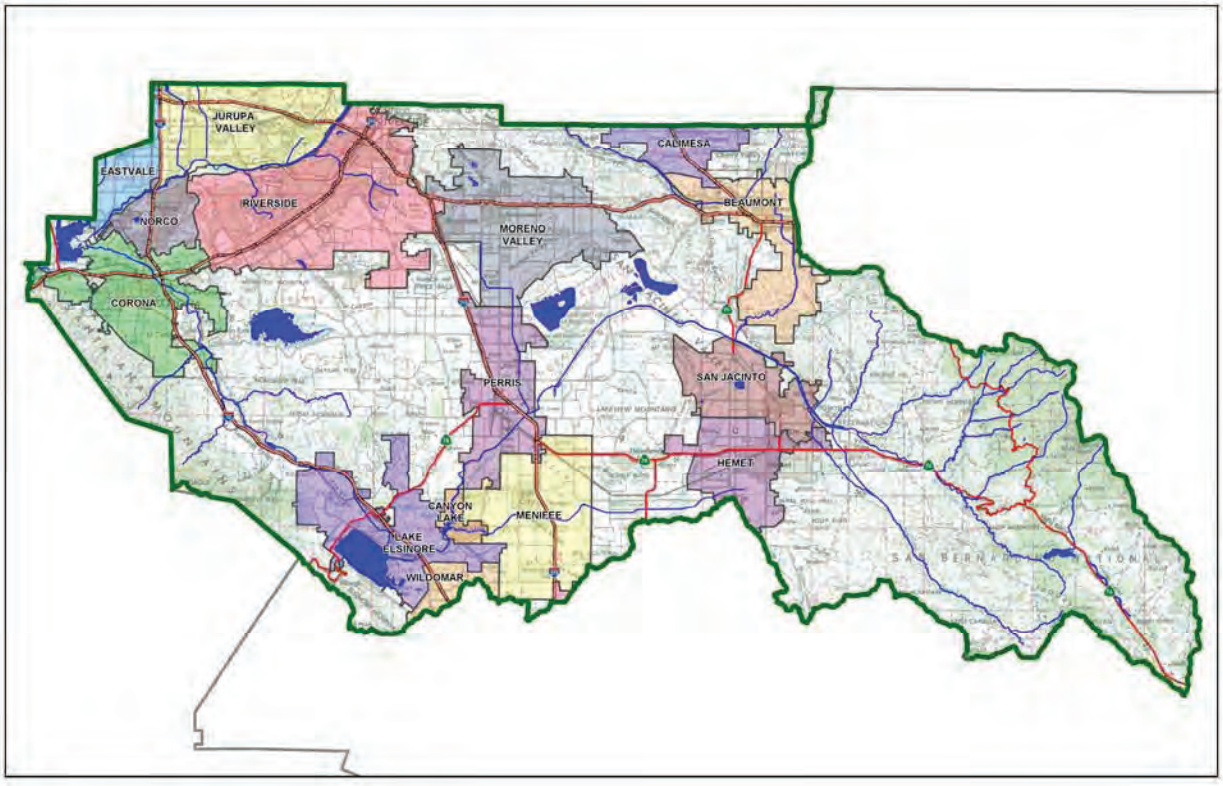
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Magnolia Flats - 10431 Magnolia Avenue

Public Works No: PW19-1103

Design Review/Case No: P19-0863



☒ **Preliminary**
☐ **Final**

Original Date Prepared: November 18, 2019

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Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

Contact Information:

Prepared for:
Magnolia Partnership, LLC
Darrin Olson
1201 Dove Street, Suite 520
Newport Beach, CA 92660
(949) 975-1122

Prepared by:
KHR Associates
James H. Kawamura, President
17530 Von Karman Avenue, Suite 200
Irvine, CA 92614
(949) 756-6440

OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Magnolia Partnership, LLC by KHR Associates for the Magnolia Flats project.

This WQMP is intended to comply with the requirements of the City of Riverside for A 450 unit mixed-use development with 9,042 square feet of retail space, Planning Case No. P19-0863 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 and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. 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 the City of Riverside Water Quality Ordinance (Municipal Code Section 14.12.315).

"I, the undersigned, certify under penalty of law 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	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

James H. Kawamura Preparer's Signature	May 19, 2020 Date
James H. Kawamura Preparer's Printed Name	President Preparer's Title/Position

Preparer's Licensure: Registered Civil Engineer No. C30560
Exp. 3/31/22

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Section A: Project and Site Information

The proposed development involves new construction of approximately 15.53 acres (676,321 sf.) consisting of a four-story, 450-unit apartment building with retail space, and surface parking on a 16.58 acre (722,171 sf.) property. New construction consists of approximately 110,414 square feet apartment building, 9,042 square feet of retail space, 125,864 square feet of landscaping, 238,998 square feet of exposed vehicular and surface parking area, 88,958 square feet of carports, 77,146 square feet of hardscape, 3,042 square feet of pool and spa, and 22,562 square feet of turf. Approximately 1.05 acres (45,850 square feet) of the existing project site that consists of 7,778 square feet of retail building, 4,578 square feet of retail landscaping, 30,988 square feet of retail surface parking area, 894 square feet of retail hardscape, along with 1,188 square feet of residential walls and 424 square feet of residential landscaping (backyards that encroaches on-site) will be left untouched. Open space for residential use consists of a pool and landscaping, including a 45,360 square foot park along the northwesterly portion of the site. The entire site along with approximately 0.36 acres (15,816 square feet) that runs onto the project site will be treated by means of infiltration.

PROJECT INFORMATION	
Type of Project:	Mixed-Use
Planning Area:	Ward 6
Community Name:	La Sierra
Development Name:	Magnolia Flats
PROJECT LOCATION	
Latitude & Longitude (DMS): 33D 54M 43S N, 117D 27M 56S W	
Project Watershed and Sub-Watershed: Santa Ana; Santa Ana River, Reach 3	
APN(s): 143-180-028-7; 143-180-031-9; 148-180-026-5; 148-180-032-0	
Map Book and Page No.: Book 221, Page 91-92	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Mixed-Use
Proposed or Potential SIC Code(s)	6513, 5399
Area of Impervious Project Footprint (SF)	591,305 sf.
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	550,457 sf.
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	328,572 sf.
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	N/A
What is the Water Quality Design Storm Depth for the project?	0.60

A.1 Maps and Site Plans

Appendix 1 includes a map of the local vicinity and existing site. In addition, WQMP Site Plan, located in Appendix 1, includes the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Downspouts
- Impervious Surfaces
- Standard Labeling

A.2 Receiving Waters

In order of upstream to downstream, the receiving waters that the project site is tributary to are as follows. A map of the receiving waters is included in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	Hydrologic Unit	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Santa Ana River, Reach 3	801.21	Copper, Lead, Indicator Bacteria	AGR, GWR, REC1, REC2, WARM, WILD, RARE	Approximately 9 miles

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ 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
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*		
City of Riverside Conditional Use Permit	☐ Y	☒ N
City of Riverside Design Review	☒ Y	☐ N
City of Riverside Building Permit	☒ Y	☐ N
City of Riverside Grading Permit	☒ Y	☐ N
City of Riverside Construction Permit	☒ Y	☐ N

Section B: Optimize Site Utilization (LID Principles)

Site Optimization

Does the project identify and preserve existing drainage patterns? If so, how? If not, why?

The site will match as close to possible existing drainage paths and minimize usage of inlets. For the most part, drainage will occur over impervious surfaces.

Does the project identify and protect existing vegetation? If so, how? If not, why?

The site, although vacant, does not have any existing vegetation or sensitive areas to protect.

Does the project identify and preserve natural infiltration capacity? If so, how? If not, why?

The geotechnical report has shown that there is a potential for the upper 10 to 15 feet of the underlying soils to collapse when wetted upon loading. Additionally, a consistent layer of impermeable clay with a thickness varying from 5 to 15 feet was encountered directly below these soils. Per the geotechnical report, "infiltration of stormwater within the upper 30 feet of the soil profile is not feasible due to the anticipated adverse impacts to the site soils or mounding of groundwater." However, based on the results of the percolation testing performed on-site at depths from 35 to 40 feet below grade, the measured permeability of the subsurface soils at the tested depths are determined to be suitable for infiltration by means of dry wells.

Does the project identify and minimize impervious area? If so, how? If not, why?

The nature of the development limits the potential to minimize impervious areas. Landscaping will be utilized around the buildings and parking lots as well as used within the parking lots to the maximum extent practical. Drive aisles, parking stalls and sidewalks will be designed to the minimum widths allowed. A 45,360 square foot park will be located along the northwesterly portion of the site.

Does the project identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Due to soil conditions, including collapsible soils and the potential for mounding of water on the clay layer, runoff will not be dispersed to adjacent pervious areas. The geotechnical report recommends landscaping not be planned within 10 feet of the buildings unless impermeable liners underlie the landscaping, and that roof drainage be collected and conducted away from the buildings.

Section C: Delineate Drainage Management Areas (DMAs)

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)	Area (Sq. Ft.)	DMA Type
1A	Landscape	80,319	D
1B	Roof (Building, Carport)	143,366	D
1C	Walk /Turf	47,392	D
1D	Asphalt	105,063	D
2A	Landscape	12,543	D
2B	Roof (Carport)	9,126	D
2C	Walk	10,323	D
2D	Asphalt	35,952	D
3A	Landscape	29,260	D
3B	Roof (Carport/Building/Trash Enclosure)	49,954	D
3C	Walk/Water Features/Turf	42,312	D
3D	Asphalt	79,571	D
4A	Landscape	8,952	D
4B	Roof (Building/Trash Enclosure)	21,664	D
4C	Walk	6,555	D
4D	Asphalt	55,635	D

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
N/A			

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				Type 'C' DMAs that are draining to the Self-Retaining Area		
DMA Name/ ID	Post-project surface type	Area (square feet)	Storm Depth (inches)	DMA Name / ID	[C] from Table C.4 =	Required Retention Depth (inches)
		[A]	[B]		[C]	[D]
N/A						

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
N/A							

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
A	Drywell
B	Drywell
C	Drywell
D	Drywell

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (ref: Chapter 2.4.4 of the WQMP Guidance Document)? ☐ Y ☒ N

Geotechnical Report

A Geotechnical Report is required by the City of Riverside to confirm present and past site characteristics that may affect the use of Infiltration BMPs, see Appendix 3.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?	X	
Describe here: Per the geotechnical report, a consistent layer of impermeable clay with a thickness varying from 5 to 15 feet thick was encountered directly below the upper soils consisting of loose to medium dense silty sands and soft sandy silts. According to the geotechnical report, infiltration of a significant amount of stormwater within the upper 30 feet of the soil profile may cause collapse or mounding of water on the clay layer, while the loose to medium dense silty sands, if saturated would be susceptible to liquefaction settlement under the design earthquake load. However, based on the results of the percolation testing performed on-site at depths from 35 to 40 feet below grade, the measured permeability of the subsurface soils at the tested depths are determined to be suitable for infiltration by means of dry wells. The geotechnical report recommends infiltration devices be placed at a sufficient distance from the new apartment building and retail buildings and existing buildings on adjacent properties or deepened to the dense sands underlying the site. The geotechnical report also recommends landscaping not be planned within 10 feet of the buildings unless impermeable liners underlie the landscaping, and that roof drainage be collected and conducted away from the buildings.		

D.2 Harvest and Use Assessment

The following conditions apply*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verified with the City of Riverside).

☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. (Harvest and Use BMPs are still encouraged, but are not required as the Design Capture Volume will be infiltrated or evapotranspired).

☐ None of the above.

Harvest and Use BMPs need not be assessed for the site.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

For the project, the following applies:

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5.

☒ None of the above.

D.4 Feasibility Assessment Summaries

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
A	☒	☐	☐	☐	☐
B	☒	☐	☐	☐	☐
C	☒	☐	☐	☐	☐
D	☒	☐	☐	☐	☐

LID BMPs are feasible for all project DMAs.

D.5 LID BMP Sizing

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* *Drywell #1*		
	[A]		[B]	[C]	[A] x [C]			
1A	*80,319*	*Landscaping*	*.1*	*0.11*	*8,871.9*	*Design Storm Depth (in)* [E]	*Design Capture Volume,* V_{BMP} *(cubic feet)* [F]	*Proposed Volume on Plans (cubic feet)* [G]
1B	*143,366*	*Roof*	*1*	*0.89*	*127,882.5*			
1C	*47,392*	*Walk*	*1*	*0.89*	*42,273.7*			
1D	*105,063*	*Asphalt*	*1*	*0.89*	*93,716.2*			
	376,140				272,744.3	0.6	13,637.2	13,655

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A of the WQMP Guidance Document
[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* *Drywell #2*		
	[A]		[B]	[C]	[A] x [C]			
2A	*12,543*	*Landscaping*	*.1*	*0.11*	*1,385.5*	*Design Storm Depth (in)* [E]	*Design Capture Volume,* V_{BMP} *(cubic feet)* [F]	*Proposed Volume on Plans (cubic feet)* [G]
2B	*9,126*	*Roof*	*1*	*0.89*	*8,140.4*			
2C	*10,323*	*Walk*	*1*	*0.89*	*9,208.1*			
2D	*35,952*	*Asphalt*	*1*	*0.89*	*32,069.2*			
	67,944				50,803.2	0.6	2,540.2	2,546

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A of the WQMP Guidance Document
[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* *Drywell #3*		
	[A]		[B]	[C]	[A] x [C]			
3A	*29,260*	*Landscaping*	*.1*	*0.11*	*3,232*	*Design Storm Depth (in)* [E]	*Design Capture Volume, V_{BMP} (cubic feet)* [F]	*Proposed Volume on Plans (cubic feet)* [G]
3B	*49,954*	*Roof*	*1*	*0.89*	*44,559*			
3C	*42,312*	*Walk*	*1*	*0.89*	*37,742.3*			
3D	*79,571*	*Asphalt*	*1*	*0.89*	*70,977.3*			
	201,097				156,510.6	0.6	7,825.5	7,852

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A of the WQMP Guidance Document
[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here* *Drywell #4*		
	[A]		[B]	[C]	[A] x [C]			
4A	*8,952*	*Landscaping*	*.1*	*0.11*	*988.8*	*Design Storm Depth (in)* [E]	*Design Capture Volume, V_{BMP} (cubic feet)* [F]	*Proposed Volume on Plans (cubic feet)* [G]
4B	*21,664*	*Roof*	*1*	*0.89*	*19,324.3*			
4C	*6,555*	*Walk*	*1*	*0.89*	*5,847.1*			
4D	*55,635*	*Asphalt*	*1*	*0.89*	*49,626.4*			
	92,806				75,786.6	0.6	3,789.3	3,825

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A of the WQMP Guidance Document
[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

The site will use MaxWell IV Drywells to infiltrate the Design Capture Volume within the required drawdown time of 72 hours. See Appendix 6 for the calculations.

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to confirmation of LID waiver approval by the Regional Board). For the project, the following applies:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Regional Board and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Pollutants of Concern

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☒ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☒	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

To effectively mitigate the potential project priority pollutants of concern, the design capture volume for the site will be collected and infiltrated by drywells. Infiltration systems are considered to have zero discharge. To ensure longevity, the infiltration system will be offline and an Aqua-Swirl unit will be used as pretreatment prior to infiltration by the drywells.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

The project does not create a Hydrologic Condition of Concern, meeting the criteria for HCOC Exemption as shown below:

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

Results included in Table F.1 below and hydrologic analysis included in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration			
Flow (CFS)			
Volume (Cubic Feet)			
Volume Infiltrated			

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (Prado Dam, Santa Ana River) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

F.2 HCOC Mitigation

As an alternative to the HCOC Exemption Criteria above, HCOC criteria is considered mitigated if the project meets one of the following conditions, as indicated:

☐ a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

☒ b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

☐ c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

☐ d. None of the above.

Section G: Source Control BMPs

The following table identifies the potential sources of runoff pollutants for this project and specifies how they are addressed through permanent controls and operational BMPs:

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site storm drain inlets	Location of inlets shown on WQMP Exhibit. Mark all inlets with the words "Only Rain Down the Storm Drain" or similar.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage Systems Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Interior floor drains and elevator shaft sump pumps	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.
Need for future indoor & structural pest control	Pests will be kept out of buildings using barriers, screens and caulking.	Provide Integrated Pest Management information to owners, lessees, and operators.
Landscape/Outdoor Pesticide Use	Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes,	Maintain landscaping using minimum or no pesticides. Provide IPM information to new owners, lessees and operators. See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater/.

	climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	
Pools, spas, ponds, decorative fountains, and other water features	Plumb to sewer in accordance with local requirements. If draining to landscaped area, remove any chemicals and debris before slowly discharging to landscaping.	See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/.
Refuse areas	Location of refuse areas shown on WQMP Exhibit. Signs will be posted on or near dumpster stating "Do not dump hazardous materials here" or similar. Any doors to trash area and bin lids will be kept closed. Bins will be emptied weekly.	Receptacles will be inspected weekly and repaired/replaced when leaking. Bin lids are to remain closed and refuse area will be maintained daily. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.
Vehicle and Equipment Cleaning	Vehicle and equipment cleaning will not be allowed on-site.	Lease agreement shall state that vehicle and equipment cleaning is prohibited on-site. See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.
Vehicle / Equipment Repair and Maintenance	Vehicle and equipment repair and maintenance will not be allowed on-site.	No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinse water from parts cleaning into stormwater. No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building. Leaking vehicle fluids shall be contained or drained from vehicle immediately. No person shall leave unattended drip parts or other

		open containers containing vehicle fluids, unless such containers are in use or in an area of secondary containment.
Miscellaneous Drain or Wash Water or Other Sources: Boiler drain lines; Condensate drain lines; Rooftop equipment; Roofing, gutters, and trim; Other sources	Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
Plazas, sidewalks, and parking lots		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
1	Maxwell IV Drywell	Preliminary Storm Drain Plan
2	Maxwell IV Drywell	Preliminary Storm Drain Plan
3	Maxwell IV Drywell	Preliminary Storm Drain Plan
4	Maxwell IV Drywell	Preliminary Storm Drain Plan

Section I: Operation, Maintenance and Funding

As required by the City of Riverside, the following Operation, Maintenance and Funding details are provided as summarized:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred.
3. An outline of general maintenance requirements for the Stormwater BMPs selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance.

See Appendix 9 for a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on site, and an agreement assigning responsibility for maintenance and providing for inspections and certification.

Maintenance Mechanism: Covenant & Agreement, Funding for the on-going operation and maintenace of post-construction BMPs is the responsibility of Magnolia Partnership, LLC (the property owner).

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

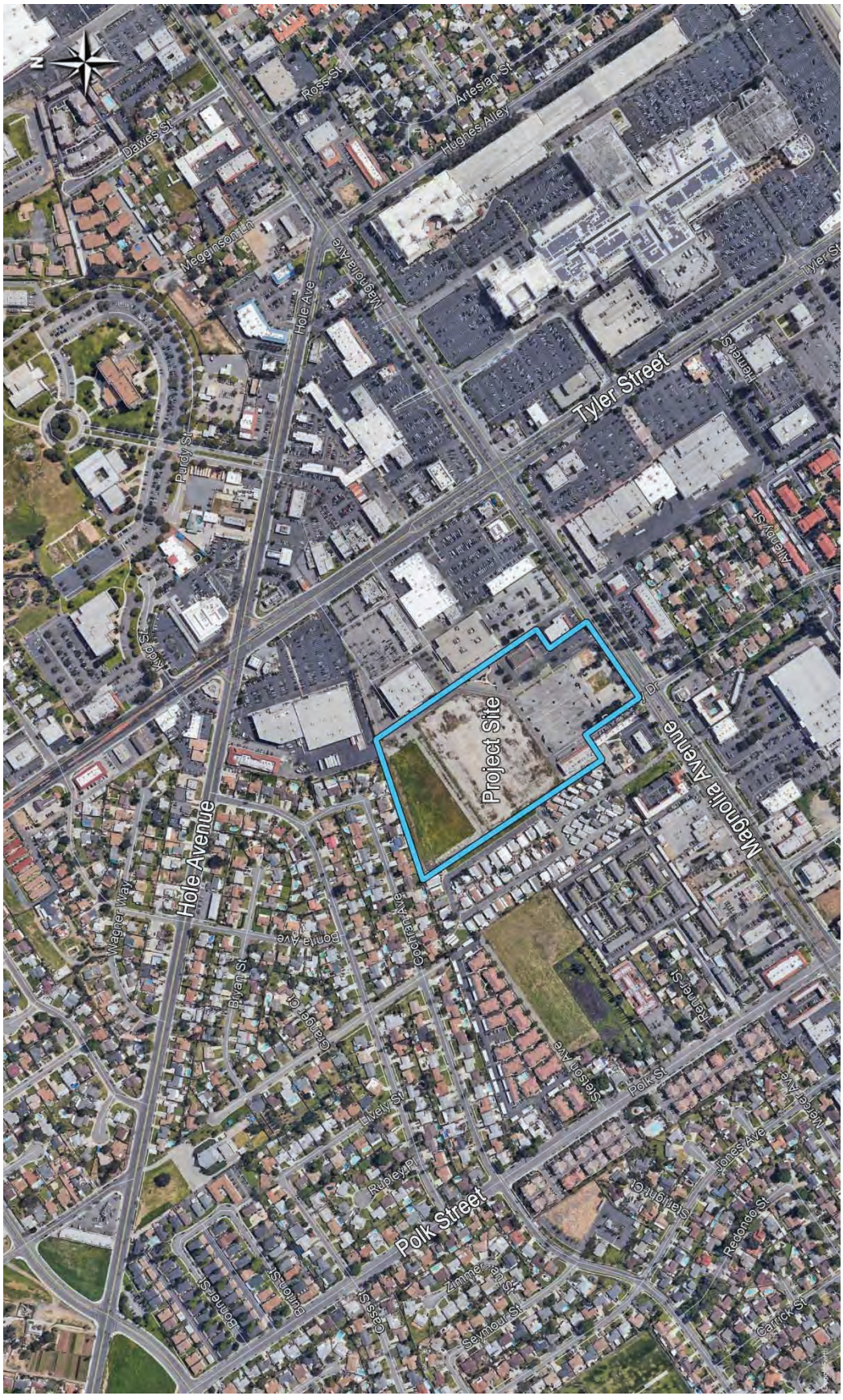
☐ Y ☒ N

Operation and Maintenance Plan and Maintenance Mechanism is included in Appendix 9. Educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP are included in Appendix 10.

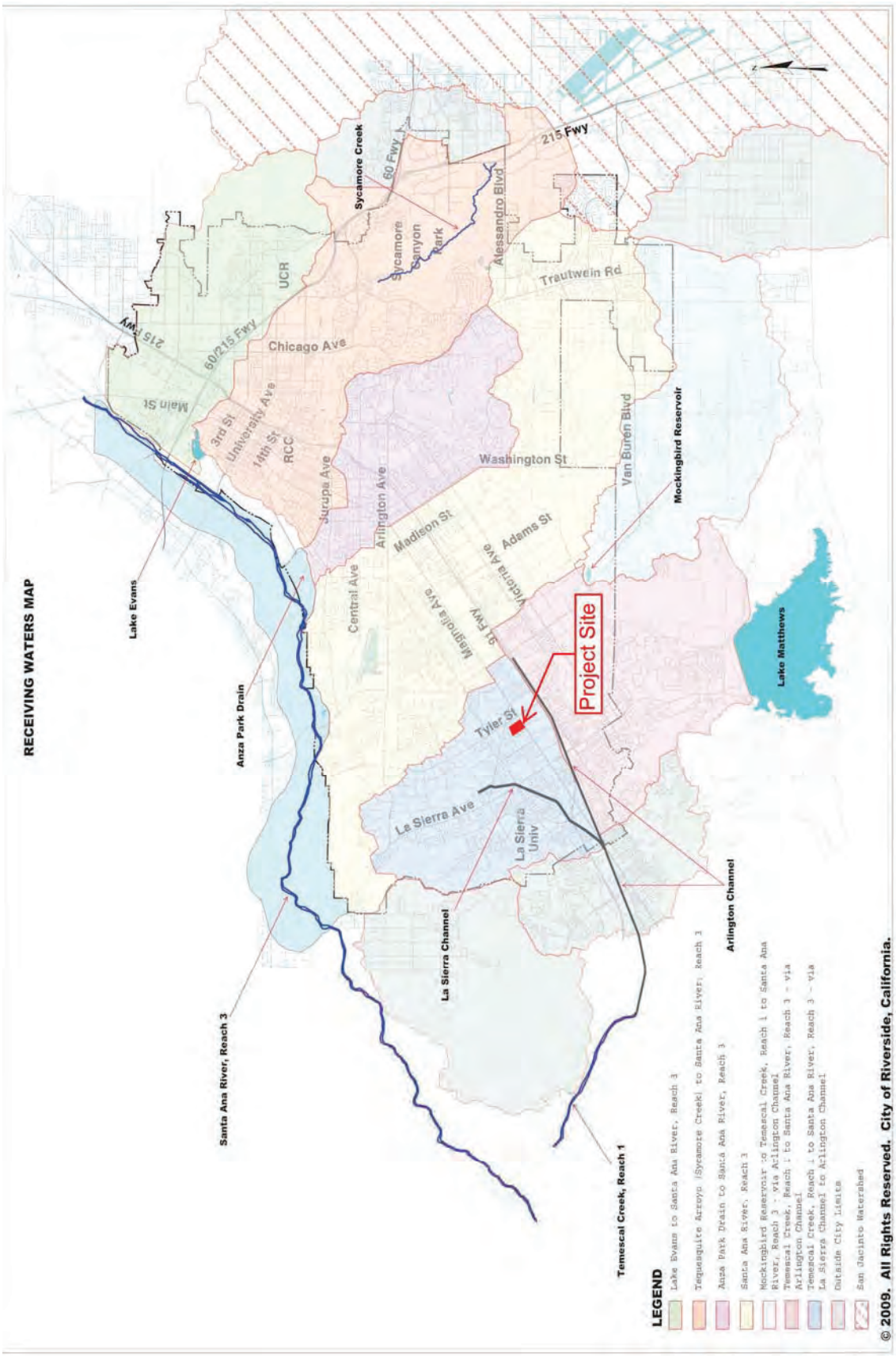
Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

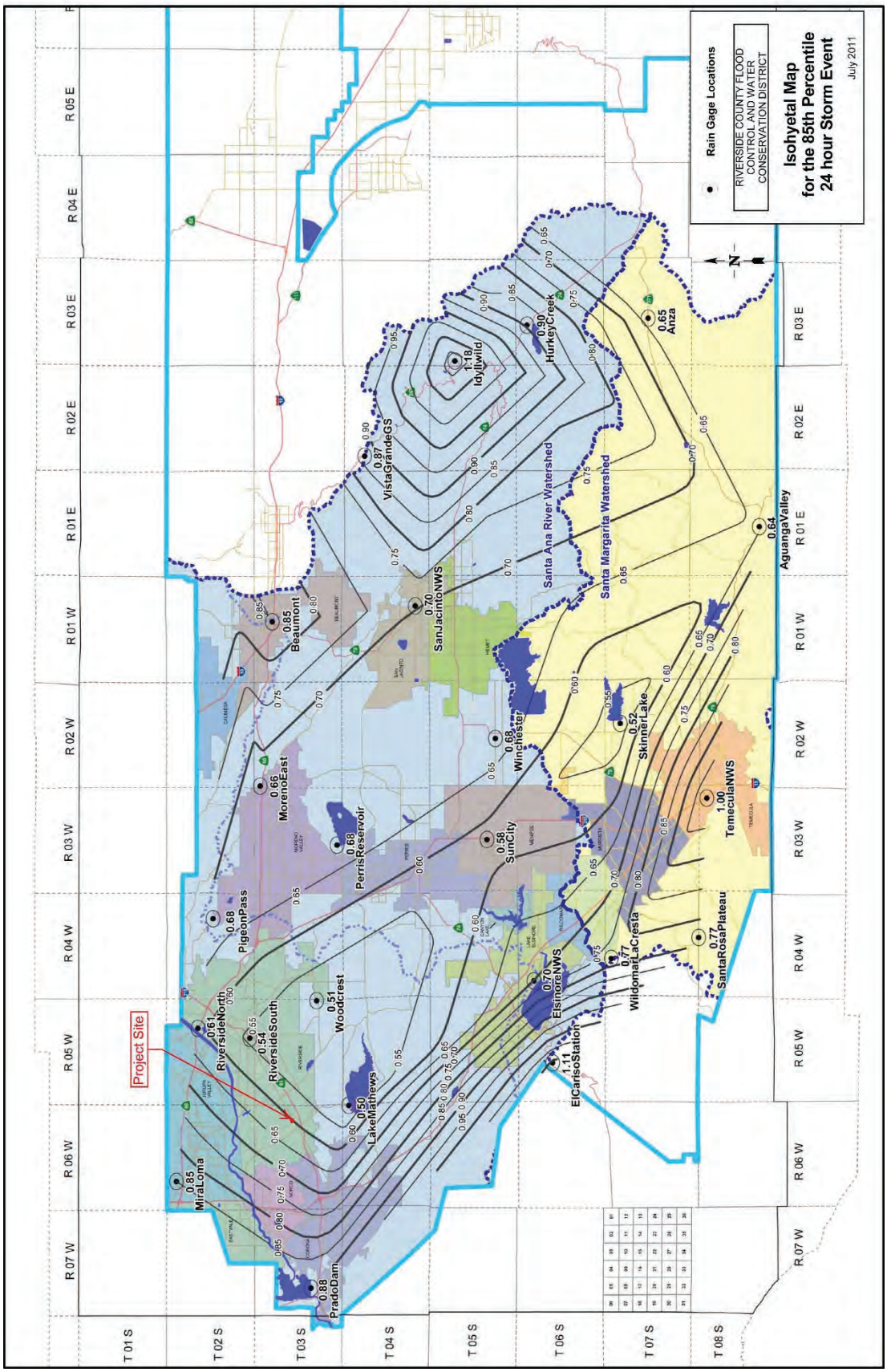
Location Map

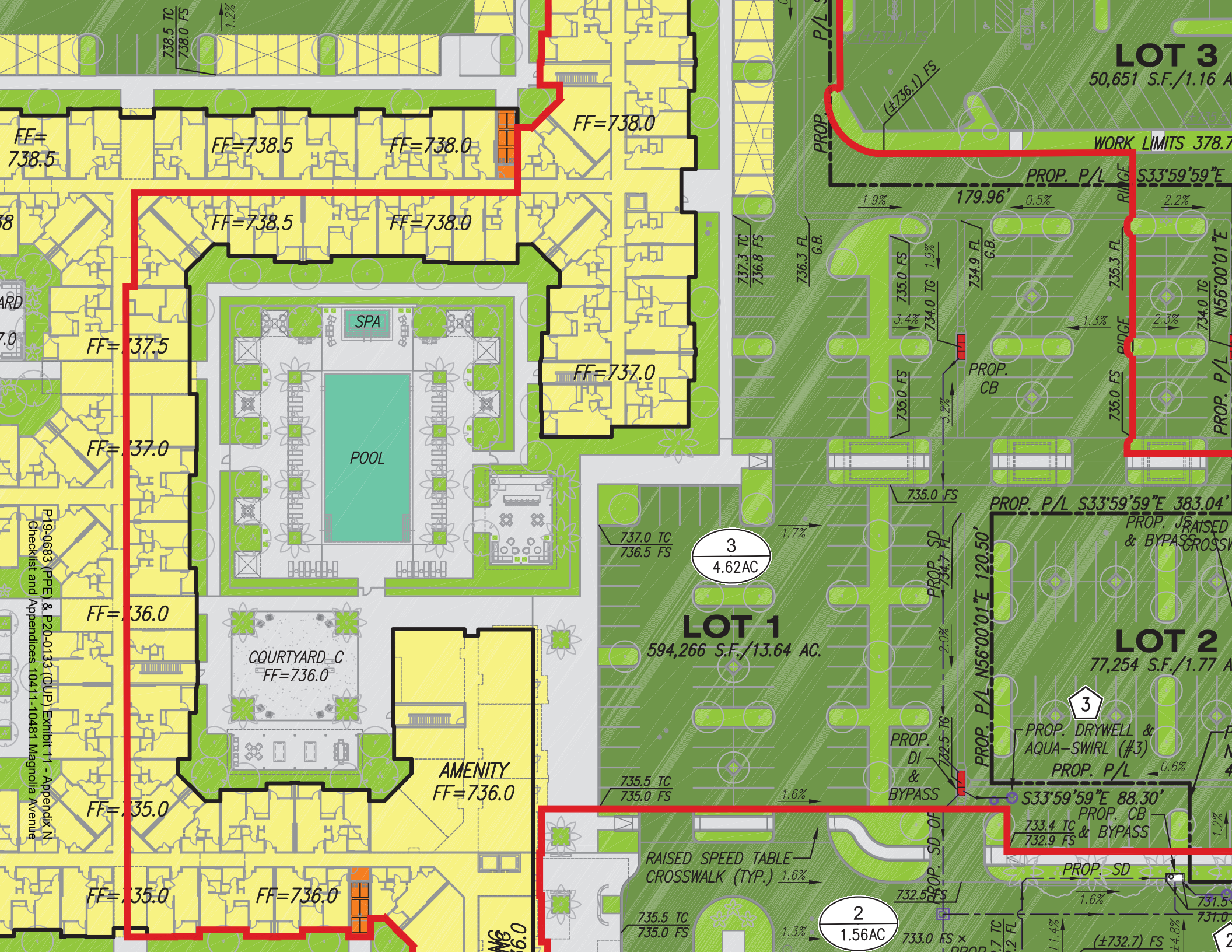


Receiving Waters Map



85th Percentile Isohyetal Map

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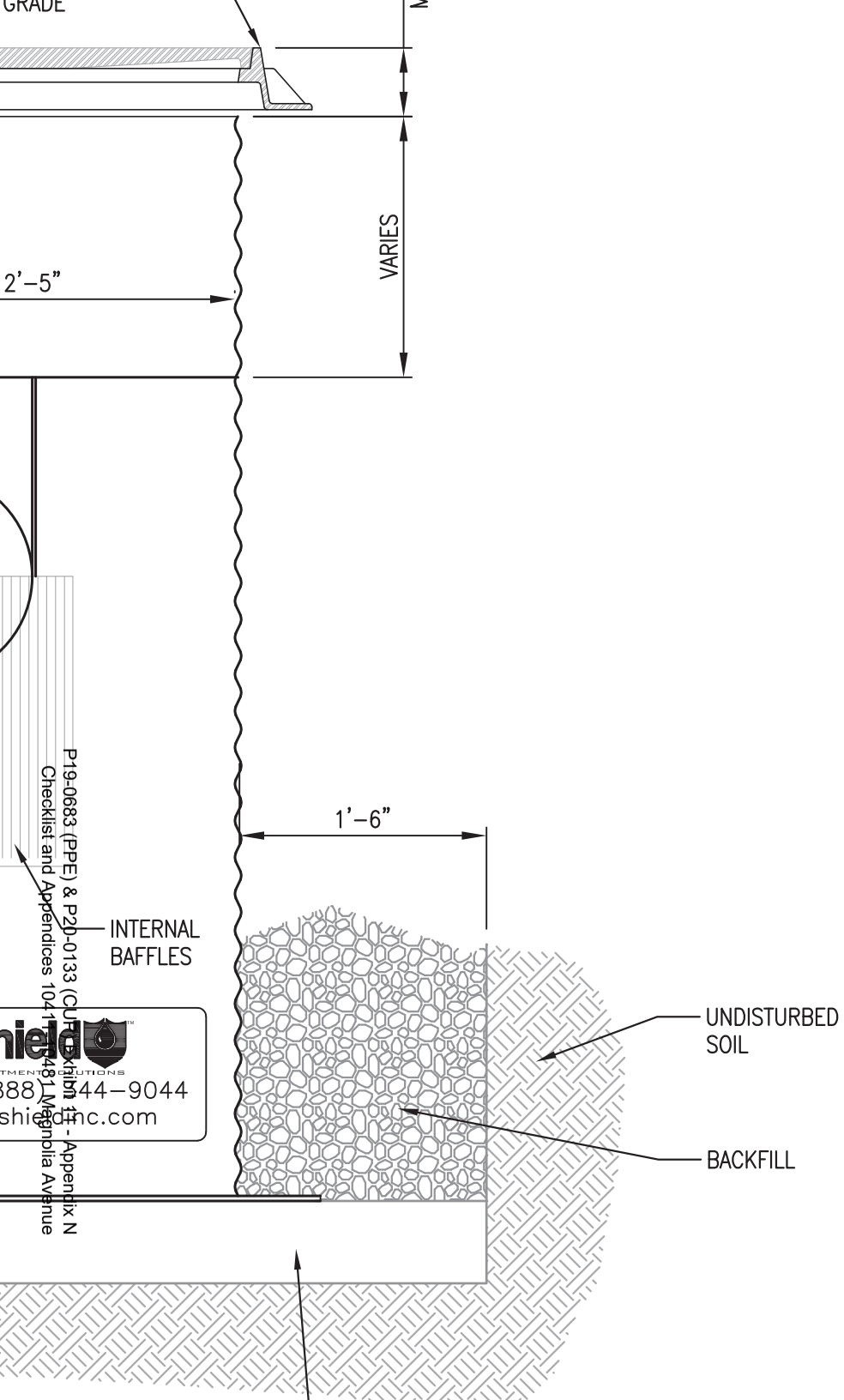
50,651 S.F./1.16 A
WORK LIMITS 378.7
PROP. P/L S33°59'59"E
179.96'
PROP. P/L S33°59'59"E 383.04'
PROP. P/L N56°00'01"E 120.50'
LOT 1
594,266 S.F./13.64 AC.
LOT 2
77,254 S.F./1.77 A
3
4.62AC
2
1.56AC
SPA
POOL
COURTYARD C
FF=736.0
AMENITY
FF=736.0
FF=738.0
FF=738.5
FF=737.5
FF=737.0
FF=736.0
FF=735.0
PROP. CB
PROP. DI & BYPASS
PROP. SD
PROP. DRYWELL & AQUA-SWIRL (#3)
PROP. CB & BYPASS
RAISED SPEED TABLE CROSSWALK (TYP.)
PROP. JB & RAISED CROSSW
P19-0683 (PPE) & P20-0133 (CUP) Exhibit 11 - Appendix N
Checklist and Appendices 10411-10481 Magnolia Avenue



ALHAMBRA FOUNDRY A1530 ADA–COMPLIANT OPEN
(26" OVERALL BASE AND 22" CLEAR OPENING).

3. GRADED BASIN OR PAVING (BY OTHERS).

4. COMPACTED BASE MATERIAL (BY OTHERS).

5. PUREFLO® DEBRIS SHIELD – ROLLED 16 GA. STEE
ANTI–SIPHON AND INTERNAL 0.265" MAX. SWO FLAT
LENGTH. FUSION BONDED EPOXY COATED.

6. PRE–CAST LINER – 4000 PSI CONCRETE 48" I.D. x
SECTIONS TO MAXIMIZE BEARING SURFACE. EIGHT (8
WHERE NOTED.

7. MIN. 6' ø DRILLED SHAFT.

8. SUPPORT BRACKET – FORMED 12 GA. STEEL. FUSIO

9. OVERFLOW PIPE – SCH. 40 PVC MATED TO DRAINA

10. DRAINAGE PIPE – ADS HIGHWAY GRADE WITH TRI–A
BACKFILL OPERATIONS TO PREVENT BUCKLING OR B

11. BASE SEAL – GEOTEXTILE, POLY LINER OR CONCRE

12. ROCK – CLEAN AND WASHED, SIZED BETWEEN 3/8'
SOIL CONDITIONS.

13. FLOFAST® DRAINAGE SCREEN – SCH. 40 PVC 0.12
SLOTS PER ROW/FT. 96" OVERALL LENGTH WITH TR

14. MIN. 4' ø SHAFT – DRILLED TO MAINTAIN PERMEABI

15. FABRIC SEAL – U.V. RESISTANT GEOTEXTILE – TO E
COMPLETION.

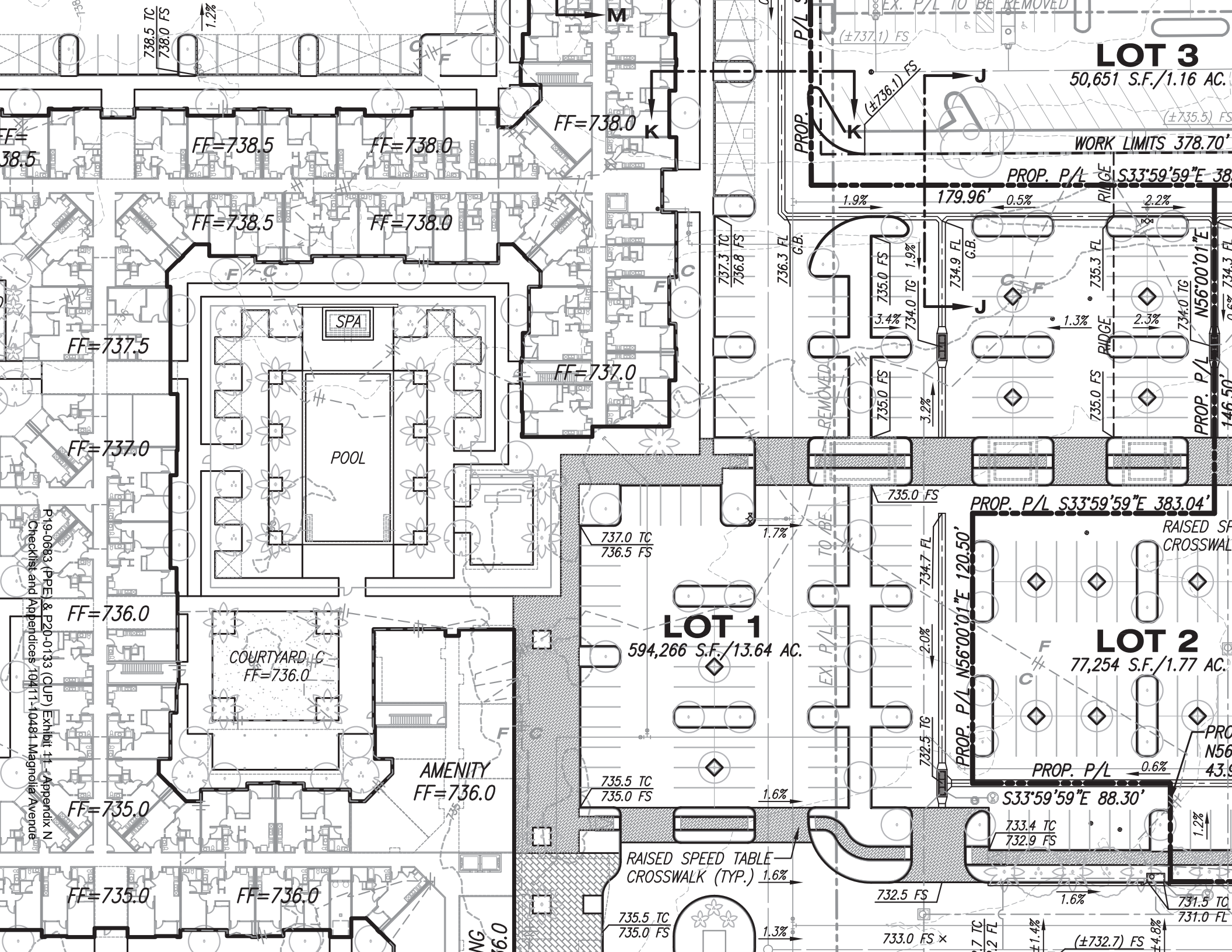
16. ABSORBENT – HYDROPHOBIC PETROCHEMICAL SPON
PER CHAMBER.

17. FREEBOARD DEPTH VARIES WITH INLET PIPE ELEVATI
AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATION
MAX. CHAMBER DEPTH FOR INSTALLATION WITHIN DR
GREATER THAN 25', CONTRACTOR MUST EXCAVATE S
MAINTAIN THE 25' MAX. CHAMBER DEPTH WITHIN TH

18. INLET PIPE (MIN. 4" DIA.) – INVERT CONNECTIONS
SLURRY BACKFILL BELOW PIPE INVERT.

Appendix 2: Construction Plans

Grading and Drainage Plans


LOT 3
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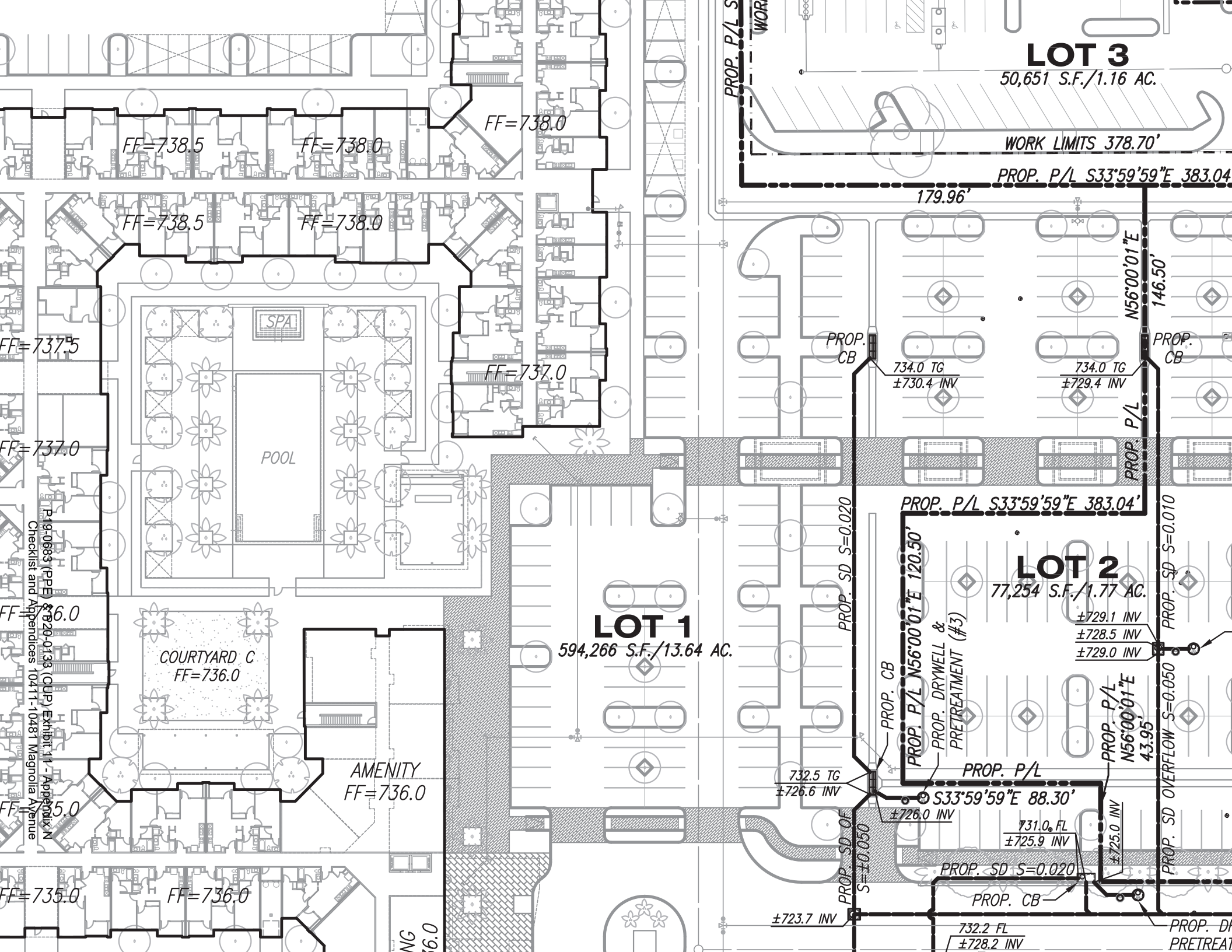
LOT 1
594,266 S.F./13.64 AC.
LOT 2
77,254 S.F./1.77 AC.
SPA
POOL
COURTYARD C
FF=736.0
AMENITY
FF=736.0
FF=738.5
FF=738.0
FF=737.5
FF=737.0
FF=736.0
FF=735.0
WORK LIMITS 378.70'
PROP. P/L S33°59'59"E 383.04'
PROP. P/L N56°00'01"E 120.50'
PROP. P/L S33°59'59"E 88.30'
PROP. P/L N56°00'01"E 146.50'
179.96'
RAISED SPEED TABLE CROSSWALK (TYP.)
EX. P/L TO BE REMOVED
PROP. P/L
738.5 TC
738.0 FS
737.3 TC
736.8 FS
737.0 TC
736.5 FS
735.5 TC
735.0 FS
733.4 TC
732.9 FS
731.5 TC
731.0 FL
736.3 FL
735.0 FS
734.0 TG
734.9 FL
735.3 FL
734.7 FL
732.5 TG
732.5 FS
733.0 FS
(±737.1) FS
(±736.1) FS
(±735.5) FS
(±732.7) FS
735.0 FS
1.9%
0.5%
2.2%
3.4%
1.3%
2.3%
3.2%
1.7%
2.0%
1.6%
0.6%
1.2%
1.4%
4.8%
G.B.
RIDGE
P19-0683 (PPE) & P20-0133 (CUP) Exhibit 11 - Appendix N
Checklist and Appendices 10411-10481 Magnolia Avenue


LOT 3
50,651 S.F./1.16 AC.
WORK LIMITS 378.70'
PROP. P/L S33°59'59"E 383.04'
179.96'
N56°00'01"E
146.50'
PROP. CB
734.0 TG
±730.4 INV
734.0 TG
±729.4 INV
PROP. P/L
PROP. P/L S33°59'59"E 383.04'
LOT 2
77,254 S.F./1.77 AC.
PROP. SD S=0.020
PROP. SD S=0.010
PROP. P/L N56°00'01"E 120.50'
PROP. DRYWELL & PRETREATMENT (#3)
±729.1 INV
±728.5 INV
±729.0 INV
LOT 1
594,266 S.F./13.64 AC.
PROP. CB
732.5 TG
±726.6 INV
PROP. P/L
S33°59'59"E 88.30'
±726.0 INV
PROP. P/L N56°00'01"E 43.95'
731.0 FL
±725.9 INV
±725.0 INV
PROP. SD OF S=±0.050
PROP. SD S=0.020
PROP. SD OVERFLOW S=0.050
PROP. CB
±723.7 INV
732.2 FL
±728.2 INV
PROP. DR
PRETREAT
SPA
POOL
FF=738.5
FF=738.0
FF=738.0
FF=738.5
FF=738.0
FF=737.5
FF=737.0
FF=737.0
FF=736.0
COURTYARD C
FF=736.0
AMENITY
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FF=735.0
FF=735.0
FF=736.0
P19-0683 (PPE) & P20-0133 (CUP) Exhibit 11 - Appendix N
Checklist and Appendices 10411-10481 Magnolia Avenue

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL PROFESSIONALS INC.

December 20, 2019

Magnolia Partnership LLC
1201 Dove Street, Suite 520
Newport Beach, California 92660

Attention: Mr. Todd Cadwell

Subject: Percolation/Infiltration Testing
Proposed Apartment and Retail Development
Magnolia Flats
NEC Magnolia Avenue and Banbury Drive
Riverside, California
GPI Project No. 2917.1I

Dear Mr. Cadwell:

This report presents the results of planning phase percolation testing performed by Geotechnical Professionals Inc. (GPI) for stormwater disposal systems for the subject site. Our scope of services was presented in our proposal dated October 17, 2019. The testing was performed in accordance with the County of Riverside guidelines (Reference 1). We provided a Feasibility-Level Investigation report for the subject project site (Reference 2), dated February 18, 2019.

The location of the site is shown on the Site Location Map, Figure 1. The fieldwork described in this report was performed as part of our concurrent geotechnical investigation for the planned development.

Project Description

The project includes constructing a new mixed-use apartment development at the subject site. The apartment portion of the development consists of 4-story wood framed structures surrounded by at-grade parking. Carports are planned for a substantial portion of the at-grade parking. The apartment buildings will be at-grade surrounding courtyards and a swimming pool area. A shops building with retail and restaurants will be located in front of the development adjacent to Magnolia Avenue. A park is planned at the north portion of the site beyond at-grade apartment parking. The preliminary site configuration is shown on Figure 2, Site Plan.

Based on data from our feasibility investigation, we determined that infiltration of storm water is not feasible in the upper 30 feet of the soil profile due to the anticipated adverse impacts to the site soils or mounding of groundwater. Based on discussions

with KHR, three potential locations for the dry well stormwater infiltration systems have been identified.

Scope of Services

Our scope of services for the percolation/infiltration testing consisted of installation of six test wells at the three different locations, field percolation testing, and the preparation of this summary report. The wells were installed as part of a comprehensive geotechnical investigation that included ten exploratory borings and preparation of a full geotechnical report to be issued at a later date.

Subsurface Exploration

The borings were drilled using truck-mounted hollow-stem auger drill equipment at the locations shown on Figure 2, Site Plan. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D 3550). Bulk (disturbed) samples were also obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 6066). The field explorations for the investigation were performed under the continuous technical supervision of GPI's representative, who visually inspected the site, maintained detailed logs of the borings, classified the soils encountered, and obtained relatively undisturbed samples for examination and laboratory testing.

The soils encountered in the borings were classified in the field and through further examination in the laboratory in general accordance with the Unified Soils Classification System. The logs of Borings B-4, B-7, and B-10, drilled within the limits of the proposed infiltration areas and near percolation test wells P-1 through P-6, are attached.

Laboratory Testing

We performed laboratory tests to determine the percent fines (silts and clays) for selected samples of the on-site soils in accordance with ASTM D 422. The results are shown in the table below.

Fines Content of Selected Samples

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-4	37	Sandy Silt (ML)	59
B-4	41	Sand with Silt (SP-SM)	6
B-7	37	Sand with Silt (SP-SM)	8
B-7	41	Silty Sand (SM)	42
B-7	45	Sand (SP)	4
B-10	37	Sandy Silt (SP-SM)	45
B-10	41	Silt (ML)	96
B-10	45 (Upper)	Clayey Sand (SC)	42
B-10	45 (Lower)	Sand with Silt (SP-SM)	7

Subsurface Soil Conditions

In the exploratory borings adjacent to the percolation wells, we predominately encountered layered sands, and silty sands at depths below 35 feet from existing grade. The sands and silty sands were generally medium dense to dense and dry to slightly moist. A layer of silt was encountered in B-7 and B-10 from at a depth of approximately 40 feet below existing grade. The silt was very stiff and wet. Detailed descriptions of the subsurface conditions encountered are shown on the Logs of Borings, Figures 3 to 6.

Groundwater was encountered in one of our exploratory borings at a depth of approximately 57 feet below existing ground surface. The historical high groundwater has not been determined in the area by the State of California.

Percolation Test Wells

Test wells, P-1 thru P-6, were installed in boreholes drilled using truck-mounted hollow-stem auger drill equipment. The wells consisted of 2-inch diameter PVC casing installed in an 8-inch diameter borehole. The casing was perforated in the lower 2 feet of the wells. Packing material around the slotted sections of the well casing consisted of #3 sand. The test wells were constructed to depths of approximately 35 to 40 feet below existing grade. The percolation testing was performed in general accordance with the County of Riverside requirements (Reference 1).

The test wells were filled with water the day before testing and presoaked at least 15 hours. Prior to running the tests in the wells, we conducted the Sandy Soil Criteria Test by filling the test holes as described in the Reference 1 and taking measurements of the water levels. The Sandy Soil Criteria was achieved in each of the wells. Two consecutive measurements showed that at least 6 inches of water seeped away in less than 25 minutes, therefore the test was continued for at least 1 hour as described in the criteria.

The percolation testing was conducted as outlined in the County guidelines for ‘sandy soils’ for at least six consecutive 10-minute readings. The initial water heights in the test wells were on the order of 2 to 4 feet above the bottom of the test well. After each reading, the water level was raised to approximately the same height. Details of the percolation tests are presented in the attached Tables 1 through 6, Borehole Infiltration Test Results.

The measured infiltration rates were calculated using the drop in water level over the test increment time and corrected using the Porchet Method. The final measured rates for each well, corrected as indicated above are presented in the following table and should be used with an appropriate factor of safety.

Infiltration Test Results Summary

TEST WELL	APPROXIMATE DEPTH OF TEST WELL (feet)	CORRECTED INFILTRATION RATE (in./hr.)
P-1	41	5.5
P-2	40	6.0
P-3	35	3.9
P-4	35	2.5
P-5	40	0.7
P-6	40	4.6

After completion of the infiltration testing, a portion of the well casings were removed, and the holes were backfilled with the on-site soils.

Conclusions and Recommendations

Based on the results of the percolation testing, the subsurface soils at the depths tested (35 to 40 feet below grade) at the site are suitable for dry well infiltration based on the measured field permeability. At the northwest portion of the site, we observed infiltration rates ranging from 5.5 to 6.0 inches per hour. At the center portion of the site, we observed infiltration rates ranging from 2.5 to 3.9 inches per hour, and at the southwest portion of the site, we observed infiltration rates ranging from 0.7 to 4.6 inches per hour.

Before performing percolation testing at P-5, a water line was broken causing significant flooding of the well. We assume that fine grained soils may have flowed into the well which negatively impacted the infiltration rate. We believe this may have skewed the results of our infiltration testing, and that the rate for P-5 may be excluded when designing the infiltration system.

The County of Riverside guidelines require a factor of safety of 2 be applied to the measured infiltration rates. If the corrected measured infiltration rate is greater than 0.3 inches per hour, the soils are considered potentially feasible.

The Project Civil Engineer should determine a “design infiltration rate” using the technical guidelines of the County of Riverside. The County requires a factor of safety to determine the design infiltration rate of not less than 2.0, but it may be higher at the discretion of the design engineer and acceptance of the plan reviewer.

Infiltration of storm water shallower than the depths tested is not acceptable due to collapsible soils and potential mounding due to clay layers as discussed in Reference 2.

It should be noted that this infiltration rate is for clean, clear water and does not include any effects of sediment, fines, dissolved solids or any other debris as the materials will significantly reduce the percolation rates of the subsurface soils.

LIMITATIONS

The report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by Magnolia Partnership LLC and their consultants in designing the proposed development. The report is not suitable for a project other than the currently proposed development.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the conclusions drawn in this report are based on the assumption that the data obtained in the field and laboratory are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either express or implied, is included or intended in our report.

Respectfully submitted,
Geotechnical Professionals Inc.

Patrick I.F. McGervey, P.E.
Staff Engineer

Donald A. Cords, G.E.
Principal

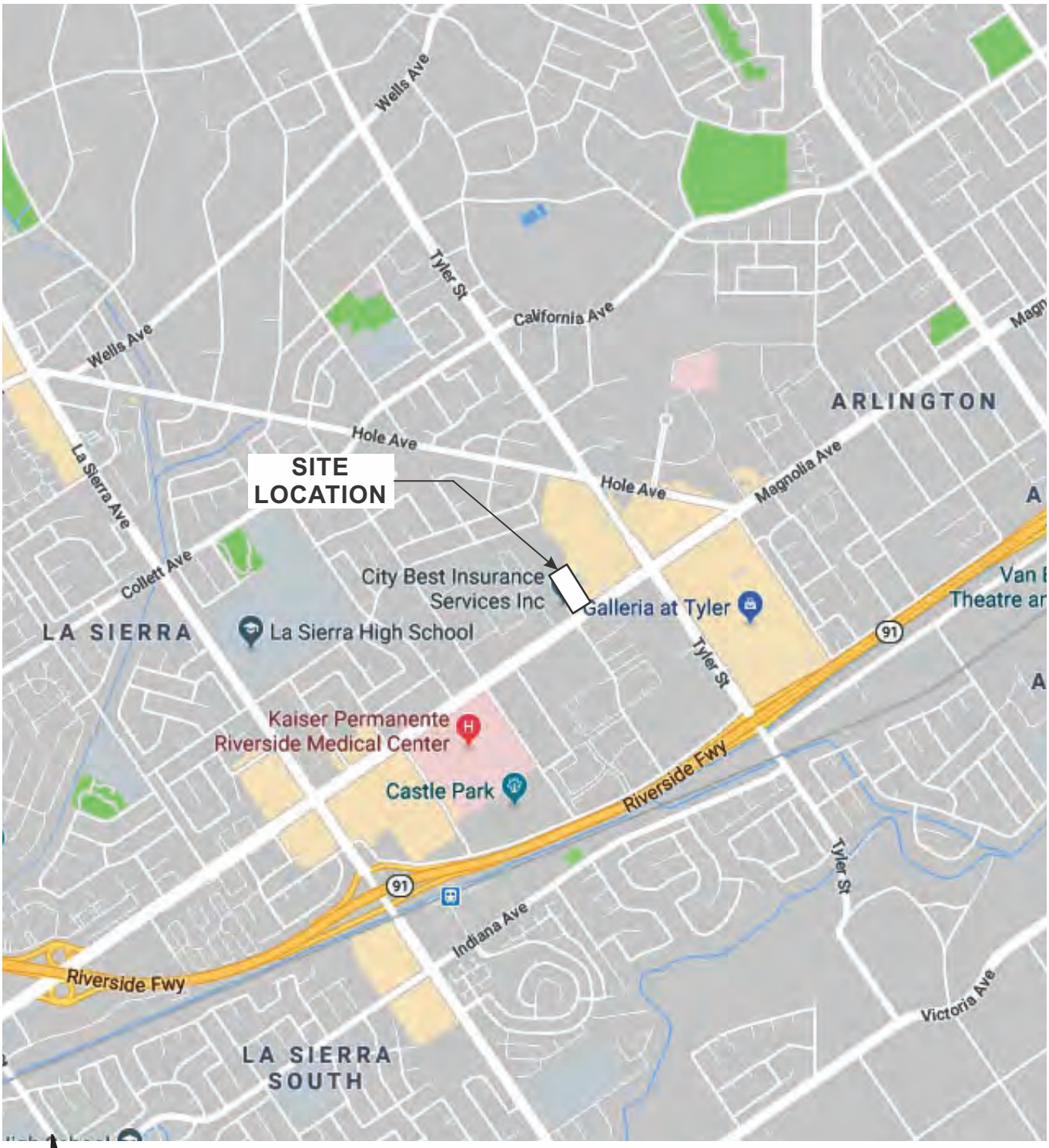
Enclosures:
Figure 1	-	Site Location Plan
Figure 2	-	Site Plan
Figures 3 to 5	-	Logs of Borings
Table 1	-	Borehole Infiltration Test Results

Distribution: Addressee (e-mail only)
Gave Uribe, KHR Associates (e-mail only)

REFERENCES

1. County of Riverside, “Infiltration Testing”, Appendix A, Low Impact Development BMP Design Handbook, rev. September 2011

2. Geotechnical Professionals, Inc., “Feasibility-Level Investigation, Proposed Mixed-Use Apartment Development, NEC Magnolia Avenue and Banbury Drive, Riverside, California,” GPI Project No. 22924.I, dated February 18, 2019.



BASE PLAN REPRODUCED FROM GOOGLE MAPS © 2019

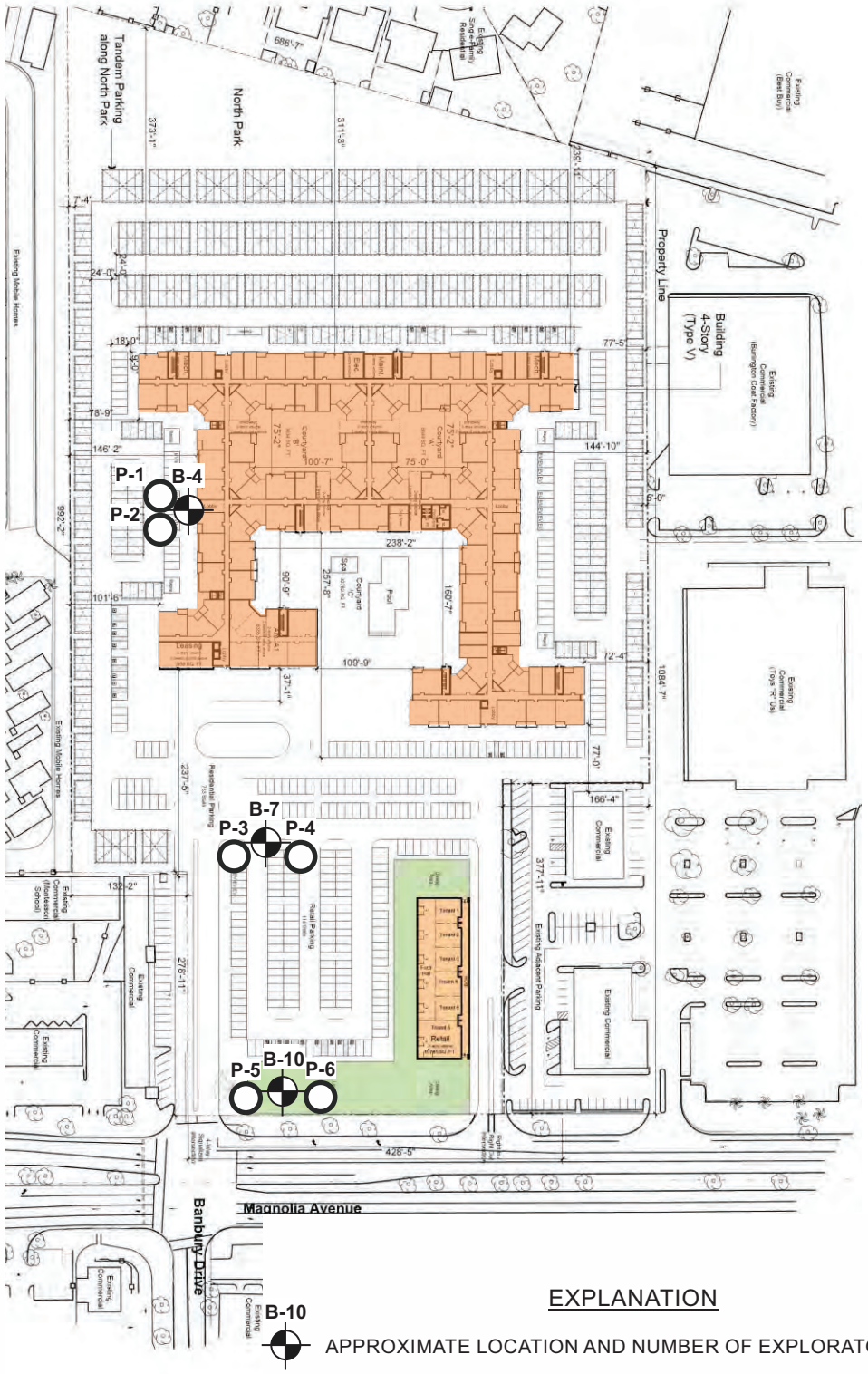
GPI GEOTECHNICAL PROFESSIONALS, INC.

MAGNOLIA AVENUE & BANBURY DRIVE

GPI PROJECT NO.:2924.I | SCALE: 1" = 2000'

SITE LOCATION MAP

FIGURE 1



EXPLANATION

B-10 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING

P-6 — APPROXIMATE LOCATION AND NUMBER OF PERCOLATION TEST

N ACTUAL NORTH

N PROJECT NORTH

0 200 400 FEET

BASE PLAN REPRODUCED FROM SITE PLAN, CONCEPTUAL DESIGN, PRODUCED BY KTGY ARCHITECTURE, DATED SEPTEMBER 18,2019

GPI GEOTECHNICAL PROFESSIONALS, INC.

MAGNOLIA FLATS

GPI PROJECT NO.:2924.I | SCALE: 1" = 200'

SITE PLAN

FIGURE 2

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
			B	0	Pulverized concrete 8-Inch over silty sand, brown, moist Fill: **SILTY SAND (SM)** brown, moist	
				5	5 to 35 feet, not sampled	730
				10		725
				15		720
				20		715
				25		710
				30		705
21.9		22	S	35	Natural: **CLAYEY SILT (ML)** brown, very moist, very stiff	700
19.9		19	S		**SANDY SILT (ML)** brown, wet, very stiff	
2.4		42	S		**SAND (SP)** light brown, dry to slightly moist, dense	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-31-19

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2924.1I

MAGNOLIA FLATS

LOG OF BORING NO. B-4

FIGURE 3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
				40		
4.0		29	S		**SAND WITH SILT (SP-SM)** light brown, dry, dense, medium to coarse grained @ 41 feet, medium dense	
2.3		28	S			
2.7		34	S	45	@ 45 feet, dense, coarse grained	690
9.9		38	S		@ 47 feet, fine to medium grained, trace gravel, 3-Inch lens of silt	
9.4	99	77	D	50	@ 50 feet, very dense, sandy silt @ tip	685
					Total Depth 51 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-31-19

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2924.1I

MAGNOLIA FLATS

LOG OF BORING NO. B-4

FIGURE 3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
			B	0	1-Inch AC Fill: **SILTY SAND (SM)** brown, moist	730
				5	5 to 35 feet, not sampled	725
				10		720
				15		715
				20		710
				25		705
				30		700
2.0		27	S	35	**SAND WITH SILT (SP-SM)** light brown, dry to slightly moist, medium dense, coarse grained	
3.4		28	S		@ 37 feet, medium to coarse grained	695
3.9		19	S			

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-30-19

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): 57

GPI

PROJECT NO.: 2924.1I

MAGNOLIA FLATS

LOG OF BORING NO. B-7

FIGURE 4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
					This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
23.8				40	**SILT (ML)** brown, wet, very stiff	
20.0		22	S		**SILTY SAND (SM)** light brown, wet, medium dense, fine to medium grained	
4.2		31	S		**SAND (SP)** light brown, dry to slightly moist, dense, coarse grained	690
2.3		43	S	45	@ 44 feet, 4-Inch lens of silty sand	
2.6		31	S			685
3.7		43	S	50		
						680
5.2	125	71	D	55	**SANDY SILT (ML)** brown, dry, hard	
					SAND (SP) light brown, slightly moist, very dense, coarse grained	675
32.8	93	88/9"	D	60	**SILT (ML)** brown, wet, hard	
					SAND (SP) orange brown, wet, very dense	
					Total Depth 61 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-30-19

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): 57

GPI

PROJECT NO.: 2924.1I

MAGNOLIA FLATS

LOG OF BORING NO. B-7

FIGURE 4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	ELEVATION (FEET)
			B	0	3-Inch AC over silty sand, brown, slightly moist Fill: **SILTY SAND (SM)** brown, slightly moist	730
				5	5 to 35 feet, not sampled	725
				10		720
				15		715
				20		710
				25		705
				30		700
2.8		23	S	35	Natural: **SAND (SP)** light brown, dry to slightly moist, medium dense, medium to coarse grained	
16.5		15	S		**SILTY SAND (SM)** brown, wet, medium dense	
1.7		19	S		**SAND (SP)** light brown, dry, medium dense	695

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-30-19

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2924.1I

MAGNOLIA FLATS

LOG OF BORING NO. B-10

FIGURE 5

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				40	This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	
34.2		10	S		**SILT (ML)** grey, wet, very stiff	
11.0		21	S		@ 43 feet, 4-Inch lens of grey sand	690
18.6		35	S	45	**CLAYEY SAND (SC)** grey, wet, dense	
4.2					**SAND WITH SILT (SP-SM)** grey, slightly moist, dense, coarse grained	
3.4		39	S		@ 47 feet, trace gravel	685
3.1	112	64	D	50		
					Total Depth 51 feet	

SAMPLE TYPES
- C Rock Core
- S Standard Split Spoon
- D Drive Sample
- B Bulk Sample
- T Tube Sample

DATE DRILLED: 10-30-19

EQUIPMENT USED: 8 " Hollow Stem Auger

GROUNDWATER LEVEL (ft): Not Encountered

GPI

PROJECT NO.: 2924.1I

MAGNOLIA FLATS

LOG OF BORING NO. B-10

FIGURE 5

TABLE 1

BOREHOLE INFILTRATION TEST RESULTS (corrected with Porchet Method)

Riverside County Method-TGD, 2011

Project No. 2924.I Project Name: Magnolia Flats Date: 12/20/2019

NOTE: Slowest rate from percolation testing used to calculate infiltration rate

Test Well	Test Duration (min)	Water Depth Initial (ft)	Water Depth Final (ft)	Total Depth of Hole (ft)	Hole Diameter (inches)	Initial Water Height (ft)	Final Water Height (ft)	Change in Height of Water (ft)	Average Height of Water (ft)	Infiltration Rate (in/hr)
	Δt	D_o	D_f	D_T	d	H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-1	10	36.80	38.37	40.80	8	4.00	2.43	1.57	3.22	5.6
P-1	10	36.80	38.37	40.80	8	4.00	2.44	1.565	3.22	5.5
P-1	10	36.80	38.36	40.80	8	4.00	2.44	1.56	3.22	5.5
P-1	10	36.80	38.36	40.80	8	4.00	2.44	1.56	3.22	5.5
P-1	10	36.80	38.37	40.80	8	4.00	2.44	1.565	3.22	5.5
P-1	10	36.80	38.36	40.80	8	4.00	2.45	1.555	3.22	5.5

Test Date 10/24/2018 NOTE: Slowest rate from percolation testing used to calculate infiltration rate

Test Well	Test Duration (min)	Water Depth Initial (ft)	Water Depth Final (ft)	Total Depth of Hole (ft)	Hole Diameter (inches)	Initial Water Height (ft)	Final Water Height (ft)	Change in Height of Water (ft)	Average Height of Water (ft)	Infiltration Rate (in/hr)
	Δt	D_o	D_f	D_T	d	H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-2	10	36.45	38.11	40.45	8	4.00	2.34	1.66	3.17	6.0
P-2	10	36.45	38.11	40.45	8	4.00	2.35	1.655	3.17	5.9
P-2	10	36.45	38.10	40.45	8	4.00	2.35	1.65	3.18	5.9
P-2	10	36.45	38.11	40.45	8	4.00	2.34	1.66	3.17	6.0
P-2	10	36.45	38.11	40.45	8	4.00	2.35	1.655	3.17	5.9
P-2	10	36.45	38.12	40.45	8	4.00	2.34	1.665	3.17	6.0

TABLE 1 (Continued)

BOREHOLE INFILTRATION TEST RESULTS (corrected with Porchet Method)

Riverside County Method-TGD, 2011

Project No. 2924.I Project Name: Magnolia Flats Date: 12/20/2019

NOTE: Slowest rate from percolation testing used to calculate infiltration rate

Test Well	Test Duration (min)	Water Depth Initial (ft)	Water Depth Final (ft)	Total Depth of Hole (ft)	Hole Diameter (inches)	Initial Water Height (ft)	Final Water Height (ft)	Change in Height of Water (ft)	Average Height of Water (ft)	Infiltration Rate (in/hr)
	Δt	D_o	D_f	D_T	d	H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-3	10	33.42	34.07	35.40	8	1.98	1.33	0.65	1.66	4.3
P-3	10	33.40	33.97	35.40	8	2.00	1.44	0.565	1.72	3.6
P-3	10	33.40	34.01	35.40	8	2.00	1.39	0.61	1.70	3.9
P-3	10	33.40	34.01	35.40	8	2.00	1.39	0.61	1.70	3.9
P-3	10	33.40	34.01	35.40	8	2.00	1.39	0.61	1.70	3.9
P-3	10	33.40	34.01	35.40	8	2.00	1.39	0.61	1.70	3.9

Test Date 10/24/2018 NOTE: Slowest rate from percolation testing used to calculate infiltration rate

Test Well	Test Duration (min)	Water Depth Initial (ft)	Water Depth Final (ft)	Total Depth of Hole (ft)	Hole Diameter (inches)	Initial Water Height (ft)	Final Water Height (ft)	Change in Height of Water (ft)	Average Height of Water (ft)	Infiltration Rate (in/hr)
	Δt	D_o	D_f	D_T	d	H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-4	10	33.25	33.63	35.25	8	2.00	1.62	0.38	1.81	2.3
P-4	10	33.25	33.63	35.25	8	2.00	1.63	0.375	1.81	2.3
P-4	10	33.25	33.66	35.25	8	2.00	1.59	0.41	1.80	2.5
P-4	10	33.25	33.64	35.25	8	2.00	1.61	0.385	1.81	2.3
P-4	10	33.25	33.66	35.25	8	2.00	1.59	0.41	1.80	2.5
P-4	10	33.25	33.67	35.25	8	2.00	1.59	0.415	1.79	2.5

TABLE 1 (Continued)

BOREHOLE INFILTRATION TEST RESULTS (corrected with Porchet Method)

Riverside County Method-TGD, 2011

Project No. 2924.I Project Name: Magnolia Flats Date: 12/20/2019

NOTE: Slowest rate from percolation testing used to calculate infiltration rate

Test Well	Test Duration (min)	Water Depth Initial (ft)	Water Depth Final (ft)	Total Depth of Hole (ft)	Hole Diameter (inches)	Initial Water Height (ft)	Final Water Height (ft)	Change in Height of Water (ft)	Average Height of Water (ft)	Infiltration Rate (in/hr)
	Δt	D_o	D_f	D_T	d	H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-5	10	37.73	37.94	39.80	8	2.07	1.86	0.205	1.97	1.2
P-5	10	37.68	37.87	39.80	8	2.12	1.93	0.19	2.03	1.0
P-5	10	37.66	37.82	39.80	8	2.14	1.98	0.16	2.06	0.9
P-5	10	37.73	37.85	39.80	8	2.07	1.95	0.12	2.01	0.7
P-3	10	37.74	37.86	39.80	8	2.06	1.94	0.12	2.00	0.7
P-5	10	37.70	37.82	39.80	8	2.10	1.98	0.12	2.04	0.7

Test Date 10/24/2018 NOTE: Slowest rate from percolation testing used to calculate infiltration rate

Test Well	Test Duration (min)	Water Depth Initial (ft)	Water Depth Final (ft)	Total Depth of Hole (ft)	Hole Diameter (inches)	Initial Water Height (ft)	Final Water Height (ft)	Change in Height of Water (ft)	Average Height of Water (ft)	Infiltration Rate (in/hr)
	Δt	D_o	D_f	D_T	d	H_o	H_f	$\Delta H=\Delta D$	H_{avg}	I_t
P-6	10	37.70	38.50	39.97	8	2.27	1.47	0.8	1.87	4.7
P-6	10	37.80	38.55	39.97	8	2.17	1.42	0.75	1.80	4.6
P-6	10	37.80	38.56	39.97	8	2.17	1.42	0.755	1.79	4.6
P-6	10	37.80	38.56	39.97	8	2.17	1.42	0.755	1.79	4.6
P-6	10	37.80	38.55	39.97	8	2.17	1.42	0.75	1.80	4.6
P-6	10	37.80	38.55	39.97	8	2.17	1.42	0.75	1.80	4.6