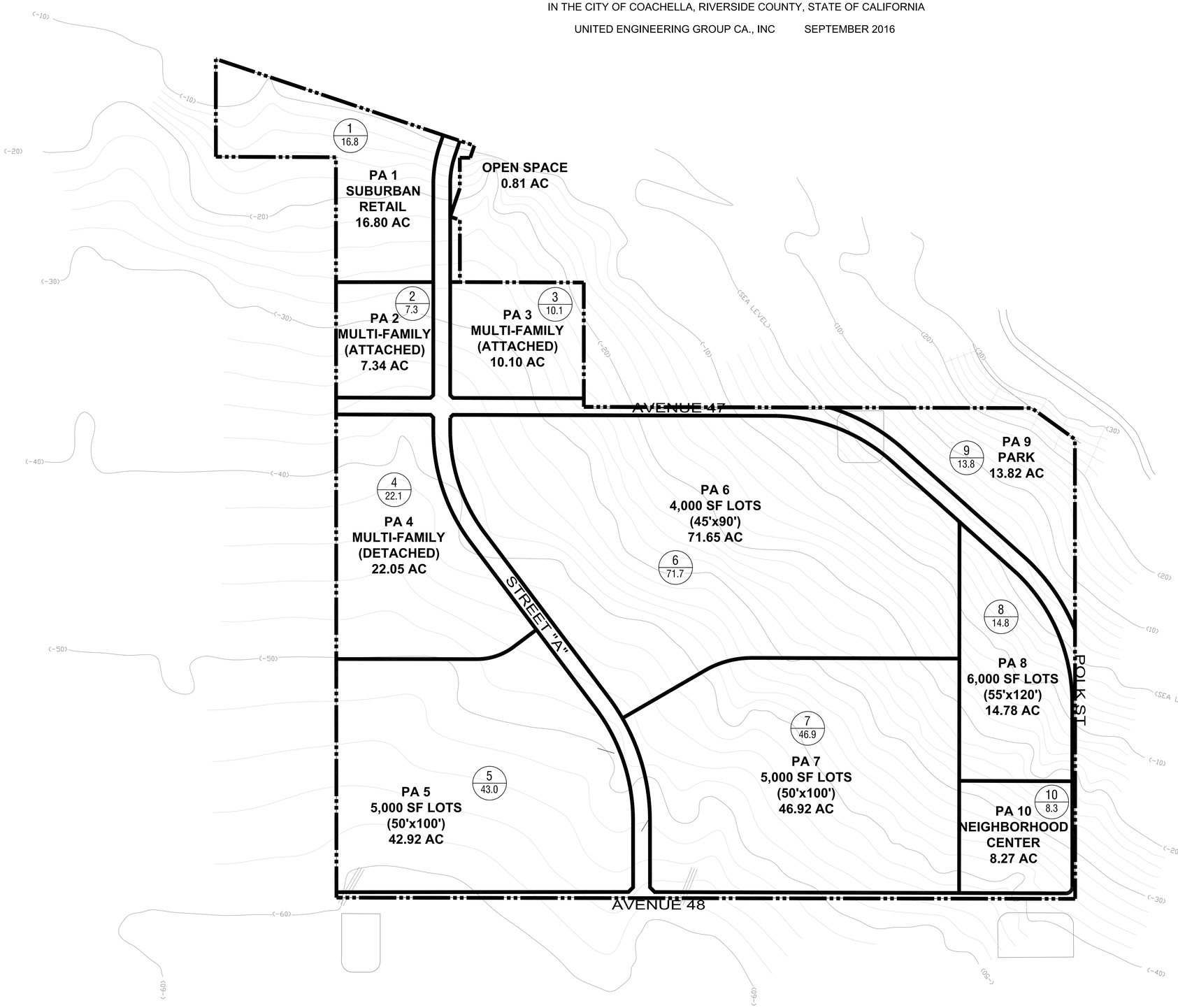
*-May be developed as 41 Single Family Units

INTERSTATE 10
DILLON ROAD
SHADOW VIEW BLVD
HIGHWAY 86
Shadow View Specific Plan
47th AVENUE
48th AVENUE
POLK STREET
PA 1 SUBURBAN RETAIL 16.80 Ac
PA 1 OPEN SPACE 0.81 Ac
PA 2 MULTI-FAMILY (ATTACHED) 7.33 Ac
PA 3 MULTI-FAMILY (ATTACHED) 10.10 Ac
PA 4 MULTI-FAMILY (DETACHED) 21.94Ac
PA 5 5,000 SF LOTS (50'x100') 43.03 Ac
PA 6 4,000 SF LOTS (45'x90') 71.56 Ac
PA 7 5,000 SF LOTS (50'x100') 46.89 Ac
PA 8 6,000 SF LOTS (55'x120') 14.82 Ac
PA 9 PARK 13.82 Ac
PA 10 NEIGHBORHOOD CENTER 8.27 Ac
ROW 19.92 Ac

WQMP DMA MAP
FOR THE VISTA DEL AGUA SPECIFIC PLAN

IN THE CITY OF COACHELLA, RIVERSIDE COUNTY, STATE OF CALIFORNIA

UNITED ENGINEERING GROUP CA., INC SEPTEMBER 2016



SCALE 1" = 200'

LEGEND:

PROJECT BOUNDARY
CONTRIBUTORY BASIN BOUNDARY

2 / 22.4 — DRAINAGE MANAGEMENT AREA (DMA) / AREA (ACRES)

NOTE: REFER TO WQMP FOR DESIGN DETAILS AND RESULTS OF DESIGN

NOTE: EXISTING TOPOGRAPHY SHOWN. REFER TO SP AND TPM FOR DESIGN DETAIL

SUBMITTALS:	REVISIONS		
	NO.	DESCRIPTION	DATE
DESIGNED BY:			
DRAWN BY:			
CHECKED BY:			

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER F. LENZ — NO. 63001 EXP. 6/30/16 — CIVIL — STATE OF CALIFORNIA

CHRISTOPHER F. LENZ DATE
R.C.E. No. 63001

LICENSED LAND SURVEYOR — DEAN C. PHILLIPS — EXP. 9/30/15 — NO. 6974 — STATE OF CALIFORNIA

DEAN C. PHILLIPS DATE
L.S. No. 6974
dphillips@unitedeng.com

ueg
united engineering group
10602 Trademark Pkwy
Suite 509
Rancho Cucamonga,
CA 91730
Phone: 909.466.9240
www.unitedeng.com

WQMP DMA MAP

VISTA DEL AGUA

SEPTEMBER 2016

SHEET 1 OF 1

PROJECT NUMBER

CA-30025

Appendix C

Supporting Detail Related to Hydrologic Conditions of Concern

Appendix D

Educational Materials

RIVERSIDE COUNTY
ANIMAL SERVICES LOCATIONS:

www.rcdas.org

BLYTHE
16450 West Hobson Way
Blythe, CA 92225
760-921-7857

COACHELLA VALLEY ANIMAL CAMPUS
72-050 Petland Place
Thousand Palms, CA 92276
760-343-3644

RIVERSIDE COUNTY ANIMAL SERVICES
6851 Van Buren Blvd.
Riverside, CA 92509
951-688-4340

OTHER ANIMAL SHELTERS:

ANIMAL CARE CENTER OF INDIO
45-355 Van Buren
Indio, CA 92201
760-391-4138

ANIMAL FRIENDS OF THE VALLEYS
29001 Bastron Avenue
Lake Elsinore, CA 92530
951-674-0618
(Serving incorporated Temecula, Wildomar, Lake Elsinore, Murrieta and Canyon Lake)

MARY S. ROBERTS PET ADOPTION CENTER
6185 Industrial Avenue
Riverside, CA 92504
951-688-4340

RAMONA HUMANE SOCIETY
690 Humane Way
San Jacinto 92586
951-654-8002
(Serving Sun City, Menifee, Romoland and Homeland)

Looking to adopt a pet?
This website is linked to many animal shelters.
www.petfinder.com

To report illegal storm drain disposal, call
1-800-506-2555

Or visit our website at www.rcflood.org

E-mail fcnpdes@rcflood.org

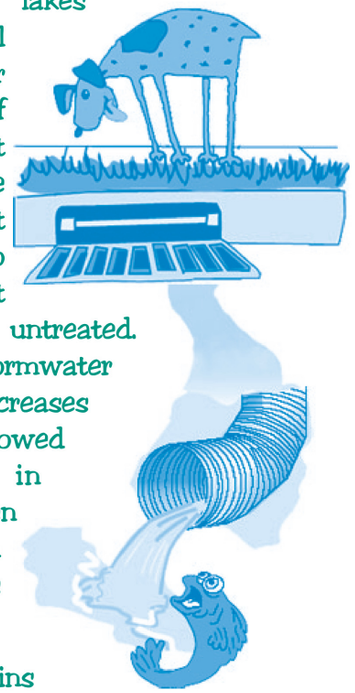
What's the Scoop?

Tips for a Healthy Pet and a Healthier Environment

CREATE A HEALTHY ENVIRONMENT in and around your home by following these simple pet practices. Your pet, family and neighbors will appreciate their clean comfortable surroundings.

HOUSEHOLD PETS

We all love our pets, but pet waste is a subject everyone likes to avoid. Pet waste left on trails, sidewalks, streets and grassy areas can be washed into the nearest waterway when it rains. Even if you can't see streams or lakes near you, rainfall (stormwater) or sprinkler runoff can wash pet waste into the storm drains that carry runoff to the nearest streams or lakes untreated. The risk of stormwater contamination increases if pet waste is allowed to accumulate in outdoor animal pen areas or left on sidewalks, streets or driveways.



Pet waste contains nutrients and bacteria. Nutrients can promote the growth of algae in streams and lakes. Algae can cause fish kills and other environmental damage if it is fed too many nutrients. Pet Waste also contains e. Coli and fecal bacteria, which can cause disease in other animals and humans that come in contact with it when swimming or splashing in streams and lakes. Dogs also carry salmonella and giardia, which can make people sick.

Pet waste that is not picked up and properly disposed can also increase vector problems. Flies and other insects are not only attracted to and feed on pet waste, but can also be infected with diseases and spread those diseases to humans and other animals.

WHAT CAN YOU DO?

- SCOOP up pet waste and flush it down the toilet or place in trash can.
- NEVER DUMP pet waste into a storm drain or catch basin.
- USE the complimentary bags or mutt mitts offered in dispensers at local parks.
- CARRY EXTRA BAGS when walking your dog and make them available to other pet owners who are without.
- TEACH CHILDREN how to properly clean up after a pet.
- TELL FRIENDS AND NEIGHBORS about the ill effects of animal waste on the environment. Encourage them to clean up after pets.

Call 1-800-506-2555 TOLL FREE to report illegal dumping to the storm drain, find the dates and times of local Household Hazardous Waste Collection Events, obtain additional information on stormwater problems and solutions, request presentations about stormwater pollution in your child's classroom, or learn about free grasscycling and composting workshops.

SCOOP THE POOP

Many communities have "Scoop the Poop" laws that govern pet waste cleanup. Some of these laws specifically require anyone who walks an animal off their property to carry a bag, shovel, or scooper. Any waste left by the animal must be cleaned up immediately. CALL YOUR LOCAL CODE ENFORCEMENT OFFICE to find out more about pet waste regulations.

OTHER WAYS TO PROTECT YOUR PETS AND THE ENVIRONMENT

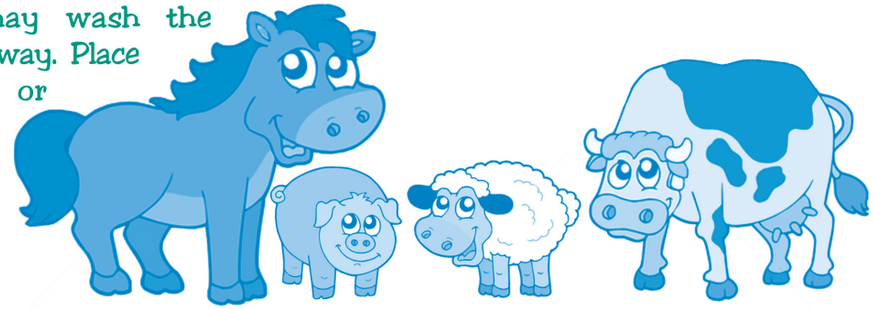
Pets are only one of many sources that contribute to water pollution. However, these other sources of water pollution cannot only harm the environment but also harm your pet. Improperly used or stored lawn fertilizers, pesticides, soaps, grease and vehicle fluids cannot only be washed into local streams and lakes, these chemicals can also harm your pet if they ingest or touch these chemicals. Call 1-800-506-2555 for information regarding how to properly dispose of household hazardous wastes such as these. You can also keep your pets and our environment healthy by properly maintaining your vehicles, and limiting use of pesticides and fertilizers to only the amount that is absolutely needed.

Make sure to not only protect your pets, but to also protect your neighbors pets. NEVER HOSE VEHICLE FLUIDS into the street or gutter. USE ABSORBENT MATERIALS such as cat litter to clean-up spills. SWEEP UP used absorbent materials and place it in the trash.

HORSES AND LIVESTOCK

Fortunate enough to own a horse or livestock? You, too, can play a part in protecting and cleaning up our water resources. The following are a few simple Best Management Practices (BMPs) specifically designed for horses and livestock.

- STORE your manure properly. Do not store unprotected piles of manure in places where stormwater runoff may wash the manure away. Place a cover or tarp over the pile to keep rainwater out.



- BUILD a manure storage facility to protect your pets, property and the environment. These structures usually consist of a concrete pad to protect groundwater and a short wall on one or two sides to make manure handling easier.
- READ the Only Rain Down the Storm Drain brochure titled "Tips for Horse Care" for additional guidance and recommendations. This brochure should be available from your local city office or for download at www.rcflood.org/stormwater.
- KEEP animals out of streams - Horses and livestock can deficate in streams causing stormwater pollution. Livestock and horses in streams can also disturb sensitive habitat and vegetation, causing additional environmental damage. Keep livestock and horses away from streams and use designated stream crossings whenever possible.
- MATERIAL STORAGE SAFETY TIPS Many of the chemicals found in barns require careful handling and proper disposal. When using these chemicals, be certain to follow these common sense guidelines:
  - Buy only what you need.
  - Treat spills of hoof oils like a fuel spill. Use kitty litter to soak up the oil and dispose of it in a tightly sealed plastic bag.
  - Store pesticides in a locked, dry, well-ventilated area.
  - Protect stored fertilizer and pesticides from rain and surface water.

RESOURCE CONSERVATION DISTRICTS CAN HELP

Call 1-800-506-2555 for assistance with locating a local conservation district that can help you properly manage your manure, re-establish healthy pastures, control weeds, or identify appropriate grasses for your soils.

Thank you for doing your part to protect your watershed, the environment, your pets and your community!

Saltwater Pools

- Salt water pools, although different from regular pools, are in fact, sanitized using chlorine. A salt-chlorine generator separates the chlorine and sodium molecules in salt and reintroduces them into the pool water. The same harmful effects of chlorine still apply.
- A salt water pool is still maintained with chemicals such as Muriatic acid, soda ash and sodium carbonate to help keep a proper pH, total Alkalinity, Calcium Hardness and Stabilizer levels.

- It may be illegal to discharge salt water to land. The salt may kill plants and the build-up of salt in soil puts animals, plants, and groundwater at risk. Consult your city representatives to determine local requirements regarding salt water drainage.

NEVER put unused chemicals into the trash, onto the ground or down a storm drain.

IMPORTANT: The discharge of pollutants into the street, gutter, storm drain system or waterways - without a permit or waiver - is strictly prohibited by local ordinances, state and federal law. Violations may result in monetary fines and enforcement actions.

Helpful telephone numbers and links

Riverside County Water Agencies:

City of Banning	(951) 922-3130
City of Beaumont/Cherry Valley	(951) 845-9581
City of Blythe	(760) 922-6161
City of Coachella	(760) 398-3502
City of Corona	(951) 736-2263
City of Hemet	(951) 765-3710
City of Norco	(951) 270 5607
City of Riverside Public Works	(951) 351-6140
City of San Jacinto	(951) 654-4041
Coachella Valley Water District	(760) 398-2651
Desert Water Agency (Palm Springs)	(760) 323-4971
Eastern Municipal Water District	(951) 928-3777
Elsinore Valley Municipal Water District	(951) 674 3146
Elsinore Water District	(951) 674-2168
Farm Mutual Water Company	(951) 244-4198
Idyllwild Water District	(951) 659-2143
Indio Water Authority	(760) 391-4129
Jurupa Community Services District	(951) 685-7434
Lee Lake Water	(951) 658-3241
Mission Springs Water	(760) 329-6448
Rancho California Water District	(951) 296-6900
Ripley, CSA #62	(760) 922-4951
Riverside Co. Service Area #51	(760) 227-3203
Rubidoux Community Services District	(951) 684-7580
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(951) 789-5000
Yucaipa Valley Water District	(909) 797-5117

CALL 1-800-506-2555 to:

- Report clogged storm drains or illegal storm drain disposal from residential, industrial, construction and commercial sites into public streets, storm drains and/or water bodies.
- Find out about our various storm drain pollution prevention materials.
- Locate the dates and times of Household Hazardous Waste (HHW) Collection Events.
- Request adult, neighborhood, or classroom presentations.
- Locate other County environmental services.
- Receive grasscycling information and composting workshop information.

Or visit our
Riverside County Flood Control and Water Conservation District
website at: www.rcflood.org

Other links to additional storm drain pollution information:

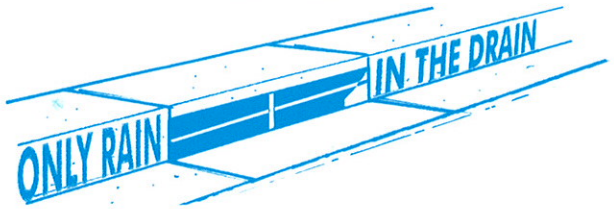
- County of Riverside Environmental Health: www.rivcoeh.org
- State Water Resources Control Board: www.waterboards.ca.gov
- California Stormwater Quality Association: www.casqa.org
- United States Environmental Protection Agency (EPA): www.epa.gov/compliance/assistance (compliance assistance information)

Riverside County's, "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

Guidelines for Maintaining your...

Swimming Pool, Jacuzzi and Garden Fountain

Where does the water go?



Pool, Jacuzzi and Fountain wastewater and rain water runoff (also called stormwater) that reach streets can enter the storm drain and be conveyed directly into local streams, rivers and lakes.

A storm drain's purpose is to prevent flooding by carrying rain water away from developed areas. Storm drains are not connected to sanitary sewers systems and treatment plants!

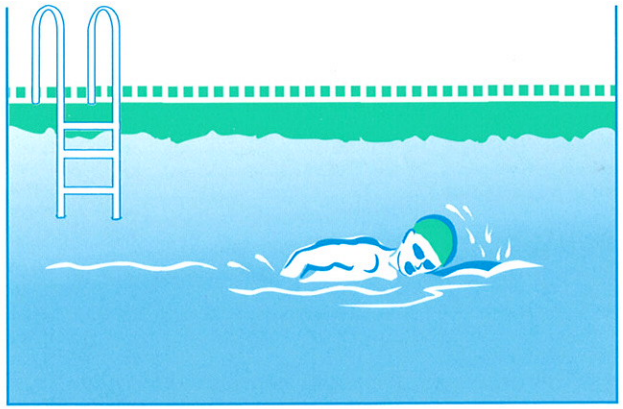
Wastewater, from residential swimming pools, Jacuzzis, fishponds and fountains, often contains chemicals used for sanitizing or cleansing purposes. Toxic chemicals (such as chlorine or copper-based algaecides) may pollute the environment when discharged into a storm drain system.

The Cities and County of Riverside have adopted ordinances that prohibit the discharge of wastewater to the street and storm drain system.

Discharge Regulations

Regulatory requirements for discharging wastewater from your pool may differ from city to city. Chlorinated water should not be discharged into the street, storm drain or surface waters. Check with your water agency to see if disposal to the sanitary sewer line is allowed for pool discharges (see reverse for Riverside County sewer agencies).

If allowed, a hose can be run from the pool Jacuzzi, or fountain to the private sewer cleanout, washing machine drain or a sink or bathtub.



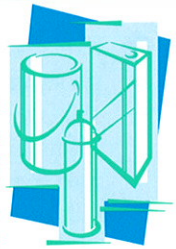
If you cannot discharge to the sewer, you may drain your fountain, pool, or jacuzzi to your landscaping by following these guidelines:

First, reduce or eliminate solids (e.g. debris, leaves or dirt) in the pool water and allow the chemicals in the pool water to dissipate before draining the pool (this could take up to 7 days, verify using a home pool test kit).

Second, slowly drain to a landscaped area away from buildings or structures. Control the flow to prevent soil erosion; it may take more than one day to empty. Do not allow sediment to enter the street, gutter or storm drain.

Maintenance & Chemicals

Cleaning Filters



Filter rinse water and backwash must be discharged to the sanitary sewer, on-site septic tank and drain field system (if properly designed and adequately sized), or a seepage pit. Alternatively, rinse water or backwash may be diverted to landscaped or dirt areas. Filter media and other non-hazardous solids should be picked up and disposed of in the trash.

Algaecides

Avoid using copper-based algaecides unless absolutely necessary. Control algae with chlorine, organic polymers or other alternatives to copper-based pool chemicals. Copper is a heavy metal that can be toxic to aquatic life when you drain your pool.

Chemical Storage and Handling

- Use only the amount indicated on product labels
- Store chlorine and other chemicals in a covered area to prevent runoff. Keep out of reach of children and pets.
- Chlorine kits, available at retail swimming pool equipment and supply stores, should be used to monitor the chlorine and pH levels before draining your pool.
- Chlorine and other pool chemicals should never be allowed to flow into the gutter or storm drain system.

Take unwanted chemicals to a Household Hazardous Waste (HHW) Collection Event. There's no cost for taking HHW items to collection events – it's FREE! Call **1-800-506-2555** for a schedule of HHW events in your community.

Stormwater and the Construction Industry

Protect Natural Features

Bad

Good

- Minimize clearing.
- Minimize the amount of exposed soil.
- Identify and protect areas where existing vegetation, such as trees, will not be disturbed by construction activity.
- Protect streams, stream buffers, wild woodlands, wetlands, or other sensitive areas from any disturbance or construction activity by fencing or otherwise clearly marking these areas.

Construction Phasing

- Sequence construction activities so that the soil is not exposed for long periods of time.
- Schedule or limit grading to small areas.
- Install key sediment control practices before site grading begins.
- Schedule site stabilization activities, such as landscaping, to be completed immediately after the land has been graded to its final contour.

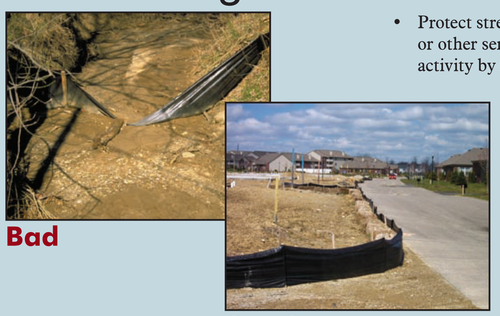
Vegetative Buffers

Bad

Good

- Protect and install vegetative buffers along waterbodies to slow and filter stormwater runoff.
- Maintain buffers by mowing or replanting periodically to ensure their effectiveness.

Silt Fencing



Bad

Good

- Inspect and maintain silt fences after each rainstorm.
- Make sure the bottom of the silt fence is buried in the ground.
- Securely attach the material to the stakes.
- Don't place silt fences in the middle of a waterway or use them as a check dam.
- Make sure stormwater is not flowing around the silt fence.

Maintain your BMPs!

IN RIVERSIDE COUNTY....Call 1-800-506-2555

TO REPORT ILLEGAL STORMDRAIN DISPOSAL

E-mail: Flood.fcnpdes@co.riverside.ca.us

Visit our website: www.floodcontrol.co.riverside.ca.us

Brought to you by the Storm Water/Clean Water Pollution Protection Program.....

REMEMBER, ONLY RAIN IN THE STORMDRAIN!

Site Stabilization

Bad

Good

- Vegetate, mulch, or otherwise stabilize all exposed areas as soon as land alterations have been completed.

Construction Entrances

Bad

Good

- Remove mud and dirt from the tires of construction vehicles before they enter a paved roadway.
- Properly size entrance BMPs for all anticipated vehicles.
- Make sure that the construction entrance does not become buried in soil.

Slopes

Bad

Good

- Rough grade or terrace slopes.
- Break up long slopes with sediment barriers, or under drain, or divert stormwater away from slopes.

Dirt Stockpiles

Bad

Good

- Cover or seed all dirt stockpiles.

Storm Drain Inlet Protection

Bad

Good

- Use rock or other appropriate material to cover the storm drain inlet to filter out trash and debris.
- Make sure the rock size is appropriate (usually 1 to 2 inches in diameter).
- If you use inlet filters, maintain them regularly.

www.epa.gov/npdes/menuofbmps

Stormwater and the Construction Industry

Planning and Implementing Erosion and Sediment Control Practices

The construction industry is a critical participant in the nation's efforts to protect streams, rivers, lakes, wetlands, and oceans. Through the use of best management practices (BMPs), construction site operators are the key defense against erosion and sedimentation.

As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. High volumes of stormwater can also cause stream bank erosion, and destroy downstream aquatic habitat. Preventing soil erosion and sedimentation is an important responsibility at all construction sites.

In addition to the environmental impact, uncontrolled erosion can have a significant financial impact on a construction project. It costs money and time to repair gullies, replace vegetation, clean sediment-clogged storm drains, replace poorly installed BMPs, and mitigate damage to other people's property or to natural resources.

Best Management Practice (BMP)
A BMP is a method used to prevent or control stormwater runoff and the discharge of pollutants, including sediment, into local waterbodies. Silt fences, inlet protection, and site-stabilization techniques are typical BMPs on a construction site.

Operator
An operator is someone who has control over and the ability to modify construction plans and specifications (e.g. owner, general contractor)

or

Someone who has control over the day-to-day operations at a site (e.g., owner, general contractor) that are necessary to ensure compliance with the permit requirements. It is the responsibility of a construction site owner or operator to contain stormwater runoff and prevent erosion during **all** stages of a project.

There may be more than one person at a site who meets these definitions and must apply for permit coverage. (States may have different definitions of the term "operator.")

So what's being done about polluted runoff?

The Clean Water Act includes the National Pollutant Discharge Elimination System (NPDES) permitting program. As of January 2003, 44 states and territories are authorized to issue NPDES stormwater permits. If your state isn't authorized to operate the NPDES stormwater permit program, EPA issues the permits. Permits vary from state to state, so contact your state or EPA for specific information. Your permitting authority has specific information on your state's NPDES stormwater permit program. In general, construction permits require construction operators to do all of the following:

- Develop and implement a stormwater pollution prevention plan
- Submit a permit application or notice of intent (NOI)
- Comply with the permit, including maintaining BMPs and inspecting the site

Under the NPDES program, construction activities that disturb 1 or more acres are required to obtain stormwater permit coverage. States have different names for the plans that construction operators must develop, such as

- Stormwater pollution prevention plan
- Erosion and sediment control plan
- Erosion control and stormwater management plan
- Stormwater management plan
- Water pollution control plan
- Pollution prevention plan

This document uses the term "*Plan*."

I think I need a permit... Where do I start?

All land-disturbing activities, including clearing, grading, and excavation, that disturb **1 or more acres** are required to be covered under a state or EPA-issued NPDES construction stormwater permit **prior to land disturbance**. Permit requirements vary by state. Begin by researching the specific requirements in your state. You might already be subject to local erosion and sediment control requirements, but that doesn't release you from the requirements of the NPDES program at the state or EPA level. Although you must comply with both sets of requirements, in most cases they have been designed to be complementary. Contact your permitting authority to find out exactly what you need to do. A good place to start your search is the Construction Industry Compliance Assistance web site at http://www.envcap.org/cica.

The NPDES permit requirements include small construction activities that are part of a larger common plan of development or sale, such as a single lot within a larger subdivision. For developments with multiple operators, all operators must have permit coverage for their individual parts of the larger development, no matter how large or small each operation happens to be. When there are multiple operators at one site, they're encouraged to develop and share one comprehensive Plan and obtain permit coverage as co-permitees.

The **owner or operator** of the construction site is responsible for complying with the requirements of the permit. Responsibilities include developing a Plan, obtaining permit coverage, implementing BMPs, and stabilizing the site at the end of the construction activity.

Construction sites that discharge unpermitted stormwater are in violation of the Clean Water Act and may be subject to fines of up to $27,500 a day per violation.

Determine your eligibility

All construction activity that disturbs 1 or more acres of land, as well as activity that disturbs less than 1 acre but is part of a larger common plan of development, must obtain permit coverage.

Read and understand your stormwater permit requirements

Get a copy of the permit for construction activities and a permit application (or notice of intent form) from your state or EPA permitting authority.

Develop a Plan

Most states do not require you to submit your Plan. However, you do need to keep the Plan on site. If that's impractical, you may post a notice that tells where the Plan is kept so it can be accessed by the permitting authority and other interested parties.

You'll need to post a copy of your completed application on site. Put it in a place where the public can see it so they'll know your site is covered by an NPDES permit!

Apply for permit coverage

Once you understand your permit requirements and have developed a Plan, you can submit a stormwater permit application (or notice of intent) to your permitting authority. This must be done before beginning any land disturbance on the site. Some states require a few days of lead time, so check with your permitting authority. Once you've submitted the application, you must satisfy the conditions of the permit.

Implement the Plan

Be prepared to implement the BMPs in your Plan before construction begins. Ensure that BMPs are properly maintained, and upgrade and repair them as necessary.

Developing and Implementing a Plan

You must have a Plan that includes erosion and sediment control and pollution prevention BMPs. These Plans require

- Advance planning and training to ensure proper implementation of the BMPs
- Erosion and sediment control BMPs in place until the area is permanently stabilized
- Pollution prevention BMPs to keep the construction site "clean"
- Regular inspection of the construction site to ensure proper installation and maintenance of BMPs

Fortunately, the practices and measures that must be included in your Plan are already part of the standard operating procedures at many construction sites.

Six steps are associated with developing and implementing a stormwater Plan. There's a wealth of information available on developing pollution prevention plans. Please contact your permitting authority for help in finding additional guidance materials, or visit www.epa.gov/npdes/stormwater. A sample construction plan is available at www.epa.gov/npdes/pubs/sample_swppp.pdf.

1. *Site Evaluation and Design Development*

- **Collect site information**
- **Develop site plan design**
- **Prepare pollution prevention site map**

The first step in preparing a Plan is to define the characteristics of the site and the type of construction that will occur. This involves collecting site information, identifying natural features that should be protected, developing a site plan design, describing the nature of the construction activity, and preparing a pollution prevention site map.

2. *Assessment*

- **Measure the site area**
- **Determine the drainage areas**
- **Calculate the runoff coefficient**

The next step is assessing the impact the project will have on stormwater runoff. Determine the drainage areas and estimate the runoff amounts and velocities. For more information on calculatng the runoff coefficient, go to www.epa.gov/npdes/pubs/chap02_conguide.pdf, page 11.

3. *Control Selection and Plan Design*

- **Review and incorporate state or local requirements**
- **Select erosion and sediment controls**
- **Select other controls**
- **Select stormwater management controls**
- **Indicate the location of controls on the site map**
- **Prepare an inspection and maintenance plan**
- **Coordinate controls with construction activity**
- **Prepare sequence of major activities**

In the third step you'll actually document your procedures to prevent and control polluted stormwater runoff. You must delineate areas that will not be disturbed, including critical natural areas like streamside areas, floodplains, and trees. You must also identify the measures (or BMPs) you'll use to protect these areas.

Phasing your project to minimize the amount of exposed soil at any given time is a highly effective way to prevent erosion. Erosion control measures designed to prevent soil from being mobilized include diversions to route stormwater away from exposed soils and stabilization with vegetation, mulch, and geotextiles. Sedimentation control measures designed to remove sediment from stormwater or prevent it from leaving the site include silt fences, sediment traps, and diversions.

You'll need to select erosion and sediment controls—including stabilization measures for protecting disturbed areas and structural controls for diverting run-off and removing sediment—that are appropriate for your particular site. The appropriateness of the control measures will depend on several factors, but will be influenced most directly by the site characteristics. Some stabilization measures you might consider are temporary seeding, permanent seeding, and mulching. Structural control measures include earth dikes, silt fences, and sediment traps. No single BMP will meet all of the erosion and sedimentation control needs of a construction site. A combination of BMPs is necessary. For more information on the types of BMPs appropriate for your construction site, see the BMP fact sheet series available at www.epa.gov/npdes/menuofbmps.

Soil erosion control tips...

- Design the site to infiltrate stormwater into the ground and to keep it out of storm drains. Eliminate or minimize the use of stormwater collection and conveyance systems while maximizing the use of stormwater infiltration and bioretention techniques.
- Minimize the amount of exposed soil on site.
  - To the extent possible, plan the project in stages to minimize the amount of area that is bare and subject to erosion. The less soil exposed, the easier and cheaper it will be to control erosion.
  - Vegetate disturbed areas with permanent or temporary seeding immediately upon reaching final grade.
  - Vegetate or cover stockpiles that will not be used immediately.
- Reduce the velocity of stormwater both onto and away from the project area.
  - Interceptors, diversions, vegetated buffers, and check dams are a few of the BMPs that can be used to slow down stormwater as it travels across and away from the project site.
  - Diversion measures can also be used to direct flow away from exposed areas toward stable portions of the site.
  - Silt fences and other types of perimeter filters should never be used to reduce the velocity of runoff.
- Protect defined channels immediately with measures adequate to handle the storm flows expected.
  - Sod, geotextile, natural fiber, riprap, or other stabilization measures should be used to allow the channels to carry water without causing erosion. Use softer measures like geotextile or vegetation where possible to prevent downstream impacts.
- Keep sediment on site.
  - Place aggregate or stone at construction site vehicle exits to accommodate at least two tire revolutions of large construction vehicles. Much of the dirt on the tires will fall off before the vehicle gets to the street.
  - Regular street sweeping at the construction entrance will prevent dirt from entering storm drains. Do not hose paved areas.
  - Sediment traps and basins are temporary structures and should be used in conjunction with other measures to reduce the amount of erosion.
- Maintaining all BMPs is critical to ensure their effectiveness during the life of the project.
  - Regularly remove collected sediment from silt fences, berms, traps, and other BMPs.
  - Ensure that geotextiles and mulch remain in place until vegetation is well established.
  - Maintain fences that protect sensitive areas, silt fences, diversion structures, and other BMPs.

Other BMPs and Activities to Control Polluted Runoff

You'll need to select other controls to address potential pollutant sources on your site. Construction materials, debris, trash, fuel, paint, and stockpiles become pollution sources when it rains. Basic pollution prevention practices can significantly reduce the amount of pollution leaving construction sites. The following are some simple practices that should be included in the Plan and implemented on site:

- Keep potential sources of pollution out of the rain as practicable (e.g., inside a building, covered with plastic or tarps, or sealed tightly in a leak-proof container).
- Clearly identify a protected, lined area for concrete truck washouts. This area should be located away from streams, storm drain inlets, or ditches and should be cleaned out periodically.
- Park, refuel, and maintain vehicles and equipment in one area of the site to minimize the area exposed to possible spills and fuel storage. This area should be well away from streams, storm drain inlets, or ditches. Keep spill kits close by and clean up any spills or leaks immediately, including spills on pavement or earthen surfaces.
- Practice good housekeeping. Keep the construction site free of litter, construction debris, and leaking containers. Keep all waste in one area to minimize cleaning.
- Never hose down paved surfaces to clean dust, debris, or trash. This water could wash directly into storm drains or streams. Sweep up materials and dispose of them in the trash. Never bury trash or debris!
- Dispose of hazardous materials properly.

4. *Certification and Notification*

- **Certify the Plan**
- **Submit permit application or notice of intent**

Once the Plan has been developed, an authorized representative must sign it. Now is the time to submit the permit application or notice of intent. Your permit might require that the Plan be kept on site, so be sure to keep it available for the staff implementing the Plan.

Erosion and sedimentation control practices are only as good as their installation and maintenance.

5. *Implementing and Maintaining a Plan*

- **Implement controls**
- **Inspect and maintain controls**
- **Update/change the Plan**
- **Report releases of hazardous materials**

A Plan describes the practices and activities you'll use to prevent stormwater contamination and meet the NPDES permit requirements. Make sure that the Plan is implemented and that the Plan is updated as necessary to reflect changes on the site.

Erosion and sedimentation control practices are only as good as their installation and maintenance. Train the contractors that will install the BMPs and inspect immediately to ensure that the BMPs have been installed correctly.

Regularly inspect the BMPs (especially before and after rain events) and perform any necessary repairs or maintenance immediately. Many BMPs are designed to handle a limited amount of sediment. If not maintained, they'll become ineffective and a source of sediment pollution.

It's also important to keep records of BMP installation, implementation, and maintenance. Keep track of major grading activities that occur on the site, when construction activities cease (temporarily or permanently), and when a site is temporarily or permanently stabilized.

If construction plans change at any time, or if more appropriate BMPs are chosen for the site, update the Plan accordingly.

6. *Completing the Project: Final Stabilization and Termination of the Permit*

- **Final stabilization**
- **Notice of Termination**
- **Record retention**

Many states and EPA require a Notice of Termination (NOT) or other notification signifying that the construction activity is completed. An NOT is required when

- Final stabilization has been achieved on all portions of the site for which the permittee is responsible.
- Another operator has assumed control over all areas of the site that have not been finally stabilized. That operator would need to submit a new permit application to the permitting authority.
- For residential construction only, temporary stabilization of a lot has been completed prior to transference of ownership to the homeowner, with the homeowner being made aware of the need to perform final stabilization.

Permittees must keep a copy of their permit application and their Plan for at least 3 years following final stabilization. This period may be longer depending on state and local requirements.

Preconstruction Checklist

- A site description, including
  - Nature of the activity
  - Intended sequence of major construction activities
  - Total area of the site
  - Existing soil type and rainfall runoff data
  - A site map with:
    - Drainage patterns
    - Approximate slopes after major grading
    - Area of soil disturbance
    - Outline of areas which will not be disturbed
    - Location of major structural and nonstructural soil erosion controls
    - Areas where stabilization practices are expected to occur
    - Surface waters
    - Stormwater discharge locations
  - Name of the receiving water(s)
- A description of controls:
  - Erosion and sediment controls, including
    - Stabilization practices for all areas disturbed by construction
    - Structural practices for all drainage/discharge locations
  - Stormwater management controls, including
    - Measures used to control pollutants occurring in stormwater discharges after construction activities are complete
    - Velocity dissipation devices to provide nonerosive flow conditions from the discharge point along the length of any outfall channel
  - Other controls, including
    - Waste disposal practices that prevent discharge of solid materials
    - Measures to minimize offset tracking of sediments by construction vehicles
    - Measures to ensure compliance with state or local waste disposal, sanitary sewer, or septic system regulations
  - Description of the timing during the construction when measures will be implemented
- State or local requirements incorporated into the Plan
- Inspection and maintenance procedures for control measures identified in the Plan
- Contractor certification and Plan certification

Implementation Checklist

- Maintain records of construction activities, including
  - Dates when major grading activities occur
  - Dates when construction activities temporarily cease on the site or a portion of the site
  - Dates when construction activities permanently cease on the site or a portion of the site
  - Dates when stabilization measures are completed on the site
- Prepare inspection reports summarizing
  - Name of person conducting BMP inspections
  - Qualifications of person conducting BMP inspections
  - BMPs/areas inspected
  - Observed conditions
  - Necessary changes to the Plan
- Report releases of reportable quantities of oil or hazardous materials
  - Notify the National Response Center at 800-424-8802 immediately
  - Report releases to your permitting authority immediately, or as specified in your permit. You must also provide a written report within 14 days.
  - Modify the Plan to include
    - The date of release
    - Circumstances leading to the release
    - Steps taken to prevent reoccurrence of the release
- Modify Plan as necessary
  - Incorporate requests of the permitting authority to bring the Plan into compliance
  - Address changes in design, construction operation, or maintenance that affect the potential for discharge of pollutants

An ounce of prevention is worth a pound of cure! It's far more efficient and cost-effective to prevent pollution than it is to try to correct problems later. Installing and maintaining simple BMPs and pollution prevention techniques on site can greatly reduce the potential for stormwater pollution and can also save you money!

Visit www.epa.gov/npdes/stormwater for more information.

StormWater CleanWater PROTECTION PROGRAM

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers

Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

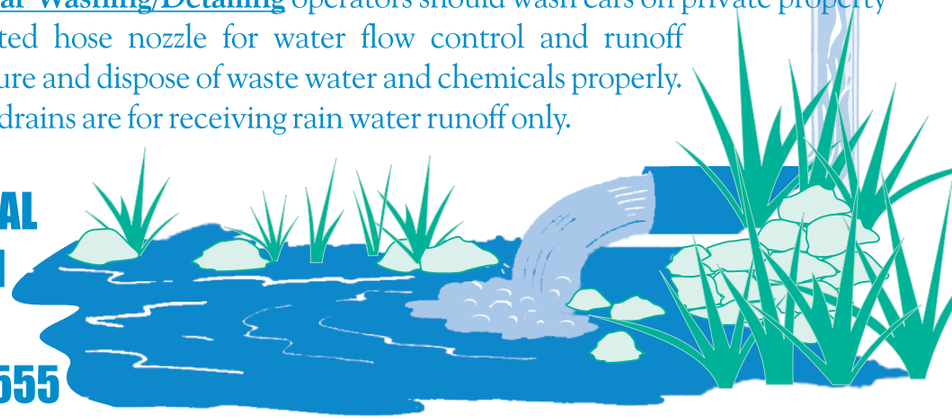
Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.

Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.

When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

After the Storm

A Citizen's Guide to Understanding Stormwater

EPA 833-B-03-002

January 2003

For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

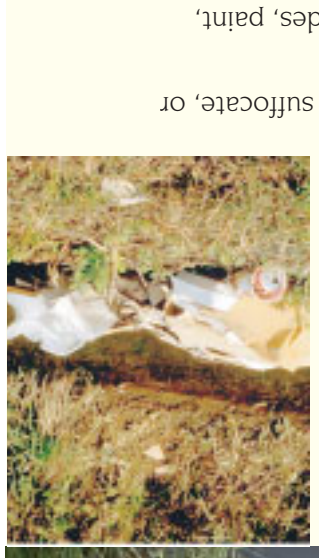
Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

Why is stormwater runoff a problem?

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.



Stormwater Pollution Solutions

Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Commercial

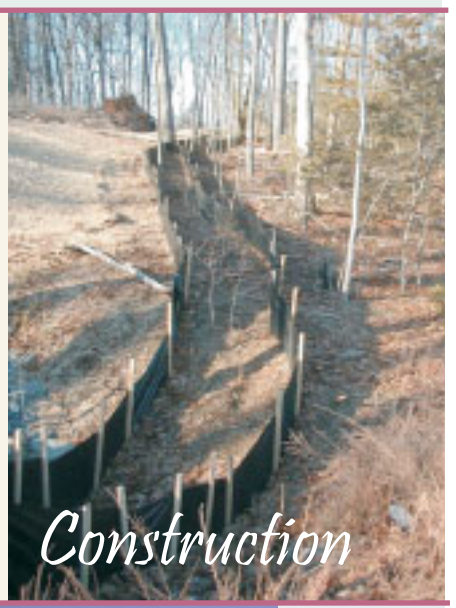
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



Agriculture

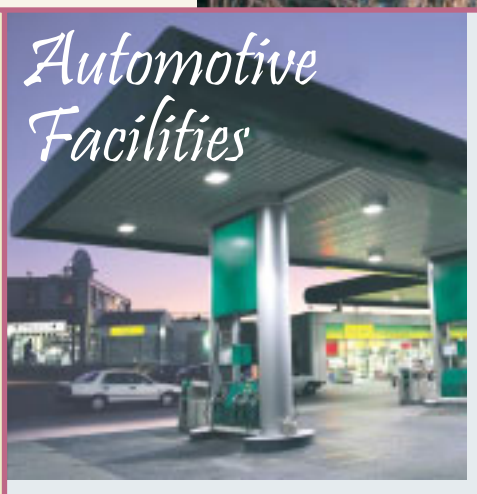
Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.



Automotive Facilities

Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Appendix E

Soils Report

May 7, 2015
J.N. 14-108

Mr. Beau Cooper
UNITED ENGINEERING GROUP
3595 Inland Empire Boulevard, Suite 2200
Ontario, CA 91764

Subject: **Preliminary Geotechnical Investigation, *Agua Del Vista Project* (Former Alpine 280 Project), Located East of Tyler Street, West of Polk Street, South of I-10 and North of Avenue 48, City of Coachella, California**

References: See Literature Reviewed

Dear Mr. Cooper:

Petra Geosciences, Inc. (Petra) {formerly Petra Geotechnical, Inc.} is pleased to submit this report presenting the updated results of our preliminary geotechnical investigation for land planning purposes for the proposed development. Currently there is a conceptual land use plan, prepared by United Engineering Group. This plan shows a conceptual street layout, a general commercial area, parks and greenspace, a neighborhood center, and single-family and multi-family developments. Our work was performed in accordance with the scope of work outlined in our Proposal dated January 21, 2014. This report presents the results of our field investigations, laboratory testing, and our engineering judgment, analysis, opinions, conclusions and recommendations pertaining to the preliminary geotechnical design aspects of the proposed development.

It should be noted that this preliminary geotechnical evaluation does not address soil contamination or other environmental issues which may affect the property.

It is a pleasure to be of continuing service to you on this project. Should you have any questions regarding the contents of this report, or should you require additional information, please do not hesitate to contact us.

Respectfully submitted,

PETRA GEOSCIENCES, INC

Alan Pace
Vice President

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UPDATED PRELIMINARY GEOTECHNICAL INVESTIGATION
AGUA DEL VISTA PROJECT (FORMER ALPINE 280 PROJECT), LOCATED EAST OF TYLER STREET, WEST OF POLK STREET, SOUTH OF I-10, AND NORTH OF AVENUE 48
CITY OF COACHELLA, RIVERSIDE COUNTY, CALIFORNIA

INTRODUCTION

Petra Geosciences, Inc. (Petra) {formerly Petra Geotechnical, Inc.} is pleased to present the results of our geotechnical investigation for the subject property. The main purpose of this investigation is to provide support for land planning activities by determining the nature of subsurface soil conditions and presenting general geotechnical design recommendations with respect to site clearing and grading and design and construction of new building foundations, retaining walls, pavement surfaces and other improvements.

This investigation included a review of published and unpublished literature and geotechnical maps and aerial photographs with respect to active and potentially active faults located on the site that may have an impact on the proposed construction. A portion of the site in the northeastern portion of the property lies within a State-mandated, judicial "Alquist-Priolo Earthquake Fault Zone", recently revised by the state and now called simply an Earthquake Fault Hazard Zone. We understand that development of habitable structures is not planned within the Earthquake Fault Zone.

As a part of this investigation, we have also reviewed a draft report prepared for the site by Sladden Engineering, dated February 25, 2005 (References). That investigation included drilling of 8 exploratory borings, collecting soil samples, and laboratory testing. Their borings reached a maximum depth of 51.5 feet. Their borings were drilled to collect soil samples for laboratory testing to determine physical characteristics of the soils for foundation design purposes. No fault trenching was performed by Sladden within the Fault Hazard Zone discussed above.

SITE LOCATION AND DESCRIPTION

The irregularly shaped site comprises approximately 279 acres east of Tyler Street, south of I-10, and west of Polk Street in the city of Coachella, California. The area of study is indicated on Figure 1.

The entire site slopes gradually down to the southwest, from a high of approximately 25 feet in the northeasterly corner to a low of approximately 60 feet below sea level in the southwesterly corner.

The subject property is mixed-use; most of it, in the northerly and southwesterly portions, is vacant, undeveloped native terrain; the east-southeasterly approximately 90 acres is under active grape cultivation. The agricultural area is irrigated by water from an active reservoir at the northwestern corner.

There is an empty abandoned reservoir, vacant house and sheds in approximately the center of the subject property. Some of this central portion also has been farmed in the past, and includes an abandoned citrus orchard. There are scattered waste mounds, trash and debris over the entire property. The City of Coachella owns a number of significant water lines that traverse under portions of the property.

OBJECTIVES AND SCOPE OF SERVICES

The objectives of this investigation was to characterize the site to identify the geotechnical conditions that would impact site development and to provide geotechnical recommendations for the design and construction of the project:

To accomplish these objectives, our scope of services included the following:

1. Review of available reports and literature concerning soil and geologic conditions within and adjacent to the site.

2. Review of historical stereoscopic pairs of aerial photographs from the years 1939, 1951 and 1956.

3. Performance of a field investigation consisting of:

    a. Excavating, logging and sampling 17 backhoe trenches to depths between 6 to 14 feet,

    b. Performing 8 cone penetrometer soundings (CPTs) to a maximum depth of 50 feet, and

    c. Drilling, logging and sampling 4 small-diameter hollow stem borings to a maximum of 51 ½ feet. (Exploration logs are presented in Appendix A).

4. Laboratory testing and analyses on selected soil samples to determine their engineering properties. Laboratory test criteria and test results are presented in Appendix B.

5. Engineering and geologic analyses of field and laboratory data as they pertain to the proposed development.

6. Presentation of Seismic Design Considerations, in accordance with the 2013 California Building Code.

7. Preparation of this report presenting the results of our preliminary investigation and preliminary recommendations for the proposed development in conformance with the 2013 California Building Code and Riverside County requirements.

PROPOSED DEVELOPMENT

According to the current conceptual land use plan, proposed grading at the site will ultimately accommodate development of lots for residential/commercial structures, associated streets and other improvements such as a park and green spaces. It should be noted that development and grading plans were not available for our review.

Based on our experience with similar projects and on our observations of surrounding developments, maximum proposed cuts and fills are anticipated to be on the order of a few feet. Ultimate compacted fill depths will increase as a result of the required remedial grading (i.e., overexcavation and recompaction of unsuitable near-surface soils). This will include re-excavation and recompaction of trenches originally excavated for our fault Investigation in the northeast corner of the property, as shown on Figure 2 (map pocket). Significant cut or fill slopes (greater than 5 feet) are not anticipated for the development.

AERIAL PHOTOGRAPH ANALYSIS

An aerial photograph review was performed to assess previous land use and determine whether geomorphic features are present within or adjacent to the site that would be suggestive of active faulting or former natural drainage courses that may have flooded the site in the past. Our review was also performed to determine if there was any evidence suggestive of past grading activities that are not currently discernable at the site. Stereo-paired black and white aerial photographs for years 1939, 1951, and 1956 were reviewed as part of our investigation (see Table I). The photos are a part of Petra's in-house aerial photograph collection.

TABLE I

Aerial Photograph Reviewed

Flight No.	Frames	Date	Scale	Color
C-1940C	142-144	2/1932	1"=1200'	B/W
C-6060	568-571	10/1939	1"=1500'	B/W
C-14031	134-136	7/21/1949	1"=2000'	B/W
C-16107	134-137	1/31/1951	1"=1667'	B/W
C-22693	1-37, 1-38	11/30/1956	1"=5280'	B/W

Geologic mapping and analysis of the air-photos indicate that surficial soils at the site consist primarily of sedimentary wind blown sand, alluvial fan, and lake deposits. The lake deposits are associated with ancient Lake Cahuilla that likely had a high stand of ~42 feet above sea level approximately 300 years ago.

Petra also performed a lineament analysis of the site and local surrounding properties. Lineaments are relatively linear surface features that are typically due to either topographic relief (geomorphic) or tonal contrasts. Lineaments can result from a number of factors including faulting, groundwater variations leading to vegetation lines, erosion, or geologic contacts to name a few. Lineaments are typically

evaluated as either weak, moderate or strong. A weak lineament typically extends discontinuously and for less than 1000 feet. A strong lineament will typically extend continuously and often for lengths greater than 1000 feet. Moderate strength lineaments fall between weak and strong. Details of our lineament analysis were presented in our fault investigation report (Petra 2006).

SUBSURFACE EXPLORATION

Our subsurface exploration included the drilling and sampling of 17 test trenches and 4 hollow-stem auger soil borings, and the completion of 8 CPT soundings. The approximate locations of the exploratory excavations are shown on the Geotechnical Map, Figure 2 (map pocket). Logs describing the nature of earth materials encountered in the test pits and borings are presented in Appendix A. Exploration logs from the Sladden (2005) investigation are also included.

Test trenches were excavated using a rubber-tired backhoe and hollow-stem-auger soil borings were advanced using a CME55 drill rig. The CPT soundings were conducted in general accordance with ASTM specifications (ASTM D3441-02) using an electronic cone penetrometer. Gregg Drilling and Testing Inc., of Signal Hill, California, under a subcontract with Petra, performed the CPTs. The CPT sounding technique consists of pushing a cone-tipped probe into a soil deposit while simultaneously recording the end bearing and side friction resistance of the soil to penetration. The subsurface soil profile and some of the relevant engineering properties of soils may be interpreted from this data based on established correlations. Data acquisition, reduction and interpretation methodology along with logs of CPTs are included in Appendix A.

Bulk samples and relatively undisturbed drive samples of soil were collected for laboratory testing. Undisturbed drive samples were obtained from the soil borings using a 3-inch, outside diameter, California-modified, split-spoon soil sampler lined with a series of 1-inch long brass rings, or a Standard Penetration Test sampler, with a 2” outer diameter. The soil sampler was driven with successive drops of a 140-pound automatic hammer assembly that was mounted on the back of a hollow-stem-auger drill rig. Hammer blows used to drive the sampler were recorded for each 6-inch interval. The bottom portions of the driven California split-spoon core samples, and the entire recovered standard penetration test samples, were placed in sealed containers and transported to our laboratory for testing.

LABORATORY TESTING

Various laboratory tests were performed to determine the physical and chemical properties of the on-site soils. These tests included:

- In-situ dry density and moisture content
- Maximum dry density and optimum moisture content
- Expansion potential
- Grain size analysis
- Consolidation
- Soluble sulfate content
- Chloride content
- pH
- Minimum resistivity
- Organic content

A description of laboratory test procedures and summaries of the test data are presented in Appendix B. An evaluation of the test data is reflected throughout the "Conclusions and Recommendations" section of this report.

FINDINGS

Regional Geology

The property lies within the Salton Trough that comprises a portion of the Colorado Desert Geomorphic Province. The Salton Trough region is well known for its exposures of the San Andreas and related faults that form the margin between the Pacific and North American Plates. In southern California, these plates move past each other along a somewhat diffuse array of faults comprising the San Andreas Fault System (Powell, 1993). Geologic development of the Salton Trough began as a major half-graben basin when regional crustal extension affected much of western North America in Miocene time prior to the development of the San Andreas Fault System. During the past 12 to 15 million years, the modern Salton Trough has continued to develop during formation of the northern part of the Gulf of California rift basin. This is due to “pull-apart” oblique strike-slip motion between the North American and Pacific plates within the Sea of Cortez (Gulf of Mexico), which continues into the southern Salton Trough region.

The Salton Trough, part of which is below sea level, has progressively been filling with sediments eroded from the San Jacinto Mountains along the western margins, the San Bernardino Mountains and Little San Bernardino Mountains to the north and northeast respectively, the Orocopia Mountains to the east, and sediments deposited by the Colorado River to the southeast. Sediments in the Salton Trough are estimated to be over three miles thick.

Regional Geology and Soil Conditions

The site is partially underlain by lacustrine sediments deposited by the ancient Lake Cahuilla, and partially by fluvial fan sands and gravels and dune sands. All trench and boring logs are located in Appendix A of this report.

Lacustrine Sediments (Ql)

Primarily, the lacustrine sediments are interbedded silty fine sands and sandy silts, brown to dark yellow brown in color, medium dense or stiff, and moist. Bedding within these silts was generally indistinct, without persistent fine laminations. Scattered throughout, however, were lenses of fine-grained to coarse-grained sands and gravels. These are channel deposits and represent sedimentation in a higher-energy environment. In test trench T10, we exposed a 1.5 foot thick sand and cobble channel deposit, with cobbles up to 4 inches in maximum dimension.

Interbedded within the silts and the gravel lenses are thin layers of fossil shells, sometimes as scattered layers one shell in thickness, to thicker beds of shells concentrated and packed into 4" to 6" layers.

There were indications of oxidation in the silt beds, with scattered orange iron oxide staining. We noted flecks of charcoal scattered at several locations, notably in test trench T4, at depths of 4 to 5 feet below ground surface.

Alluvial Fans (Qf)

The alluvial fan deposits encountered in our trenches are located mainly in the northeastern portion of the subject property. They consist of fine- to coarse-grained sand with lenses of gravel and some thin scattered silt layers, and fossil shell fragments. They are medium dense, dry to moist and primarily gray in color.

Dune Deposits (Qd)

The dune deposits encountered onsite are primarily dry, loose to very loose fine-grained sand, poorly sorted; they contain scattered fossil shell fragments. They also show "foreset" bedding, caused by wind deposition of sands on the lee and windward sides of a dune structure. On the subject property, the dune sands are found as topographic highs, projecting up to 20 feet above the general surrounding flat elevations.

Artificial Fill (Qaf)

Limited areas of artificial fill were found onsite, primarily as reservoir berms and as loose, piled mounds. The berms are compacted but undocumented; the mounds are loose and composed of sands and silts, with varying amounts of trash and debris.

Evidence for Faulting

We did not observe direct evidence for faulting within our seventeen test trenches; there were no observed fault planes, fault gouge, "flower" structures, or displacement of stratigraphic horizons. In addition, there was no observed evidence of liquefaction related to a seismic event, such as sand boils or contorted bedding. Please note that we directly observed trench walls to a depth of 6 to 7 feet only; we did not enter the trenches, for safety reasons, below these depths.

Groundwater

Free groundwater was encountered in test trenches Nos. T-1 and T-3, at depths of 12 feet below ground surface (bgs), or elevations of –97 to –102 feet msl, respectively. In our hollow stem borings, groundwater was encountered at 10.5, 12 and 16.5 feet bgs, or at elevations of –58.5, -69, and –50.5 feet msl respectively. Rainfall, irrigation and other possible factors that may not have been evident at the time of our investigation, may change local groundwater and perched water conditions.

For liquefaction analysis, the depth to high ground water was considered to be the level measured in the nearby borings. Return to historic levels would be unlikely because the area was historically below the level of the lake, and therefore human habitation would not be possible in the area if the area was flooded.

Faulting and Seismicity

The geologic structure of the southern California area is dominated by northwest-trending strike-slip faults associated with the San Andreas Fault system. Some of the major fault zones within the San Andreas fault system include, from west to east, the Whittier-Elsinore, San Jacinto, and the San Andreas fault zones. All of these major fault zones are seismically active, and the San Jacinto and San Andreas fault zones are known to have ruptured the ground surface in historic time. Also within the southern California region exists a number of west-trending reverse faults primarily associated with uplift of the San Gabriel and San Bernardino Mountains that are similarly active.

The Indio 7.5-minute topographic quadrangle for the State of California Alquist-Priolo Earthquake Zoning Act (Hart and Bryant, 1999) indicates that a Fault-Rupture Hazard Zone exists for the San Andreas fault in the northeastern portion of the site, as shown on Figure 2 (map pocket).

A listing of historical earthquakes published by the National Earthquake Information Center (2004) indicates that the largest earthquake occurring within a radius of approximately 62 miles (100 kilometers) of the site was the Magnitude 7.3 Landers earthquake in 1992. This event, along with the associated aftershocks, occurred approximately 35 miles to the northeast of the subject property. The closest documented earthquake greater than magnitude 6.0, was a magnitude 6.3 Joshua Tree earthquake that occurred approximately 17 miles north of the site in 1992.

Seismic Hazards

According to the County of Riverside Safety Element, Chapter 6.0 of the General Plan (adopted October 7, 2003), the northeast portion of the site is located within the Alquist-Priolo zone of the San Andreas Southern Fault. Therefore, seismic hazards for the site include strong ground motion, surface fault rupture, soil liquefaction and other secondary earthquake-related hazards.

Seismically-Induced Flooding

Seismically induced flooding which might be considered a potential hazard to a site normally includes flooding due to a tsunami (seismic sea wave), a seiche (i.e., a wave-like oscillation of the surface of water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention structure upstream of the site. The site is located many miles from the Pacific Ocean, and is not expected to be directly affected by a tsunami event.

There are two small agricultural-type reservoirs on the property, one of which is active and was filled with water at the time of our field explorations. In addition, there are two active reservoirs just off the property, at the southwestern corner and at the southeastern corner. It is anticipated that the onsite reservoirs will be demolished and graded for future home sites. The offsite reservoirs, if they remain, may present flooding hazards if their north-side berms are damaged during a seismic event. Analysis of reservoir structural integrity and seismic response is not within the scope of this report.

Earthquake Loads

General

Earthquake loads on earthen structures and buildings are a function of ground acceleration which may be determined from the site-specific acceleration response spectrum. The seismic parameters that were used

to construct the acceleration response spectrum for analysis and design of the proposed site improvements were determined in accordance with the provisions of Section 1613 of the 2013 California Building Code (CBC), which incorporates the 2010 edition of the American Society of Civil Engineers (ASCE) document "Minimum Design Loads for Buildings and Other Structures" (ASCE/SEI 7-10).

To construct the site-specific acceleration response spectrum for this project, we performed a seismic hazard analysis to first determine the ground motion characteristics for the Risk Targeted Maximum Considered Earthquake (MCER) as required by Section 1613 of the 2013 CBC. We determined peak ground acceleration (PGA) levels for use in analysis and design as prescribed in Section 1803.5.12 of the 2013 CBC. The Building Seismic Safety Council (BSSC), in its commentary to Section 11.8.3 of ASCE/SEI 7-10, states that for ordinary design (including retaining walls), the use of the lower design level PGA is appropriate. However, for analysis of liquefaction, it states that the full MCE peak ground acceleration with a recurrence interval of approximately 2,475 years is to be used; due to the potentially catastrophic effect liquefaction can have on a building structure.

The MCER ground motion is determined using both probabilistic and deterministic methods and is defined as the level of ground motion that will produce 1 percent collapse risk in 50 years for a generic structure. The probabilistic component is taken as the level of ground acceleration having a 2 percent chance of exceedance in 50 years (a 2,475-year recurrence interval). The deterministic models assume an 84th percentile ground motion to provide the upper bound subset for the likely ground motion at a site. Both types of analysis include directivity effects. The CBC also specifies that the MCE ground motion be scaled by a factor of ⅔ to determine the appropriate design values. This scaling is approximately equivalent to the level of ground motion that would result from a probabilistic analysis at a 10 percent chance of exceedance in 50 years (a 475-year recurrence interval).

Two computer applications are available on the United States Geological Survey (USGS) website, http://geohazards.usgs.gov/, for determination of site ground motion characteristics. These programs calculate the ground motion parameters for a particular site based on the site latitude, longitude, and soil class definition. Specifically, the U.S. Seismic Design Maps web application http://geohazards.usgs.gov/designmaps/us/application.php may be used to calculate the acceleration parameters. And, the 2008 PSHA Interactive Deaggregation web site http://geohazards.usgs.gov/deaggint/2008/ may be used to determine the appropriate earthquake magnitude.

Results

To run the above computer applications, knowledge of "Site Class", which depends on the average shear wave velocity within the upper 30 meters (approximately 100 feet) of site soils, is necessary. A shear wave velocity of 250 meters per second for a depth of 30 meters (Vs30) was used for the site based on engineering experience and judgment and the results of our CPT testing.

The following table, Table 1, provides parameters required to construct site-specific acceleration response spectrum for the site based 2013 CBC guidelines. Printouts of the computer output are attached in Appendix C.

It should be noted that, based on our evaluation, San Andreas fault located approximately at the northwest corner of the site, would probably generate the most severe site ground motions and is therefore the majority contributor to the deterministic minimum component of the ground motion models.

Table 1

SEISMIC DESIGN PARAMETERS

Ground Motion Parameters	Reference	Parameter Value	Unit
Latitude (North)	-	33.70522	°
Longitude (West)	-	-116.15675	°
Site Class Definition	Table 20.3-1, ASCE 7-10	D	-
Assumed Risk Category	Table 1604.5, CBC 2013	II	-
M_w - Earthquake Magnitude	Section 1803.5.12.2, CBC 2013	7.0	-
S_s - Mapped Spectral Response Acceleration	Figure 1613.3.1(1), CBC 2013	2.629	g
S_1 - Mapped Spectral Response Acceleration	Figure 1613.3.1(2), CBC 2013	1.280	g
F_a - Site Coefficient	Table 1613.3.3(1), CBC 2013	1.0	-
F_v - Site Coefficient	Table 1613.3.3(2), CBC 2013	1.5	-
S_{MS} - Adjusted Maximum Considered Earthquake Spectral Response Acceleration	Equation 16-37, CBC 2013	2.629	g
S_{M1} - Adjusted Maximum Considered Earthquake Spectral Response Acceleration	Equation 16-38, CBC 2013	1.919	g
S_{DS} - Design Spectral Response Acceleration	Equation 16-39, CBC 2013	1.752	g
S_{D1} - Design Spectral Response Acceleration	Equation 16-40, CBC 2013	1.280	g
T_o - (0.2 S_{D1}/ S_{DS})	Section 11.3, ASCE 7-10	0.146	s
T_s - (S_{D1}/ S_{DS})	Section 11.3, ASCE 7-10	0.731	s
T_L - Long Period Transition Period	Figure 22-12, ASCE 7-10	8	s
F_{PGA} - Site Coefficient	Figure 22-7, ASCE 7-10	1.0	-
[1]PGA_M - Peak Ground Acceleration at MCE	Equation 11.8-1, ASCE 7-10	1.015	g
[2]PGA – Design Level – (0.4 S_{DS})	Equation 11.4-5, ASCE 7-10	0.701	g
C_{RS} - Short Period Risk Coefficient	Figure 22-17, ASCE 7-10	0.958	-
C_{R1} - Long Period Risk Coefficient	Figure 22-18, ASCE 7-10	0.932	-
[3]Seismic Design Category	Section 1613.3.5, CBC 2013	E	-

[1] PGA Calculated at the MCE return period of 2475 years (2 percent chance of exceedance in 50 years).

[2] PGA Calculated at the Design Level of 2/3 of MCE which is approximately equivalent to a return period of 475 years (10 percent chance of exceedance in 50 years).

[3] Seismic Design Category may be calculated by the structural engineer in accordance with the alternate design procedures of Section 1613.3.5.1 based on structural characteristics in addition to the ground motion parameters, this may supersede the category listed herein.

References: USGS Seismic Design Web Application – http://geohazards.usgs.gov/designmaps/us/application.php
USGS 2008 Interactive Deaggregation Tool - https://geohazards.usgs.gov/deaggint/2008/

Strong Ground Motion

The primary seismic hazard to the site is strong ground shaking from earthquakes along the San Andreas Fault. The maximum magnitude of earthquake that is believed to be tectonically possible along the San Andreas Fault is estimated to be 7.8 (Cao, et al., CGS, 2003). Historically, the following seven seismic events have significantly affected the immediate vicinity of the site in the last 100 years, based upon the available data:

- *Desert Hot Springs Earthquake*: On December 4th 1948, an earthquake of moment magnitude 6.0 occurred east of Desert Hot Springs. This event was strongly felt in the Palm Springs area.

- *Palm Springs Earthquake*: On July 8th 1986, an earthquake of moment magnitude 6.2 occurred in the Painted Hills causing minor surface creep of the Banning segment of the San Andreas Fault. This event was strongly felt in the Palm Springs area and reportedly caused various structural damages and injuries to the residents of that area.

- *Joshua Tree Earthquake*: On April 22, 1992, an earthquake of moment magnitude 6.1 occurred in the mountains 9 miles east of the Desert Hot Springs. Structural damage and minor injuries occurred in the Palm Springs area as a result of this earthquake.

- *Landers and Big Bear Earthquake*: On June 28, 1992, an earthquake of moment magnitude 7.3 occurred near Landers. Surface rupture reportedly occurred just south of the town of Yucca Valley and extended some 43 miles toward Barstow. Another earthquake, on the same day of moment magnitude 6.4 occurred near Big Bear Lake. No structural damage from these earthquakes was reported in the Palm Springs area as a result of this earthquake.

- *Hector Mine Earthquake*: On October 16, 1999, an earthquake of moment magnitude 7.1 occurred on the Lavic Lake and Bullion Mountain faults north of Twentynine Palms. No structural damage from these earthquakes was reported in the Coachella Valley area as a result of this earthquake.

- *El Mayor/ Cucapah Earthquake*: On April 4 2010 and earthquake of moment magnitude 7.2 occurred on the Laguna Salada fault approximately 100 mile to the south of the site. Moderate shaking was reported in the Coachella Valley. Damage was primarily limited to non-structural household items.

While accurate earthquake predications are not possible, various agencies have conducted statistical seismic risk analysis. According to the working group of California Earthquake Probabilities (WGCEP, 1995) there is a 22 percent conditional probability that a magnitude 7 or greater earthquake may occur between 1994 and 2024 along the Coachella segment of the San Andreas fault.

Site-Specific Liquefaction Analysis

In April 1991, the State of California enacted the Seismic Hazards Mapping Act (Public Resources Code, Division 2, Chapters 7-8). The purpose of the Act is to protect the public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure. The Act defines mitigation as "… *those measures that are consistent with established practice and reduce seismic risk to acceptable levels.*" Acceptable level of risk is defined as "*that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project [California Code of Regulations; Section 3721 (a)]*." In the context of that Act, mitigation of the potential liquefaction hazards at this site to appropriate levels of risk can be accomplished through appropriate foundation and/or subsurface improvement design.

Based on the site exploration, this site is considered susceptible to seismic liquefaction. This is due primarily to the documented presence of unconsolidated granular (sandy) soils in the area, the relatively shallow groundwater conditions, and to the proximity of seismic sources. For this reason, a site-specific liquefaction analysis was performed as part of this study.

Assessment of liquefaction potential for a particular site requires knowledge of a number of regional as well as site-specific parameters, including the estimated design earthquake magnitude, and the associated probable peak horizontal ground acceleration at the site, subsurface stratigraphy and soil characteristics. Parameters such as estimated probable peak horizontal ground acceleration can readily be determined using published references, or by utilizing a commercially available computer program specifically designed to perform a probabilistic analysis. On the other hand, stratigraphy and soil characteristics can only be accurately determined by means of a site-specific subsurface investigation combined with appropriate laboratory analysis of representative samples of onsite soils.

Propagating earthquake waves induce shearing stresses and strains in soil materials during strong ground shaking. This process rearranges the structure of granular soils such that there is an increase in density, with a corresponding decrease in volume, which results in vertical settlement. Dynamic settlement has been well documented in wet, sandy deposits undergoing liquefaction (see Tokimatsu and Seed, 1987) and in relatively dry sediments as well (Stewart et al, 1996). Specific methods to analyze potential wet and dry dynamic settlement are reported in Tokimatsu and Seed (1987), and specifically dry settlement in Pradel (1998) and Stewart et al. (2001; 2002) respectively. Most of the referenced papers focus on the seismic effects on dry, clean sands of a uniform grain size, though several reports extend the literature to fine-grained soils (Stewart et al., 2001 & 2002). State guidelines for evaluating dynamic settlement are provided in the California Geological Survey Special Publication 117A (CGS, 2008).

Analyses Using CPT Results

We utilized 7 of the 8 site CPT soundings in the liquefaction analysis (the 8th sounding was only to a depth of 25 feet, and therefore does not give complete results). Our analysis using the CPT data provides *continuous* penetration resistance data rather than borehole data using SPT sampling that must be averaged over discrete sampling increments (e.g., 5 or 10 feet). A variety of computer programs are available that were developed specifically for liquefaction and seismic settlement analyses. For purposes of this study, we selected the commercially available software program Cliq Version 1.7.6.49 (Geologismiki, 2014) that implements updated versions of the NCEER procedure as recommended by Dr. Peter Robertson (2010), or that of Professors Idriss and Boulanger (2008, 2014). The procedures were

based on the methods originally recommended by Seed and Idriss (1982). Calculations using CPT data are also provided in Appendix D.

Analysis Results and Assessment of Liquefaction Effects

Section 1803.5.12.3 of the 2013 CBC requires the "assessment of potential consequences of liquefaction and soil strength loss, including, but not limited to" the following items, which we will discuss in the order that they appear in the code.

CBC Section 1803.5.12.3 – 3.1 – Estimation of total and differential settlement;

Analyses with groundwater assumed at current levels below the ground surface indicated that the potentially liquefiable zone is at approximately 8 to 46 feet below the ground surface. Please note, that there are small interbedded non-liquefiable layers.

For CPT settlement we used the Robertson (2001) NCEER procedure to estimate the free field settlement. The depth weighting function suggested by Cetin (2009) was applied to the vertical settlement analysis. Tabulated results of the estimated settlement for this analysis method are provided in Appendix D of this report and in Table 2 below. The results of the other methods are shown on the summary comparison plot printouts.

Table 2: Settlement (Robertson 2009)

CPT #	Settlement (inches)
075C01	1.1
075C02	0.7
075C03	1.4
075C04	1.8
075C05	1.4
075C06	0.9
075C08	0.4

Because of the high potential of differential settlement resulting from soil liquefaction, preliminary recommendations for residential structures may include using structural mats with either conventional reinforcement or post-tensioned tendons designed to accommodate the estimated differential settlement of 2.0 inches in a 40-foot span. This can be represented by an angular distortion ratio of 1:240. The minimum goal of liquefaction mitigation should be to provide a foundation system that can withstand the expected movement without causing such structural damage so as to pose a life-safety hazard (such as structural collapse from excessive drift). This conclusion is reached based on sparsely located CPT

soundings and conventional boring data. We recommend that further CPT investigations be performed to refine our differential settlement estimates.

Surface Manifestation of Liquefaction

The test pits performed as a part of this investigation throughout the southern and southwestern portions of the site (See Figure 2, map pocket), did not show any evidence of surface manifestation of liquefaction (such as presence of sand boils or contorted bedding) due to any previous seismic activity, to approximate depths of 7 feet below ground surface. Based on the method outlined by Ishihara (1985), and considering the depth of the liquefiable layers identified in CPT-1 through CPT-8, the thickness of the surface non-liquefiable layer above the liquefiable zone appears to be insufficient to prevent surface manifestation of liquefaction (such as sand boils, ground fissures, etc.). The recommended remedial grading and installation of geogrids within the compacted fills (as described on page 22 of this report) is anticipated to reduce the potential for surface manifestation of liquefaction. It should be noted that the positive impact of inclusion of geogrids for this purpose could not be quantified, given the present state-of-knowledge of liquefaction phenomena.

In the eastern and northeastern portions of the site, the thickness of the surface non-liquefiable layer above the liquefiable zone appears to be sufficient to prevent surface manifestation of liquefaction, based on the method outlined by Ishihara (1985), as observed in CPT-7 and CPT-8. As described in Petra's 2006 companion Fault Investigation report, the Fault trenches excavated on the northeast portions of the property (See Figure 2), did not show any evidence of surface manifestation of liquefaction (such as presence of sand boils or contorted bedding) due to previous seismic activity, to approximate depths of 25 feet below ground surface.

CBC Section 1803.5.12.3 – 3.2 – Lateral soil movement;

Lateral spreading is the movement of the ground surface down a gentle slope or toward an open free face during a seismic event that causes soil liquefaction. Therefore given the depths and thicknesses of the liquefiable layers identified and the gently sloping site ground geometry we can conclude that lateral spreading may occur at this site. We estimated the amount of lateral spreading using the Youd approach for sloping ground and used an average ground slope measured at each CPT sounding ranging from 1.2 to 2.7 percent (based on available topographic elevation data for the site). Using this method approximately 16 to 32 inches of lateral movement may be estimated at this site during a strong seismic event at the CPT locations provided in Table 3, below. It should be noted that this method is an empirical one and should be used with caution and as a first level of approximation.

Table 3: Lateral Spreading (Youd)

CPT #	Lateral Displacement (inches)
075C01	18
075C02	22
075C03	28
075C04	33
075C05	25
075C06	19
075C08	16

Due to the very strong shaking at the site and the uncertainty with liquefaction analysis at such high magnitude events we had the results of our analysis reviewed by Professor Peter Robertson (Personal Communication 2015) the author of the primary liquefaction assessment methodology that we used. He made several general observations. He noted that the site is mostly sands with layers of fine-grained soils. However, the sands are mostly dense, which shows that they are dilative at large strains. Hence, in general, shear strains will be limited to small levels. He also noted that the design earthquake is very large (PGA > 1g and M > 7.5), and that these values are far outside the case history database and are likely very conservative. He also noted that large lateral displacements would require continuity of the liquefiable layer over larger distances. As indicated previously, the exploration performed was spread over a large site, therefore continuity of layers between exploration points could not be verified.

It should also be noted that the geological evidence of liquefaction and lateral spreading was not observed in the test pits and test trenches at the site. This contradicts the analysis based on the empirical methods for liquefaction assessment. However it should be considered that as noted by Professor Robertson the site characteristics fall well outside of the known case history data set, therefore strong conclusions may be difficult to reach based on the existing methods of assessment.

The general allowable limits of lateral spreading indicated by SP117A is in the range of 12 to 18 inches. The estimated displacements exceed those limits. The use of a well compacted fill layer reinforced with geogrid, and additionally conventionally reinforced or post-tensioned concrete building slabs has the potential to reduce some of the detrimental effects of lateral spreading. That is, ground improvement measures, such as the inclusion of geogrid layers may be considered to reduce the lateral spreading potential. Further, such measures together with the use of mat slabs are intended to allow for the structure to remain as a single block and therefore any movement of the ground would not be transferred to separate sections of the structure independently, but only as a whole.

Further subsurface exploration to better determine the extent of large lateral spreading displacements may be warranted. Some portions of the site were not explored with CPT methods. The extent of the lateral spreading issues identified cannot be easily quantified at this stage, and therefore it must be assumed that they apply to the majority of the site until further study could be conducted.

CBC Section 1803.5.12.3 – 3.3 – Lateral soil loads on foundations;
Basement structures are not planned for this site, therefore lateral load effects on basement foundations are not a concern.

CBC Section 1803.5.12.3 – 3.4 – Reduction in foundation soil-bearing capacity and lateral soil reaction;
Due to the lack of soil cover between the proposed foundation and the liquefiable layer identified, the potential for soil strength loss of the liquefied soils to create a reduced bearing capacity is high. Deepened and strengthened conventional foundations, mat foundations, or post-tensioned foundations may be required. Further foundation design recommendations are located in subsequent sections of this report.

CBC Section 1803.5.12.3 – 3.4 – Soil downdrag and reduction in axial and lateral soil reaction for pile foundations;
Piles foundation system will not be utilized; therefore, downdrag and reduction in axial and lateral soil reaction are not applicable.

CBC Section 1803.5.12.3 – 3.5 – Increases in soil lateral pressures on retaining walls;
Conceptual plans provided to date do not indicate the need for retaining walls at the site, therefore liquefaction should not be a concern.

CBC Section 1803.5.12.3 – 3.6 – Floatation of buried structures.
Structures that enclose a void space such as pipelines, manholes, or buried vaults may be subject to buoyant forces if they are located within the layers below 8 feet from the ground surface where we noted that liquefaction was likely to occur for this site. Such structures may need to be anchored if they are not located within areas mitigated by remedial grading.

CONCLUSIONS AND RECOMMENDATIONS

General Feasibility

Based on our preliminary review and subsurface investigation, it is our opinion that development of the subject property is feasible from a geotechnical standpoint provided that the recommendations in this report are incorporated into the design criteria and project specifications. It is further our opinion that the

anticipated grading and construction will not adversely affect the stability of the adjacent properties provided that they are performed in accordance with the recommendations presented herein. In general, the site should be graded in accordance with our Standard Grading Specifications (Appendix D), or as specified otherwise herein.

Grading Plan Review

This report has been prepared without the aid of a grading plan depicting the proposed grading and construction. As such, the recommendations provided in this report should be considered preliminary and tentative until a finalized grading plan is available, and we have had an opportunity to review the plan. Additional recommendations and/or modification of the recommendations provided herein might be necessary depending upon the results of our grading plan review.

Primary Geotechnical Considerations

There are several geotechnical conditions within the property that will require consideration during the design of the proposed development. These conditions are discussed in the following sections.

Removal and Recompaction of Compressible Surficial Soils

Based on the results of our subsurface and laboratory investigation, the site is underlain by surficial native soil materials that were observed to be generally soft or loose, and will require overexcavation and re-compaction to mitigate excessive settlement. These unsuitable surficial materials typically extend to depths on the order of 3 to 4 feet below the existing ground surface (bgs); however, locally deeper removals may be necessary in areas located between boreholes drilled during our field investigation. Additionally, there are scattered deep sand dunes which consist primarily of loose to very loose sands. Ultimate removal depths must be determined based on observation and testing by the geotechnical consultant during grading operations.

In addition to unsuitable surficial soils, all soils that are disturbed because of Petra's ongoing fault investigation and grading, or agricultural activities, should be removed to a competent bottom and backfilled properly to the satisfaction of the project geotechnical engineer. The depth of removal should be determined based on site observation during the proposed grading. However, a tentative depth of removal may be developed based on the logs of fault trenches and depicted on the site grading plan prior to commencement of the grading activities at the site. The fault trench excavations have been boundary surveyed for precise locations.

Boundary Conditions

As previously stated, average remedial removals within the subject site are anticipated to generally range from 3 to 4 feet below the existing ground surface. Based on the relatively loose, non-cohesive nature of on-site soils, temporary backcut slopes adjacent to the tract boundaries will generally be restricted to a slope ratio of 1:1 (horizontal to vertical) or flatter to protect adjacent offsite improvements (including sidewalks, walls, buried utilities, etc., if they exist). Depending on the actual horizontal extent of remedial grading that is achievable by the grading contractor, it is likely that a wedge of unsuitable soil will remain in place along the site perimeter that will extend into the site to a horizontal distance equal to twice the depth of remedial removals (i.e., approximately 6 to 8 feet). Since new perimeter site improvements may be proposed within this zone, such improvements may need to be designed and constructed with deepened and/or strengthened foundation systems designed to withstand relative movement that is likely to result from settlement of these potentially compressible surficial soils.

Earthwork Recommendations

General Earthwork and Grading Recommendations

All earthwork and grading should be performed in accordance with all applicable requirements of Riverside County and in accordance with recommendations provided in Appendix D, Standard Grading Specifications or where specifically addressed in this report. A representative of the geotechnical consultant of record should be present during grading operations to verify the adequate removal of unsuitable materials and the proper placement and adequate compaction of all fills, as well as to verify compliance with all other recommendations.

Clearing and Grubbing

All existing vegetation such as weeds, grasses, brush, and crops should be stripped and removed from the site prior to any grading, as should all trash and debris. Large shrubs and trees, when removed, should be grubbed out so as to include their stumps and major root systems, and these organic materials removed from the site. Remaining roots exposed during grading will require hand labor for proper removal.

Any existing underground utility lines (such as main irrigation lines) encountered within the areas of proposed grading and construction, if encountered, should be removed from the site. Resultant cavities should be cleared of loose soil and then backfilled with properly compacted fill. Although none were encountered within the site during our subsurface investigation, any seepage pits that may exist within the areas of proposed grading and construction should be cleaned out, backfilled with gravel or clean sand that is jetted in-place, and then capped with a minimum of 5 feet of compacted on-site soils (below

finished grade). Any concrete septic tanks should also be excavated and removed from the site. Any leach line trenches should be located, exposed, and removed from the site. Resultant cavities should be cleared of loose soil and then backfilled with properly compacted fill.

The berms of the existing agricultural reservoirs should be removed. If the bottoms of the existing reservoir basins are found to be loose and yielding, the basins should be excavated to a suitable bottom, and then backfilled with properly compacted fill.

The project geotechnical consultant should be notified at the appropriate times to provide observation services during clearing operations to verify compliance with the above recommendations. Should any unusual geotechnical conditions or subsurface structures be encountered during site clearing and/or grading that are not described or anticipated herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations.

Water Well Capping

Abandonment of water wells, if any, should be performed in accordance with the State of California Well Standards and requirements of Riverside County. In addition, a 5-foot-thick compacted fill blanket (below the proposed grade) should be placed above any capped water well.

Exploratory Trench Backfill Removal and Recompaction

As previously mentioned, we excavated very deep, long trenches in the northeast corner of the property as part of our detailed fault investigation. These trenches have been surveyed and should be demarcated on the grading plans. The excavated soil was pushed back into the trenches with no compactive effort. Soils should therefore be re-excavated, moisture conditioned and re-compacted to ASTM standards as described in the "Fill Placement" section of this report.

Ground Preparation - Fill Areas

All existing low-density surficial materials will require removal to underlying competent native materials (as determined by the project geotechnical consultant) and replacement as properly compacted fill. Competent native materials are defined as undisturbed materials possessing an in-place relative compaction of at least 85 percent and a moisture content that is at or near the optimum moisture content.

Based on exploratory boring and CPT sounding data and laboratory test results, anticipated removal depths of surficial soil materials will vary from approximately 3 to 4 feet. Elevated sand dunes, composed of loose sand, should be removed during grading. It must be emphasized that the estimates are

based on conditions observed at the boring and CPT sounding locations at the time of drilling/excavation. Subsurface conditions can and usually do vary between points of exploration. For this reason, the actual removal depths will have to be determined during grading on the basis of in-grading observations and testing performed by representatives of the project geotechnical consultant.

Where removals and grading do not provide at least 3 feet of compacted fill below the finished grade or at least 3.0 feet below the bottoms of proposed footings, these areas should be overexcavated to 3.0 feet below proposed grade or 3.0 feet below the bottoms of footings, whichever is deeper.

Remedial grading and ground preparation should be performed prior to placing any new fills. Prior to placing structural fill, exposed bottom surfaces in each removal area approved for fill should first be scarified to a depth of at least 6 inches, watered or air-dried as necessary to achieve optimum or slightly above-optimum moisture conditions, and then recompacted in place to a minimum relative compaction of 90 percent.

Processing of Cut Areas

Where existing unsuitable surficial soils are not removed in their entirety in cut areas, these unsuitable materials should be overexcavated to competent native alluvial materials and replaced as properly compacted fill. The depth of overexcavation should be a minimum of 3 feet below the proposed pad grade or at least 3.0 feet below the bottoms of footings, whichever is deeper.

Cut/Fill Transition Areas

It is anticipated that future grading will result in numerous cut-to-fill transitions being exposed at the design finish grade elevations. In most cases, it is expected that cut-to-fill transitions will be eliminated as part of the remedial grading already discussed in the previous paragraphs. However, in areas where only minimal or no remedial grading is to be performed, the transitions should be eliminated by overexcavating the "cut" portions of the lots and replacing the excavated material as properly compacted fill.

The generally recommended depths of overexcavation within each individual building pad are one-half the maximum thickness of fill on the pad, to a minimum depth of 3 feet below the bottoms of the footings, whichever is greater, and a maximum depth of 15 feet below proposed pad grade. The horizontal limits of overexcavation should extend at least 5 feet beyond the proposed building footprint.

Fill Placement

All fills should be placed in lifts no greater than 8 inches in thickness, watered or air-dried as necessary to achieve a uniform moisture content equal to or slightly greater than optimum, and then compacted in place to a minimum relative compaction of 90 percent. The laboratory maximum dry density and optimum moisture content for each change in soil type should be determined in accordance with Test Method ASTM D 1557-02.

Mitigation of Areas Subject to Surface Manifestation of Liquefaction

As explained in a preceding section of this report, titled "Surface Manifestation of Liquefaction", and in order to potentially reduce the adverse impact of insufficient thickness of a non-liquefiable layer over a liquefiable layer (as observed in CPT-1 through CPT-8), installation of two layers of geogrid (Tensar BX1200 or an approved equivalent) is suggested in the southern and southeastern area of the site. If installed, the depth of geogrid should be such that it does not interfere with the installation of utility lines. It is recommended that the extent of these areas be evaluated by additional field investigation after the site grading plans are available.

Stability of Temporary Excavations

Considering the physical characteristics of the native alluvial and lacustrine soils that presently underlie the site, temporary excavations into these materials that are equal to or less than 5 feet in height may be cut vertical. For excavation sidewalls that exceed a height of 5 feet, the lower 5 feet of the temporary excavation may be cut vertical, and the upper portion exceeding this height should be cut back at a maximum slope ratio of 1:1, horizontal to vertical. Where granular, non-cohesive alluvial materials (i.e., sands and gravelly sands) may be exposed in temporary backcut slopes, flatter slope ratios will likely be required to prevent excessive sloughing or backcut failures. In areas where flatter slopes are not possible due to space constraints imposed by tract boundaries and/or offsite structures, shoring may be required.
It is important to emphasize that all temporary slopes should be observed by a representative of the project geotechnical consultant for any evidence of potential instability. Depending on the results of these observations, flatter temporary slope configurations may be necessary in particular, in localized areas.

Geotechnical Observations

Exposed bottom surfaces in each removal and overexcavated area should be observed and approved by a representative of the project geotechnical consultant prior to placing fill. The project geotechnical consultant should also be present on site during grading operations to verify proper placement and

adequate compaction of all fills, as well as to verify compliance with the other recommendations presented herein.

Shrinkage and Subsidence

Volumetric changes will occur when excavated undocumented fill, dune sands and alluvial and lacustrine soils are removed and replaced as properly compacted fill. Based on in-place densities of the earth materials encountered, and on the estimated average degree of compaction that will likely be achieved during grading, an approximate shrinkage of 20 to 25 percent may be anticipated.

The higher factors given above are based on an average in-place relative compaction of 95 percent compaction while the lower factors are based on an average in-place relative compaction of 90 percent. Consequently, as evidenced by these figures, the actual shrinkage that will occur during grading will depend on the average degree of relative compaction achieved. A subsidence estimate of less than 0.2 feet is anticipated as a result of the scarification and recompaction of the exposed ground surfaces within the removal areas.

The above estimates of shrinkage and subsidence are merely intended for use by project planners in approximating earthwork quantities and should not be considered as absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that will occur during grading. It is recommended that additional laboratory testing be performed during future geotechnical investigations to confirm these initial estimates.

Post-Grading Considerations

Pad Drainage

Positive surface drainage systems consisting of a combination of sloped concrete flatwork, sheet flow gradients and earth swales in yard areas, and surface area drains (where needed) should be provided around each building and within the yard areas to collect and direct all surface waters to the adjacent streets. Concrete flatwork surfaces should be inclined at a minimum gradient of 1 percent while sheet-flow-graded ground surfaces should be inclined at a minimum gradient of 2 percent away from building foundations and similar structures. Surface waters should not be allowed to collect or pond against building foundations and within the level areas of the lots, or to flow onto adjacent slopes. Minimum 12-inch-high berms should be maintained along the tops of all descending slopes to prevent any water from flowing over the slopes. Roof gutters with downspouts should be used on the sides of houses where there

is insufficient area to construct effective yard drainage devices and/or where roof drainage is directed onto adjacent slopes.

Future landscape and hardscape features installed by the individual homeowners should be designed such that the positive gravity flow of all excess surface water to adjacent streets is maintained. Where new hardscape features block the surface flow of water, either the surface drainage pattern should be rerouted or surface area drains should be installed to collect the surface water and direct it to the adjacent streets through subsurface drain pipes that outlet into the street gutter.

Future homeowners should be notified that our recommendations for collection and diversion of excess surface water should be followed. Furthermore, the homeowners should be advised that all drainage devices should be properly maintained throughout the lifetime of the development. Future changes to site improvements, or planting and watering practices, should not be allowed to cause over-saturation of site soils adjacent to the structures.

Utility Trenches

All utility trench backfill should be compacted to a minimum relative compaction of 90 percent. On-site earth materials cannot be densified adequately by flooding and jetting techniques. Therefore, trench backfill materials should be placed in lifts no greater than approximately 12 to 18 inches in thickness, watered or air-dried as necessary to achieve near optimum moisture conditions, and then mechanically compacted in place to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should probe and test the backfills to verify adequate compaction.

As an alternative for shallow trenches where pipe or utility lines may be damaged by mechanical compaction equipment, such as under building floor slabs, imported clean sand having a sand equivalent (SE) value of 30 or greater may be utilized. The sand backfill materials should be watered to achieve near optimum moisture conditions and then tamped into place. No specific relative compaction will be required; however, observation, probing, and if deemed necessary, testing should be performed by a representative of the project geotechnical consultant to verify an adequate degree of compaction.

If clean, imported sand is to be used for backfill of exterior utility trenches, it is recommended that the upper 12 inches of trench backfill materials consist of properly compacted on-site soil materials. This is to reduce infiltration of irrigation and rainwater into granular trench backfill materials.

Where an exterior and/or interior utility trench is proposed in a direction parallel to a building footing, the bottom of the trench should not extend below a 1:1 (horizontal to vertical) plane projected downward

from the bottom edge of the adjacent footing. Where this condition occurs, the adjacent footing should be deepened or the utility constructed and the trench backfilled and compacted prior to constructing the footing.

FOUNDATION DESIGN GUIDELINES

Allowable Bearing Capacity, Estimated Settlement and Lateral Resistance

Allowable Soil Bearing Capacities

Pad Footings

An allowable soil bearing capacity of 1,500 pounds per square foot may be utilized for design of isolated 24-inch-square footings founded at a minimum depth of 12 inches below the lowest adjacent final grade for pad footings that are not a part of the slab system and are used for support of such features as roof overhang, second-story decks, patio covers, etc. This value may be increased by 20 percent for each additional foot of depth and by 10 percent for each additional foot of width, to a maximum value of 2,500 pounds per square foot. The recommended allowable bearing value includes both dead and live loads, and may be increased by one-third for short duration wind and seismic forces.

Continuous Footings

An allowable soil bearing capacity of 1,500 pounds per square foot may be utilized for design of continuous footings founded at a minimum depth of 12 inches below the lowest adjacent final grade. This value may be increased by 20 percent for each additional foot of depth and by 10 percent for each additional foot of width, to a maximum value of 2,500 pounds per square foot. The recommended allowable bearing value includes both dead and live loads, and may be increased by one-third for short duration wind and seismic forces.

Estimated Footing Settlement

Based on the allowable bearing values provided above, total settlement of the footings under the anticipated loads is expected to be on the order of ¼ inch. Differential settlement is expected to be less than ¼ inch over a horizontal span of 40 feet. The majority of settlement is likely to take place as footing loads are applied or shortly thereafter.

Lateral Resistance

A passive earth pressure of 250 pounds per square foot per foot of depth, to a maximum value of 2,500 pounds per square foot, may be used to determine lateral bearing resistance for footings. In addition, a coefficient of friction of 0.30 times the dead load forces may be used between concrete and the supporting

soils to determine lateral sliding resistance. The above values may be increased by one-third when designing for transient wind or seismic forces. It should be noted that the above values are based on the condition where footings are cast in direct contact with compacted fill or competent native soils. In cases where the footing sides are formed, all backfill placed against the footings upon removal of forms should be compacted to at least 90 percent of the applicable maximum dry density.

Deepened and Strengthened Conventional Foundations

Onsite soils consist of soil materials that exhibit a Very Low expansion potential as classified in accordance with Section 1803.5.3 of the 2013 CBC. As such, the design of slabs on-grade is considered to be exempt from the procedures outlined in Sections 1803.5.3 and 1808.6.2 of the 2013 CBC and may be performed using any method deemed rational and appropriate by the project structural engineer. However, in order to accommodate for conventional footings founded on potentially liquefiable soils, we recommend that building foundations and floor slabs be deepened and strengthened in accordance with the following minimum criteria:

1. Exterior and interior footings for both one-story and two-story construction should be founded at a minimum depth of 24 inches below the lowest adjacent final grade.

2. All continuous footings should be reinforced with a minimum of four No. 5 bars, two at the top and two at the bottom. Pad footings should be reinforced with No. 5 bars spaced 18 inches on centers, both ways, near the bottoms of the footings. The pad footings should be connected to adjacent pad and continuous footings with reinforced grade beams.

3. Exterior isolated pad footings intended for support of roof overhangs or similar structural features should be a minimum 24 inches square, and founded at a minimum depth of 24 inches below the lowest adjacent final grade. The pad footings should be reinforced in a similar manner as recommended above and connected to adjacent footings with grade beams.

4. Concrete floor slabs should be a minimum 5 inches thick, and reinforced with No. 4 bars spaced 12 inches on centers, both ways. All slab reinforcement should be supported on concrete chairs or brick to ensure the desired placement near mid-depth. Concrete floor slabs should also be doweled into the adjacent footings with No. 4 bars placed 24 inches on centers.

5. Living area concrete floor slabs and areas to receive moisture sensitive floor covering should be underlain with a moisture vapor retarder consisting of a minimum 10-mil-thick polyethylene or polyolefin membrane that meets the minimum requirements of ASTM E96 and ASTM E1745 for vapor retarders (such as Husky Yellow Guard®, Stego® Wrap, or equivalent). All laps within the membrane should be sealed, and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface cannot be achieved by grading, consideration should be given to lowering the pad finished grade an additional inch and then placing a 1-inch-thick leveling course of sand across the pad surface prior to the placement of the membrane.

At the present time, some slab designers, geotechnical professionals and concrete experts view the sand layer below the slab (blotting sand) as a place for entrapment of excess moisture that could adversely impact moisture-sensitive floor coverings. As a preventive measure, the potential for moisture intrusion into the concrete slab could be reduced if the concrete is placed directly on the vapor retarder. However, if this sand layer is omitted, appropriate curing methods must be implemented to ensure that the concrete slab cures uniformly. A qualified materials engineer with experience in slab design and construction should provide recommendations for alternative methods of curing and supervise the construction process to ensure uniform slab curing. Additional steps would also need to be taken to prevent puncturing of the vapor retarder during concrete placement.

6. Garage floor slabs should be a full 5 inches thick and reinforced in a similar manner as living area slabs. 12-inch-wide by 24-inch-deep grade beams should be provided across garage entrances. The grade beams should be reinforced with four No. 5 bars, two at the top and two at the bottom. Consideration should be given to placement of a moisture vapor retarder below the garage slab, similar to that provided in Item 2 above, should the garage slab be overlain with moisture sensitive floor covering.

7. Pre-saturation of subgrade soils below floor slabs will not be required; however, prior to placing concrete, the subgrade soils should be pre-watered to promote uniform curing of the concrete and reduce the development of shrinkage cracks.

Furthermore, additional slab thickness, footing sizes and/or reinforcement more stringent than that recommended above should be provided for structural considerations as determined by the project architect or structural engineer.

Mat Foundation Recommendations

A mat foundation system, if used, should be designed by a qualified structural engineer assuming that total settlements within the site will range up to approximately 1.5 - 2 inches with a differential settlement of approximately 1 inch over a span of 40 feet. The recommended mat foundation should be, at a minimum, 12 inches thick and reinforced with No. 4 bars spaced a maximum of 18 inches on center, both ways. If additional slab thickness and reinforcement are dictated by the project architect or structural engineer, the more conservative design should take precedence. While this system may mitigate distress to the structure due to differential ground subsidence, the slab may require re-leveling using mud jacking or other means following the liquefaction event.

A uniform allowable contact pressure of 1,000 pounds per square foot should be used for design of a reinforced concrete mat foundation system embedded at a minimum depth of 6 inches below the nearest adjacent final grade. No increase in this value is allowed for mat slabs having a greater depth. However, an increase in contact pressure to a maximum of 2,500 pounds per square foot in localized areas, such as mat slab edges and under concentrated loads, may be considered in design. The recommended contact

pressure includes both dead and live loads, and may be increased by one-third when designing for short duration wind but not seismic forces. For design of the building foundation, a modulus of subgrade reaction of 120 pounds per cubic inch may be considered.

Post-Tensioned Foundations

As an alternative to a deepened and strengthened conventional foundation system or a concrete mat foundation, a post-tensioned foundation system may be used within the site. Based on our test results and calculations, onsite soils are expected to have a Very Low expansion potential; however, the potential exists for significant total and differential settlement of the proposed building foundations due to liquefaction-induced settlement. The project structural engineer should assume that total settlements within the site will range up to approximately 1 ½ inches with a differential settlement of approximately 1 inch over a span of 40 feet in order to design the proposed foundations in accordance with Section 6.13.3 of the Post-Tensioning Institutes "Design of Post-Tensioned Slabs-on-Ground, Third Edition," (PTI). The settlement estimates are based on an allowable bearing value of 1,500 pounds per square foot for the foundation soils.

The minimum post-tension design and construction recommendations that follow are based on the above described anticipated soil conditions and may be considered for mitigating the effects of anticipated total and differential settlements. These recommendations have been developed on the basis of previous experience of this firm on projects with similar soil conditions. Although construction performed in accordance with these recommendations has been found to reduce post-construction movement and/or cracking, they generally do not positively mitigate all potential effects of future settlement. The settlement soil parameters provided previously should be utilized by the project structural engineer to design post-tensioned foundations in accordance with Section 6.13.3 of the PTI. Based on this design, thicker floor slabs, larger footing sizes and/or additional reinforcement and additional grade beams may be required and should govern the design if more restrictive than the minimum recommendations provided below:

1. Perimeter footings should be founded at a minimum depth of 12 inches below the lowest adjacent final ground surface. Interior footings may be founded at a minimum depth of 12 inches below the tops of the finish floor slabs.

2. The thickness of the floor slabs should be determined by the project structural engineer with consideration to the estimated settlements; however, we recommend a minimum post-tensioned slab thickness of at least 5 inches.

3. All dwelling area floor slabs constructed on-grade should be underlain with a moisture vapor retarder consisting of a minimum 10-mil-thick polyethylene or polyolefin membrane that meets

the minimum requirements of ASTM E96 and ASTM E1745 for vapor retarders (such as Husky Yellow Guard®, Stego® Wrap, or equivalent). All laps within the membrane should be sealed, and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface cannot be achieved by grading, consideration should be given to lowering the pad finished grade an additional inch and then placing a 1-inch-thick leveling course of sand across the pad surface prior to the placement of the membrane.

At the present time, some slab designers, geotechnical professionals and concrete experts view the sand layer below the slab (blotting sand) as a place for entrapment of excess moisture that could adversely impact moisture-sensitive floor coverings. As a preventive measure, the potential for moisture intrusion into the concrete slab could be reduced if the concrete is placed directly on the vapor retarder. However, if this sand layer is omitted, appropriate curing methods must be implemented to ensure that the concrete slab cures uniformly. A qualified materials engineer with experience in slab design and construction should provide recommendations for alternative methods of curing and supervise the construction process to ensure uniform slab curing. Additional steps would also need to be taken to prevent puncturing of the vapor retarder during concrete placement.

4. Exterior isolated pad footings intended for support of roof overhangs such as second-story decks, patio covers and similar construction should be a minimum of 24 inches square and founded at a minimum depth of 18 inches below the lowest adjacent final grade. The pad footings should be reinforced in a similar manner as recommended above and connected to adjacent footings with grade beams.

5. Presaturation of the subgrade below floor slabs will not be required; however, prior to placing concrete, the subgrade below all dwelling and garage floor slab areas should be thoroughly moistened to achieve a moisture content that is at least equal to or slightly greater than optimum moisture content. This moisture content should penetrate to a minimum depth of 12 inches below the bottoms of the slabs.

6. A 12-inch-wide grade beam founded at the same depth as adjacent footings should be provided across the garage entrance.

7. Garage floor slabs should be designed in a similar manner as living area floor slabs. Consideration should be given to placement of a moisture vapor retarder below the garage slab, similar to that provided in Item 3 above, should the garage slab be overlain with moisture sensitive floor covering.

Footing Observations

All footing trenches should be observed by a representative of the project geotechnical consultant to document that they have been excavated into competent bearing soils prior to the placement of forms, reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, sloughed or moisture-softened soils and/or any construction debris should be removed prior to the placing of concrete. Excavated soils derived from footing and/or utility trenches should not be placed in building

slab-on-grade areas or exterior concrete flatwork areas unless the soils are compacted to at least 90 percent of maximum dry density.

General Corrosivity Screening

As a screening level study, limited chemical and electrical tests were performed on representative samples of onsite soils to identify potential corrosive characteristics of these soils. The following sections present the test results and an interpretation of current codes and guidelines that are commonly used in our industry as they relate to the adverse impact of chemical contents of the site soils and their associated moisture on various components of the proposed structures in contact with site soils.

A variety of test methods are available to quantify corrosive potential of soils for various elements of construction materials. Depending on the test procedures adopted, characteristics of the leachate that is used to extract the target chemicals from the soils and the test equipment; the results can vary appreciably for different test methods in addition to those caused by variability in soil composition. The testing procedures referred to herein are considered to be typical for our industry and have been adopted and/or approved by many public or private agencies. In drawing conclusions from the results of our chemical and electrical laboratory testing and providing mitigation guidelines to reduce the detrimental impact of corrosive site soils on various components of the structure in contact with site soils, heavy references were made to 2013 CBC and American Concrete Institute, 2011 Structural Concrete Building Code (ACI 318-11). Where relevant information was not available in these codes, references were made to guidelines developed by California Department of Transportation (Caltrans), mainly because their risk tolerance for highway bridges are considered comparable to those for residential or commercial structures and that Post Tensioning Institute (PTI), in part, accepts and uses Caltrans' relevant corrosivity criteria for post-tensioned slabs on-grade.

It should be noted that Petra does not practice corrosion engineering; therefore, the test results, opinion and engineering judgment provided herein should be considered as general guidelines only. Additional analyses would be warranted, especially, for cases where buried metallic building materials (such as copper and cast or ductile iron) in contact with site soils are planned for the project. In many cases, the project geotechnical engineer is not informed of these choices. Therefore, for conditions where such elements are considered, we recommend that the project design professionals (i.e., the architect and/or structural engineer) consider recommending a qualified corrosion engineer to conduct additional sampling and testing of near-surface soils during the final stages of site grading to provide a complete assessment of soil corrosivity. Recommendations to mitigate the detrimental effects of corrosive soils on buried

metallic and other building materials that may be exposed to corrosive soils should be provided by the corrosion engineer as deemed appropriate.

Concrete in Contact with Site Soils

Soils containing soluble sulfates beyond certain threshold levels as well as acidic soils are considered to be detrimental to long-term integrity of concrete placed in contact with such soils. For the purpose of this study, soluble sulfates (SO_4) concentration in soils determined in accordance with California Test Method No. 417. The soil soluble sulfate severity rating is adopted from ACI 318 publication. Soil acidity, as indicated by hydrogen-ion concentration (pH), was determined in accordance with California Test Method No. 643. The soil acid severity rating is adopted from The United States Department of Agriculture, Natural Resources Conservation Service classification.

The results of our limited laboratory tests indicate that on-site soils contain a water soluble sulfate content of 0.0486 percent to 0.5346 percent by weight. Based on Article 1904.1 of Section 1904 of the 2013 CBC, concrete that will be exposed to sulfates in water or soil should be assigned exposure classes in accordance with the durability requirements of ACI 318.

Based on the test results and in reference to Table 4.2.1 of ACI 318-11, an exposure class of **S2** is appropriate for onsite soils. Accordingly, a severity level of **Severe** for exposure to sulfate may be expected for concrete placed in contact with the onsite soil materials. Further, Article 1904.2 of Section 1904 of the 2013 CBS requires that concrete mixtures conform to the most restrictive maximum water-cementitious material ratios, maximum cementitious admixture, minimum air-entrainment and minimum specified concrete compressive strength requirements of ACI 318. Table 4.3.1 of ACI 318-11 indicates that Type V cement (in accordance with ASTM C150) would be required for this condition. In addition, the maximum water/cement ratio of the fresh concrete should not exceed 0.45, and concrete minimum unconfined compressive strength, f'_c, should not be less than 4,500 psi. However, Post Tensioning Institute recommends a minimum f'_c of 3,000 psi for post-tensioned slabs on-grade where water-soluble sulfate is greater than 0.2 percent by weight.

It should be noted that for occupancies and appurtenances thereto in Group R occupancies that are in buildings less than four stories above grade plane the 2013 CBC allows for an exception to the above requirements. That is, in lieu of the above requirements, Article 1904.2 of Section 1904 of the 2013 CBC provides that normal weight aggregate concrete is permitted to comply with the requirements of Table1904.2 (in conjunction with Figure 1904.2), which appears to suggest that the minimum unconfined compressive strength, f'_c, may be reduced to 2,500 psi. It is our understanding that this recommendation

may not apply to post-tensioned slabs on-grade as Post Tensioning Institute requirements is a minimum f'_c of 3,000 psi for this condition.

The results of limited in-house testing of representative samples indicate that soils within the subject site are slightly alkaline with respect to a pH of 8.0 to 8.4. Based on this finding and according to Table 8.22.2 of Caltrans' 2003 Bridge Design Specifications (2003 BDS) requirements (which consider the combined effects of soluble sulfates and soil pH), a commercially available Type V or Type II Modified cement may be used.

The guidelines provided herein should be evaluated and confirmed, or modified, in its entirety by the project structural engineer and the contractor responsible for concrete placement for concrete used in exterior and interior footings, interior slabs on-ground, garage slabs, walls foundation and concrete exposed to weather such as driveways, patios, porches, walkways, ramps, steps, curbs, etc.

Metals Encased in Concrete

Soils containing a soluble chloride concentration beyond a certain threshold level are considered corrosive to metallic elements such as reinforcement bars, tendons, cables, bolts, etc. that are encased in concrete that, in turn, is in contact with such soils. For the purpose of this study, soluble chlorides (Cl) in soils were determined in accordance with California Test Method No. 422.

Based on Article 1904.1 of Section 1904 of the 2013 CBC, concrete that will be exposed to chlorides from "*deicing chemicals, salt, saltwater, brackish water, seawater or spray from these sources, where concrete has steel reinforcement*" should be assigned exposure classes in accordance with the durability requirements of ACI 318. According to Table 4.2.1 of ACI 318-11, an exposure class of **C0** with a severity designation of **Not Applicable** is appropriate for reinforced concrete that remains dry or protected from moisture. Similarly, an exposure class of **C1** with a severity designation of **Moderate** is appropriate for reinforced concrete that is exposed to moisture but not to external sources of chlorides. And, lastly, an exposure class of **C2** with a severity designation of **Severe** is appropriate for reinforced concrete that is exposed to moisture and external sources of chlorides as enumerated above.

Based on our understanding of the project, it is our professional opinion that an exposure class of **C1** with a severity designation of **Moderate** is appropriate for a majority of reinforced concrete, to be placed at the site, that are in contact with site soils. It should be noted, however, that an exposure class of **C2** with a severity designation of **Severe** is more appropriate for reinforced concrete that is planned for pool walls and decking, should such features be considered for the project.

The results of our limited laboratory tests performed indicate that onsite soils contain a water-soluble chloride concentration of 238 to 780 parts per million (ppm). Article 1904.2 of Section 1904 of the 2013 CBC requires that concrete mixtures conform to the most restrictive maximum water-cementitious material ratios, maximum cementitious admixture, minimum air-entrainment and minimum specified concrete compressive strength requirements of ACI 318 based on the exposure classes assigned in Article 1904.1. No maximum water/cement ratio for the fresh concrete is prescribed by ACI 318 for class **C1** (or **Moderate** severity) exposure condition. However, Table 4.3.1 of ACI 318-11indicates that concrete minimum unconfined compressive strength, f'_c, should not be less than 2,500 psi. For class **C2** (or **Severe**) exposure condition, Table 4.3.1 of ACI 318-11requires that the maximum water/cement ratio of the fresh concrete should not exceed 0.40, and concrete minimum unconfined compressive strength, f'_c, should not be less than 5,000 psi.

One method of protecting reinforcement in concrete where elevated chloride concentrations are present in the soils is to increase the thickness of the concrete cover over the reinforcement. Table 8.22.1 of Caltrans BDS 2003 provides a minimum concrete cover of 3 inches for all structural elements of foundation when chloride concentration in the surrounding soils is determined to be in excess of 500 ppm but less than 5,000 ppm (as is the case for the subject site). Further, Section 6.2.2 of Standard Requirements for Design of Shallow Post-Tensioned Concrete Foundations on Expansive soils by Post Tensioning Institute requires that a minimum concrete cover of 3 inches is maintained for the tendons, encapsulated tendons be used or any other method of corrosion protection is devised by the Engineer. This guideline should be evaluated and confirmed or modified by the project structural engineer.

The guidelines provided herein should be evaluated and confirmed, or modified, in its entirety by the project structural engineer for reinforced concrete placement for concrete used in exterior and interior footings, interior slabs on-ground, garage slabs walls foundation and concrete exposed to weather such as driveways, patios, porches, walkways, ramps, steps, curbs, etc.

It should be noted that another source of elevated chloride-ion concentration can be the chloride content of water that is used to prepare the fresh concrete at the plant. The protection against high chloride concentration in fresh concrete should therefore be provided by concrete suppliers for the project in accordance with Table 4.3.1 of ACI 318-11.

Metallic Elements in Contact with Site Soils

Elevated concentrations of soluble salts in soils tend to induce low level electrical currents in metallic objects in contact with such soils. This process promotes metal corrosion and can lead to distress to

building metallic components that are in contact with site soils. The minimum electrical resistivity measurement provides a simple indication of relative concentration of soluble salts in the soil and, therefore, is widely used to estimate soil corrosivity with regard to metals. For the purpose of this investigation, the minimum resistivity in soils is measured in accordance with California Test Method No. 643. The soil corrosion severity rating is adopted from the Handbook of Corrosion Engineering by Pierre R. Roberge.

The minimum electrical resistivity for onsite soils was found to be in the range of 140 to 730 ohm-cm based on limited testing, less than 1000 ohm-cm. The result indicates that on-site soils are **Extremely Corrosive** to ferrous metals and copper. As such, any ferrous metal or copper components of the subject buildings (such as cast iron or ductile iron piping, copper tubing, etc.) that are expected to be placed in direct contact with site soils should be protected against detrimental effects of extremely corrosive soils based on recommendations provided by a qualified corrosion engineer.

Free-Standing Masonry Block Walls

Footings for masonry block walls should be designed using the allowable bearing and lateral resistance values provided previously for building footings. However, as a minimum, the wall footings should be founded at a depth of at least 12 inches below the lowest adjacent final grade. However, where loose surface soils are not removed and recompacted near the tract boundary lines as previously recommended herein, the footings in these areas should be extended through the loose surface soils and founded in the underlying competent bearing materials. In addition, the footings should be reinforced with a minimum of two No. 4 bars, one top and one bottom. In order to reduce the potential for unsightly cracking related to the possible effects of differential settlement and/or expansion, consideration should be given to providing positive separations (construction joints) between wall sections at each corner. The separations should be provided in the free-standing wall sections and not extend through the footings. The footings should be poured monolithically with continuous rebars to serve as effective "grade beams" below the walls.

Retaining Wall Design Recommendations

Allowable Bearing Capacity and Lateral Resistance for Footings

Retaining wall footings may be designed using the allowable bearing capacity and lateral resistance values recommended for building footings; however, when calculating lateral resistance, the upper 6 inches of the soil cover should be ignored in areas where the footings will not be covered with concrete flatwork.

Active and At-Rest Earth Pressures

As of the date of this report, it is uncertain whether any retaining walls proposed on site will be backfilled with on-site soils or imported granular materials. For this reason, active and at-rest earth pressures are provided below for both conditions.

1. On-Site Soils Used for Backfill

   Based on our testing of near surface soils, it is assumed that site surface soils at the completion of grading will have expansion potentials that range from Very Low to Low. Therefore, active earth pressures equivalent to fluids having densities of 40 and 63 pounds per cubic foot should be used for design of cantilevered walls retaining a level backfill and ascending 2:1 backfill, respectively. For walls that are restrained at the top, at-rest earth pressures of 60 and 95 pounds per cubic foot (equivalent fluid pressures) should be used. The above values are for retaining walls that have been supplied with a proper subdrain system (see Figures RW-1, 2 & 3, Appendix D). All walls should be designed to support any adjacent structural surcharge loads imposed by other nearby walls or footings in addition to the above recommended active and at-rest earth pressures.

   It should be noted that the above earth pressures are based on a condition where expansive on-site soils are used for backfill. If less expansive on-site materials are available for wall backfill, these lateral earth pressures may be reduced accordingly. Final recommendations should be provided by the project geotechnical consultant at the completion of rough grading operations.

2. Sand Backfill

   Where sufficient area exists behind the proposed walls, clean sand exhibiting a sand equivalent value (SE) of 30 or greater, or pea gravel or crushed rock may be used for wall backfill to reduce the lateral earth pressures provided these granular backfill materials extend behind the walls to a minimum horizontal distance equal to one-half the wall height. In addition, the sand, pea gravel or rock backfill materials should extend behind the walls to a minimum horizontal distance of 2 feet at the base of the wall or to a horizontal distance equal to the heel width of the footing, whichever is greater (see Figures RW-2 and RW-3). For the above conditions, cantilevered walls retaining a level backfill and ascending 2:1 backfill may be designed to resist active earth pressures equivalent to fluids having densities of 30 and 41 pounds per cubic foot, respectively. For walls that are restrained at the top, at-rest earth pressures equivalent to fluids having densities of 45 and 62 pounds per cubic foot are recommended for design of restrained walls supporting a level backfill and ascending 2:1 backfill, respectively. These values are also for retaining walls supplied with a proper subdrain system. Furthermore, as with native soil backfill, the walls should be designed to support any adjacent structural surcharge loads imposed by other nearby walls or footings in addition to the recommended active and at-rest earth pressures.

All structural calculations and details should be provided to this firm for verification purposes prior to grading and construction phases.

Drainage

Perforated pipe and gravel subdrains should be installed behind all retaining walls to prevent entrapment of water in the backfill (see Figures RW-1 through RW-3). Perforated pipe should consist of 4-inch-minimum diameter PVC Schedule 40, or ABS SDR-35, with the perforations laid down. The pipe should be encased in a 1-foot-wide column of ¾-inch to 1½-inch open-graded gravel. If on-site soils are used as backfill, the open-graded gravel should extend above the wall footings to a minimum height equal to one-third the wall height, or to a minimum height of 1.5 feet above the footing, whichever is greater unless laboratory testing determines that the soil material used is "clean". If imported sand, pea gravel, or crushed rock is used as backfill, the open-graded gravel should extend above the wall footing to a minimum height of 1 foot above the footing. The open-graded gravel should be completely wrapped in filter fabric consisting of Mirafi 140N, or equivalent. Solid outlet pipes should be connected to the subdrains and then routed to a suitable area for discharge of accumulated water.

For low-height retaining walls, an alternative drainage system consisting of weepholes or open masonry joints may be used in lieu of a pipe and gravel subdrain. Weepholes, if used, should be 3 inches minimum diameter and provided at maximum intervals of 6 feet along the walls. Open vertical masonry joints should be provided at 32-inch minimum intervals. One cubic foot of gravel should be placed behind the weepholes or open masonry joints. The gravel should be wrapped in filter fabric to prevent infiltration of fines and subsequent clogging of the gravel. Filter fabric should consist of Mirafi 140N or equivalent. **Weep holes are not recommended where slabs or hardscape are proposed at the base of the walls.**

Waterproofing

The portions of retaining walls supporting backfill should be coated with an approved waterproofing compound or covered with a similar material to inhibit infiltration of moisture through the walls.

Wall Backfill

Recommended active and at-rest earth pressures for design of retaining walls are based on the physical and mechanical properties of the on-site soils. To facilitate compaction of the backfill, consideration may be given to using sand, pea gravel, crushed rock, or on-site granular soils for backfill that exhibit a **VERY LOW** expansion potential (Expansion Index of less than 20). For this condition, the reduced active and at-rest pressures provided previously for sand, pea gravel or crushed rock backfill may be considered in wall design provided that they are installed as shown on Figures RW-2 and RW-3 and provided that sufficient room exists behind the walls to make the proper backcuts.

Where on-site soils or imported sand are used for backfill, they should be placed in approximately 6- to 8-inch-thick maximum lifts, watered as necessary to achieve near optimum moisture conditions, and then mechanically compacted in place to a minimum relative compaction of 90 percent. Flooding or jetting of clean sand materials may be performed. A representative of the project geotechnical consultant should observe the backfill procedures and test the wall backfill to verify adequate compaction.

If imported pea gravel or rock is used for backfill, the gravel should be placed in approximately 2- to 3-foot-thick lifts, thoroughly wetted but not flooded, and then mechanically tamped or vibrated into place. A representative of the project geotechnical consultant should observe the backfill procedures and probe the backfill to determine that an adequate degree of compaction is achieved.

To mitigate the potential for the direct infiltration of surface water into the backfill, imported sand, gravel or rock backfill should be capped with at least 12 inches of on-site fine-grained (silty soils, etc.) soil. Filter fabric such as Mirafi 140N, or equivalent, should be placed between the soil and the imported gravel or rock to prevent fines from penetrating into the backfill.

Exterior Concrete Flatwork

Thickness and Joint Spacing

To reduce the potential for development of unsightly cracking, concrete sidewalks and patio-type slabs should be at least 3 inches thick and provided with construction joints or expansion joints every 6 feet or less. Concrete driveway slabs should be at least 4 inches thick and provided with construction joints or expansion joints every 10 feet or less.

Reinforcement

Consideration should be given to reinforcing all concrete patio-type slabs, driveways and sidewalks greater that 5 feet in width with 6” x 6” gauge welded wire mesh. The reinforcement should be positioned near the middle of the slabs by means of concrete chairs or bricks.

Subgrade Preparation

As a further measure to mitigate cracking and/or shifting of concrete flatwork, the subgrade soils below concrete flatwork areas should be compacted to a minimum relative compaction of 90 percent prior to placing concrete. The moisture content of the soils should be at least equal to optimum moisture content. Flooding or ponding of the subgrade may be considered feasible to achieve the above moisture

conditions. Alternatively, moisture conditioning should be achieved with sprinklers or a light spray applied to the subgrade over a period of several days just prior to placing concrete.

The project geotechnical consultant should observe and verify the density and moisture content of the soils, and the depth of moisture penetration prior to placing concrete.

Preliminary Pavement Section Design

Structural pavement section thicknesses for the roadways within the subject tract were calculated based on a preliminary assumed R-value of 58 and Traffic Indices (T.I.'s) in accordance with Caltrans criteria and Riverside County requirements. We recommend a structural pavement section consisting of hot mix asphalt (HMA) underlain suitable aggregate base (AB) for all streets. Preliminary structural pavement sections for various T.I.'s are summarized in the following table.

Preliminary Structural Pavement Sections

Traffic Index	Preliminary R-Value	Asphaltic Concrete (inches)	Aggregate Base (inches)
5.0	58	3.0	4.0
6.0	58	3.0	4.5
7.0	58	4.0	4.5
9.0	58	5.5	6.5

It should be noted that the following structural pavement sections should be reevaluated based on R-value tests on near-surface soil samples after completion of rough grading.

Subgrade soils should be properly compacted, smooth, and non-yielding prior to pavement construction. The subgrade soils should be compacted to at least 95 percent of ASTM D1557-02.

Aggregate base materials should be Crushed Aggregate Base, Crushed Miscellaneous Base, or Processed Miscellaneous Base conforming to Section 200-2 of the Standard Specifications for Public Works Construction (Greenbook). It should be noted that base thickness reported herein is based on the use of Crushed Aggregate base material. For conditions where either Crushed Miscellaneous Base or Processed Miscellaneous Base Materials are used, a 10 percent increase in base section thickness should be incorporated in the design and construction of the structural pavement section. The base materials should be brought to a uniform moisture near optimum and then compacted to at least 95 percent of ASTM D1557-02. Asphaltic concrete materials and construction should conform to Section 203 of the Greenbook.

RECOMMENDATIONS FOR ADDITIONAL STUDY

The findings and conclusions presented in this preliminary geotechnical investigation report are based on our review of the current site conditions and without development plans. When final grading plans for the site have been developed they should be submitted to Petra for review. Based on the results of that review, additional studies (possibly including supplemental subsurface investigation and geotechnical analysis) may be necessary to provide detailed recommendations that are appropriate for the grading and construction proposed.

FUTURE IMPROVEMENTS AND/OR GRADING

If additional significant residential yard improvements are considered at any time in the future, our firm should be notified so that we may provide design recommendations to mitigate movement, settlement and/or tilting of the structures. Design recommendations are particularly critical where new improvements may be planned on or near the top of any descending slope.

Potential problems can develop when drainage on the pad is altered in any way such as by placement of fill and construction of new walkways, patios, garden walls and planters. Therefore, it is recommended that we be engaged to review the final design drawings, specifications and grading plan prior to any new construction. If we are not provided the opportunity to review these documents with respect to the geotechnical aspects of new construction and grading, we can take no responsibility for misinterpretation of our recommendations presented herein.

INVESTIGATION LIMITATIONS

This report is based on the proposed project and geotechnical data as described herein. The materials encountered on the project site, described in other literature, and utilized in our laboratory investigation are believed representative of the total project area, and the conclusions and recommendations contained in this report are presented on that basis. However, soils can vary in characteristics between points of exploration, both laterally and vertically, and those variations could affect the conclusions and recommendations contained herein. As such, observation and testing by a geotechnical consultant during the construction phase of the project are essential to confirming the basis of this report. To provide the greatest degree of continuity between the design and construction phases, consideration should be given to retaining Petra Geotechnical, Inc., for construction services.

This report has been prepared consistent with the level of care being provided by other professionals providing similar services at the same locale and in the same time period. This report provides our

professional opinions and as such, they are not to be considered a guaranty or warranty. This report should be reviewed and updated after a period of one year or if the site conditions, ownership or project concept changes from that described herein.

This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes.

This opportunity to be of service is sincerely appreciated. Should you have any questions pertaining to this report, please do not hesitate to call.

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Respectfully submitted,

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TABLE 1

LABORATORY MAXIMUM DRY DENSITY[1]

Test Pit Number	Depth (ft.)	Soil Type	Optimum Moisture (%)	Maximum Dry Density (pcf)
B-1	0-5	Silty Sand	12.5	114.5
B-3	0-5	Silty Sand	12.0	118.5

EXPANSION INDEX[2]

Test Pit Number	Depth (ft.)	Soil Type	Expansion Index (Expansion Potential)
B-1	0-5	Silty Sand (SM)	2 (VERY LOW)
B-3	0-5	Silty Sand (SM)	2 (VERY LOW)

DIRECT SHEAR TEST DATA[3]

Test Pit Number	Depth (ft.)	Cohesion(psf)	Friction Angle	Soil Type
B-1 (Peak)	0-5	130	27	Silty Sand (SM)
B-1 (Ultimate)	0-5	90	27	Silty Sand (SM)
B-3 (Peak)	0-5	210	27	Silty Sand (SM)
B-3 (Ultimate)	0-5	105	26	Silty Sand (SM)

CORROSION TESTS

Location/Depth (ft)	Sulfate [4] (ppm)	Chloride [5] (ppm)	pH[6]	Resistivity[7] (ohm-cm)	Corrosivity Potential
B1 @ 0-5	486	238	8.0	730	Severe to Very Severe
B3 @ 0-5	535	780	8.4	140	Severe to Very Severe

ORGANIC CONTENT[8]

Location/Depth (ft)	Organic content (%)	Moisture Content (%)
B1 @ 0-5	.48	4.1
B2 @ 0-5	.97	14.2
B3 @ 0- 5	.61	8.0
B4 @ 0-5	.34	.69

WASH SIEVE ANALYSIS[9]

Location/Depth (ft)	% Retained on -#200 Sieve	% Passing -#200 Sieve
B1 @ 0-5	76	24

(1) Per Test Method ASTM D 1557-00
(2) Per Test Method UBC Standard 18-2.
(3) Per Test Method ASTM: D3080-72 (remolded to 90%)
(4) Per California Test Method No. 417
(5) Per California Test Method No. 422
(6) Per California Test Method No. 643
(7) Per California Test Method No. 643
(8) Per Test Method ASTM D2974-00
(9) Per Test Method ASTM D1140-00

LABORATORY TEST PROCEDURES

Soil Classification
Soil and bedrock materials encountered within the property were classified and described utilizing the visual manual procedures of the Unified Soil Classification System, and in general accordance with Test Method ASTM D2488

In-Situ Moisture and Density
Moisture content and dry density of the in place soils were determined in representative strata in accordance with test method ASTM D 2216-98. Test data are summarized for the exploratory borings, trenches and CPT soundings in the Exploration Logs, Appendix A.

Laboratory Maximum Dry Density
Maximum dry density and optimum moisture content of near-surface materials were determined for two samples in accordance with ASTM D 1557-02. The results of these tests are presented on Table 1.

Direct Shear
The Coulomb shear strength parameters (angle of internal friction and cohesion) were determined for remolded samples. The shear tests were performed in accordance with Test Method no. ASTM D 3080-98. The test specimens were sheared under varying normal loads at a maximum constant rate of strain of 0.01 inches per minute. Results are graphically presented on Plates B-17 and B-18.

Expansion Potential
Expansion index tests were performed on two selected samples of near surface soils in accordance with California Building Code Standard Test No. 18-2. The results of this test are presented on Table 1.

Soluble Sulfates and Chlorides
Chemical analyses were performed on selected samples of near-surface soils to determine preliminary soluble sulfate and chloride contents in accordance with California Test Method Nos. 417 and 422, respectively. Test results are presented on Table 1 below.

pH and Resistivity
pH and resistivity tests were performed on selected samples of near-surface site soils to provide a preliminary evaluation of their corrosive potential to concrete and metal construction materials. These tests were performed in accordance with California Test Method Nos. 532 and 643, respectively. The results of these tests are included in Table 1.

Grain-Size Analysis
Grain-size analyses were performed on selected samples. These tests were performed in general accordance with ASTM Test Method D 422-90. Test results are presented on Plates B-1 through B-4.

Consolidation
Settlement predictions under anticipated loads were made on the basis of the consolidation tests. These tests were performed in general accordance with Test Method ASTM D 2435-96. Axial loads were applied in several increments to a laterally restrained 1-inch-high sample. Loads were applied in a geometric progression by doubling the previous load, and the resulting deformations were recorded at selected time intervals. Test samples were inundated at the calculated overburden pressure. Results of these are graphically presented on Plates B-5 through B-16.

Organic Content
Determination of ash content and organic matter content by percentage was performed on selected soil samples. These tests were performed in general accordance with ASTM Test Method D2974-00. Results of these tests are presented in Table 1.

Wash Sieve Analysis (-#200)
Determination of amount of soil passing -#200 sieve (75-um) by wet sieving was performed on a soil sample. This test was performed in general accordance with ASTM Test Method D1140-00. Results of this test is presented on Table 1.

STANDARD GRADING SPECIFICATIONS

These specifications present the usual and minimum requirements for projects on which Petra Geotechnical, Inc. is the geotechnical consultant.

No deviation from these specifications will be allowed, except where specifically superseded in the preliminary geology and soils report, or in other written communication signed by the Soils Engineer or Engineering Geologist of record.

I. GENERAL

A. The Soils Engineer and Engineering Geologist are the Owner=s or Builders' representative on the Project. For the purpose of these specifications, participation by the Soils Engineer includes that observation performed by any person or persons employed by, and responsible to, the licensed Civil Engineer signing the soils report.

B. All clearing, site preparation, or earthwork performed on the project shall be conducted by the Contractor under the supervision of the Soils Engineer.

C. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Soils Engineer and to place, spread, mix, water, and compact the fill in accordance with the specifications of the Soils Engineer. The Contractor shall also remove all material considered unsatisfactory by the Soils Engineer.

D. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of compaction. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement, and time of year.

E. A final report shall be issued by the Soils Engineer and Engineering Geologist attesting to the Contractor's conformance with these specifications.

II. SITE PREPARATION

A. All vegetation and deleterious material shall be disposed of off site. This removal shall be concluded prior to placing fill.

B. Soil, alluvium, or bedrock materials determined by the Soils Engineer as being unsuitable for placement in compacted fills shall be removed from the site. Any material incorporated as a part of a compacted fill must be approved by the Soils Engineer.

C. After the ground surface to receive fill has been cleared, it shall be scarified, disced, or bladed by the Contractor until it is uniform and free from ruts, hollows, hummocks, or other uneven features which may prevent uniform compaction.

The scarified ground surface shall then be brought to optimum moisture, mixed as required, and compacted as specified. If the scarified zone is greater than 12 inches in depth, the excess shall be removed and placed in lifts restricted to 6 inches.

Prior to placing fill, the ground surface to receive fill shall be inspected, tested, and approved by the Soils Engineer.

D. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines, or others are to be removed or treated in a manner prescribed by the Soils Engineer.

E. In order to provide uniform bearing conditions in cut-fill transition lots and where cut lots are partially in soil, colluvium, or unweathered bedrock materials, the bedrock portion of the lot extending a minimum of 3 feet outside of building lines shall be over excavated a minimum of 3 feet and replaced with compacted fill. (Typical details are given on Plates SG-1.)

III. COMPACTED FILLS

A. Any material imported or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Soils Engineer. Roots, tree branches, and other matter missed during clearing shall be removed from the fill as directed by the Soils Engineer.

1. Rock fragments less than 6 inches in diameter may be utilized in the fill, provided:

2. They are not placed in concentrated pockets.

3. There is a sufficient percentage of fine grained material to surround the rocks.

B. The distribution of rocks is supervised by the Soils Engineer.

C. Rocks greater than 6 inches in diameter shall be taken off site, or placed in accordance with the recommendations of the Soils Engineer in areas designated as suitable for rock disposal. (A typical detail for Rock Disposal is given in Plate SG-2).

D. Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fill.

E. Representative samples of material to be utilized as compacted fill shall be analyzed by the laboratory of the Soils Engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Soils Engineer as soon as possible.

F. Material used in the compaction process shall be evenly spread, watered processed, and compacted in thin lifts not to exceed 6 inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Soils Engineer.

G. If the moisture content or relative density varies from that required by the Soils Engineer, the Contractor shall rework the fill until it is approved by the Soils Engineer.

H. Each layer shall be compacted to 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency. (In general, ASTM D-1557-91, the five-layer method will be used.)

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soils condition, the area to receive fill compacted

to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the soils report.

I. All fills shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material except where the slope receiving fill exceeds a ratio of five horizontal to one vertical, in accordance with the recommendations of the Soils Engineer.

J. The key for hillside fills should be a minimum of 15 feet in width and within bedrock or firm materials, unless otherwise specified in the soils report. (See detail on Plate SG-3).

K. Subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, or with the recommendations of the Soils Engineer or Engineering Geologist. (Typical Canyon Subdrain details are given in Plate SG-4.)

L. The contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses, and stabilization fills. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure which produces the required compaction.

M. All fill slopes should be planted or protected from erosion by other methods specified in the soils report.

N. Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials, and the transition shall be stripped of all soil prior to placing fill. (See detail on Plate SG-7.)

IV. CUT SLOPES

A. The Engineering Geologist shall inspect all cut slopes at vertical intervals not exceeding 10 feet.

B. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Soils Engineer, and recommendations shall be made to treat these problems. (Typical details for stabilization of a portion of a cut slopes are given in Plates SG-5 and SG-8).

C. Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a nonerodible interceptor swale placed at the top of the slope.

D. Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

E. Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Soils Engineer or Engineering Geologist.

STANDARD GRADING SPECIFICATIONS

V. GRADING CONTROL

A. Observation of the fill placement shall be provided by the Soils Engineer during the progress of grading.

B. In general, density tests should be made at intervals not exceeding 2 feet of fill height or every 500 cubic yards of fill placement. This criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verily that the required compaction is being achieved.

C. Density tests should also be made on the surface material to receive fill as required by the Soils Engineer.

D. All cleanouts, processed ground to receive fill, key excavations, subdrains, and rock disposals must be inspected and approved by the Soils Engineer or Engineering Geologist prior to placing any fill. It shall be the Contractor's responsibility to notify the Soils Engineer when such areas are ready for inspection.

VI. CONSTRUCTION CONSIDERATIONS

A. Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

B. Upon completion of grading and termination of inspections by the Soils Engineer, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Soils Engineer or Engineering Geologist.

C. Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of permanent nature on or adjacent to the property.

UPDATED PRELIMINARY GEOTECHNICAL INVESTIGATION AGUA DEL VISTA PROJECT (FORMER ALPINE 280 PROJECT) LOCATED EAST OF TYLER STREET, WEST OF POLK STREET SOUTH OF I-10 AND NORTH OF AVENUE 48 CITY OF COACHELLA, CALIFORNIA

UNITED ENGINEERING GROUP

May 7, 2015
J.N. 14-108

PETRA GEOTECHNICAL, INC.
RIVERSIDE COUNTY

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Temecula, CA 92591
T: 951.600.9271 F: 951.719.1499

December 1, 2014
J.N. 14-108

Mr. Beau D. Cooper
UNITED ENGINEERING GROUP
10602 Trademark Parkway, Suite 509
Rancho Cucamonga, California 91730

Subject: **Summary On-Site Falling-Head Percolation Testing, *Vista del Agua Project*, Northwest Corner of Avenue 48 and Polk Street, City of Coachella, Riverside County, California**

References: United Engineering Group, 2014, Vista Del Agua, Infrastructure Plans 5-12, Drainage/Hydrology, Figure 5-6, City of Coachella, County of Riverside, California

Dear Mr. Cooper:

Petra Geotechnical, Inc. (Petra) is pleased to submit this report documenting on-site falling-head percolation testing in support of engineering design of the proposed retention basin and three proposed water quality basins within the property located at the on the northwest corner of Avenue 48 and Polk Street in the City of Coachella, Riverside County, California. This work was performed in general accordance with the scope of work outlined in our proposal dated January 23, 2014. The purpose of this field testing was to determine additional un-factored infiltration test rates for use in the design of the proposed retention basin improvements.

SCOPE OF SERVICES

The purpose of this study is to conduct four on-site falling-head percolation testing at proposed basin locations and provide infiltration test results. Basin plans recently provided to Petra are limited to location; basin depths were provided by the client by electronic and verbal communication.

One percolation test was conducted at each of the specified locations. Boring locations, plotted on the site plan, were located in the field by Petra's field personnel on November 25, 2014. Four, three-inch diameter borings were drilled the same day to depths of five (5) feet below existing grades. The holes were pre-soaked immediately after drilling. Percolation testing was completed on September 26, 2014 by

one of Petra's senior engineering technicians. Pre-soaking was maintained on each test hole until testing commenced. All test holes were checked for caving prior to the onset of testing, as well as at the completion of testing. No caving occurred in any of the borings.

The falling-head percolation test data was utilized in determining the test infiltration rate, I_t, expressed in units of inches/hour, utilizing the Porchet Method (RCFCWCD, 2011). Test data are attached for each test. The infiltration rate, I_t, was calculated for each test by determining the volumetric water flow through the wetted borehole surface area, expressed in terms of inches per hour.

The percolation testing program consisted of the following:

1. Drill one boring (P-1) near the southwest corner of the site in the area of the proposed retention basin on PA-5 to a depth of 5 feet. Conducted testing in the entire 5 feet of the boring.

2. Drill one boring (P-2) in the area of the proposed water quality basin located on PA-10 to a depth of 5 feet. Conducted testing in the entire 5 feet of the boring.

3. Drill one boring (P-3) in the area of the proposed water quality basin located on PA-2 to a depth of 5 feet. Conducted testing in the entire 5 feet of the boring.

4. Drill one boring (P-4) in the area of the proposed water quality basin located on PA-6 to a depth of 5 feet. Conducted testing in the entire 5 feet of the boring.

5. Conduct falling head percolation tests in general compliance with County of Riverside Department of Environmental Health, Onsite Wastewater Treatment Systems – Technical Guidance Manual.

6. Analyze the percolation test data to determine the corresponding test infiltration rate.

7. Preparation of this report identifying the test locations, soil description, percolation test data, method of data analysis, and recommended <u>un-factored</u> test infiltration rates.

<u>Soil Conditions</u>

Soils encountered in test holes P-1 through P-4 consisted predominantly of sand and silty sand with trace fine to coarse gravel and occasional gravel lenses.

Infiltration Test Results

Test data are attached and summarized in the following table.

SUMMARY OF INFILTRATION TEST RESULTS			
Test Designation	**Test Date**	**Basin Location**	**Un-Factored Infiltration Rate, I_t (in/hr)**
P-1	11-25-2014	PA-5	2.2
P-2	11-25-2014	PA-10	1.6
P-3	11-25-2014	PA-2	1.8
P-4	11-25-2014	PA-6	2.7

This opportunity to be of service is sincerely appreciated. If you have any questions, please contact this office.

Respectfully submitted,
PETRA GEOTECHNICAL, INC.

Grayson Walker, GE
Vice President
GE 871

REGISTERED PROFESSIONAL ENGINEER
GRAYSON R. WALKER
GE 871
GEOTECHNICAL
STATE OF CALIFORNIA

AGW/GRW/nbc

Attachments: Percolation Test Location Map, Figure 1
Infiltration Test Results (P-1 through P-4)
Distribution: (3) Addressee

LEGEND

P-4 - Approximate Percolation Test Location

Reference: Bing Maps

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40880 County Center Drive, Suite R
Temecula, California 92591
PHONE: (951) 600-9271
COSTA MESA TEMECULA PALM DESERT SANTA CLARITA

Percolation Test Location Map

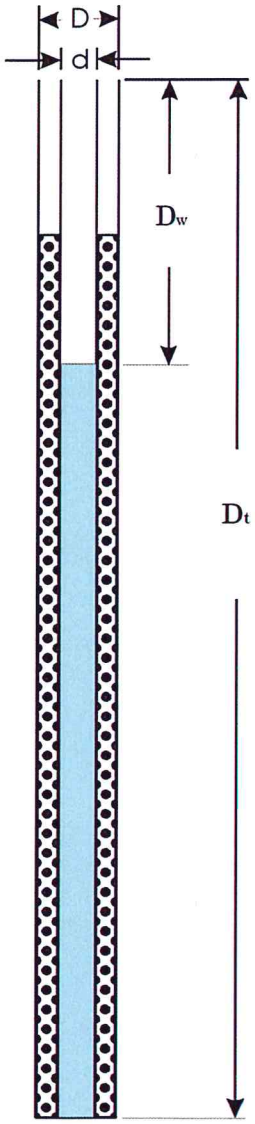
Vista Del Agua Project
Coachella, California

DATE: December, 2014	J.N.: 14-108	**Figure 1**
DWG BY: AGW	SCALE: NTS	

PERCOLATION TEST SUMMARY

Test Number: P-1

Job No. 14-108
Project Name: Vista del Agua
Client: UEG
Tested by: L. Holmes / A. Wood
Date: November 25, 2014



Depth to Bottom,ft (D_t): 5
Diameter of Hole, in (D): 3
Diameter of Pipe, in (d): 0
Agg. Correction (% Voids): 100
Soil Description: Silty SAND / SAND

Time Interval (min)	Depth to Water Surface Dw (ft)		Change in Head (in)	Perc Rate gal/day/ft^2
	1st Reading	2nd Reading		
5	0.00	2.50	30.00	88.31
5	0.00	2.20	26.40	74.78
5	0.00	1.80	21.60	58.24
5	0.00	1.60	19.20	50.55
5	0.00	1.60	19.20	50.55
5	0.00	1.50	18.00	46.85
5	0.00	1.40	16.80	43.22
5	0.00	1.30	15.60	39.68
5	0.00	1.20	14.40	36.22
5	0.00	1.10	13.20	32.83
5	0.00	1.10	13.20	32.83
5	0.00	1.10	13.20	32.83

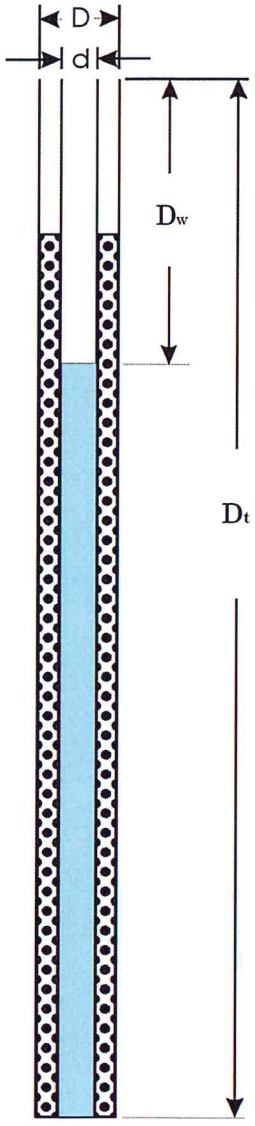
Percolation Rate: **32.8 gal/day/ft^2**
Infiltration Rate: **2.2 inches/hour**

PETRA GEOTECHNICAL, INC.

PERCOLATION TEST SUMMARY

Test Number: P-2

Job No. 14-108
Project Name: Vista del Agua
Client: UEG
Tested by: L. Holmes / A. Wood
Date: November 25, 2014



Depth to Bottom,ft (D_t): 5
Diameter of Hole, in (D): 3
Diameter of Pipe, in (d): 0
Agg. Correction (% Voids): 100
Soil Description: Silty SAND / SAND

Time Interval (min)	Depth to Water Surface Dw (ft)		Change in Head (in)	Perc Rate gal/day/ft^2
	1st Reading	2nd Reading		
5	0.00	2.80	33.60	102.96
5	0.00	2.10	25.20	70.49
5	0.00	1.60	19.20	50.55
5	0.00	1.40	16.80	43.22
5	0.00	1.10	13.20	32.83
5	0.00	1.00	12.00	29.52
5	0.00	0.92	11.04	26.92
5	0.00	0.92	11.04	26.92
5	0.00	0.92	11.04	26.92
5	0.00	0.83	9.96	24.05
5	0.00	0.83	9.96	24.05
5	0.00	0.83	9.96	24.05

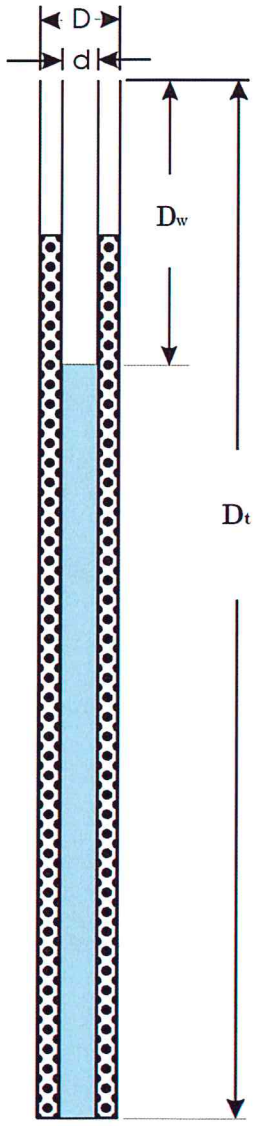
Percolation Rate: **24.0 gal/day/ft^2**
Infiltration Rate: **1.6 inches/hour**

PETRA GEOTECHNICAL, INC.

PERCOLATION TEST SUMMARY

Test Number: P-3

Job No. 14-108
Project Name: Vista del Agua
Client: UEG
Tested by: L. Holmes / A. Wood
Date: November 25, 2014



Depth to Bottom,ft (D_t): 5
Diameter of Hole, in (D): 3
Diameter of Pipe, in (d): 0
Agg. Correction (% Voids): 100
Soil Description: Silty SAND / SAND

Time Interval (min)	Depth to Water Surface Dw (ft)		Change in Head (in)	Perc Rate gal/day/ft^2
	1st Reading	2nd Reading		
5	0.00	2.10	25.20	70.49
5	0.00	1.60	19.20	50.55
5	0.00	1.20	14.40	36.22
5	0.00	1.20	14.40	36.22
5	0.00	1.10	13.20	32.83
5	0.00	1.10	13.20	32.83
5	0.00	1.00	12.00	29.52
5	0.00	1.00	12.00	29.52
5	0.00	1.00	12.00	29.52
5	0.00	0.92	11.04	26.92
5	0.00	0.92	11.04	26.92
5	0.00	0.92	11.04	26.92

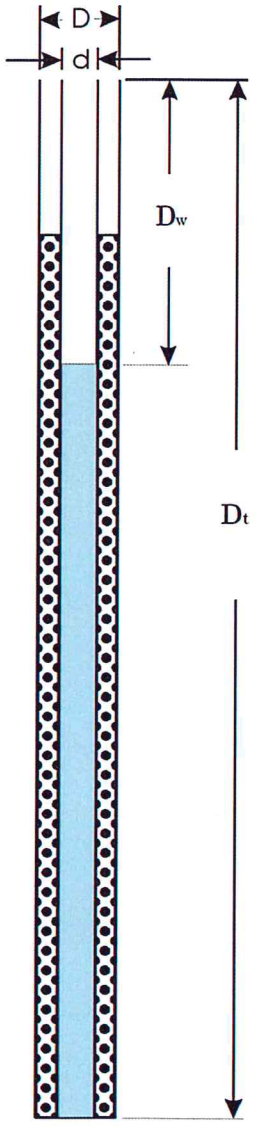
Percolation Rate: **26.9 gal/day/ft^2**
Infiltration Rate: **1.8 inches/hour**

PETRA GEOTECHNICAL, INC.

PERCOLATION TEST SUMMARY

Test Number: P-4

Job No. 14-108
Project Name: Vista del Agua
Client: UEG
Tested by: L. Holmes / A. Wood
Date: November 25, 2014



Depth to Bottom,ft (D_t): 5
Diameter of Hole, in (D): 3
Diameter of Pipe, in (d): 0
Agg. Correction (% Voids): 100
Soil Description: Silty SAND / SAND

Time Interval (min)	Depth to Water Surface Dw (ft)		Change in Head (in)	Perc Rate gal/day/ft^2
	1st Reading	2nd Reading		
5	0.00	2.20	26.40	74.78
5	0.00	1.70	20.40	54.35
5	0.00	1.50	18.00	46.85
5	0.00	1.40	16.80	43.22
5	0.00	1.40	16.80	43.22
5	0.00	1.40	16.80	43.22
5	0.00	1.30	15.60	39.68
5	0.00	1.30	15.60	39.68
5	0.00	1.30	15.60	39.68
5	0.00	1.30	15.60	39.68
5	0.00	1.30	15.60	39.68
5	0.00	1.30	15.60	39.68

Percolation Rate: **39.7 gal/day/ft^2**
Infiltration Rate: **2.7 inches/hour**

PETRA GEOTECHNICAL, INC.

Appendix F

Structural BMP and/or Retention Facility Sizing Calculations
and Design Details

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	ROADS		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 20.73 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 20.73 acres

Calculate Impervious Area Ratio (I_f) I_f = 1.00

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.89

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.36 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 27,090 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A10		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 8.27 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 7.44 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.90

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 8,706 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A9		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 13.82 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 0.00 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.00

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.04

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.02 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,003 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A8		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 14.82 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 8.90 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.60

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.41

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.16 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 8,607 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A7		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 46.89 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 28.13 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.60

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.41

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.16 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 27,234 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A6		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 71.65 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 43.00 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.60

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.41

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.16 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 41,614 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A5		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 43.03 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 25.82 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.60

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.41

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.16 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 24,992 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A4		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 21.94 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 17.55 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.80

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.60

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.24 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 19,114 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A3		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 10.1 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 8.08 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.80

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.60

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.24 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 8,799 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A2		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 7.33 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 5.86 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.80

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.60

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.24 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 6,386 ft^3

Notes:

Whitewater Watershed

BMP Design Volume, V_{BMP} (Rev. 06-2014)

Legend: Required Entries / Calculated Cells

Company Name	United Engineering Group	Date	8/29/2016
Designed by	Chris Morgan	County/City Case No	
Company Project Number/Name	Vista Del Agua		
Drainage Area Number/Name	A1		

Enter the Area Tributary to this Feature (A_{TRIB}) A_{TRIB} = 16.8 acres

Determine the Impervious Area Ratio

Determine the Impervious Area within A_{TRIB} (A_{IMP}) A_{IMP} = 15.10 acres

Calculate Impervious Area Ratio (I_f) I_f = 0.90

$I_f = A_{IMP}/A_{TRIB}$

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C_{BMP} = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C_{BMP} = 0.73

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 80% Unit Storage Volume $V_U = 0.40 \times C_{BMP}$ V_u = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 17,685 ft^3

Notes:

Appendix G

AGREEMENTS – CC&RS, COVENANT AND AGREEMENTS, BMP MAINTENANCE AGREEMENTS AND/OR OTHER MECHANISMS FOR ENSURING ONGOING OPERATION, MAINTENANCE, FUNDING AND TRANSFER OF REQUIREMENTS FOR THIS PROJECT-SPECIFIC WQMP

Appendix H

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT – SUMMARY OF SITE REMEDIATION CONDUCTED AND USE RESTRICTIONS

All Phase Environmental, Inc.

September 24, 2014

CVP PALM SPRINGS, LLC
c/o Mr. Jim Nozak
Strategic Land Partners
12671 High Bluff Drive, Suite 150
San Diego, CA 92130

RE: Phase I Environmental Site Assessment, Vista Del Agua
Northwest Corner of the Intersection of 48th Avenue and Polk Street, Coachella, California 92236
APEI Project Number 13514.00

Dear Mr. Nozak:

CVP Palm Springs, LLC (Client) have requested our professional opinion regarding the existence of recognized environmental conditions on the above referenced site, hereinafter referred to as the "Property." In response to your request, All Phase Environmental, Inc. (APEI) has performed a Phase I Environmental Site Assessment (ESA) on the Property in conformance with the scope and limitations of ASTM Practice E-1527-13. Any exceptions to or deletions from this practice are described in Section 2.2 of this report. This report also meets the requirements of All Appropriate Inquiries as defined in CERCLA 42, U.S.C. 9601(35)(B). The enclosed report and opinion are based on the intent to develop the Property. We understand that you will rely on this opinion in connection with such purposes.

This assessment has revealed no evidence of recognized environmental conditions, historical recognized environmental conditions, controlled recognized environmental conditions, or de minimis conditions in connection with the Property. There are, however, several findings we would like to present:

1. Previous Agriculture Use on Property

The Property use had been agricultural from at least 1952 through the present day. Prior to 1972, it was a common practice to use environmentally persistent pesticides. Specifically, pesticides that included DDT, DDD, DDE and Toxaphene. Environmentally persistent pesticides, if previously used on the Property, may still be present. However, specific information regarding the previous use of such chemicals was not found. The possible presence of residual concentrations of environmentally persistent pesticides, is a recognized environmental condition. There are human and animal receptors

in the area due to the unpaved condition of the Property. If the Property is intended for future development, sampling of the near surface soil to assess whether residual concentrations exceed State of California action levels is recommended in areas that were agricultural prior to 1972. The presence of pesticides in the soil may represent a health risk to tenants or occupants on the Property and the soil may require specialized handling and disposal. It is recommended that a grid be used to take representative samples where crops were grown on the Property. It is recommended that the samples be analyzed for pesticides using EPA Method 8081.

2. Wetlands on the Property

APEI screened the Property for the presence of suspect wetlands during the site reconnaissance and by reviewing the U.S. Department of the Interior, Fish and Wildlife Service, *National Wetlands Inventory* online map dated September 8, 2014 presented in Appendix A. This source indicated that there are two areas designated as wetlands on the Property. Near the center of the Property is an area designated as a Freshwater Pond. North of this is an area designated as a Freshwater Forested Shrub Wetland. Along the north Property border is a pond that has not been designated as a wetland but will require additional research to define its status. A wetland delineation was beyond the scope of this assessment. Based on the findings, APEI recommends that a comprehensive wetland determination and delineation be conducted on the Property prior to construction activities that may cause destruction or place fill material into known or suspected wetland areas.

3. Groundwater Wells On The Property

At least one groundwater well is located on the Property, near the water retention pond along the north Property border. A second well may also exist along the north Property border, south of the north adjacent scrap metal yard. Other wells may exist on the Property that were not identified during the Property reconnaissance. The presence of groundwater wells on the Property is not a recognized environmental condition, however, they must be properly decommissioned or protected if the Property is to be developed. The Riverside County Community Health Agency, Department of Environmental Health, Water Engineering Department in Indio, California (telephone 760-863-7000) have information on the locations of wells and specific requirements for the closure of wells and should be consulted if the Property is to be developed. No further investigation in regards to this condition is deemed necessary at this time.

4. Possible Septic System or Cesspool On The Property

Several structures appear to have once been developed along the north Property border, south of the north adjacent scrap metal yard. These appear to have been single family residences. A septic system or cesspool may have been associated with this former development and may still exist on the Property. However, since there have been no uses on the Property involving hazardous materials or petroleum products, it would not be a significant environmental concern. A septic system or cesspool on the Property is not considered a recognized environmental condition when used in association with a residential property. No further investigation in regards to this condition is deemed necessary at this time.

5. Solid Waste Disposal On The Property

There was evidence observed of debris, trash, empty cans, clothing, furniture, concrete, roofing, wood, cuttings, rubber tires, railroad ties, and other materials typical of illegal dumping noted throughout the Property. These materials were typically located in areas along the access roads. There were two other areas where more solid waste was identified including the former water retention pond near the center of the Property and the area south of the north adjacent scrap metal yard. The solid waste appeared to be innocuous household trash dumped illegally and there were no signs of disposed hazardous materials or petroleum products. Other than the recommendation that these material be removed to help avert further dumping, no further investigation in regards to this condition is deemed necessary at this time.

6. Suspect Asbestos Containing Materials On The Property

Physical sampling of suspect Asbestos Containing Materials (ACMs) was not part of the scope of this project and only a very limited and cursory visual inspection was performed. The presence of asbestos or suspect asbestos does not represent a recognized environmental condition for the Property.

APEI noted a pile of roofing materials that had been dumped on the Property in the vicinity of the former water retention pond near the center o the Property. The suspect asbestos containing materials included asphalt roofing, roof tar, and roofing felt. It is recommended that these materials be tested for asbestos. If found to contain asbestos, an asbestos abatement contractor will be required to have this material removed from the Property.

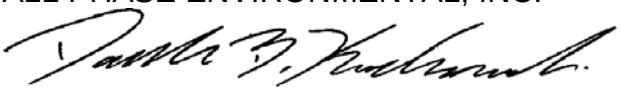
The shed located near the paintball field has suspect asbestos containing roofing. It is recommended that if this shed will be demolished, the roofing materials be tested for asbestos prior to the disturbance of this material. If found to contain asbestos, an asbestos abatement contractor will be required to have this material removed from the shed prior to its demolition.

No above grade indications were observed that cement asbestos pipes (Transite pipe) were used on the Property. However, cement asbestos pipes are known to have been used for water distribution systems for crop irrigation. It is recommended that during excavation activities on the Property, if suspect cement asbestos pipes are identified, they be removed and disposed of by a licensed asbestos abatement contractor.

It is recommended that the Client review the entire report prior to making any decisions in regards to the Property. If questions concerning this report arise or we may be of further service, please feel free to contact me anytime on my cell phone at (714) 719-0714.

Sincerely,

ALL PHASE ENVIRONMENTAL, INC.



Douglas B. Kochanowski; CAC, CHMM
Biologist, Project Manager

PHASE I ENVIRONMENTAL SITE ASSESSMENT

OF:

VISTA DEL AGUA

NORTHWEST CORNER OF THE INTERSECTION OF 48TH AVENUE AND POLK STREET
COACHELLA, CALIFORNIA, 92236

SEPTEMBER 24, 2014

PREPARED FOR:

CVP PALM SPRINGS, LLC
C/O STRATEGIC LAND PARTNERS
12671 HIGH BLUFF DRIVE, SUITE 150
SAN DIEGO, CA 92130

PREPARED BY:

All Phase Environmental, Inc.

8792 LAUDER CIRCLE, SUITE 200
HUNTINGTON BEACH, CA 92646
(800) 567-7729
www.PhaseOneESA.com

APEI PROJECT NO. 13514.00

INDEX

LIST OF APPENDIX SECTIONS

1.0 SUMMARY

All Phase Environmental, Inc. (APEI) has performed a Phase I Environmental Site Assessment (ESA) of the approximately 279.64-acres site located at the northwest corner of the intersection of 48th Avenue and Polk Street, in the City of Coachella, in the County of Riverside, California, 92236 referred to herein as the "Property."

APEI has conducted this Phase I ESA in conformance with the scope and limitations of ASTM Practice E-1527-13 of the Property. Any exceptions to or deletions from this practice are described in Section 2.2 of this report. This report also meets the requirements of All Appropriate Inquiries as defined in CERCLA 42, U.S.C. 9601(35)(B). The enclosed report and opinion are based on the intent to develop the Property. We understand that you will rely on this opinion in connection with such purposes.

This assessment has revealed no evidence of recognized environmental conditions, historical recognized environmental conditions, controlled recognized environmental conditions, or de minimis conditions in connection with the Property except for the following:

1. Previous Agriculture Use on Property

The Property use had been agricultural from at least 1952 through the present day. Prior to 1972, it was a common practice to use environmentally persistent pesticides. Specifically, pesticides that included DDT, DDD, DDE and Toxaphene. Environmentally persistent pesticides, if previously used on the Property, may still be present. However, specific information regarding the previous use of such chemicals was not found. The possible presence of residual concentrations of environmentally persistent pesticides, is a recognized environmental condition. There are human and animal receptors in the area due to the unpaved condition of the Property. If the Property is intended for future development, sampling of the near surface soil to assess whether residual concentrations exceed State of California action levels is recommended in areas that were agricultural prior to 1972. The presence of pesticides in the soil may represent a health risk to tenants or occupants on the Property and the soil may require specialized handling and disposal. It is recommended that a grid be used to take representative samples where crops were grown on the Property. It is recommended that the samples be analyzed for pesticides using EPA Method 8081.

2. Wetlands on the Property

APEI screened the Property for the presence of suspect wetlands during the site reconnaissance and by reviewing the U.S. Department of the Interior, Fish and Wildlife Service, *National Wetlands Inventory* online map dated September 8, 2014 presented in Appendix A. This source indicated that there are two areas designated as wetlands on the Property. Near the center of the Property is an area designated as a Freshwater Pond. North of this is an area designated as a Freshwater Forested Shrub Wetland. Along the north Property border is a pond that has not been designated as a wetland but will require additional research to define its status. A wetland delineation was beyond the scope of this assessment. Based on the findings, APEI recommends that a comprehensive wetland determination and delineation be conducted on the Property prior to construction activities that may cause destruction or place fill material into known or suspected wetland areas.

3. Groundwater Wells On The Property

At least one groundwater well is located on the Property, near the water retention pond along the north Property border. A second well may also exist along the north Property border, south of the north adjacent scrap metal yard. Other wells may exist on the Property that were not identified during the Property reconnaissance. The presence of groundwater wells on the Property is not a recognized environmental condition, however, they must be properly decommissioned or protected if the Property is to be developed. The Riverside County Community Health Agency, Department of Environmental Health, Water Engineering Department in Indio, California (telephone 760-863-7000) have information on the locations of wells and specific requirements for the closure of wells and should be consulted if the Property is to be developed. No further investigation in regards to this condition is deemed necessary at this time.

4. Possible Septic System or Cesspool On The Property

Several structures appear to have once been developed along the north Property border, south of the north adjacent scrap metal yard. These appear to have been single family residences. A septic system or cesspool may have been associated with this former development and may still exist on the Property. However, since there have been no uses on the Property involving hazardous materials or petroleum

products, it would not be a significant environmental concern. A septic system or cesspool on the Property is not considered a recognized environmental condition when used in association with a residential property. No further investigation in regards to this condition is deemed necessary at this time.

5. Solid Waste Disposal On The Property

There was evidence observed of debris, trash, empty cans, clothing, furniture, concrete, roofing, wood, cuttings, rubber tires, railroad ties, and other materials typical of illegal dumping noted throughout the Property. These materials were typically located in areas along the access roads. There were two other areas where more solid waste was identified including the former water retention pond near the center of the Property and the area south of the north adjacent scrap metal yard. The solid waste appeared to be innocuous household trash dumped illegally and there were no signs of disposed hazardous materials or petroleum products. Other than the recommendation that these material be removed to help avert further dumping, no further investigation in regards to this condition is deemed necessary at this time.

6. Suspect Asbestos Containing Materials On The Property

Physical sampling of suspect Asbestos Containing Materials (ACMs) was not part of the scope of this project and only a very limited and cursory visual inspection was performed. The presence of asbestos or suspect asbestos does not represent a recognized environmental condition for the Property.

APEI noted a pile of roofing materials that had been dumped on the Property in the vicinity of the former water retention pond near the center o the Property. The suspect asbestos containing materials included asphalt roofing, roof tar, and roofing felt. It is recommended that these materials be tested for asbestos. If found to contain asbestos, an asbestos abatement contractor will be required to have this material removed from the Property.

The shed located near the paintball field has suspect asbestos containing roofing. It is recommended that if this shed will be demolished, the roofing materials be tested for asbestos prior to the disturbance of this material. If found to contain asbestos, an asbestos abatement contractor will be required to have this material removed from the shed prior to its demolition.

No above grade indications were observed that cement asbestos pipes (Transite pipe) were used on the Property. However, cement asbestos pipes are known to have been used for water distribution systems for crop irrigation. It is recommended that during excavation activities on the Property, if suspect cement asbestos pipes are identified, they be removed and disposed of by a licensed asbestos abatement contractor.

2.0 INTRODUCTION

2.1 Definitions

To assist the reader with the interpretation of this report, APEI would like to provide the following definitions of significant ESA terminology as defined by ASTM E1527-13.

Recognized environmental condition

A recognized environmental condition is defined as*, "*the presence or likely presence of any hazardous substances or petroleum products in, on, or at a Property: (*1*) due to any release to the environment; (*2*) under conditions indicative of a release to the environment; or (*3*) under conditions that pose a material threat of a future release to the environment."

Historical recognized environmental condition

A *historical recognized environmental condition* is defined as, *"*a past release of any hazardous substances or petroleum products that has occurred in connection with the Property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the Property to any required controls (for example, Property use restrictions, activity and use limitations, institutional controls, or engineering controls)."

Controlled recognized environmental condition

A controlled recognized environmental condition is defined as*, "*a *recognized environmental condition* resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with *hazardous substances* or *petroleum products* allowed to remain in place subject to the implementation

of required controls (for example, *property* use restrictions, *activity and use limitations*, *institutional controls*, or *engineering controls*)."

De minimis condition

A de minimis condition is defined as*, "*a condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies. Conditions determined to be *de minimis conditions* are not *recognized environmental conditions* nor *controlled recognized environmental conditions*."

2.2 Purpose and Scope

A Phase I ESA is intended to provide a brief description of the Property, its location and surroundings and to identify, to the extent feasible, associated r*ecognized environmental conditions, controlled recognized environmental conditions, historical recognized environmental condition,* and *de minimis conditions* associated with the Property or surrounding land use and to create a list of the potential human and environmental receptors. The protocol followed for this assessment is in conformance with the requirements of All Appropriate Inquiries as defined in CERCLA 42, U.S.C. 9601(35)(B) and the American Society for Testing and Materials Standard Practice for Environmental Site Assessment for Commercial Real Estate Transactions, ASTM Standard E-1527-13. Any exceptions are noted in Section 2.2 – Limiting Conditions and Methodology Used. APEI understands that this ESA will be used by CVP Palm Springs, LLC to perform due diligence with respect to environmental conditions at the Property.

2.3 Limitations, Exceptions and Methodology of Assessment

Due care was taken during the investigation process, but a Phase I ESA cannot eliminate uncertainty about a Property's potential for Environmental Conditions. It should be noted that all Phase I ESAs are inherently limited in the sense that conclusions are drawn and recommendations developed from information obtained from limited research and site evaluation. APEI accepts no liability for hidden conditions, variations in composition of materials and identification of materials not normally found in construction use. Subsurface conditions were not field investigated as part of this study and may differ from the conditions implied by the surface observations. APEI has relied on one or more documents developed by other parties and is not liable for any conclusions drawn using these sources if their findings or procedures were erroneous. Additionally, the passage of time may result in a change in the environmental characteristics at this Property and surrounding sites.

The scope of work for this report did not include testing of electrical equipment for the potential presence of polychlorinated biphenyls or the collection of other environmental samples. The scope of work did not include a detailed assessment of natural hazards such as naturally occurring asbestos, arsenic, radon gas or methane gas, an assessment of the potential presence of radionuclides, an assessment of nonchemical hazards such as the potential for damage from earthquakes or floods, or the presence of endangered species or wildlife habitats. The scope of work for this report did not include an assessment of the environmental compliance status of the Property, the businesses operating at the Property, or a health-based risk assessment. The scope of work for this report did not include any wetland studies, indoor air quality assessment, or vapor intrusion assessment.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the field of environmental science and engineering. The Property boundaries and other drawings have been compiled from the best available recorded information and have not been verified by a field survey, therefore, actual conditions may vary.

All areas of the Property were visually inspected as part of this investigation except for some areas where thick vegetation prevented access. In addition, some of the vineyards and fallow areas were inspected by traversing the grounds in a crossing pattern intended to cover representative areas but not all of these areas were visually inspected. It is the opinion of APEI that the ability to identify conditions indicative of releases or threatened releases has not been hampered by the lack of the visual inspection in these areas.

2.4 Data Gaps

In accordance with the ASTM standard, an attempt to confirm the history and use of the Property was performed from the present back to when the Property was first developed with any structures or was used for residential, agricultural, commercial, industrial or governmental purposes. Multiple historical sources were consulted to fill in any data gaps dating back to 1904, the first reasonably available information. Information from the Property owner representative, Mr. Beau Cooper, dated back approximately three-years to 2011. Aerial photographs with coverage of the Property were found and reviewed from the years 1953, 1959, 1978, 1989, 1996, 2002, 2005, 2006, 2009, 2010, and 2012. City Directories were reviewed in intervals of approximately five-years beginning in 1975. Historical USGS topographic maps of the Property were reviewed from the years 1904, 1947, 1956, and 1972. APEI reviewed the FEMA Flood Insurance Map (2003 and 2011) and

the U.S. Department of the Interior, Fish and Wildlife Service, *National Wetlands Inventory* online map (September 8, 2014).

Sanborn Fire Insurance Maps with coverage of the Property were searched but no maps were made for this area. Due to the undeveloped nature of the Property and its lack of a street address; building department records, and fire department records could not be effectively researched. There were no users or tenants on the Property. ASTM 1527-13 does not require the environmental professional to undertake a review of recorded land title records or search for environmental liens. This responsibility is placed upon the user. It is APEI's understanding that a lender will engage a title company or title professional to undertake a review of reasonably ascertainable recoded land title records and lien records relating to the Property. Per the scope of work, APEI did not obtain recorded land title records or conduct an environmental lien search. If the Client provides APEI with this information, it can be added to the Phase I report.

2.5 Reliance

This report was prepared for the sole use and benefit of CVP Palm Springs, LLC, Strategic Land Partners, and United Engineering Group. The information and opinions rendered in this report are for the exclusive use and reliance by CVP Palm Springs, LLC, Strategic Land Partners, and United Engineering Group. APEI will not distribute or publish this report without the consent of CVP Palm Springs, LLC, Strategic Land Partners, or United Engineering Group except as required by law and court order. The information and opinions expressed in this report are given in response to a limited assignment by CVP Palm Springs, LLC and should be considered and implemented only in light of that assignment. The services provided by APEI in completing this project have been provided in a manner consistent with normal standards of the profession. This report is not a legal opinion and does not offer warranties or guarantees expressed or implied.

3.0 SITE DESCRIPTION

3.1 Location and Legal Description

The Property is approximately 279.64-acres, has no street address, and is located at the northwest corner of the intersection of 48th Avenue and Polk Street, in the City of Coachella, in the County of Riverside, California, 92236. Vista Del Sur and Avenue 47 delimit portions of the north Property border, Avenue 48 delimits the Property to the south, Polk Street delimits a portion of the Property to the east, and unpaved roads delimit the Property to the west.

The approximate latitude and longitude near the center of the Property are 33°42'14.40" (33.704) north and 116°9'16.92" (116.1547) west, respectively. The Property is composed of twelve parcels. The APN numbers for the Property are 603-122-005, 603-130-003, 603-130-004, 603-130-009, 603-150-004, 603-150-005, 603-150-007, 603-150-008, 603-150-009, 603-150-010, 603-150-011, and 603-150-012. The Property is irregular in shape with the longest dimensions consisting of approximately 4,600-feet from east to west and 4,500-feet from north to south.

The Property was undeveloped except for utilities, a shed, groundwater wells, retention ponds, a vineyard, paintball field, and remnants from former structures. The current owners of the Property were reported by the Property owner representative to be CVP Palm Springs, LLC. A Record Boundary Map presented in Appendix A contains a legal description of the Property.

3.2 Site and Vicinity Characteristics

3.2.1 Surface Characteristics

The general topography of the Property slopes to the south at a rate of approximately 34-feet per mile. According to the U.S. Geological Survey (USGS) topographic map, Indio, Quadrangle, the finished elevation of the Property is approximately 38-feet below Mean Sea Level (MSL). Except for several concrete pads, there were no paved areas on the Property.

3.2.2 Drainage Patterns/Basins

No special flood hazards are noted at the Property on the FEMA Q3 Flood Insurance Rate Map, Riverside (panel number 06065C) dated 2003 and 2011. The nearest significant surface water, other than the pond located along the north Property border, is the Coachella Channel located near the northeast Property corner. This channel flows to the southeast.

There was no industrial water discharge from the Property into a sanitary sewer system. Stormwater drainage on the Property is primarily downward surface percolation. There were no groundwater monitoring wells, floor drains, clarifiers, sumps, or french drains noted on the Property.

At least one groundwater well is located on the Property, near the water retention pond along the north Property border. A second well may also exist along the north Property border, south of the north adjacent scrap metal yard. Other wells may exist on the Property that were not identified during the Property reconnaissance. The presence of groundwater wells on the

Property is not a recognized environmental condition, however, they must be properly decommissioned or protected if the Property is to be developed. The Riverside County Community Health Agency, Department of Environmental Health, Water Engineering Department in Indio, California (telephone 760-863-7000) have information on the locations of wells and specific requirements for the closure of wells and should be consulted if the Property is to be developed. No further investigation in regards to this condition is deemed necessary at this time.

Several structures appear to have once been developed along the north Property border, south of the north adjacent scrap metal yard. These appear to have been single family residences. A septic system or cesspool may have been associated with this former development and may still exist on the Property. However, since there have been no uses on the Property involving hazardous materials or petroleum products, it would not be a significant environmental concern. A septic system or cesspool on the Property is not considered a recognized environmental condition when used in association with a residential property. No further investigation in regards to this condition is deemed necessary at this time.

3.2.3 Physiology and Geology

The Property lies within the Coachella Valley of the Peninsula Range province of Southern California. A significant feature within the province is the Salton trough. The Salton Trough is a large northwest-trending structural depression that extends from San Gorgonio Pass, approximately 180-miles to the Gulf of California. Much of this depression in the area of the Salton Sea is below sea level. The Coachella Valley contains a thick sequence of sedimentary deposits that are Miocene to recent in age. Mountains surrounding the Coachella Valley include the Little San Bernardino Mountains on the northeast, foothills of the San Bernardino Mountains on the northwest and the San Jacinto and Santa Rosa Mountains to the southwest. These mountains expose primarily Precambrian metamorphic and Mesozoic granitic rocks. The San Andreas Fault zone within the Coachella Valley consists of the Garnet Hill Fault, the Banning Fault, and the Mission Creek Fault that traverse along the northeast margin of the valley. The Property is located at the base of a large, active alluvial fan derived from the terrestrial sediments of the San Jacinto Mountains.

According to the *Web Soil Survey* by the National Resources Conservation Service dated December 18, 2003, the primary soil type at the north half of the Property is Coachella fine sand. The landform setting for this soil is described as alluvial fan with a slope of 0 to 2 percent. This soil is moderately well drained and the depth to the water table is more than 80-inches. The

primary soil type at the south half of the Property is Gilman fine sandy loam. The landform setting for this soil is described as alluvial fan with a slope of 0 to 2 percent. This soil is moderately well drained and the depth to the water table is more than 80-inches.

3.2.4 Hydrogeology

The Property is located within the Colorado River hydrologic region, Coachella Valley groundwater basin, Indio subbasin (Groundwater Basin No. 7-21.01, DWR, 2003). The Indio sub basin is bound by the Garnet Hill fault to the northeast, the San Jacinto and Santa Rosa Mountains to the west and south, and the Thermal subarea of the Indio subbasin to the east. Groundwater in this subbasin generally flows in a southerly direction toward the Salton Sea from the main recharge areas along the base of the San Jacinto Mountains and near the San Gorgonio Pass. The alluvial materials within this subbasin are primarily heterogeneous alluvial fan deposits exhibiting little sorting and with a low percentage of fine grained material (DWR, 1964).

APEI reviewed data from a Leaking Underground Storage Tank site located near the Property. Coachella Travel Center is located approximately 3,500-feet west of the northwest Property corner. In a report dated April 10, 2009 by Kleinfelder West, Inc. entitled "*First Quarter Groundwater Monitoring Report and Request For No Further Action, Coachella Travel Center*" the average depth to groundwater was 21.60 feet bgs (9.04 feet below MSL). The groundwater gradient was to the southeast at a rate of 0.04 feet per foot (ft/ft).

Specific information about the groundwater depth on the Property was not reasonably available. Based upon the information presented above, the depth to groundwater is estimated at approximately 10 to 30-feet bgs. This number is an approximation and physical testing must be performed to state the true depth to groundwater due to the possibility of varying levels of perched groundwater in the area of the Property.

Based solely on the surface topography at the Property and the presumed groundwater flow direction at the Property is south. This is consistent with the surface topography that drops towards the south. South is only the presumed groundwater flow direction and only physical testing can accurately state the true groundwater flow direction.

3.2.5 Wetlands

APEI screened the Property for the presence of suspect wetlands during the site reconnaissance and by reviewing the U.S. Department of the Interior, Fish and Wildlife Service, *National Wetlands Inventory* online map dated September 8, 2014 presented in Appendix A. This source indicated that there are two areas designated as wetlands on the Property. Near the center of the Property is an area designated as a Freshwater Pond. North of this is an area designated as a Freshwater Forested Shrub Wetland. Along the north Property border is a pond that has not been designated as a wetland but will require additional research to define its status. A wetland delineation was beyond the scope of this assessment. Based on the findings, APEI recommends that a comprehensive wetland determination and delineation be conducted on the Property prior to construction activities that may cause destruction or place fill material into known or suspected wetland areas.

3.2.6 Earthquake Fault Lines, Epicenters, and Liquefaction

The State of California, California Division of Mines and Geology has published a Fault Zone Map dated July 1, 1974 which is presented in Appendix A. This map indicates that a Fault Zone traverses the northeast Property corner. While this may affect the development of the Property or the condition of the Property in the event of an earthquake, it is not considered to be a recognized environmental condition.

The Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) publishes the locations of earthquake epicenters measuring five (5) or greater on the Richter scale. This information was researched and there were no such epicenters reported with one-mile of the Property.

State of California Seismic Hazard Zones delineating Liquefaction or Earthquake Induced Landslide Areas have not been developed for the Indio, California Quadrangle.

3.2.7 Methane Zone

There were no indications from the data reviewed that the Property is located over an oil field or in an area where methane is an issue. Additional oil field information and oil well data are described below in Section 5.8.

3.3 Structures, Roads and Other Improvements on the Site

There are multiple unpaved roads traversing the Property, the only named one being Avenue 47. Power lines run along portions of the north Property border and into the center of the Property. There are two concrete pads along the north Property border, south of the north adjacent scrap metal yard. Near the center of the Property, at the paintball field, are a shed and a small concrete pad. Irrigation pipes are assumed to exist in former and existing agricultural areas of Property. Stormwater drains appear to exist in some areas of the Property. There is at least one groundwater well located near the retention pond along the north Property border. Approximately one-third of the west side of the Property is occupied by a vineyard.

The Property can be accessed from Vista Del Sur, 48th Avenue, and Polk Street.

Electricity serving the Property is from Southern California Edison (SCE). Natural gas is supplied by Southern California Gas Company. Sewer service is provided by the city municipal system. A solid waste disposal company serving the Property was not identified. The supplier of potable water is Coachella Valley Water District (CVWD). In a report entitled, "*2013-14 Annual Review, Water Quality Report"* by the CVWD dated 2014, it is stated, "This annual report documents that the water served to all CVWD water users (obtained from wells drilled into the Coachella Valley's vast groundwater basin) meets state (California Department of Public Health) and federal (U.S. Environmental Protection Agency) drinking water quality standards."

3.4 Current Uses of the Property

At the time of the Property reconnaissance on September 10, 2014, the only uses identified on the Property were as a vineyard and as a paintball field. Except for the possible use of pesticides on the Property as described below in Section 3.6, there are no significant hazardous materials or petroleum products identified with these uses.

3.5 Owner and User Interviews

Mr. Beau Cooper, Entitlement Manager with Untied Engineering Group, the Property owner's representatives for CVP Palm Springs, LLC (also the users of this report) filled out an environmental questionnaire dated September 23, 2014. A copy of this form is provided in Appendix H. Mr. Cooper indicated that he knew of no significant amounts of hazardous or petroleum products used on the Property. To the best of his knowledge, Mr. Cooper stated that the Property has never had any industrial uses. Mr. Cooper marked that he

knew of no current or past environmental liens in association with the Property. He wrote that he is not aware of any Activity or Use Limitations (ALUs) such as engineering controls, land use restrictions or institutional controls in place or on file under federal, tribal, state or local law. He indicated that he had no knowledge of any Underground Storage Tanks (USTs), Above Ground Storage Tanks (ASTs) or the storage of any hazardous materials or petroleum products on the Property. Mr. Cooper wrote that to the best of his knowledge, there have never been any spills or violations on the Property in association with hazardous materials or petroleum products. Mr. Cooper was aware of no soil or groundwater contamination on the Property or on adjacent sites. He wrote that he is not aware of a reduction in the Property value due to environmental issues. Mr. Cooper wrote that to the best of his knowledge, the Property use have been limited to agricultural and is otherwise vacant land. Mr. Cooper indicated that there is an irrigation basin in the northeast area of the Property.

3.6 Historical Uses of the Property

Historical information was obtained from aerial photographs (1953, 1959, 1978, 1989, 1996, 2002, 2005, 2006, 2009, 2010, and 2012) presented in Appendix C, USGS Topographic maps (1904, 1947, 1956, and 1972) presented in Appendix D, and City Directories (intervals of five years or less, where available, beginning in 1975) presented in Appendix E. Information from the Property owner representative, Mr. Beau Cooper, dated back approximately three-years to 2011.

The Property appears to have been developed at one time with one or more single-family residences. Sometime between 1947 and 1952, several areas of the Property had been converted to agricultural use. Except for the existing vineyard, all of these areas have become fallow farmland. The existing vineyard was planted on the Property sometime between 1996 and 2002. The existing paintball filed was constructed on the Property sometime between 2010 and 2012.

There were no historical recognized environmental conditions or controlled recognized environmental conditions identified in the historical documents reviewed.

The Property use had been agricultural from at least 1952 through the present day. Prior to 1972, it was a common practice to use environmentally persistent pesticides. Specifically, pesticides that included DDT, DDD, DDE and Toxaphene. Environmentally persistent pesticides, if previously used on the Property, may still be present. However, specific information regarding the previous use of such chemicals was not found. The possible presence of

residual concentrations of environmentally persistent pesticides, is a recognized environmental condition. There are human and animal receptors in the area due to the unpaved condition of the Property. If the Property is intended for future development, sampling of the near surface soil to assess whether residual concentrations exceed State of California action levels is recommended in areas that were agricultural prior to 1972. The presence of pesticides in the soil may represent a health risk to tenants or occupants on the Property and the soil may require specialized handling and disposal. It is recommended that a grid be used to take representative samples where crops were grown on the Property. It is recommended that the samples be analyzed for pesticides using EPA Method 8081.

3.6.1 Sanborn Fire Insurance Maps

Sanborn Fire Insurance Maps with coverage of the Property area were searched but no maps were made for this area.

3.6.2 Historical Aerial Photographs

The following are descriptions of the historical aerial photographs taken at the Property and reviewed by APEI. This review has been supplemented by geographic place names and other data obtained in other assessment activities of this ESA. These photographs can be found in Appendix C.

1953

In the 1953 aerial photograph the southwest Property corner was occupied by crops. South of the center of the north Property border was a small structure or concrete pad (this area was not accessible during the Property reconnaissance due to heavy surrounding vegetation). There was a triangular water retention pond along the north Property border, west of the existing retention pond. Several small sheds, pads, or stored materials were visible on several areas of the Property. The remainder of the Property was undeveloped and occupied by native vegetation. The Coachella Channel was visible north and east of the Property. Vista Del Sur was visible and appeared to have been paved. The existing unpaved roads through and adjacent to the Property were also visible. The adjacent sites were either undeveloped or agricultural. There were no obvious signs of the storage or disposal of hazardous materials on the Property in this photograph.

1959

In the 1959 aerial photograph a water retention pond was visible in the area listed as a freshwater pond in wetland maps that was observed as dry during the Property reconnaissance. Additional areas of the west side of the Property had been cleared and were agricultural. Some of the west adjacent sites were developed with single family residences or were changed from vacant land to agricultural use. There were no other significant differences on the Property or adjacent sites in the 1959 aerial photograph from the 1953 aerial photograph. There were no obvious signs of the storage or disposal of hazardous materials on the Property in this photograph.

1953

In the 1953 aerial photograph the southwest Property corner was occupied by crops. South of the center of the north Property border was a small structure or concrete pad (this area was not accessible during the Property reconnaissance due to heavy surrounding vegetation). There was a triangular water retention pond along the north Property border, west of the existing retention pond. Several small sheds, pads, or stored materials were visible on several areas of the Property. The remainder of the Property was undeveloped and occupied by native vegetation. The adjacent sites were either undeveloped or agricultural. There were no obvious signs of the storage or disposal of hazardous materials on the Property in this photograph.

1978, 1989, and 1996

There were no significant differences on the Property or adjacent sites in the 1978, 1989, and 1996 aerial photographs from the 1953 aerial photograph. The only exception were the presence of small structures and stored materials observed in the area of the Property south of the north adjacent scrap metal yard and the presence of the existing single family residences to the north of this area beginning in 1978. There were no obvious signs of the storage or disposal of hazardous materials on the Property in these photographs.

2002

Except for some areas of the Property that were agricultural in 2002 that are no longer cultivated, the conditions of the Property and adjacent sites appeared in this photograph to be similar to that observed during the Property reconnaissance. There were no obvious signs of the storage or disposal of hazardous materials on the Property in this photograph.

2005, 2006, 2009, 2010, and 2012

There were no significant differences on the Property or adjacent sites in the 2005, 2006, 2009, 2010, and 2012 aerial photographs from the 2002 aerial photograph. There were no obvious signs of the storage or disposal of hazardous materials on the Property in these photographs.

3.6.3 Topographic Maps

Topographic maps from 1904, 1947, 1956, and 1972 are presented in Appendix D. The 1904 map depicted no roads, uses, or developments on the Property, adjacent sites, or surrounding area. The 1947 map depicted Vista Del Sur as a paved road and the Property and adjacent sites as vacant with no uses or developments identified. The 1956 and 1972 maps depicted half of the existing retention pond along the north Property border and orchards on parts of the west side of the Property. Avenue 47, Avenue 48, Tyler Street, Vista Del Sur, and the Coachella Channel were depicted on these maps. There were two small nondescript structures depicted near the center of the Property. The adjacent sites were depicted as either vacant or occupied by orchards. There were no obvious signs of the storage or disposal of hazardous materials on the Property in any of the topographic maps.

3.6.4 Building Permits

Because the Property has no street address, building permits were not researched.

3.6.5 Environmental Liens

No environmental liens were found during this investigation. The Property was not listed in the search of the Federal NPL Liens database. The Property owner representative stated that there were no environmental liens on the Property. In order for there to be an environmental lien against the Property, it must be a suspected, or confirmed, contributor to subsurface contamination. Research conducted for this report did not find any uses that would have contributed to subsurface contamination on the Property and no regulatory agencies identified it as such.

3.6.6 City Directories

APEI retained Environmental Data Resources, Inc. (EDR) to perform historical city directory research of the Property. APEI reviewed the report, "*The EDR-City Directory Abstract*" by EDR dated September 18, 2014. The complete city directory search is presented in Appendix E. Because the Property had no street addresses, there were no listings for the Property.

The City Directory report was then used to obtain data on some of the adjacent sites. There were no listings in the city directory report that identified any of the adjacent sites as those that may use, store, or dispose of significant quantities of hazardous materials or petroleum products.

3.6.7 Title Report

It was not in the scope of work for APEI to obtain a Title report for the Property. The Client did not provide APEI with a Title report for review.

3.7 Current Uses of Adjoining Sites

Current uses of the immediately adjacent sites and their addresses as noted on the buildings or researched on-line are as follows:

- North – North of Vista Del Sur is Interstate 10 and beyond that is vacant land. North of Avenue 47 is vacant land. North of the center area of the Property is occupied by single family residences and a scrap metal yard; 86475 through 86485 Vista Del Sur;
- South – Avenue 48 with agricultural land and retention ponds beyond; no address posted;
- East – Polk Street with lemon orchards beyond; no address posted;
- West – Single family residences, Corona Yacht Club, nursery's, agricultural land, and a water tank; 46600 through 47610 Tyler Street and 86201 47th Avenue.

The scrap metal yard adjacent to the north of the Property is storing former above ground and below ground steel storage tanks. APEI inspected these tanks and determined that they had no product and were not associated with any use on this adjacent site. It appears that these tanks are on this site based only on their value as scrap metal. Based on observations and research, there is a low likelihood that a recognized environmental condition exists at the Property as a result of the current adjacent land use. APEI did not detect obvious indications that adjacent sites have Underground Storage Tanks (USTs) or are engaged in any manufacturing processes that would involve the use of significant quantities of hazardous materials.

3.8 Past Uses of Adjoining Sites

3.8.1 North

Historical sources noted above, along with field notations, indicate that the site adjacent to and north of the Property across Vista Del Sur was undeveloped in 1904. Between 1959 and 1972, this adjacent site was developed with Interstate 10 and the land beyond has never been developed.

The site adjacent to and north of the Property across Avenue 47 was undeveloped in 1904 and has never been developed.

Some of the land north of the center of the Property has never been developed. Some of the land adjacent to the north of the Property had been developed with single family residences sometime between 1959 and 1978. Between 1978 and 1989, material storage was observed at the existing scrap metal yard.

There were no signs of the storage or disposal of hazardous materials on the north adjacent sites in the historical information reviewed. There were no indications from any historical sources that the Property has suffered environmental damage from the north adjacent sites.

3.8.2 South

Historical sources noted above, along with field notations, indicate that the sites adjacent to and south of the Property, across Avenue 48, were undeveloped in 1904. Between 1947 and 1953, some of these adjacent sites began being used for agricultural purposes. Except for water retention ponds, there have been no other significant uses of these sites.

There were no signs of the storage or disposal of hazardous materials on the south adjacent sites in the historical information reviewed. There were no indications from any historical sources that the Property has suffered environmental damage from the south adjacent sites.

3.8.3 East

Historical sources noted above, along with field notations, indicate that the sites adjacent to and east of the Property, across Polk Street, were undeveloped in 1904. Between 1959 and 1972, these adjacent sites began being used for agricultural purposes. There have been no other significant uses of these sites.

There were no signs of the storage or disposal of hazardous materials on the east adjacent sites in the historical information reviewed. There were no indications from any historical sources that the Property has suffered environmental damage from the east adjacent sites.

3.8.4 West

Historical sources noted above, along with field notations, indicate that the sites adjacent to and west of the Property were undeveloped in 1904. Between 1947 and 1953, some of these adjacent sites began being used for agricultural purposes. Since 1953, these sites have been improved with nurseries, single family residences, and a water tower.

There were no signs of the storage or disposal of hazardous materials on the west adjacent sites in the historical information reviewed. There were no indications from any historical sources that the Property has suffered environmental damage from the west adjacent sites.

4.0 RECORDS REVIEW

4.1 Standard Environmental Record Sources, Federal and State

A Federal, State and Local Radius Profile Report from Environmental Data Resources, Inc. dated September 5, 2014 was reviewed by APEI. The radius report, found in Appendix G, contains records of registered sites in the vicinity of the Property for the classifications and distances listed in the following tables and as required by ASTM Practice E-1527-13. Report dates for each database searched are listed in this appendix.

TABLE I - FEDERAL ENVIRONMENTAL RECORD SOURCES SUMMARY		
FEDERAL DATABASES	**SEARCH RADIUS**	**NUMBER OF REPORTED SITES**
National Priorities List (NPL)	1.00 mile	0
De-listed National Priorities List (NPL)	1.00 mile	0
Resource Conservation and Recovery Act (RCRA) Corrective Action Facilities (CORRACTS)	1.00 mile	0
Records of Decision (ROD)	1.00 mile	0
Superfund Consent Decrees (CONSENT)	1.00 mile	0
Sites currently or formerly under review by US EPA (CERCLIS and CERCLIS/NFRAP)	0.50 mile	0
RCRA permitted Treatment, Storage and Disposal Facilities (TSD)	0.50 mile	0
Mines Master Index File (MINES)	0.25 mile	0
RCRA Administrative Action Tracking System (RAATS)	0.25 mile	0
RCRA Registered Small or Large Generators of Hazardous Waste (GNRTR)	0.25 mile	0
Emergency Response Notification System (ERNS)	0.25 mile	0
Facility Index System/Facility Identification Initiative Program Summary Report (FINDS)	Property Only	0
Hazardous Materials Information Reporting System (HMIRS)	Property Only	0
Material Licensing Tracking System (MLTS)	Property Only	0
Federal Superfund Liens (NPL LIENS)	Property Only	0
PCB Activity Database System (PADS)	Property Only	0
Toxic Chemical Release Inventory System (TRIS)	Property Only	0
FIFRA/TSCA Tracking System (FTTS)	Property Only	0
Toxic Substances Control Act (TSCA)	Property Only	0

TABLE II - STATE AND LOCAL ENVIRONMENTAL RECORD SOURCES SUMMARY		
STATE AND LOCAL DATABASE	**SEARCH RADIUS**	**NUMBER OF REPORTED SITES**
Cal-Sites and Cal-Sites Annual Work Plan (AWP)	1.00 mile	0
Notify 65	1.00 mile	0
Areas Of Concern (AOCONCERN)	1.00 mile	0
California Bond Expenditure Plan (CA BEP)	1.00 mile	0
California EPA Office of Emergency Information (CORTESE) and Historical CORTESE	1.00 mile	0
Toxic Pits Cleanup facilities (TOXIC PITS)	1.00 mile	0
ENVIROSTOR	1.00 mile	0
RESPONSE	1.00 mile	0
Tribal Records (Indian Reservations, LUST, UST)	Up to 1.50 miles	0
California Spills, Leaks, Investigations & Clean-up Cost Recovery Listing (CA SLIC)	0.50 mile	0
State Landfills	0.50 mile	0
Leaking Underground Storage Tanks (LUST)	0.50 mile	0
Waste Management Unit Database/State Water Resources Control Board (WMUDS/SWAT)	0.50 mile	0
California City Land Fills (CA LA LF)	0.50 mile	0
Voluntary Cleanup Program Properties (VCP)	0.50 mile	0
Indian Reservation	0.50 mile	1
Registered Underground Storage Tanks (UST)	0.25 mile	0
California Facility Inventory Database Underground Storage Tanks (CA FID UST)	0.25 mile	0
Hazardous Substances Storage Container Database (HIST UST)	0.25 mile	0
Statewide Environmental Evaluation and Planning System UST (SWEEPS UST)	0.25 mile	0
Drycleaners	0.25 mile	0
Historical Auto Stations/Dry Cleaners	0.25 mile	0
Registered Above Ground Storage Tanks (AST)	0.25 mile	0
Emissions Inventory Data (EMI)	Property Only	0
Hazardous Waste Information System (HAZNET)	Property Only	0
California Hazardous Material Incident Report System (CHMIRS)	Property Only	0
California Waste Discharge System (CA WDS)	Property Only	0

4.1.1 Property and Adjacent Sites Summary

The Property and adjacent sites were not listed in any of the databases searched.

4.1.2 National Priorities List (NPL)

The National Priorities List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites identified for priority remedial actions under the Superfund program. A site must meet or surpass a predetermined hazard ranking system score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the US Dept of Health and Human Services and the U.S. EPA in order to become an NPL site.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (1.0-mile radius) under this listing.

4.1.3 Sites currently or formerly under review by US EPA (CERCLIS/NFRAP)

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) contains data on potentially hazardous waste sites that have been reported to the U.S. EPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites that are either on the NPL or sites that are in the screening and assessment phase for possible inclusion on the NPL.

NFRAP sites may be locations where, following an initial investigation, no contamination was found, contamination was removed quickly, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.

The Property and the adjacent sites were not listed in the search of these databases. No additional sites were found in these Federal databases search (1.0-mile radius) under this listing.

4.1.4 Resource Conservation and Recovery Act (RCRA) Corrective Action Facilities (CORRACTS)

The EPA maintains this database of Resource Conservation and Recovery Act (RCRA) facilities that are undergoing "corrective action". A "corrective action order" is issued pursuant to RCRA Section 3008 (h) when there has been a release of hazardous waste or constituents into the environment from a RCRA facility. Corrective actions may be required beyond the facility's boundary and can be required regardless of when the release occurred, even if it predates RCRA.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (1.0-mile radius) under this listing.

4.1.5 Resource Conservation and Recovery Act (RCRA) Treatment, Storage and Disposal Facilities (TSD)

The EPA's RCRA Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities that report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA TSDs are facilities that treat, store and/or dispose of hazardous waste.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (0.5-mile radius) under this listing.

4.1.6 RCRA Registered Small and Large Generators of Hazardous Waste (GNRTR)

The EPA's RCRA Program identifies and tracks hazardous waste from the point of generation to the point of disposal. RCRA Large Generators are facilities that generate at least 1,000 kg/month of non-acutely hazardous waste (or 1 kg/month of acutely hazardous waste) and Small Generators generate less than these amounts.

The Property and the adjacent sites were not listed in the search of these databases. No additional sites were found in the Federal database search (0.25-mile radius) under these listings.

4.1.7 Emergency Response Notification System (ERNS)

The ERNS database records and stores information on reported releases of oil and hazardous substances.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (0.25-mile radius) under this listing.

4.1.8 Cal-Sites and Cal-Sites Annual Work Plan (AWP)

The Cal-Sites database contains potential or confirmed hazardous substances release properties in California. The AWP list (formerly the BEP list) identifies known hazardous substances sites target for cleanup.

The Property and the adjacent sites were not listed in the search of these databases. No additional sites were found in the State database search (1.0-mile radius) under these listings.

4.1.9 California Hazardous Materials Incident Report System (CHMIRS)

The CHMIRS database contains information on reported hazardous material incidents including accidental releases or spills.

The search in this database was limited to the Property. The Property was not listed in the search of this county database.

4.1.10 State Index of Sites With Hazardous Waste (CORTESE & HIST CORTESE)

The CORTESE and HIST CORTESE lists are composed of sites that have had releases designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS) and the Department of Toxic Substances Control (Cal-Sites). The source is the California Environmental Protection Agency/Office of emergency Information. This database identifies public drinking water wells with detectable levels of contamination, hazardous substance sites selected for remedial action, sites with known toxic material identified through the abandoned site assessment program, sites with USTs having a reportable release and all solid waste disposal facilities from which there is known migration.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (1.0-mile radius) under this listing.

4.1.11 Notify 65

The Notify 65 list pertains to Proposition 65. This is a list of facilities that have released notifications about any release which could have impacted drinking water and thereby expose the public to a potential health hazard.

The Property and adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (1.0-mile radius) under this listing.

4.1.12 Toxic Pits Cleanup Facilities (TOXIC PITS)

The State Water Resources Control Board maintains records of toxic pits. This list identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (1.0-mile radius) under this listing.

4.1.13 State Landfill

The Integrated Waste Management Board maintains the Solid Waste Landfill (SWLF) records that contain an inventory of solid waste disposal facilities or landfills in the state of California. These may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites. Categories of waste are: Class I – municipal, household, shredded waste tires, Class II – industrial, Class III – farming, landscaping, land clearing waste, and Class IV – construction and demolition.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (0.5-mile radius) under this listing.

4.1.14 Waste Management Unit Database System (WMUDS/SWAT)

The State Water Resources Control Board maintains the WMUDS database. This listing is used for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections, Waste Management Unit Information, SWAT Program and Summary Information, Chapter 15 Information and Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information and Interested Parties Information.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (0.5-mile radius) under this listing.

4.1.15 Leaking Underground Storage Tanks (LUST)

The State Water Resource Control Board maintains records of reported leaking UST incidents.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (0.5-mile radius) under this listing.

4.1.16 California Bond Expenditure Plan (CA BEP)

The Department of Health Services developed the CA BEP database. This plan is a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (1.0-mile radius) under this listing.

4.1.17 Underground Storage Tank Sites (UST)

The State Water Resources Control Board's Hazardous Substances Storage Container Database tracks USTs as regulated under Subtitle I of RCRA.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (0.25-mile radius) under this listing.

4.1.18 Voluntary Cleanup Program (VCP)

The Department of Toxic Substance Control (DTSC) maintains records of sites that are low threat level properties with confirmed or unconfirmed releases and the project proponents have requested the DTSC oversee investigation and/or cleanup activity.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (0.5-mile radius) under this listing.

4.1.19 California Facility Inventory Database Underground Storage Tanks (CA FID UST)

The California Environmental Protection Agency maintains the FID database that contains historical listings of active and inactive underground storage tank locations. This data is obtained from the State Water Resource Control Board. These sites are not necessarily those that have had releases or spills.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (0.25-mile radius) under this listing.

4.1.20 Hazardous Substances Storage Container Database (HIST UST)

The Hazardous Substances Storage Container Database is a listing of historical UST sites. This data is obtained from the State Water Resource Control Board. These sites are not necessarily those that have had releases or spills.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (0.25-mile radius) under this listing.

4.1.21 Statewide Environmental Evaluation & Planning System (SWEEPS UST)

The Statewide Environmental Evaluation & Planning System Database is a listing of UST sites updated by a company under the authority of the State Water Resource Control Board (SWRCB) in the early 1980s. This list is no longer updated. These sites are not necessarily those that have had releases or spills.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (0.25-mile radius) under this listing.

4.1.22 Superfund Consent Decrees (CONSENT)

The CONSENT list is released periodically by the United States District Courts after settlement by parties to litigation matters. The list contains major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (1.0-mile radius) under this listing.

4.1.23 Records Of Decision (ROD)

The ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (1.0-mile radius) under this listing.

4.1.24 De-listed National Priorities List (NPL)

The De-listed National Priorities List (NPL) is the EPA's database of uncontrolled or abandoned hazardous waste sites that have been identified for priority remedial actions under the Superfund program, have been cleaned up to meet the closure standards set for the site and have therefore been taken off the NPL. A site must meet or surpass a predetermined hazard ranking system score, be chosen as a state's top priority site, or meet three specific criteria set jointly by the US Dept of Health and Human Services and the U.S. EPA in order to become an NPL site.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (1.0-mile radius) under this listing.

4.1.25 Facility Index System (FINDS)

The FINDS database contains both facility information and "pointers" to other sources that contain more detail.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.26 Hazardous Materials Information Reporting System (HMIRS)

The HMIRS database contains records of hazardous material spill incidents reported to the Department of Transportation (DOT).

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.27 Material Licensing Tracking System (MLTS)

The Nuclear Regulatory Commission maintains the MLTS database which contains a list of approximately 8,100 sites that possess or use radioactive materials and which are subject to NRC licensing requirements.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.28 Mines Master Index File (MINES)

The Department of Labor, Mines Safety and Health Administration (MSHA) maintain a list of active and abandoned mines.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (0.25-mile radius) under this listing.

4.1.29 Federal Superfund Liens (NPL LIENS)

The USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.30 PCB Activity Database System (PADS)

The PADS database identifies generators, transporters, commercial storage facilities, brokers and disposers of PCB's who are required to notify the EPA of such activities.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.31 RCRA Administrative Action Tracking System (RAATS)

The RAATS list contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate

RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.32 Toxic Chemical Release Inventory System (TRIS)

The TRIS database identifies facilities that release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313 (Community Right to Know).

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.33 Toxic Substance Control Act (TSCA)

The TSCA database identifies manufactures and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.34 FIFRA/TSCA Tracking System (FTTS)

The Federal Insecticide, Fungicide & Rodenticide Act and the Toxic Substances Control Act track administrative cases, pesticide enforcement actions, and compliance activities related to FIFRA and TSCA. The EPA Office of Prevention, Pesticides and Toxic Substances maintain this database.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.35 Above Ground Storage Tanks (AST)

The California State Water Resources Control Board maintains records of AST petroleum storage facilities. These sites are not necessarily those that have had releases or spills.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the Federal database search (0.25-mile radius) under this listing.

4.1.36 Drycleaners

The Department of Toxic Substances Control maintains records of drycleaner related facilities that have EPA ID numbers. These sites are not necessarily those that have had releases or spills.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (0.25-mile radius) under this listing.

4.1.37 California Waste Discharge System (CA WDS)

The CA WDS list is maintained by the California Environmental Protection Agency for sites that have been issued waste discharge requirements. These sites are not necessarily those that have had releases or spills.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.38 California Spills, Leaks, Investigations & Clean-up Cost Recovery Listing (CA SLIC)

The CA SLIC list maintained by the City Regional Water Quality Board includes sites that have impacted groundwater or have the potential to impact groundwater.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (0.5-mile radius) under this listing.

4.1.39 Hazardous Waste Information System (HAZNET)

The HAZNET database compiled by the Department of Toxic Substance Control contains data extracted from copies of hazardous waste manifests. The annual volume of manifests is typically 700,000 to 1,000,000. These are unconfirmed and uncorrected and may contain some invalid values such as generator ID, treatment storage and disposal ID, waste category or disposal method. These sites are not necessarily those that have had releases or spills.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.40 Historical Auto Stations and Dry Cleaners

EDR has searched select national collections of business directories and has collected partial listings of potential dry cleaners along with gas, filling, and service stations. EDR's review was limited to those categories of sources that might include dry cleaning, gas stations, filling stations and service stations. The categories reviewed included, but were not limited to: gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, dry cleaner, cleaners, laundry, laundromat, cleaning/laundry and wash & dry.

The Property and the adjacent sites were not listed in the search of this database. No additional sites were found in the State database search (0.25-mile radius) under this listing.

4.1.41 Areas of Concern (AOCONCERN)

The EPA Region 9 tracks areas where Volatile Organic Compound (VOC) contamination is at or above the Minimum Contaminant Level (MCL).

The Property and the adjacent sites were not designated as being in an AOCONCERN. There were no other sites found in the State database search (0.25-mile radius) under this listing.

4.1.42 Emissions Inventory Data (EMI)

The EMI database compiled by the local air pollution agencies lists sites where air pollution permits exist. These sites are not necessarily those that have had releases or spills.

The search in this database was limited to the Property. The Property was not listed in the search of this Federal database.

4.1.43 Department of Defense (DOD)

This data set from the USGS consists of federally owned or administered land, administered by the Department of Defense, that have any area equal to or great than 640-acres.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the State database search (1.0-mile radius) under this listing.

4.1.44 Tribal Records (Indian Reservations, Indian LUST, Indian UST)

This data set from tribal records consists of Indian reservations that have an area equal to or great than 640-acres, any leaking underground storage tanks, or registered underground storage tanks.

The Property and the adjacent sites were not listed in the search of these databases.

Cabazon Indian Reservation was on this list and is located approximately 1,500-feet west, southwest of the Property. There were no reports of spills, releases or violations on this site which is located down gradient from the Property in accordance with the presumed groundwater flow direction.

There were no other sites found in the database searches (up to 1.5-mile radius) under these listings.

4.1.45 ENVIROSTOR

This data from the Department of Toxic Substance Control (DTSC) Site Mitigation and Brownfields Reuse Program's lists sites that have known contamination or sites for which there may be reasons to investigate further.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the database searches (up to one-mile radius) under this listing.

4.1.46 RESPONSE

The RESPONSE list is composed of sites with confirmed releases and where the DTSC have been involved in the remediation. These confirmed releases sites are generally high-priority and high potential risk.

The Property and the adjacent sites were not listed in the search of this database. There were no other sites found in the database searches (up to one-mile radius) under this listing.

4.1.47 Indian Reservations

The Indian Reservations list is composed of areas under Indian jurisdiction. These are not sites that have necessarily had any releases or spills or were involved in the storage or use of hazardous materials or petroleum products.

The Property and the adjacent sites were not listed in the search of this database. There was one site found in the database search (up to one-mile radius) under this listing.

4.1.48 County of Riverside, Department of Environmental Health

APEI requested information for hazardous materials, petroleum product spills and USTs on the Property from the County of Riverside, Department of Environmental Health. In a telephone interview response to our request, Ms. Suzanne Cauffiel, Records Clerk, stated that without addresses, they would not be able to perform a comprehensive search of their records. She indicated that if there had been a release, spill, or UST on the Property, it would be likely that they would have applied for an address of the Property and therefore she implied that there are no records for the Property.

4.1.49 Orphan (Unmapped) Sites

Orphan (unmapped) sites indicated in the radius report were reviewed to determine their locations relative to the Property. These sites were not found to be in close proximity to the Property or their location could not be determined. Based upon APEI's area reconnaissance, types of regulatory listings identified for the orphan facilities, and conditions typical of the identified facilities activities, the orphan facilities were not considered suspect *recognized environmental conditions* to the subject property.

4.1.50 Previous Property Inspection Reports

The Client did not provide any previous inspection reports or Phase I Environmental Site Assessments for the Property.

4.1.51 Fire Department

The county and city fire departments have referred APEI to the County of Riverside, Environmental Health, Hazardous Materials Division for any inquires for USTs, spills or hazardous materials storage.

4.1.52 Santa Ana Regional Water Quality Control Board

Because the Property has never been developed and has no specific street address, a request for Santa Ana Regional Water Quality Control Board files could not be sent.

4.1.53 Department of Toxic Substances Control (DTSC)

DTSC Files

Because the Property has never been developed and has no specific street address, a request for DTSC files could not be sent.

Generator Information Services Section

Because the Property has never been developed and has no specific street address, a request for Generator Information Services Section files could not be sent.

EnviroStor

APEI searched for the Property and adjacent sites on the EnviroStor website published by the DTSC. This website contains listings of Federal Superfund sites, State Response sites, Voluntary Cleanup sites, School Cleanup sites, Evaluation sites, School Evaluation sites, Military Evaluation sites, Tiered Permit sites, Corrective Action sites, Operating Permit sites, Post Closure Permit sites, and Non-Operating Permit sites. The Property and adjacent sites were not listed on the EnviroStor website.

4.1.54 State Water Resources Control Board (GeoTracker)

APEI searched for the Property and adjacent sites on the GeoTracker website published by the State Water Resources Control Board. This site contains listing of DTSC cleanup sites, other cleanup sites, LUST sites, UST sites, land disposal sites, military sites, and DTSC Disposal Permit sites. The Property and adjacent sites were not listed on the GeoTracker website.

5.0 INFORMATION FROM SITE RECONNAISSANCE

5.1 Hazardous Substances in Connection with Identified Uses

An unaccompanied site reconnaissance of the Property was performed by Mr. Doug Kochanowski, Biologist and Project Manager, on September 10, 2014 that included a walk of the Property to determine the presence of hazardous materials and environmental conditions.

There were no signs of hazardous materials being used or stored on the Property.

5.2 Unidentified Substance Containers

Some empty 5-gallon buckets of various components such as paint were dumped on the Property in various areas, primarily near access roads. These containers did not contain any product and there were no sign of spills or releases from these containers onto the Property. The presence of these containers does not represent a recognized environmental condition for the Property.

5.3 Storage Tanks

No USTs or clarifiers were noted on the Property at the time of the Property reconnaissance.

Along the north Property border, south of the scrap metal yard, was a wooden Above Ground Storage Tank (AST) that was empty. This AST was approximately 10-feet in diameter, 30-feet long, and is estimated to have building been approximately 18,000-gallons. This AST appeared to have been illegally dumped on the Property and there were no visual or olfactory signs of spills or releases noted on the Property below or in the vicinity of the AST. Based on the size of this tank and its construction material, it is likely that it was a water tank. The presence of this AST on the Property does not represent a recognized environmental condition.

Near the groundwater well at the water retention pond along the north Property border were three plastic 500-gallon ASTs, one plastic 200-gallon tote, and one plastic 300-gallon AST. These containers appear to be associated with water treatment and storage. There were no signs of spills or releases noted at these containers. The presence of these ASTs and tote on the Property does not represent a recognized environmental condition.

5.4 Hydraulic Equipment

There were no above or below-grade hydraulic lift systems observed on the Property.

5.5 Indications of PCBs

There were no pad-mounted transformers, ballasts, or hydraulic lift systems located on the Property.

There are three pole-mounted transformers located near the water retention pond along the north Property border, one along the west Property border south of the adjacent Corona Yacht Club, and one near the center of the Property. These transformers are from Southern California Edison (SCE). In previous telephone conversations with SCE, personnel stated that transformers installed by SCE prior to 1978 contained insignificant concentrations of PCBs while those installed after 1978 were not likely to contain PCBs. In addition, SCE stated that in the event a SCE transformer leaked, it would be the responsibility of SCE to clean up the contamination. SCE also submits a form letter on the subject of PCBs in SCE transformers, which reads:

> "It is highly unlikely that the transformer serving your facility contains polychlorinated biphenyls (PCB) at concentration levels requiring special management under the Environmental Protection Agency's rules. Federal law has prohibited the manufacture of transformers containing PCB since 1977. In addition, SCE has never specified the purchase of distribution transformers utilizing PCB as the insulating/cooling fluid. SCE distribution transformers utilize mineral oil as the insulation/cooling fluid exclusively. In a statistically valid test of over 20,000 SCE distribution transformers, we determined that the concentration of PCB in the mineral oil is less than 50 parts per million (ppm) in over 96 percent of the units. The mineral oil in the 4 percent that tested above 50 ppm is generally below 100 ppm..."

The units appeared in good condition and evidence of leaks was not observed. The presence of these five pole-mounted transformers does not represent a recognized environmental condition for the Property.

5.6 Indications of Solid Waste Disposal

There was evidence observed of debris, trash, empty cans, clothing, furniture, concrete, roofing, wood, cuttings, rubber tires, railroad ties, and other materials typical of illegal dumping noted throughout the Property. These materials were typically located in areas along the access roads. There were two other areas where more solid waste was identified including the former water retention pond near the center of the Property and the area south of the north adjacent scrap metal yard. The solid waste appeared to be innocuous household trash dumped illegally and there were no signs of disposed hazardous materials or petroleum products. Other than the recommendation that these material be removed to help avert further dumping, no further investigation in regards to this condition is deemed necessary at this time.

5.7 Surface Staining

There was no evidence noted of discolored soils, odors or surface staining on the Property during the site reconnaissance. There was no evidence of sparse, stressed, or dead vegetation (from other than insufficient water). There was no visual evidence of improper handling or disposal of hazardous chemicals or materials on the Property grounds. Staining from paintball activities was noted in the area of the paintball field, however, the material used in paintballs is biodegradable, nontoxic, and does not require any special handling or disposal procedures,

5.8 Physical Setting Analysis

The Property is located in an area surrounded by commercial, residential, and agricultural uses. The area around the Property began to significantly develop in the 1970s.

There were no indications that the Property or any of the sites adjacent to the Property have been affected by the presence of oil or natural gas deposits. According to the California Department of Conservation Field and Wells Map from 2001 presented in Appendix A, the Property is not located in the proximity of an oil or gas field. The Property is located in a sedimentary basin with oil, gas, or geothermal production.

5.9 Non Scope ASTM Considerations

5.9.1 Asbestos

Physical sampling of suspect Asbestos Containing Materials (ACMs) was not part of the scope of this project and only a very limited and cursory visual inspection was performed. The presence of asbestos or suspect asbestos does not represent a recognized environmental condition for the Property.

APEI noted a pile of roofing materials that had been dumped on the Property in the vicinity of the former water retention pond near the center o the Property. The suspect asbestos containing materials included asphalt roofing, roof tar, and roofing felt. It is recommended that these materials be tested for asbestos. If found to contain asbestos, an asbestos abatement contractor will be required to have this material removed from the Property.

The shed located near the paintball field has suspect asbestos containing roofing. It is recommended that if this shed will be demolished, the roofing materials be tested for asbestos prior to the disturbance of this material. If

found to contain asbestos, an asbestos abatement contractor will be required to have this material removed from the shed prior to its demolition.

No above grade indications were observed that cement asbestos pipes (Transite pipe) were used on the Property. However, cement asbestos pipes are known to have been used for water distribution systems for crop irrigation. It is recommended that during excavation activities on the Property, if suspect cement asbestos pipes are identified, they be removed and disposed of by a licensed asbestos abatement contractor.

5.9.2 Lead Based Paint

Except for the shed which was not painted, the Property was undeveloped at the time of the site reconnaissance; therefore, no suspect lead based paint was noted on the Property.

5.9.3 Lead Contamination of Drinking Water

The condition of the drinking water at the Property is unknown.

5.9.4 Radon

Based on the results of the State of California Department of Health Services' 1990 California Statewide Radon Survey, the U.S. Environmental Protection Agency (U.S. EPA) lists Riverside County as being in Radon Zone 2. Zone 2 areas have a predicated average indoor radon screening potential of between 2.0 picocuries per liter (pCi/L) and 4.0 pCi/L. The level at which the U.S. EPA considers radon levels to be unhealthful is 4.0 pCi/L in residential structures.

There can be extreme variations of indoor radon levels within a local area based upon geologic, soil structure and building characteristics. The EPA recommends testing as the definitive method in determining the radon level within a specific structure. Radon testing was not part of this project's scope of work.

5.9.5 Urea-Formaldehyde

Except for the shed which had no urea-formaldehyde insulation, the Property was undeveloped at the time of the site reconnaissance; therefore, no suspect urea-formaldehyde containing materials were noted on the Property.

5.9.6 Mold

Except for the shed which showed no signs of mold growth or water intrusion, the Property was undeveloped at the time of the site reconnaissance, therefore, no molds that could potentially affect indoor air quality were present.

5.9.7 Fluorescent Light Tubes

There were no large quantities of fluorescent light tubes noted on the Property.

5.9.8 Mercury

Except for the shed which had no components suspected on containing mercury, the Property was undeveloped at the time of the site reconnaissance, therefore, no mercury containing components were identified on the Property.

5.9.9 Vapor Intrusion

APEI has not identified any potential sources of contamination by vapor intrusion emanating from the Property or adjacent sites. It should be noted that APEI was not contracted to perform an assessment of the Property in accordance with ASTM Standard E2600 nor does this assessment meet the requirements of said standard.

6.0 FINDINGS, CONCLUSIONS AND OPINIONS

All Phase Environmental, Inc. (APEI) has performed a Phase I Environmental Site Assessment (ESA) of the approximately 279.64-acre site located at the northwest corner of the intersection of 48th Avenue and Polk Street, in the City of Coachella, in the County of Riverside, California, 92236.

This assessment has revealed no evidence of recognized environmental conditions, historical recognized environmental conditions, controlled recognized environmental conditions, or de minimis conditions in connection with the Property except for the following: