Appendix F-1

Project Specific Water Quality Management Plan

KHR Associates

December 6, 2024

Project Specific Water Quality Management Plan

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

Project Title: **Iron Lofts – 3093 MISSION INN AVENUE**

Public Works No: GP-2023-00581

Design Review/Case No: PR-2023-001469

Preliminary
Final

Original Date Prepared: December 9, 2022

Revision Date(s): June 20, 2023; November 27, 2023; August 9, 2024; December 6, 2024

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

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OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Iron Lofts, LLC by KHR Associates for the Iron Lofts - South project.

This WQMP is intended to comply with the requirements of the City of Riverside for A 300 unit mixed-use development, Planning Case No. PR-2023-001469 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."

December 6, 2024

Owner's Signature — Date

Darrin Olson / Iron Lofts, LLC — President
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."

December 6, 2024

Preparer's Signature — Date

James H. Kawamura — President
Preparer's Printed Name — Preparer's Title/Position

Preparer's Licensure: Registered Civil Engineer No. C30560
Exp. 3/31/26

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Section A: Project and Site Information

The proposed development involves the construction of approximately 6.94 acres (302,137 sf.) for 300 residential dwelling units within a 4-story, 295 unit apartment building (72,883 square feet) and a 2-story, 5 unit townhome building (5,525 square feet) with attached 2 car garages (totaling 10 parking spots) with a parking lot that contains 294 carport parking stalls and 84 open parking stalls, along with repurposing a 4,912 square foot historic building for amenity purposes. There will be approximately 83,320 square feet of building area, 45,289 square feet of landscaping, 89,339 square feet of surface parking area, 48,781 square feet of carports, 156 square feet of trash enclosure, 2,073 square feet for a dog park, 2,283 square feet of decomposed granite, 29,586 square feet of hardscape, and 1,310 square feet of pool/spa area. The DCV drains to an Aqua-Swirl for pre-treatment prior to detention by a solid walled CMP and infiltration by a means of drywells.

Project Information

Type of Project:	Mixed-Use Residential
Planning Area:	Ward 2
Community Name:	Eastside
Development Name:	Iron Lofts - South

Project Location

Latitude & Longitude (DMS): 33D 58M 50S N, 117D 21M 53S W
Project Watershed and Sub-Watershed: Santa Ana; Santa Ana River, Reach 3
APN(s): 211-071-001, 002, 004, 005, 023, 024; 211-072-001, 002, 004, 020, 021, 022
Map Book and Page No.: Book 6, Page 48

Project Characteristics

Proposed or Potential Land Use(s)	Mixed-Use Residential	
Proposed or Potential SIC Code(s)	6513, 5399	
Area of Impervious Project Footprint (SF)	256,848 sf.	
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	251,936 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)	223,088 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 15 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 proposed development 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?

Although vacant, the site 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 the underlying soils are good for infiltration and therefore, impervious surfaces will be collected by the onsite drainage system that directs the stormwater to an underground detention tank for infiltration by drywells.

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

The nature of the developments 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.

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

Walkways within portions of the site will drain to adjacent landscaping. Due to anticipated soil conditions, including collapsible soils, runoff will not be dispersed to adjacent pervious areas. The geotechnical evaluation 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. The project will be using drywells to infiltrate the stormwater design volume.

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	24,357	D
1B	Roof (Building, Carport, Trash Enclosure)	61,934	D
1C	Walk/Turf	21,520	D
1D	Asphalt	44,125	D
2A	Landscape	20,932	D
2B	Roof (Building, Carport)	70,323	D
2C	Walk/Water Features	13,732	D
2D	Asphalt	45,214	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) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [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		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]
N/A							

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

DMA Name or ID	BMP Name or ID
1A	DW1A
1B	DW1B
1C	DW1C
1D	DW1D
2A	DW2A
2B	DW2B
2C	DW2C
2D	DW2D

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: DMAs 1 & 2 have rates less and more than 1.6 inches/hour.		
…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: According to GPI's Geotechnical Feasibility Evaluation, soils are anticipated to be moderately collapsible. The evaluation states an infiltration setback beyond the typical distance of 10-feet from buildings should be anticipated. The report also states that the on-site soils are severely corrosive to metal. The detention tank is surrounded by washed stone and then wrapped by geotextile to prevent the soil from contacting the pipe.		

Infiltration rates at end of drywells will have infiltration rates that exceeds 1.6 inches per hour.

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.

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 1.04 AC

Type of Landscaping (Conservation Design or Active Turf): Conservation Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 5.90 AC

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

The project EIATIA factor: 0.79 (Conservation); 0.47 (Active Turf)

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 4.66 AC (conservation); 2.77 AC (Active Turf)

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	**Available Irrigated Landscape (Step 1)**
2.77 AC	1.04 AC

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	
1A					
1B					
1C					
1D					
2A					
2B					
2C					
2D					

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) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	*Enter BMP Name / Identifier Here* *DW 1A, DW 1B, DW 1C, DW 1D*		
1A	*24,357*	*Landscaping*	*0.1*	*0.11*	*2,690.4*			
1B	*61,934*	*Roof*	*1*	*0.89*	*55,245.1*			
1C	*21,520*	*Walk*	*1*	*0.89*	*19,195.8*			
1D	*44,125*	*Asphalt*	*1*	*0.89*	*39,359.5*	*Design Storm Depth (in)* [E]	*Design Capture Volume, V_{BMP} (cubic feet)* [F]	*Proposed Volume on Plans (cubic feet)* [G]
	151,936				116,490.8	0.6	5,824.5	***5,875***

[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) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	*Enter BMP Name / Identifier Here* *DW 2A, DW 2B, DW 2C, DW 2D*		
2A	*20,932*	*Landscaping*	*0.1*	*0.11*	*2,312.1*			
2B	*70,323*	*Roof*	*1*	*0.89*	*62,728.1*			
2C	*13,732*	*Walk*	*1*	*0.89*	*12,248.9*			
2D	*45,214*	*Asphalt*	*1*	*0.89*	*40,330.9*	*Design Storm Depth (in)* [E]	*Design Capture Volume, V_{BMP} (cubic feet)* [F]	*Proposed Volume on Plans (cubic feet)* [G]
	150,201				117,620	0.6	5,881	***5,909***

[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

Solid walled corrugated metal pipe will be used to detain the DCV (Design Capture Volume) and drywells will infiltrate the DCV within the required drawdown time of 48 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.

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	Location of native trees shown on WQMP Exhibit. Stormwater treatment facility shown on WQMP Exhibit. Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides	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/.

	that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, 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; Drainage sumps; 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. Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. 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)	Latitude / Longitude
DW 1A – DW 1D	Drywell, Aqua-Swirl, CMP	Preliminary Storm Drain Plan	33.979589,-117.364986
DW 2A – DW 2D	Drywell, Aqua-Swirl, CMP	Preliminary Storm Drain Plan	33.980343, -117.364394

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 Iron Lofts, LLC (the property owner).

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

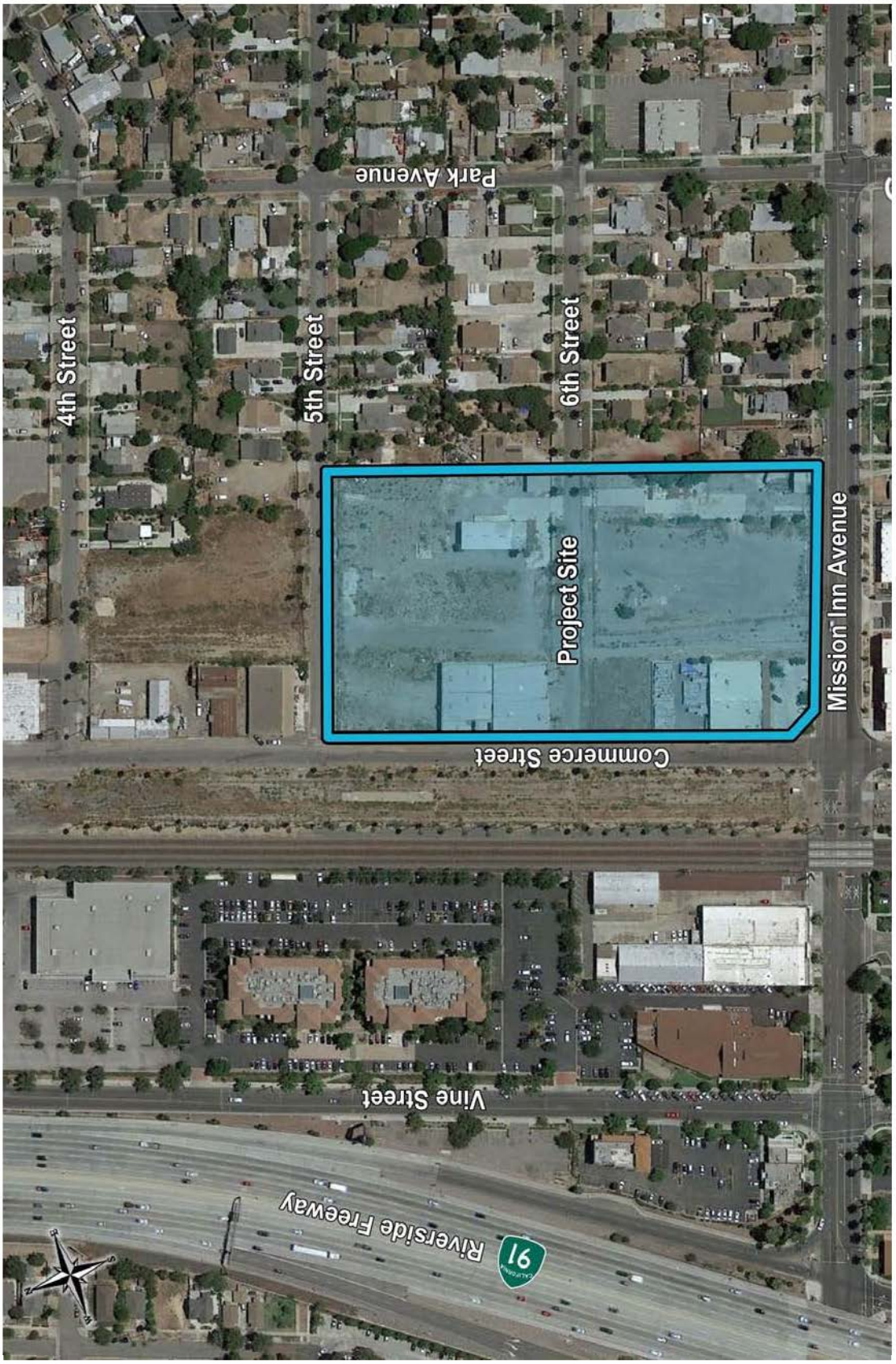
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Operation and Maintenance Plan and Maintenance Mechanism is included in Appendix 9. Educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP are included in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

Location Map



Receiving Waters Map

85th Percentile Isohyetal Map



DMA SUMMARY

DMA DESIGNATION	SURFACE TYPE	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)	TOTAL AREA (SF)	DESIGN VBMP (CF)	DESIGN FLOW RATE (CFS)	TREATMENT BMP TYPE	BMP VOLUME (CF)	PRETREATMENT TYPE/MODEL/ FLOW RATE	DRAWDOWN TIME (HRS)
1	LANDSCAPING	–	24,357	24,357						
	ROOF/CARPORT	61,934	–	61,934						
	WALK/TURF	21,520	–	21,520						
	ASPHALT	44,125	–	44,125			DETENTION (8'X90' CMP)			
TOTAL	A, B, C, D	127,579	24,357	151,936	5,825	0.50	INFILTRATION (4 DRYWELLS)	5,875	AQUA-SWIRL #AS-2 1.1 CFS	44.98
2	LANDSCAPING	–	20,932	20,932						
	ROOF/CARPORT	70,323	–	70,323						
	WALK/TURF	13,732	–	13,732						
	ASPHALT	45,214	–	45,214			DETENTION (6'X156' CMP)			
TOTAL	A, B, C, D	129,269	20,894	150,201	5,881	0.50	INFILTRATION (4 DRYWELLS)	5,909	AQUA-SWIRL #AS-2 1.1 CFS	43.51

DRYWELL SUMMARY

DRYWELL DESIGNATION	DEPTH FROM RIM TO INVERT (FT)	SLURRY DEPTH (FT)	SETTLING CHAMBER DEPTH (FT)	TOTAL INFILTRATION DEPTH (FT)	TOTAL DRYWELL DEPTH (FT)
1A	15.83	15.83	23.28	57.45	73.28
1B	16.32	16.32	23.77	57.45	73.77
1C	17.22	17.22	24.7	57.45	74.67
1D	17.55	17.55	25	57.45	75
DESIGN #s	17.55	17.55	25	57.45	75
2A	14.89	14.89	24.67	59.78	74.67
2B	15.06	15.06	24.84	59.78	74.84
2C	15.22	15.22	25	59.78	75
2D	14.76	14.76	24.54	59.78	74.54
DESIGN #s	15.22	15.22	25	59.78	75

OWNER

IRON LOFTS, LLC
1201 DOVE STREET–SUITE 520
NEWPORT BEACH, CALIFORNIA 92660
ATTN.: DARRIN OLSON
PHONE NO.: (949) 975–1122

APN

211–071–001, 002, 004, 005, 023, 024;
211–072–001, 002, 004, 020, 021, 022;

LEGEND

DESCRIPTION	SYMBOL	DMA NAME
SD-12 & SC-41: PERMEABLE AREA (LANDSCAPE AREA)		#A
SC-41: IMPERMEABLE ROOF SURFACES		#B
SD-32 & SC-34: TRASH ENCLOSURE		#B
SC-41: IMPERMEABLE HARDSCAPE AREA		#C
POOL/WATER FEATURE		#C
SC-43: IMPERMEABLE VEHICULAR SURFACE		#D
SC-44: PROPOSED PRIVATE STORM DRAIN		
PROPOSED STORM DRAIN JUNCTION STRUCTURE		
PROPOSED MAXWELL IV DRYWELL		
PROPOSED AQUA-SWIRL		
SD-13 & SC-44: PROPOSED DROP INLET/CATCH BASIN WITH STENCILING		
LID BMP IDENTIFIER	#	
LID BMP DRAINAGE AREA BOUNDARY		
DMA # DMA AREA	#.##AC	

*DMA NAME USES LID BMP IDENTIFIER OF THE SPECIFIC BMP DRAINAGE AREA WITH THE LETTER CORRESPONDING TO THE SURFACE TYPE.

SITE INFORMATION

TOTAL PROPERTY AREA:	302,137 SF (6.94 AC)
IMPERVIOUS AREA & %:	256,848 SF (5.90 AC) 85%
PERVIOUS AREA & %:	45,289 SF (1.04 AC) 15%
TOTAL DESIGN CAPTURE VOLUME (DCV):	11,706 CF
TOTAL SWQDF:	1.0 CFS
DISTURBED AREA:	297,225 SF (6.82 AC)
UNDISTURBED AREA (HISTORIC BUILDINGS):	4,912 SF (0.11 AC)

0 20 40 80 120

SCALE: 1"=40' DATE: 12/06/2024

IRON LOFTS

IRON LOFTS, LLC

PRELIMINARY WQMP SITE PLAN

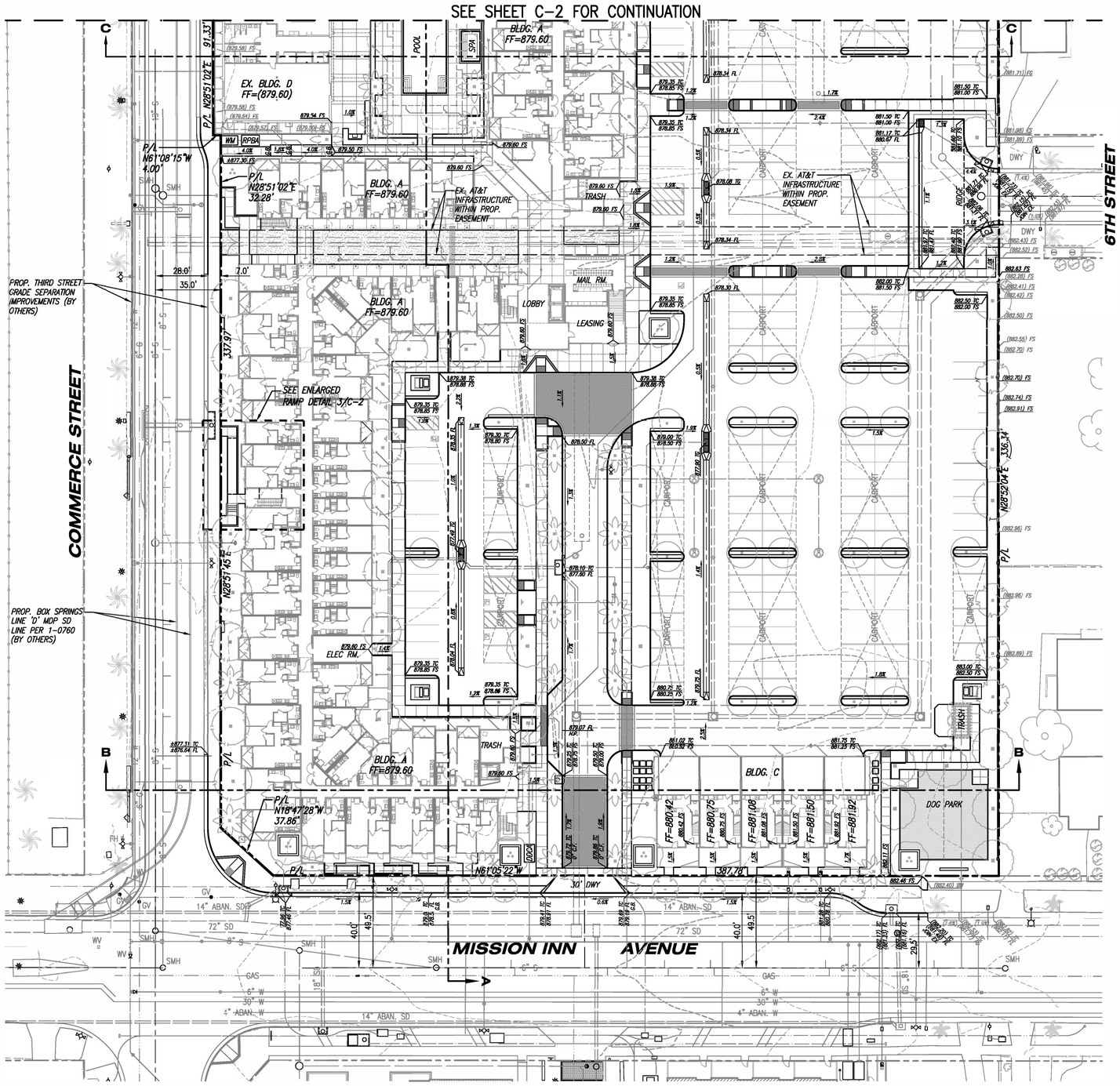
RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

K:\Realm\Realm-Riverside-Iron Lofts\Documents\WQMP\Entitlement\APPENDIX 1 - WQMP-SITE-PLAN.dwg Dec 06, 2024 - 9:38am

Appendix 2: Construction Plans

Grading and Drainage Plans



EARTHWORK QUANTITY ESTIMATE

CUT/EXPORT (REMEDIATION)	20,000 CY
FILL/IMPORT	10,000 CY

FORESTRY NOTES

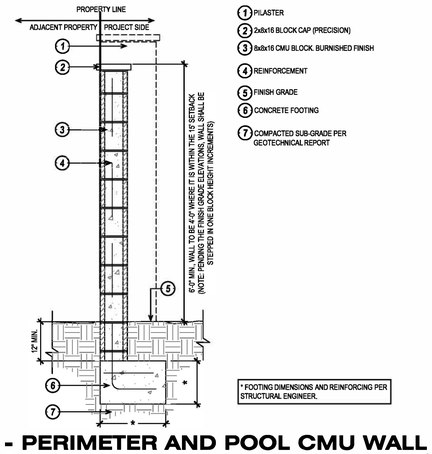
1. PROTECT IN PLACE EXISTING STREET TREES IN PUBLIC RIGHT-OF-WAY ALONG MISSION INN AVE. (WASHINGTONIA FILIFERA).
2. IF EXISTING STREET TREES ARE FOUND BY TREE INSPECTOR AT TIME OF SCHEDULED SITE INSPECTION (AFTER FINE GRADING AND HARDSCAPE INSTALLATION IS COMPLETE) TO BE MISSING, DEAD, DAMAGED, OR IN POOR CONDITION, THEY WILL BE REQUIRED TO BE REMOVED AND REPLACED WITH 24" BOX SIZE TREES TO TREE INSPECTOR'S SPECIFICATIONS. PLANTING, STAKING, IRRIGATION, AND ROOT BARRIERS TO LANDSCAPE & FORESTRY SPECIFICATIONS.
3. PLANT IN PUBLIC RIGHT-OF-WAY, 24" BOX SIZE CELTIS SINENSIS ALONG MISSION INN AVE., LOPHESTEMON CONFERTUS (BRISBANE BOX) ALONG COMMERCE ST., AND MAGNOLIA GRANDIFLORA (ST. MARY) ALONG 5TH ST. AT TYPICAL SPACING 25' O.C.
4. PRIOR TO ANY PLANTING, TREE INSPECTOR TO DETERMINE PRECISE LOCATIONS AT TIME OF SCHEDULED SITE INSPECTION AFTER FINE GRADING AND HARDSCAPE INSTALLATION IS COMPLETE. PLANTING, STAKING, IRRIGATION, AND ROOT BARRIERS TO LANDSCAPE & FORESTRY SPECIFICATIONS.

BENCHMARK

INDEX 6647 PAGE 42 DATED JANUARY 20, 2005

FOUND PK NAIL AND CITY SURVEYOR TAG IN WESTERLY END OF CATCH BASIN ON THE SOUTHERLY SIDE OF UNIVERSITY AVENUE, 95'± EASTERLY OF CENTERLINE OF PARK AVENUE.

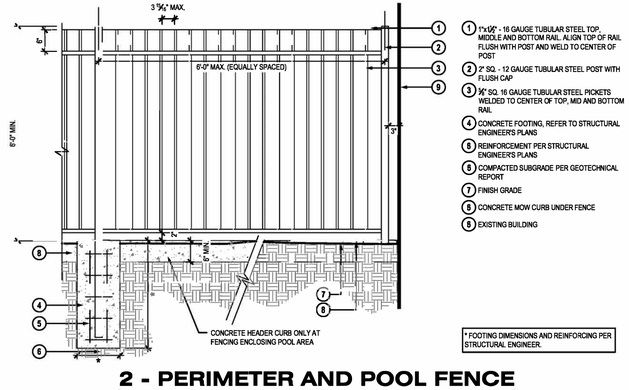
ELEVATION: 891.353 FEET



* FOOTING DIMENSIONS AND REINFORCING PER STRUCTURAL ENGINEER.

1 - PERIMETER AND POOL CMU WALL

SCALE: NONE



* FOOTING DIMENSIONS AND REINFORCING PER STRUCTURAL ENGINEER.

2 - PERIMETER AND POOL FENCE

SCALE: NONE

LOT AREA

PROPOSED LOT 1: 302,137 S.F. (6.94 ACRES)

LEGAL DESCRIPTION

LOTS 1, 2, 3, 4, 5, 6, 7, 22 THROUGH 37 IN BLOCK 6 OF WHITES ADDITION, IN THE CITY OF RIVERSIDE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 6, PAGE 48 OF MAPS, RECORDS OF SAN BERNARDINO COUNTY.

LOTS 1, 2, 3 THROUGH 7, INCLUSIVE, 22 THROUGH 37 INCLUSIVE, IN BLOCK 8 OF WHITE'S ADDITION, IN THE CITY OF RIVERSIDE, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS SHOWN BY MAP ON FILE IN BOOK 6, PAGE 48 OF MAPS, RECORDS OF SAN BERNARDINO COUNTY, CALIFORNIA.

EASEMENTS

1. EASEMENT(S) FOR INGRESS, EGRESS AD PARKING PURPOSE(S) AND RIGHTS INCIDENTAL THERETO, GRANTED TO SOUTHERN PACIFIC COMPANY RECORDED MARCH 13, 1928 IN BOOK 755, PAGE 184 OF DEEDS.

   THE EXACT LOCATION AND EXTENT OF SAID EASEMENT IS NOT DISCLOSED OF RECORD. *NO MENTIONED EASEMENTS WITHIN SAID DOCUMENT, DOES NOT AFFECT.*

2. EASEMENT(S) FOR RIVERSIDE WATER COMPANY CONSTRUCTION AND MAINTENANCE OF ALL NECESSARY WATER DITCHES, PIPES, FLUMES AND APPARATUS FOR THE PURPOSES OF IRRIGATION AND DOMESTIC USE RECORDED IN BOOK 42, PAGES 294 AND 296, OF DEEDS, SAN BERNARDINO COUNTY RECORDS.
   THE EXACT LOCATION IS UNDETERMINED FROM RECORD, DOCUMENT ILLEGIBLE.

3. EASEMENT(S) GRANTED TO SOUTHERN PACIFIC TRANSPORTATION COMPANY, A DELAWARE CORPORATION FOR RAILROAD PURPOSES AS RESERVED IN A DOCUMENT RECORDED DECEMBER 17, 1985 AS INSTRUMENT NO. 283346, OF OFFICIAL RECORDS.

   AFFECTS: OVER, ACROSS AND UPON THE NORTHWESTERLY 15.00 FEET OF SAID LOTS 4 AND 25. *AFFECTS, TO BE QUITCLAIMED.*

4. EASEMENT(S) GRANTED TO SOUTHERN PACIFIC TRANSPORTATION COMPANY, A DELAWARE CORPORATION FOR RAIL AND RAILROAD RELATED EQUIPMENT FACILITIES AND COMMUNICATIONS AND PIPELINES, LINES AND FACILITIES OF EVERY KIND AND NATURE INCLUDING BUT NOT LIMITED TO ALL EXISTING FACILITIES, TELEPHONE, TELEGRAPH, TELEVISION AND FIBER OPTIC LINES AND RELATED EQUIPMENT AND RIGHTS INCIDENTAL THERETO RECORDED AUGUST 31, 1990 AS INSTRUMENT NO. 326250, OF OFFICIAL RECORDS. *AFFECTS, TO BE QUITCLAIMED.*

5. EASEMENT(S) FOR TELECOMMUNICATIONS PURPOSE(S) AND RIGHTS INCIDENTAL THERETO, AS GRANTED TO QWEST COMMUNICATIONS COMPANY, LLC IN A DOCUMENT RECORDED DECEMBER 16, 2013 AS INSTRUMENT NO. 2013-0581753 OF OFFICIAL RECORDS. *AFFECTS PARCEL 2, NOT PLOTTABLE PER RECORD, TO BE QUITCLAIMED.*

*NOTE
SEE SHEETS C-12 THRU C-14 FOR SITE SECTIONS.

GENERAL NOTES

1. THE STREET IMPROVEMENTS SHOWN HEREON ALONG COMMERCE ST. AND 5TH ST. ARE PER HDR'S PLANS, AS PART OF THE CITY'S THIRD STREET GRADE SEPARATION PROJECT. THE STREET IMPROVEMENT SCOPE OF WORK FOR THE IRON LOFTS DEVELOPMENT WILL INCLUDE TYING INTO HDR'S STREET IMPROVEMENTS AT KEY LOCATIONS AND CONTINUING ALONG THE IRON LOFTS' FRONTAGES ALONG THE NORTH SIDE OF MISSION INN AVE., THE EAST SIDE OF COMMERCE ST., AND THE SOUTH SIDE OF 5TH ST., AS SHOWN HEREON.
2. THE ABANDONED RAIL LINE ALONG COMMERCE ST. SHALL ALSO BE REMOVED PER HDR'S PLANS.

0 15 30 60 90

SCALE: 1"=30' DATE: 12/06/24

IRON LOFTS

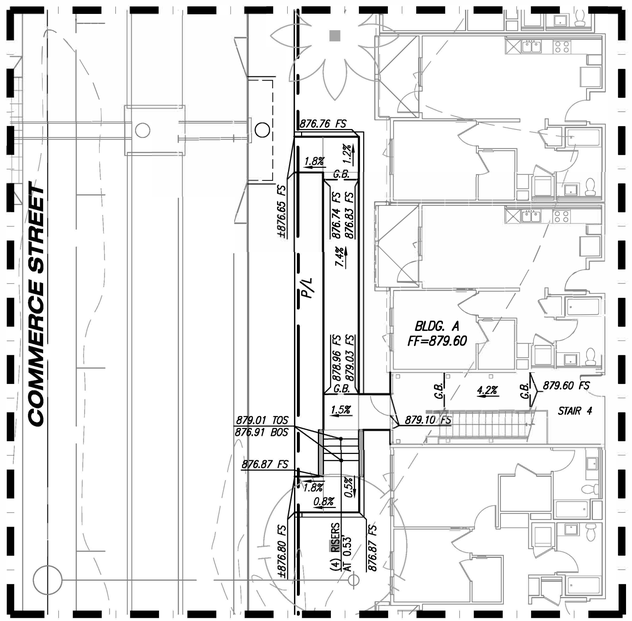
IRON LOFTS, LLC

C-1: PRELIMINARY GRADING PLAN

RIVERSIDE, CALIFORNIA

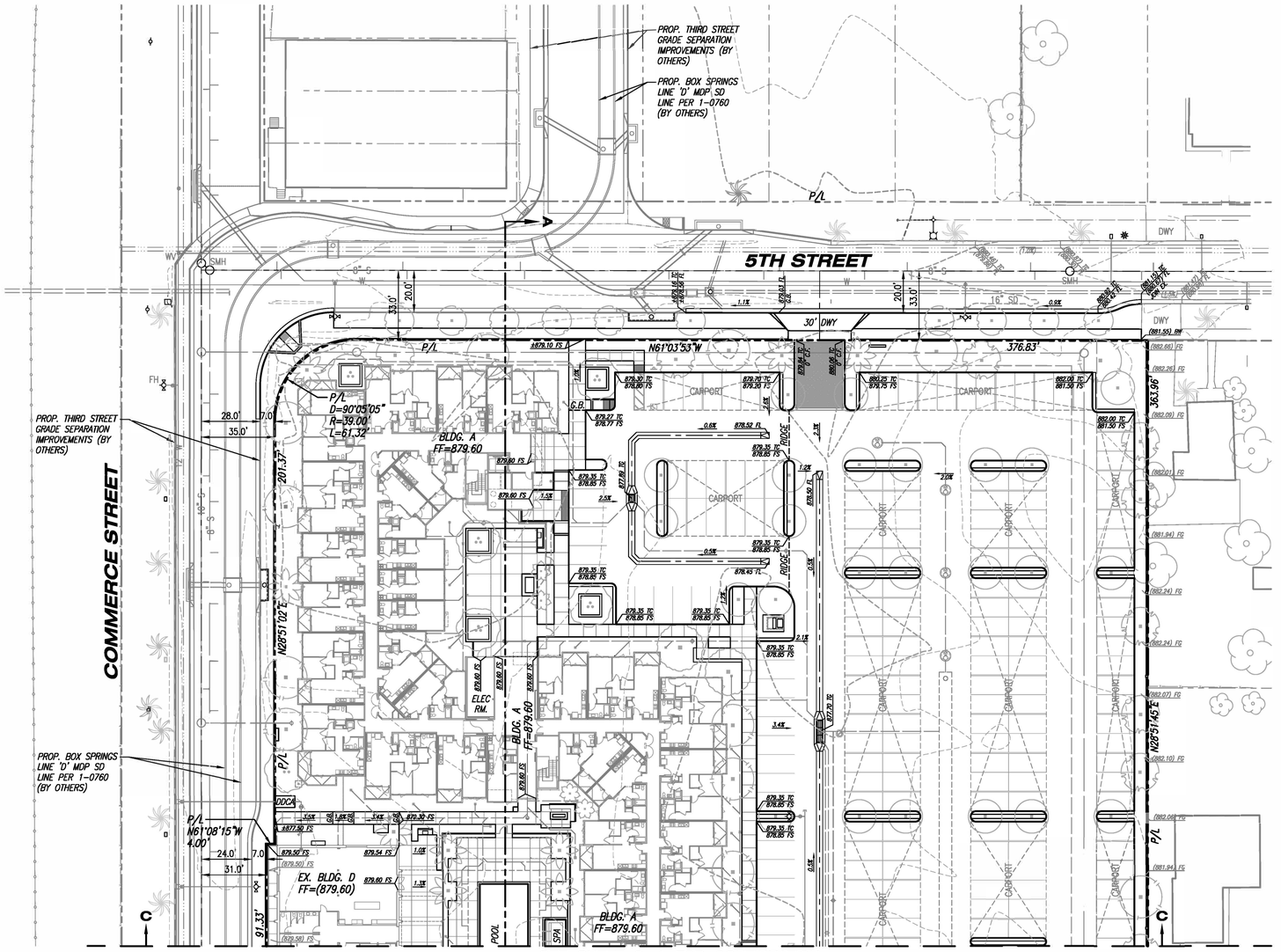
KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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3 - ENLARGED RAMP DETAIL

SEE SHEET C-1
SCALE: 1"=10'



SEE SHEET C-1 FOR CONTINUATION

GENERAL NOTES

1. THE STREET IMPROVEMENTS SHOWN HEREON ALONG COMMERCE ST. AND 5TH ST. ARE PER HDR'S PLANS, AS PART OF THE CITY'S THIRD STREET GRADE SEPARATION PROJECT. THE STREET IMPROVEMENT SCOPE OF WORK FOR THE IRON LOFTS DEVELOPMENT WILL INCLUDE TYING INTO HDR'S STREET IMPROVEMENTS AT KEY LOCATIONS AND CONTINUING ALONG THE IRON LOFTS' FRONTAGES ALONG THE NORTH SIDE OF MISSION INN AVE., THE EAST SIDE OF COMMERCE ST., AND THE SOUTH SIDE OF 5TH ST., AS SHOWN HEREON.
2. THE ABANDONED RAIL LINE ALONG COMMERCE ST. SHALL ALSO BE REMOVED PER HDR'S PLANS.

*NOTE
SEE SHEETS C-12 THRU C-14 FOR SITE SECTIONS.

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SCALE: 1"=30' DATE: 12/06/24

IRON LOFTS

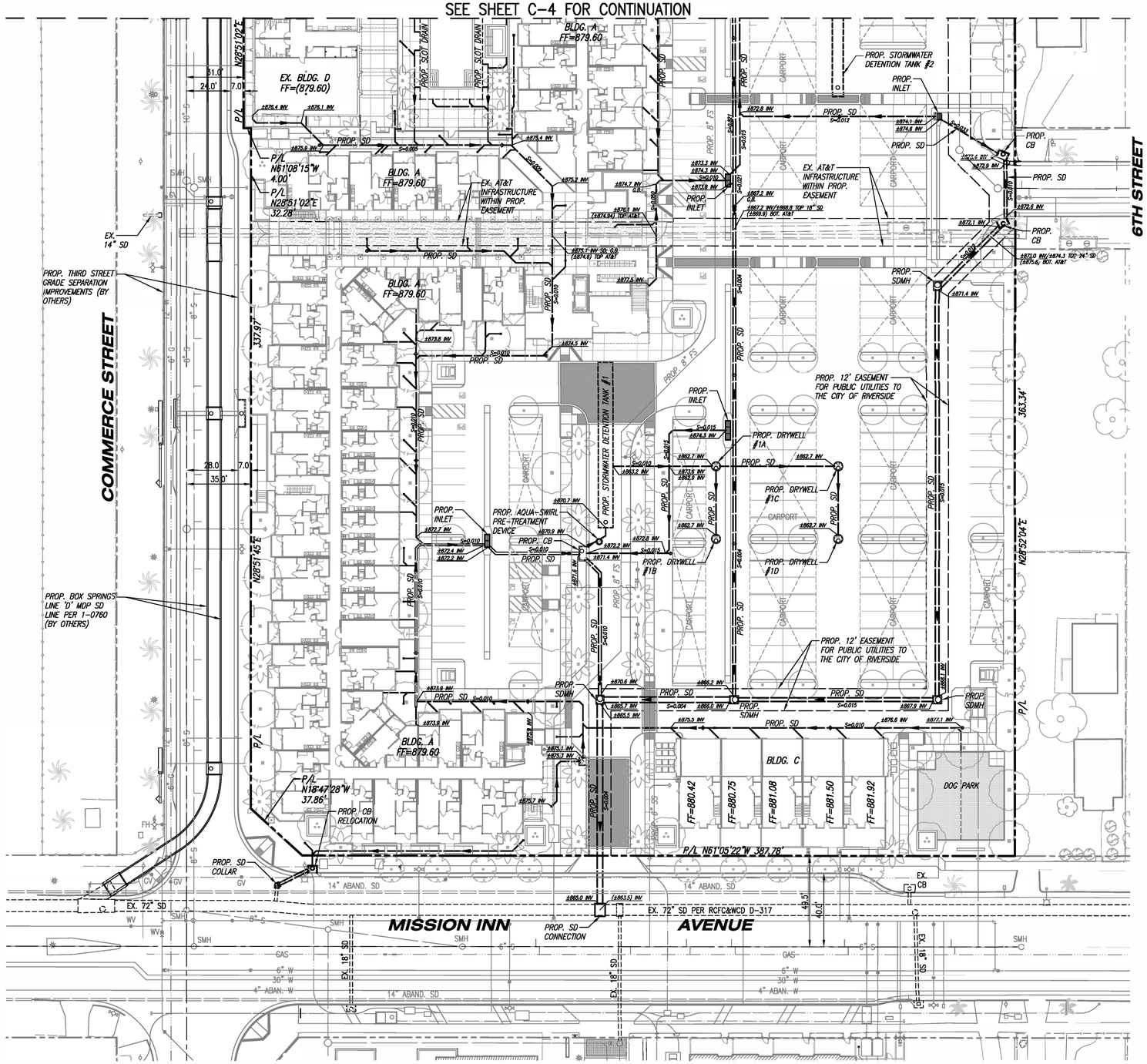
IRON LOFTS, LLC

C-2: PRELIMINARY GRADING PLAN

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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NOTE

THE PROPOSED STORM DRAIN CONNECTION TO THE EXISTING 72" STORM DRAIN LINE IN MISSION INN AVE. REQUIRES AN ENCROACHMENT PERMIT AND IS CONTINGENT UPON RCFC AND WATER CONSERVATION DISTRICT APPROVAL.

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SCALE: 1"=30' DATE: 12/06/24

IRON LOFTS

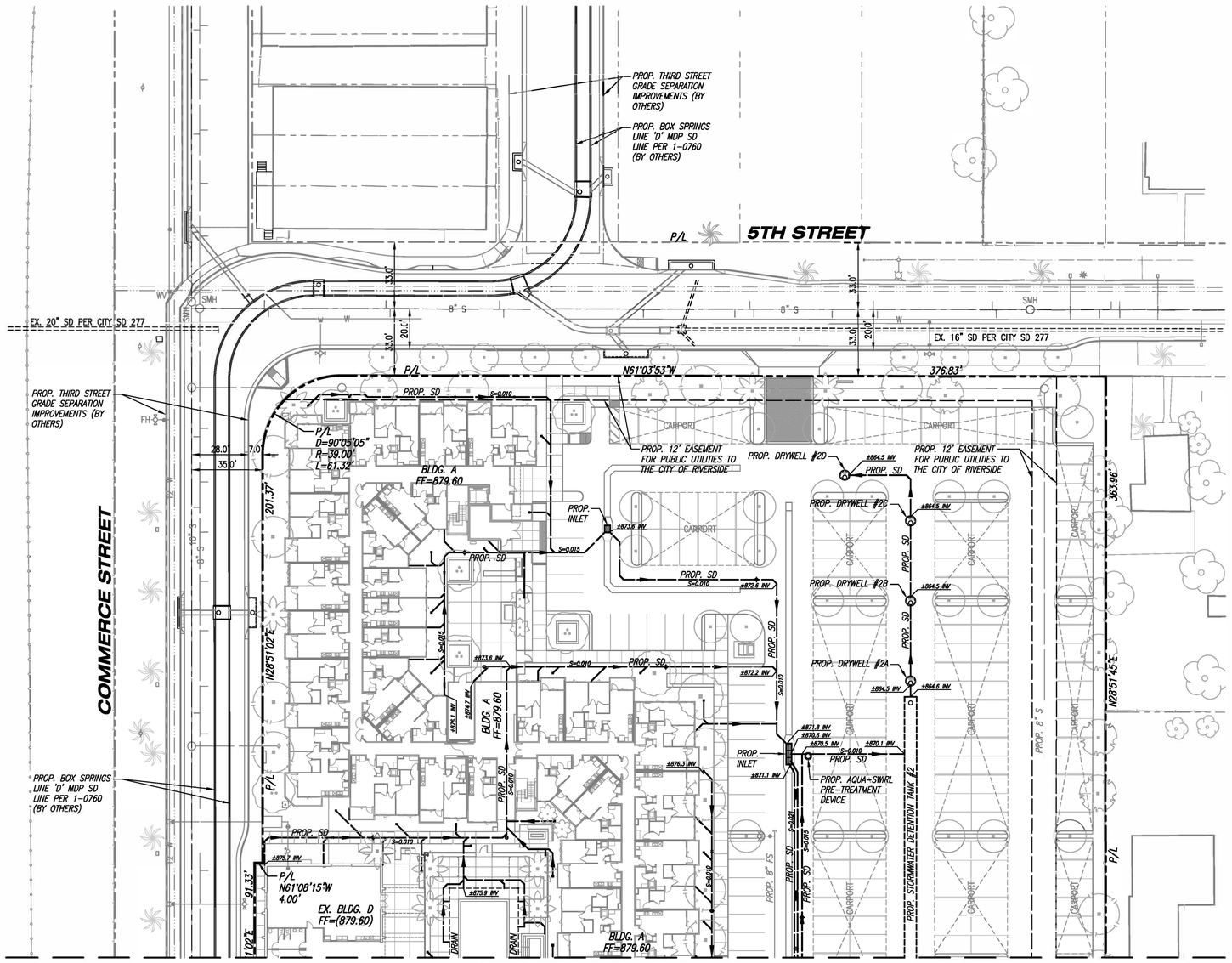
IRON LOFTS, LLC

C-3: PRELIMINARY STORM DRAIN PLAN

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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IRON LOFTS

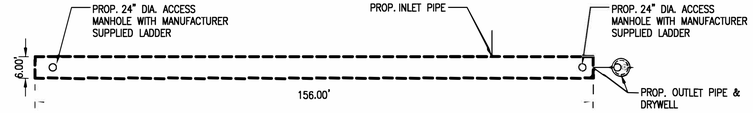
IRON LOFTS, LLC

C-4: PRELIMINARY STORM DRAIN PLAN

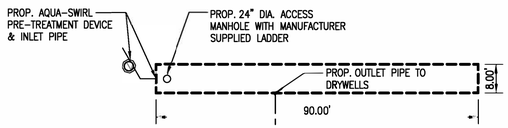
RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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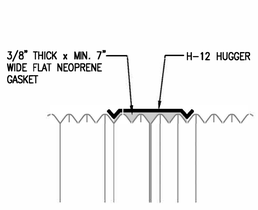
72" DIA. SOLID WALL CMP TANK (SYSTEM #2) TO HOLD A MINIMUM VOLUME OF 4,412 CF



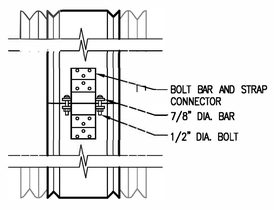
96" DIA. SOLID WALL CMP TANK (SYSTEM #1) TO HOLD A MINIMUM VOLUME OF 4,495 CF

HUGGER BAND GENERAL NOTES

1. REFER TO CONTECH BAND SELECTION GUIDE FOR BAND WIDTH, GAGE, AND FASTENER TYPES.
2. BANDS FOR PIPE-ARCH ARE THE SAME AS FOR EQUIVALENT DIAMETER ROUND PIPE.
3. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   12" THRU 48" 1-PIECE
   54" THRU 96" 2-PIECE
   102" THRU 144" 3-PIECES
4. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.



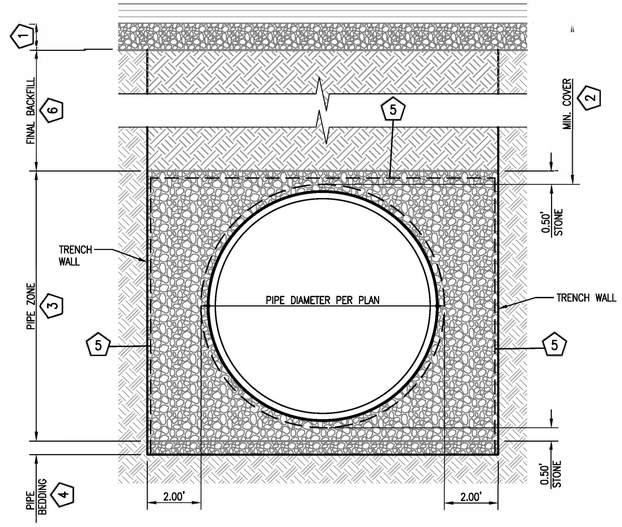
FLAT GASKET



HUGGER BAND CONNECTION DETAIL

UNDERGROUND DETENTION PIPE DETAILS

SCALE: NONE



TANK BACKFILL SECTION A-A

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

MATERIAL

THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A929.

PIPE

THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M36 OR ASTM A760. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

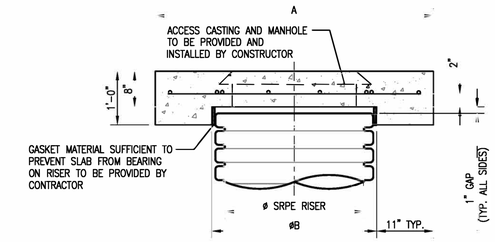
HANDLING AND ASSEMBLY

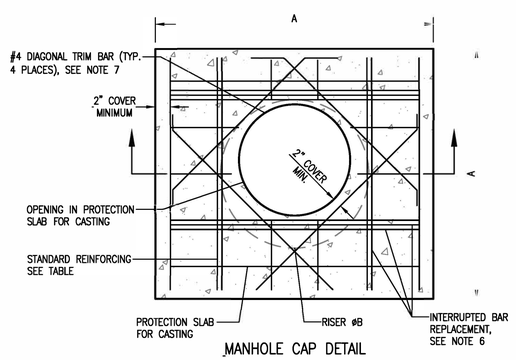
SHALL BE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NATIONAL CORRUGATED STEEL PIPE ASSOCIATION (NCSPA)

INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II OR ASTM A798 AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.





MANHOLE CAP DETAIL

FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE SOILS ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, THE 4-6 INCHES OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL MATERIAL SHALL BE FREE-DRAINING ANGULAR WASHED STONE ¾"-2" PARTICLE SIZE. MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL - SLICING, RODDING, AIR-TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE PROJECT ENGINEER OR HIS REPRESENTATIVE IS SATISFIED WITH THE LEVEL OF COMPACTION. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

EQUIPMENT USED TO PLACE AND COMPACT THE BACKFILL SHALL BE OF A SIZE AND TYPE SO AS NOT TO DISTORT, DAMAGE, OR DISPLACE THE PIPE. ATTENTION MUST BE GIVEN TO PROVIDING ADEQUATE MINIMUM COVER FOR SUCH EQUIPMENT, AND MAINTAINING BALANCED LOADING ON ALL PIPES IN THE SYSTEM, DURING ALL SUCH OPERATIONS.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

KEY (X)

1. AGGREGATE ROAD BASE PER GRADING PLANS.
2. 12" MIN. FOR DIAMETERS THROUGH 96"; 18" MIN. FOR DIAMETERS FROM 102" TO 144"; 24" MIN. FROM 150" TO 192"; AND 30" MIN. FROM 198" TO 234", MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
3. FREE DRAINING ANGULAR WASHED STONE 3/4" TO 2" PARTICLE SIZE. DENSIFIED PER GEOTECHNICAL REPORT.
4. WELL GRADED GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE 4" TO 6" IN DEPTH.
5. CONTECH C-40 NON-WOVEN GEOTEXTILE REQUIRED, WRAPPING AROUND TOP AND SIDES OF TRENCH.
6. FINAL BACK FILL MATERIAL PLACED IN 8" LIFTS AND COMPACTED TO 90%. PER PROJECT SOILS REPORT, GRADING PLANS AND SPECIFICATIONS.

GENERAL NOTES

1. REFER TO CONTECH BAND SELECTION GUIDE FOR BAND WIDTH, GAGE, AND FASTENER TYPES.
2. BANDS FOR PIPE-ARCH ARE THE SAME AS FOR EQUIVALENT DIAMETER ROUND PIPE.
3. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   12" THRU 48" 1-PIECE
   54" THRU 96" 2-PIECES
   102" THRU 144" 3-PIECES
4. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
5. REROLLED ANNULAR END CORRUGATIONS ARE NORMALLY 2-2/3" X 1/2".
6. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.

MANHOLE CAP NOTES

1. DESIGN IN ACCORDANCE WITH AASHTO, LATEST EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 PSI
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTIVE SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

REINFORCING TABLE

øSRPE RISER	A	ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	ø 4' 4' X 4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,110

** ASSUMED SOIL BEARING CAPACITY

DATE: 12/06/24

IRON LOFTS

IRON LOFTS, LLC

C-5: PRELIMINARY LID BMP DETAILS

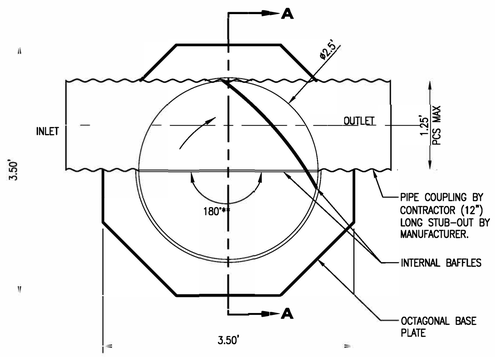
RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

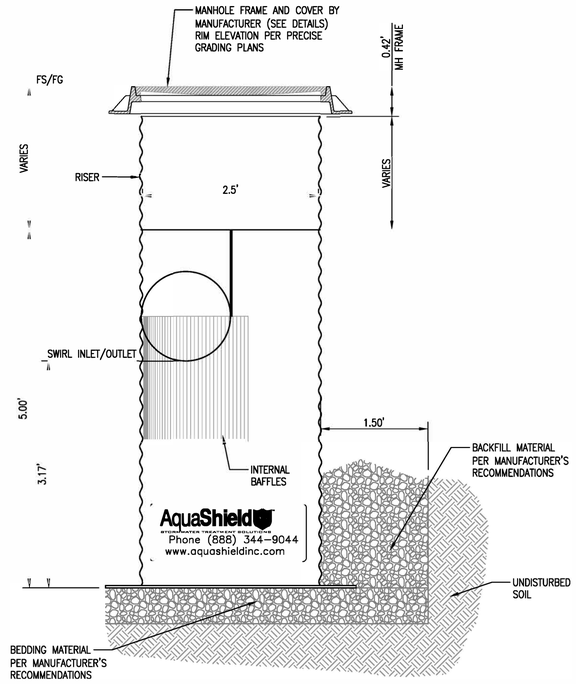
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GENERAL NOTES

1. BACKFILL SHALL EXTEND AT LEAST 18 INCHES OUTWARD FROM SWIRL CONCENTRATOR AND FOR THE FULL HEIGHT OF THE SWIRL CONCENTRATOR (INCLUDING RISER) EXTENDING LATERALLY TO UNDISTURBED SOILS. (SEE MANHOLE DETAIL BELOW)
2. AS AN ALTERNATIVE, 42–INCH OD, HS–20/25 RATED PRECAST CONCRETE RINGS MAY BE SUBSTITUTED, 14–INCH THICKNESS MUST BE MAINTAINED.
3. SEE MANUFACTURER'S SPECIFICATIONS FOR ADDITIONAL INFORMATION.
4. SEE SITE PLAN FOR ACTUAL SYSTEM ORIENTATION, WHICH MAY VARY FROM 90°, 180°, OR CUSTOM ANGLES TO MEET SITE CONDITIONS.



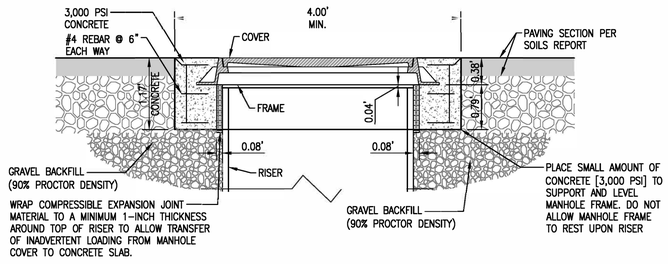
PLAN VIEW



SECTION A–A

NOTE

IF TRAFFIC LOADING (HS–25) IS REQUIRED OR ANTICIPATED, A 4–FOOT [1.22 M] DIAMETER, 14–INCH [356 MM] THICK REINFORCED CONCRETE PAD MUST BE PLACED OVER THE STORMWATER TREATMENT SYSTEM RISER TO SUPPORT AND LEVEL THE MANHOLE FRAME, AS SHOWN. THE TOP OF RISER PIPE MUST BE WRAPPED WITH COMPRESSIBLE EXPANSION JOINT MATERIAL TO A MINIMUM 1–INCH [25 MM] THICKNESS TO ALLOW TRANSFER OF WHEEL LOADS FROM MANHOLE COVER TO CONCRETE SLAB. MANHOLE COVER SHALL BEAR ON CONCRETE SLAB AND NOT ON RISER PIPE. THE CONCRETE SLAB SHALL HAVE A MINIMUM STRENGTH OF 3,000 PSI [20 MPA] AND BE REINFORCED WITH #4 [13 MM] REINFORCING STEEL AS SHOWN. MINIMUM COVER OVER REINFORCING STEEL SHALL BE 1–INCH [25 MM]. TOP OF MANHOLE COVER AND CONCRETE SLAB SHALL BE LEVEL WITH FINISH GRADE.



MANHOLE FRAME AND COVER DETAIL FOR TRAFFIC AREAS ONLY

AQUA-SWIRL MODEL AS-2 BYP PCS

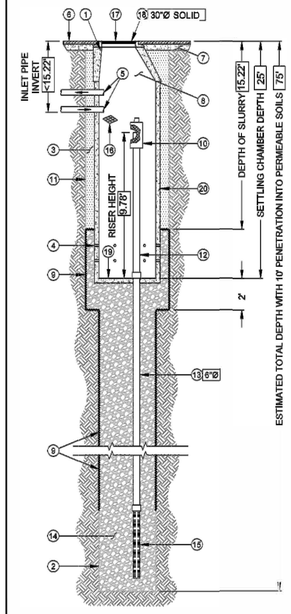
SCALE: NONE

The MaxWell® IV

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Iron Lofts - DMA 2

Riverside, CA



○ ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **MIN 4' Ø DRILLED SHAFT.**
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX.
4. **6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.**
5. **INLET PIPE/OUTLET PIPE (BY OTHERS).** SEE SEPARATE PLAN FOR INVERT ELEVATIONS.
6. **GRADED BASIN OR PAVING** (BY OTHERS).
7. **COMPACTED BASE MATERIAL,** IF REQUIRED (BY OTHERS).
8. **FREEBOARD DEPTH VARIES** WITH INLET PIPE ELEVATION. INCREASE SETTLING CHAMBER DEPTH AS NEEDED TO MAINTAIN ALL INLET PIPE ELEVATIONS ABOVE RISER PIPE.
9. **NON-WOVEN GEOTEXTILE SLEEVE** - MIRAFI 140 NL. MIN. 6 FT Ø, HELD APPROX. 10 FEET OFF THE BOTTOM OF EXCAVATION.
10. **PUREFLO® DEBRIS SHIELD** - ROLLED 16 GA. STEEL X 24" LENGTH WITH VENTED ANTI-SIPHON AND INTERNAL 0.265" MAX. SWO FLATTENED EXPANDED STEEL SCREEN X 12" LENGTH. **FUSION BONDED EPOXY COATED.**
11. **MIN. 6' Ø DRILLED SHAFT.**
12. **RISER PIPE** - SCH. 40 PVC MATED TO DRAINAGE PIPE AT BASE SEAL.
13. **DRAINAGE PIPE** - ADS HIGHWAY GRADE OR SCH. 40 PVC WITH TRI-A COUPLER. SUSPEND PIPE DURING BACKFILL OPERATIONS. DIAMETER AS NOTED.
14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
15. **FLOFAST® DRAINAGE SCREEN** - SCH. 40 PVC 0.120" SLOTTED WELL SCREEN WITH MIN. 32 SLOTS PER ROW/FT. OVERALL LENGTH VARIES. UP TO 120" WITH TRI-B COUPLER.
16. **ABSORBENT** - HYDROPHOBIC PETROCHEMICAL SPONGE. MIN. 128 OZ. CAPACITY. TYPICAL 2 PER CHAMBER.
17. **FABRIC SEAL** - U.V. RESISTANT GEOTEXTILE - **TO BE REMOVED BY CUSTOMER** AT PROJECT COMPLETION. GRATED ONLY.
18. **BOLTED RING & GRATE/COVER** - DIAMETER & TYPE AS SHOWN. CLEAN CAST IRON WITH WORDING "STORM WATER ONLY" IN RAISED LETTERS. BOLTED IN 2 LOCATIONS AND SECURE TO CONE WITH MORTAR. RIM ELEVATION ±0.02' OF PLANS.
19. **BASE SEAL** - CONCRETE SLURRY.
20. **PRE-CAST LINER** - 4000 PSI CONCRETE 48" ID. x 54" OD. CENTER IN HOLE AND ALIGN SECTIONS TO MAXIMIZE BEARING SURFACE.

Manufactured and Installed by

TorrentResources
A CRH COMPANY
An evolution of McGuckin Drilling
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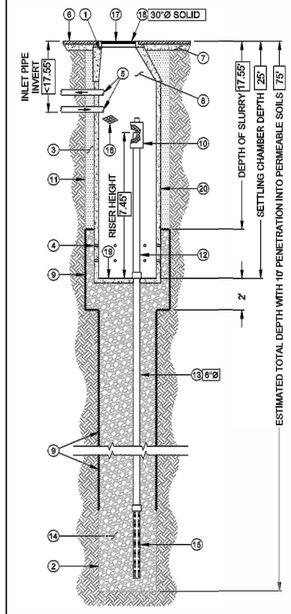
DETAIL:	IV-4-SS-CA	REVISED BY:	NJT
DRAWN ON:	07-20-23	REVISED DATE:	10-18-23
		SCALE:	N.T.S

The MaxWell® IV

DRAINAGE SYSTEM DETAILS AND SPECIFICATIONS

Iron Lofts - DMA 1

Riverside, CA



○ ITEM NUMBERS

1. **MANHOLE CONE** - MODIFIED FLAT BOTTOM.
2. **MIN 4' Ø DRILLED SHAFT.**
3. **STABILIZED BACKFILL** - TWO-SACK SLURRY MIX.
4. **6 PERFORATIONS MINIMUM PER FOOT, 2 ROWS MINIMUM.**
5. **INLET PIPE/OUTLET PIPE (BY OTHERS).** SEE SEPARATE PLAN FOR INVERT ELEVATIONS.
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14. **ROCK** - WASHED, SIZED BETWEEN 3/8" AND 1-1/2".
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Manufactured and Installed by

TorrentResources
A CRH COMPANY
An evolution of McGuckin Drilling
www.torrentresources.com

DETAIL:	IV-4-SS-CA	REVISED BY:	NJT
DRAWN ON:	07-20-23	REVISED DATE:	10-18-23
		SCALE:	N.T.S

DRYWELL & DETENTION DESIGN CALCULATIONS

Drywell #2 (Combination of DW2A, DW2B, DW2C, DW2D)

Mitigation Volume, V_{BMP}:	5,881 C.F.	From BMP Design Worksheet
Infiltration Rate, $K_{sat,measured}$:	1.60 in/hr	Test Well W-10
Factor of Safety, FS:	3	
Number of Drywells; $DW_{quantity}$:	4 each	
DW Chamber ø:	4 feet	
DW Chamber Area, DWC_{Area}:	12.57 square feet per foot	
DW Chamber Volume, DWC_{Volume}:	12.57 cubic feet per foot	
$DW_{chamber,depth}$ (from invert down):	9.78 linear feet	
DW Rock Shaft ø:	4 feet	
DW Rock Shaft Area, DWR_{Area}:	12.57 square feet per foot	
DW Rock Shaft Volume, DWR_{Volume}:	12.57 cubic feet per foot	
$DW_{rock,depth}$:	50.00 linear feet	
$DW_{infiltration,depth}$:	59.78 linear feet	
DW Bottom Area, DWB_{Area}:	12.57 square feet per foot	
T (Maximum Drawdown Time):	48 hr	
CMP Diameter (detention):	6 feet	
CMP_{Volume}:	28.2 cubic feet per foot	
CMP_{Length}:	156 linear feet	

Determine Design Infiltration Rate: $K_{sat,design}$

$K_{sat,design} = K_{sat,measured} \div FS$

$K_{sat,design} =$ 0.53 in/hr 0.000012 ft/sec

Determine Minimum Infiltration Surface Area, A_{min}

$A_{min} = (V_{BMP} \times 12\ in/ft) \div (T \times K_{sat,design})$

$A_{min} =$ 2,757 S.F.

Determine Infiltration Surface Area, A_{actual}

$A_{actual} = (DW_{infiltration,depth} \times DWR_{Area} + DWB_{Area}) \times DW_{quantity}$

$A_{actual} =$ 3,059 S.F.

Determine Volume of Drywell, $V_{drywell}$

$V_{drywell} = (DWC_{Volume} \times DW_{chamber,depth}) + (DWR_{Volume} \times DW_{rock,depth} \times 0.40) \times DW_{quantity}$

$V_{drywell} =$ 1,497 C.F.

Determine Volume Remaining to Detain in CMP, V_{detain}

$V_{detain} = V_{BMP} - V_{drywell}$

$V_{detain} =$ 4,384 C.F.

Determine CMP Detention Volume, $V_{CMP,detain}$

$V_{CMP,detain} = CMP_{Volume} \times CMP_{Length}$

$V_{CMP,detain} =$ 4,412 C.F.

Determine DW & CMP Volume, V_{design}

$V_{design} = V_{CMP,detain} + V_{drywell}$

$V_{design} =$ 5,909 C.F.

Determine Drawdown Time, T_{actual}

$T_{actual} = (V_{design} \times 12\ in/ft) \div (A_{actual} \times K_{sat,design})$

$T_{actual} =$ 43.51 hr

DRYWELL & DETENTION DESIGN CALCULATIONS

Drywell #1 (Combination of DW1A, DW1B, DW1C, DW1D)

Mitigation Volume, V_{BMP}:	5,825 C.F.	From BMP Design Worksheet
Infiltration Rate, $K_{sat,measured}$:	1.60 in/hr	Test Well W-9
Factor of Safety, FS:	3	
Number of Drywells; $DW_{quantity}$:	4 each	
DW Chamber ø:	4 feet	
DW Chamber Area, DWC_{Area}:	12.57 square feet per foot	
DW Chamber Volume, DWC_{Volume}:	12.57 cubic feet per foot	
$DW_{chamber,depth}$ (from invert down):	7.45 linear feet	
DW Rock Shaft ø:	4 feet	
DW Rock Shaft Area, DWR_{Area}:	12.57 square feet per foot	
DW Rock Shaft Volume, DWR_{Volume}:	12.57 cubic feet per foot	
$DW_{rock,depth}$:	50.00 linear feet	
$DW_{infiltration,depth}$:	57.45 linear feet	
DW Bottom Area, DWB_{Area}:	12.57 square feet per foot	
T (Maximum Drawdown Time):	48 hr	
CMP Diameter (detention):	6 feet	
CMP_{Volume}:	50.2 cubic feet per foot	
CMP_{Length}:	90 linear feet	

Determine Design Infiltration Rate: $K_{sat,design}$

$K_{sat,design} = K_{sat,measured} \div FS$

$K_{sat,design} =$ 0.53 in/hr 0.000012 ft/sec

Determine Minimum Infiltration Surface Area, A_{min}

$A_{min} = (V_{BMP} \times 12\ in/ft) \div (T \times K_{sat,design})$

$A_{min} =$ 2,730 S.F.

Determine Infiltration Surface Area, A_{actual}

$A_{actual} = (DW_{infiltration,depth} \times DWR_{Area} + DWB_{Area}) \times DW_{quantity}$

$A_{actual} =$ 2,939 S.F.

Determine Volume of Drywell, $V_{drywell}$

$V_{drywell} = (DWC_{Volume} \times DW_{chamber,depth}) + (DWR_{Volume} \times DW_{rock,depth} \times 0.40) \times DW_{quantity}$

$V_{drywell} =$ 1,380 C.F.

Determine Volume Remaining to Detain in CMP, V_{detain}

$V_{detain} = V_{BMP} - V_{drywell}$

$V_{detain} =$ 4,445 C.F.

Determine CMP Detention Volume, $V_{CMP,detain}$

$V_{CMP,detain} = CMP_{Volume} \times CMP_{Length}$

$V_{CMP,detain} =$ 4,495 C.F.

Determine DW & CMP Volume, V_{design}

$V_{design} = V_{CMP,detain} + V_{drywell}$

$V_{design} =$ 5,875 C.F.

Determine Drawdown Time, T_{actual}

$T_{actual} = (V_{design} \times 12\ in/ft) \div (A_{actual} \times K_{sat,design})$

$T_{actual} =$ 44.98 hr

MAXWELL IV DRAINAGE SYSTEM (TORRENT RESOURCES)

SCALE: NONE

DATE: 12/06/24

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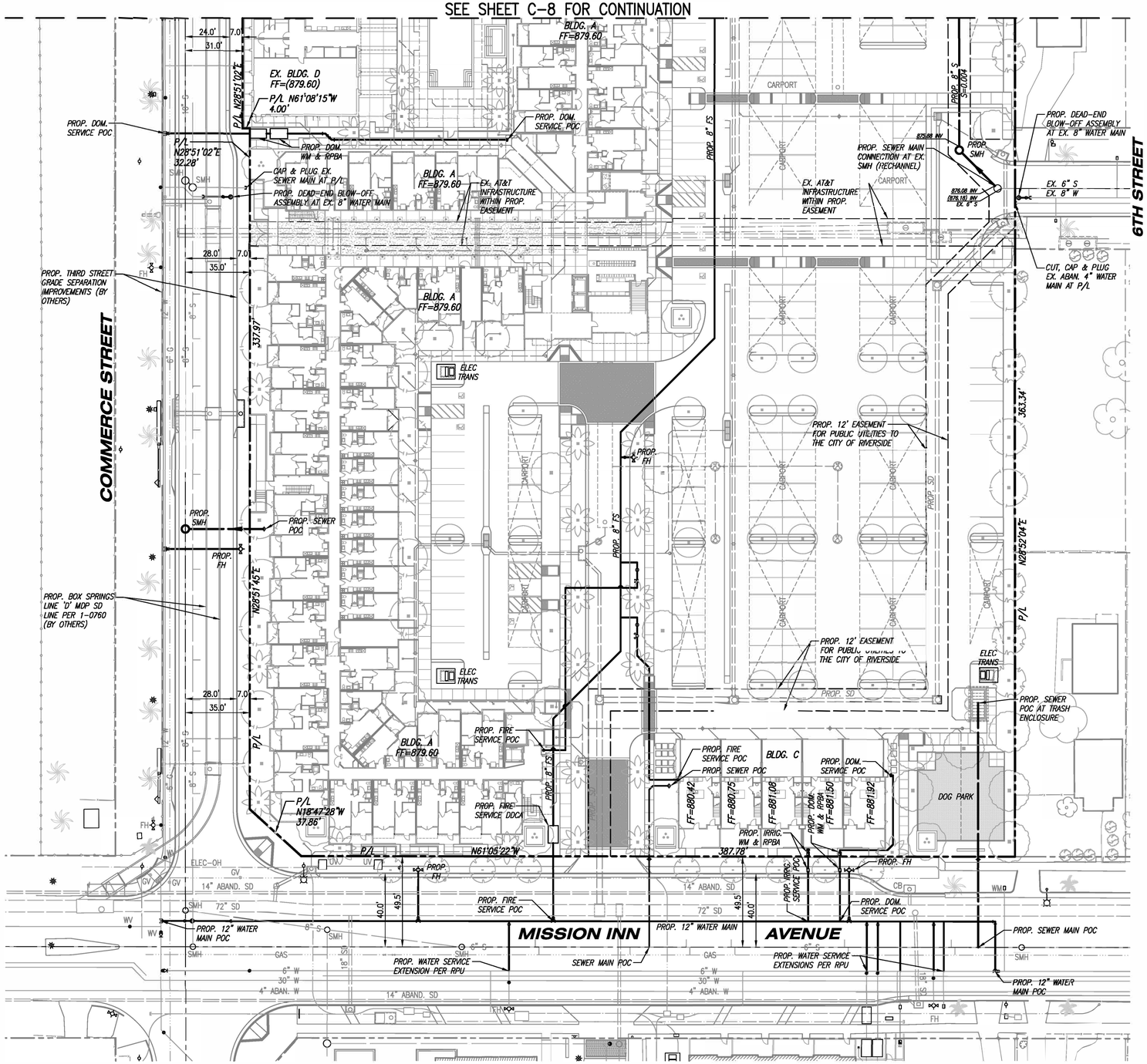
C-6: PRELIMINARY LID BMP DETAILS

RIVERSIDE, CALIFORNIA

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Irvine, California 92614

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SEE SHEET C-8 FOR CONTINUATION



NOTES

1. VACATION OF 6TH ST. WILL REQUIRE THE ABANDONMENT OF THE EXISTING 8" WATER MAIN IN THE EXISTING STREET RIGHT OF WAY. ADDITIONAL ANALYSES WILL BE NEEDED TO DETERMINE IF THE ABANDONMENT OF THAT SECTION OF MAIN WILL TRIGGER ANY ADDITIONAL OFF-SITE UPGRADES OR THE NEED TO LOOP THE MAIN THROUGH AN EASEMENT WITHIN THE PROJECT.

2. THE 6" WATER MAIN IN MISSION INN AVE. REQUIRES UPGRADE TO 12" FROM COMMERCE ST. ACROSS THE PROJECT FRONTAGE AT A MINIMUM, AND POSSIBLY UP TO PARK AVE. DEPENDING ON REQUIRED FIRE FLOW VOLUME AND IMPACTS FROM POTENTIAL ABANDONMENT OF THE 6TH ST. WATER MAIN.

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SCALE: 1"=30' DATE: 12/06/24

IRON LOFTS

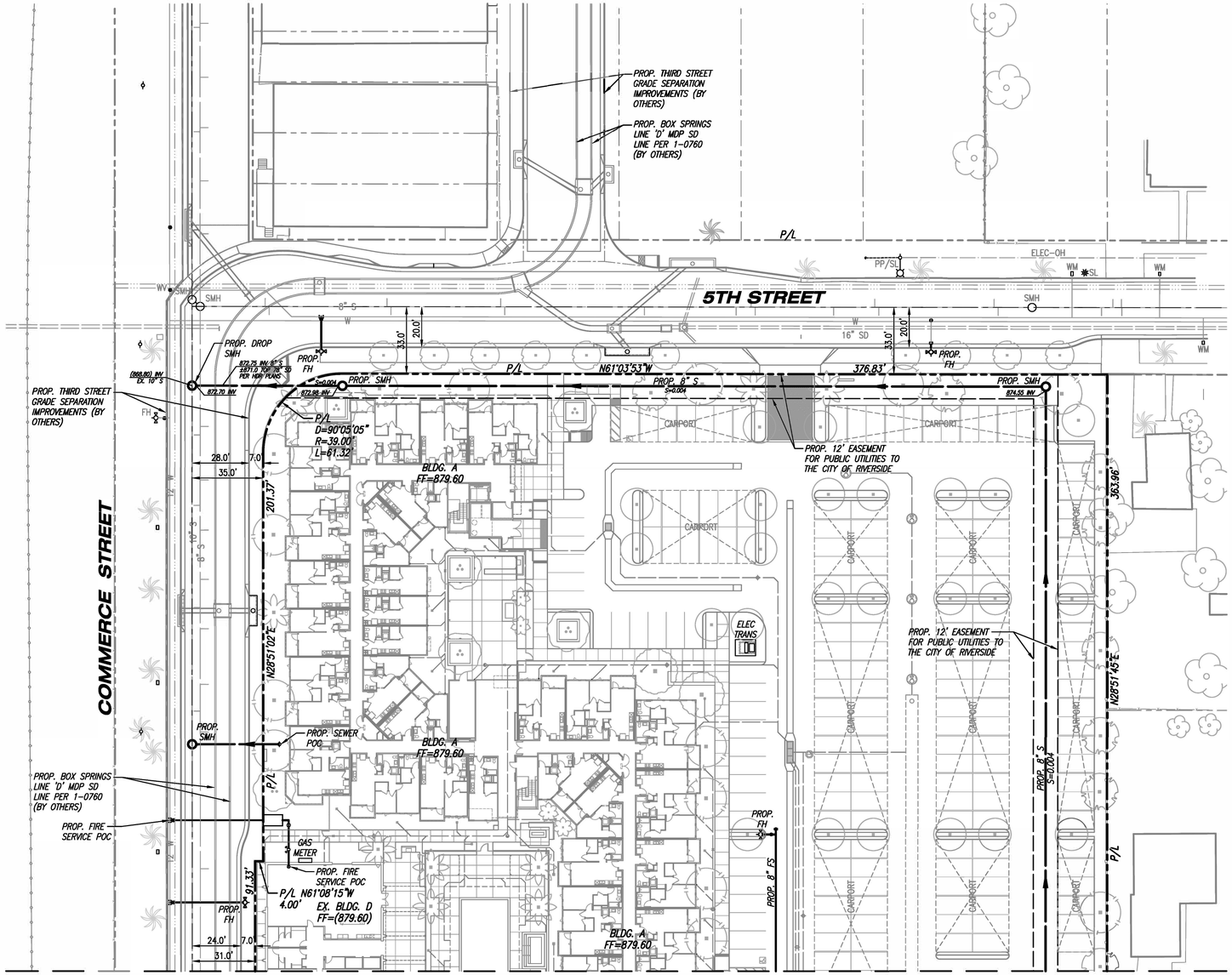
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C-7: PRELIMINARY WET UTILITY PLAN

RIVERSIDE, CALIFORNIA

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CONSULTING ENGINEERS/SURVEYORS/PLANNERS
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Irvine, California 92614

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SEE SHEET C-7 FOR CONTINUATION

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SCALE: 1"=30' DATE: 12/06/24

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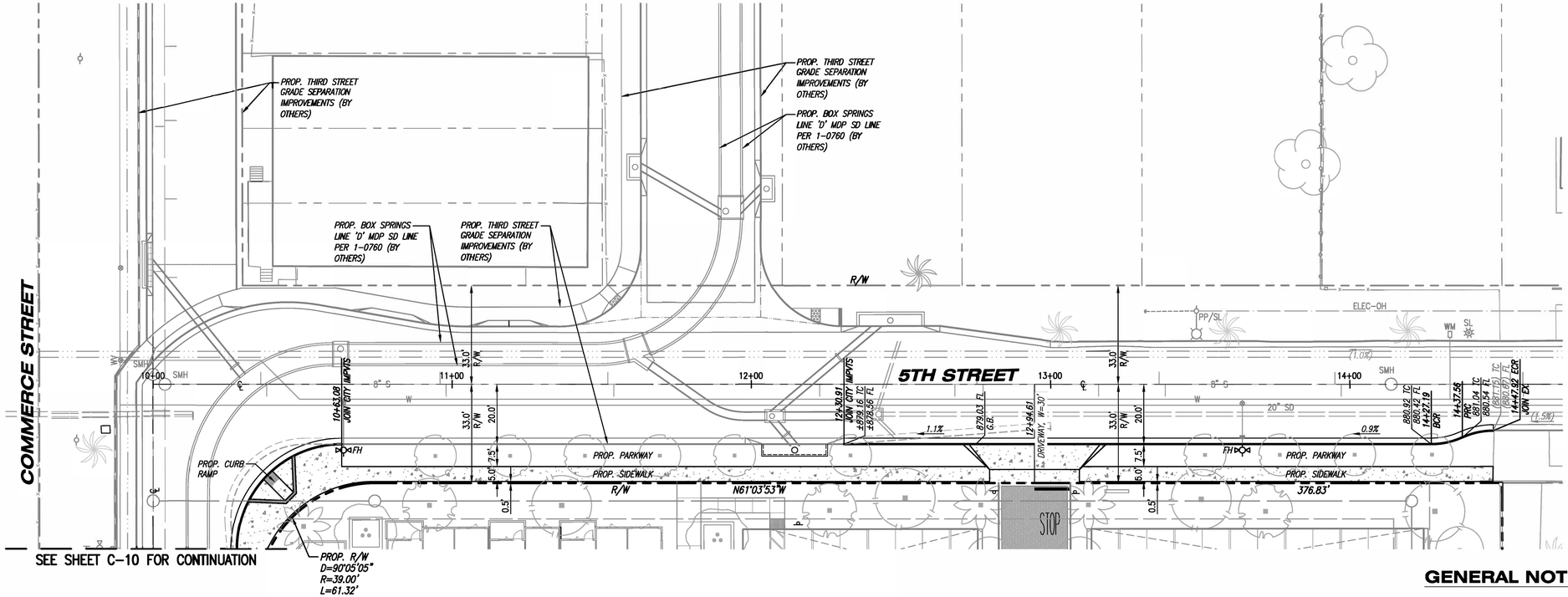
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C-8: PRELIMINARY WET UTILITY PLAN

RIVERSIDE, CALIFORNIA

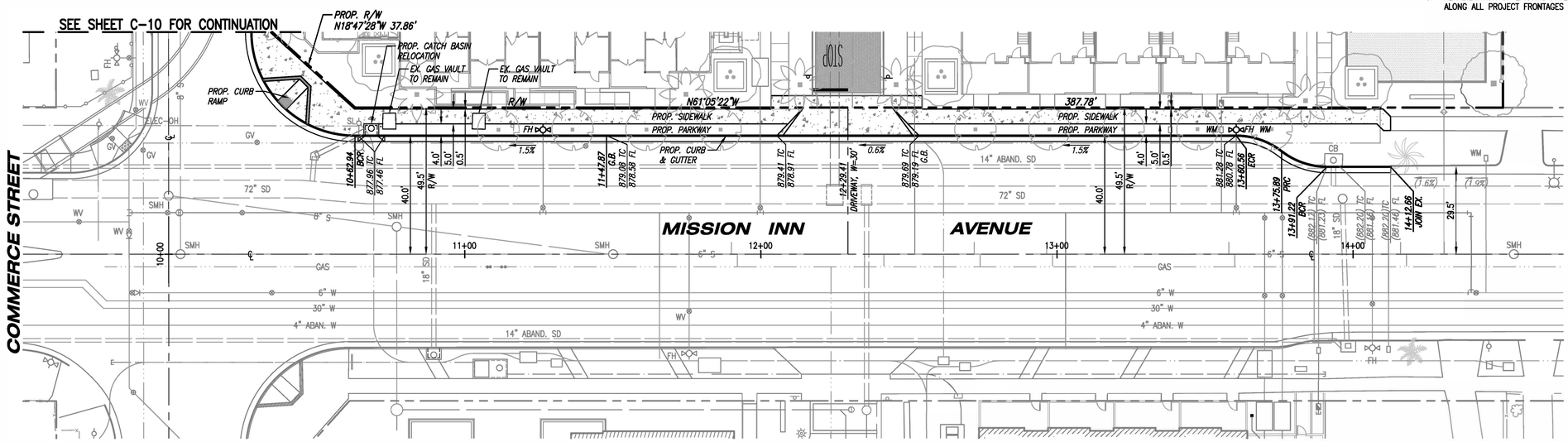
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CONSULTING ENGINEERS/SURVEYORS/PLANNERS
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Irvine, California 92614

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GENERAL NOTES

1. THE STREET IMPROVEMENTS SHOWN HEREON ALONG COMMERCE ST. AND 5TH ST. ARE PER HDR'S PLANS, AS PART OF THE CITY'S THIRD STREET GRADE SEPARATION PROJECT. THE STREET IMPROVEMENT SCOPE OF WORK FOR THE IRON LOFTS DEVELOPMENT WILL INCLUDE TYING INTO HDR'S STREET IMPROVEMENTS AT KEY LOCATIONS AND CONTINUING ALONG THE IRON LOFTS' FRONTAGES ALONG THE NORTH SIDE OF MISSION INN AVE., THE EAST SIDE OF COMMERCE ST., AND THE SOUTH SIDE OF 5TH ST., AS SHOWN HEREON.
2. THE ABANDONED RAIL LINE ALONG COMMERCE ST. SHALL ALSO BE REMOVED PER HDR'S PLANS.
3. REHABILITATION OF EXISTING PAVEMENT TO A MINIMUM OF STREET CENTERLINE ALONG ALL PROJECT FRONTAGES TO PUBLIC WORKS SPECIFICATIONS.



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SCALE: 1"=20' DATE: 12/06/24

IRON LOFTS

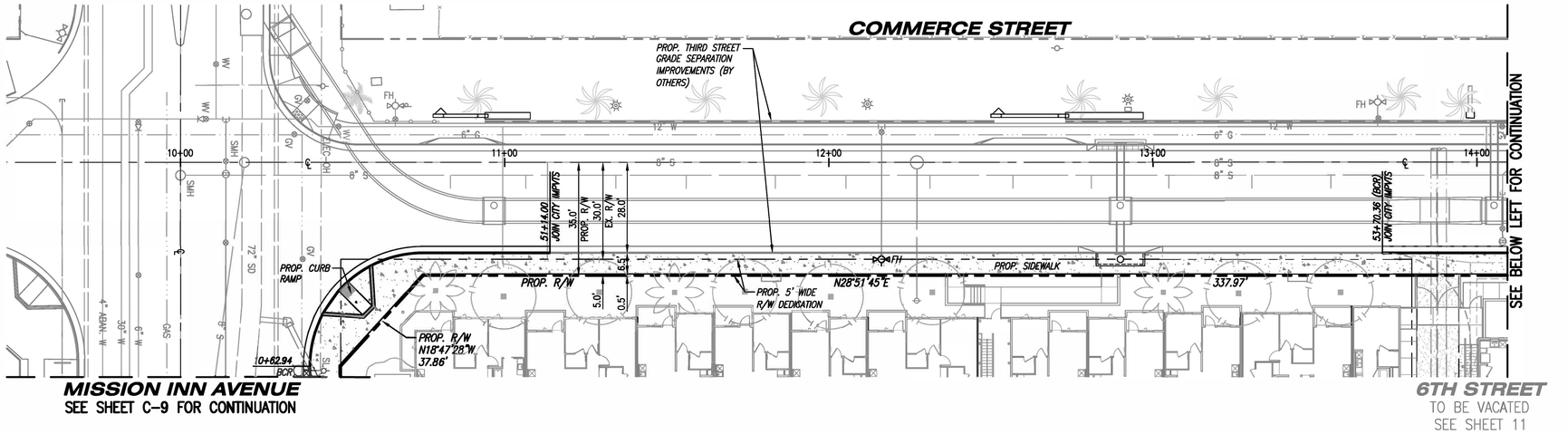
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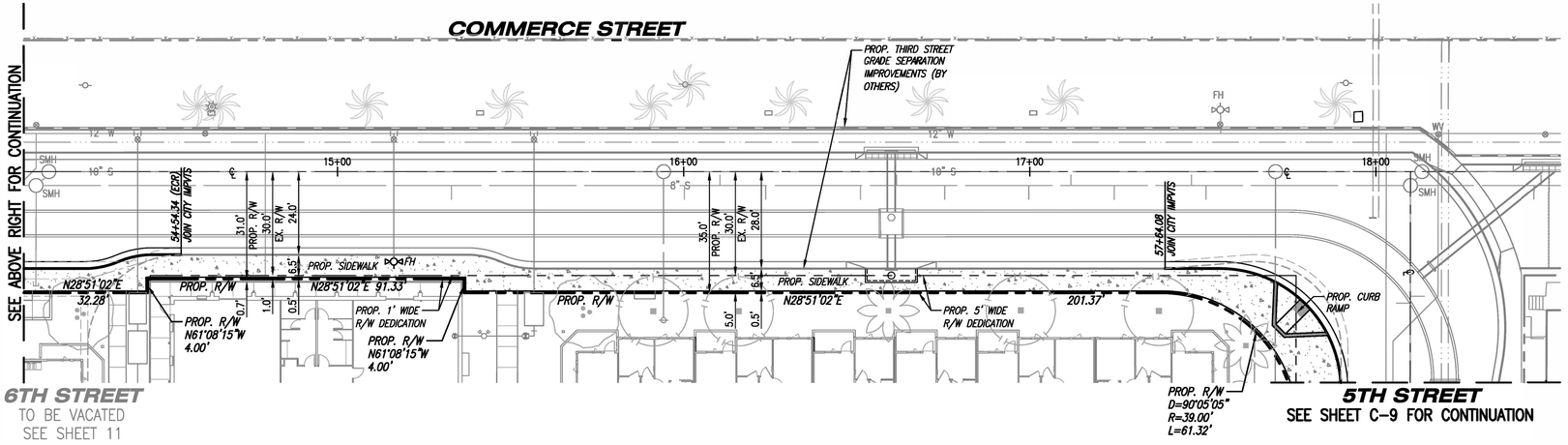
C-9: PRELIMINARY STREET PLAN

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Irvine, California 92614

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GENERAL NOTES

1. THE STREET IMPROVEMENTS SHOWN HEREON ALONG COMMERCE ST. AND 5TH ST. ARE PER HDR'S PLANS, AS PART OF THE CITY'S THIRD STREET GRADE SEPARATION PROJECT. THE STREET IMPROVEMENT SCOPE OF WORK FOR THE IRON LOFTS DEVELOPMENT WILL INCLUDE TYING INTO HDR'S STREET IMPROVEMENTS AT KEY LOCATIONS AND CONTINUING ALONG THE IRON LOFTS' FRONTAGES ALONG THE NORTH SIDE OF MISSION INN AVE., THE EAST SIDE OF COMMERCE ST., AND THE SOUTH SIDE OF 5TH ST., AS SHOWN HEREON.
2. THE ABANDONED RAIL LINE ALONG COMMERCE ST. SHALL ALSO BE REMOVED PER HDR'S PLANS.
3. REHABILITATION OF EXISTING PAVEMENT TO A MINIMUM OF STREET CENTERLINE ALONG ALL PROJECT FRONTAGES TO PUBLIC WORKS SPECIFICATIONS.

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SCALE: 1"=20' DATE: 12/06/24

IRON LOFTS

IRON LOFTS, LLC

C-10: PRELIMINARY STREET PLAN

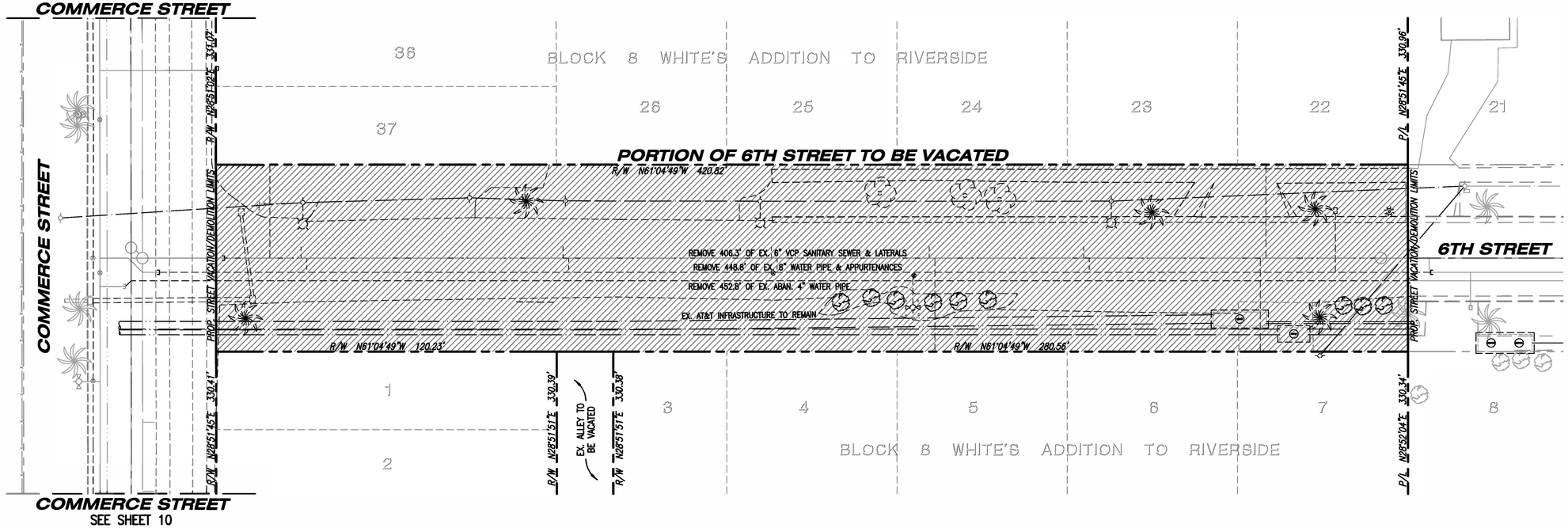
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KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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NOTES

1. ALL EXISTING IMPROVEMENTS (I.E., HARDSCAPE, LANDSCAPE, UTILITIES, ETC.) WITHIN THAT PORTION OF 6TH STREET TO BE VACATED SHALL BE DEMOLISHED AND REMOVED.
2. ALL EXISTING OVERHEAD POWER LINES ALONG THAT PORTION OF 6TH STREET TO BE VACATED SHALL BE UNDERGROUNDED.



0 10 20 40 60

SCALE: 1"=20' DATE: 12/06/24

IRON LOFTS

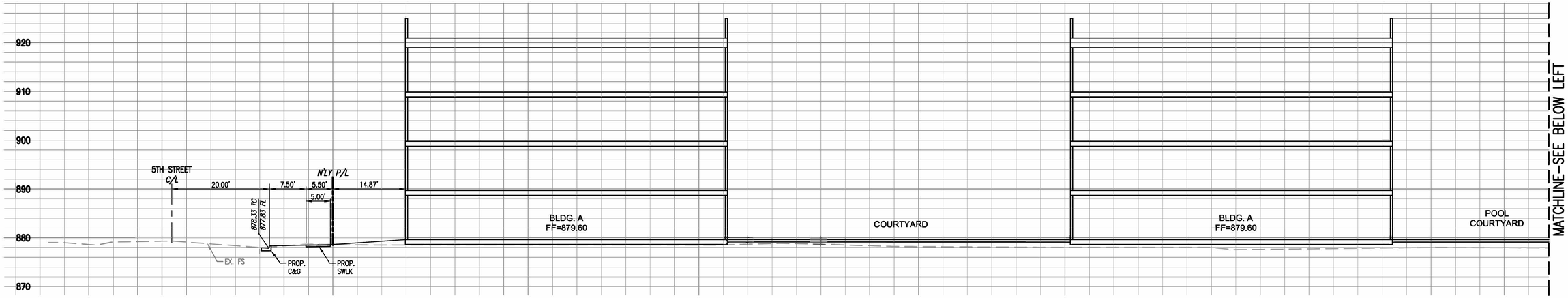
IRON LOFTS, LLC

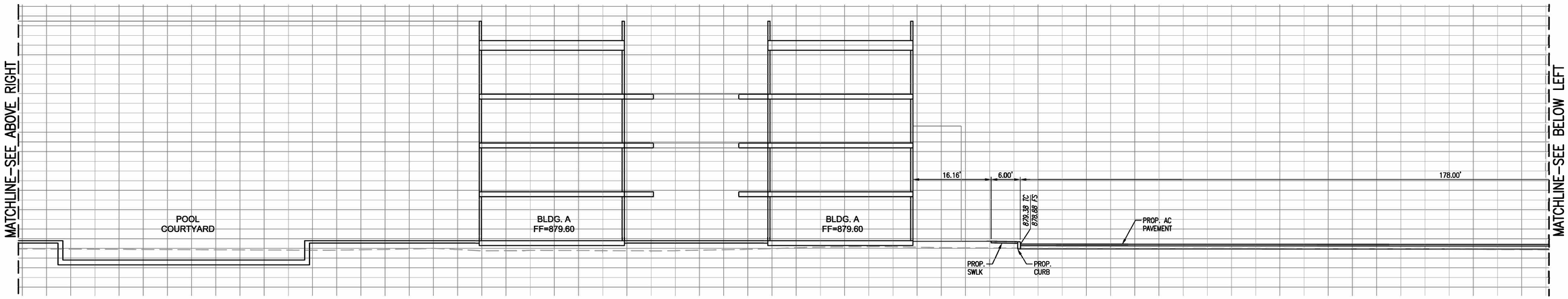
C-11: PRELIMINARY 6TH STREET VACATION & DEMOLITION PLAN

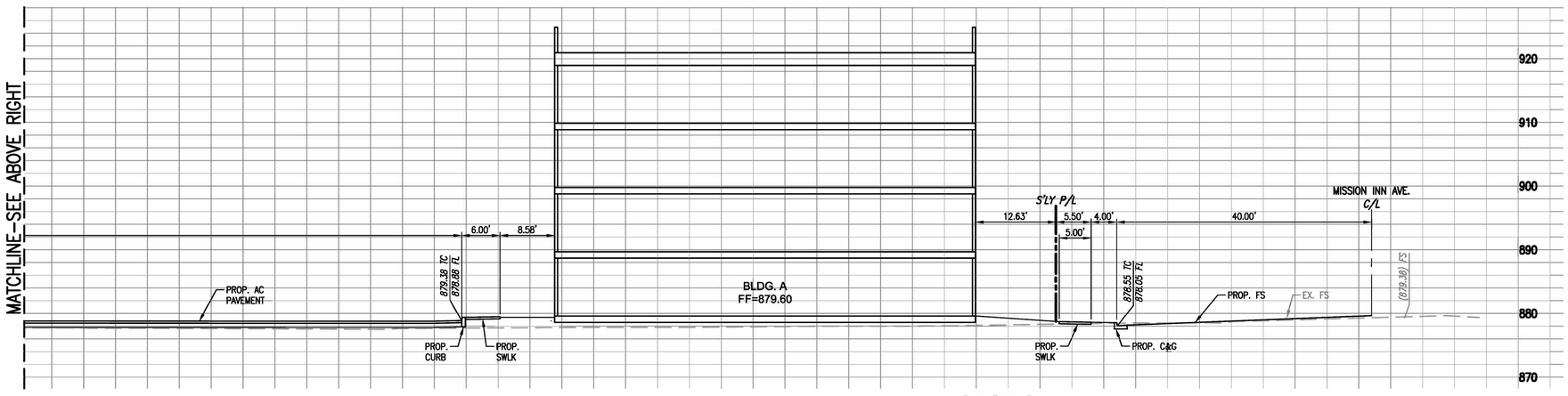
RIVERSIDE, CALIFORNIA

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SECTION "A-A"

HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

DATE: 12/06/24

IRON LOFTS

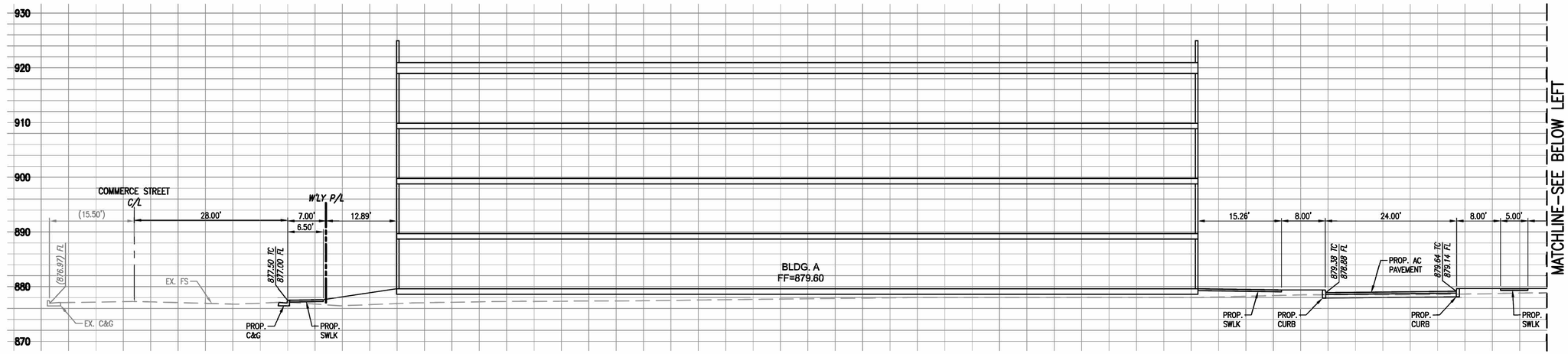
IRON LOFTS, LLC

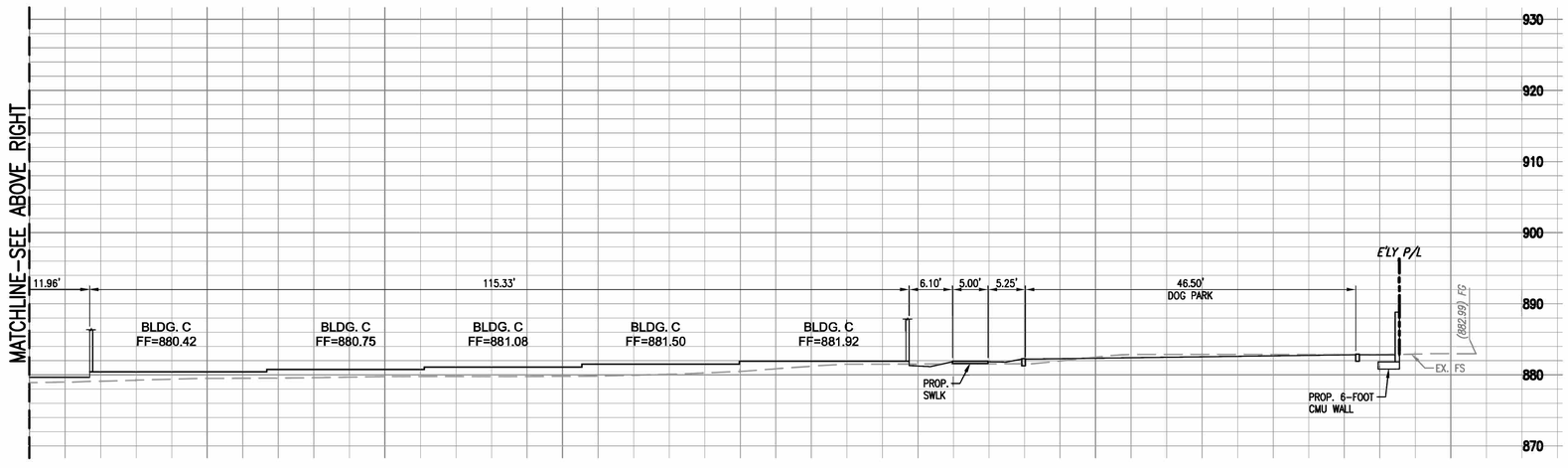
C-12: PRELIMINARY SITE SECTIONS

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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SECTION "B-B"

HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

DATE: 12/06/24

IRON LOFTS

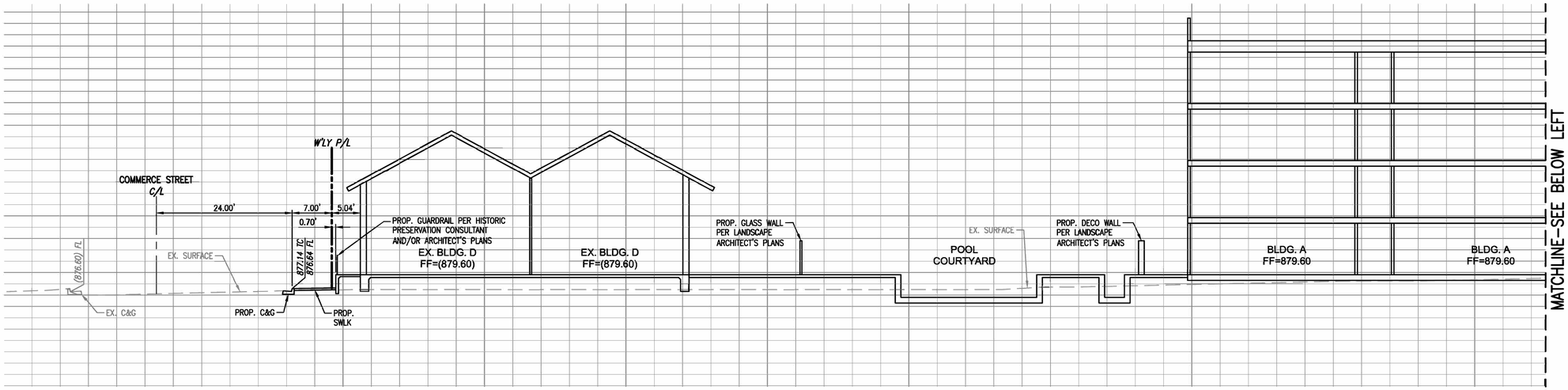
IRON LOFTS, LLC

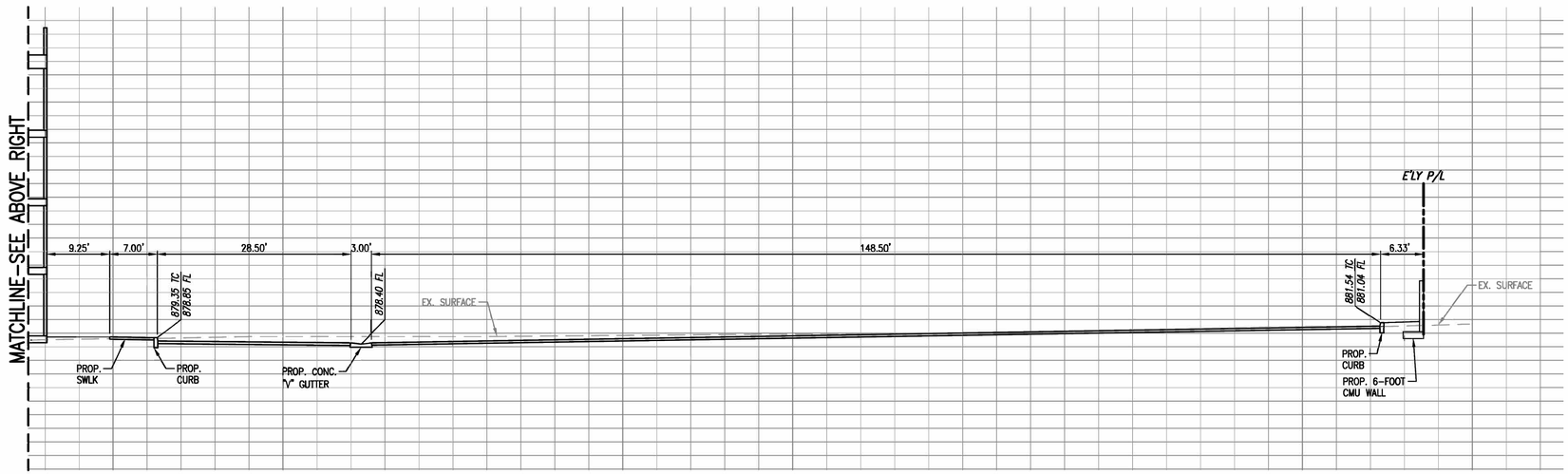
C-13: PRELIMINARY SITE SECTIONS

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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SECTION "C-C"

HORIZONTAL: 1"=10'
VERTICAL: 1"=10'

DATE: 12/06/24

IRON LOFTS

IRON LOFTS, LLC

C-14: PRELIMINARY SITE SECTIONS

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

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Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL PROFESSIONALS INC.

April 11, 2023
(Revised June 16, 2023)

Iron Lofts, LLC
c/o REALM
1201 Dove Street
Newport Beach, CA 92660

Attention: Mr. Todd Cadwell

Subject: Infiltration Study
Proposed Residential Development – Iron Lofts
NEC Mission Inn Avenue and Commerce Street
Riverside, California
GPI Project No. 3044.1I

Dear Mr. Cadwell:

This report presents the results of field exploration and infiltration testing performed by Geotechnical Professionals Inc. (GPI) for the design of stormwater infiltration systems at the subject site. This report supplements our Geotechnical Investigation (GPI, 2023) report dated February 1, 2023. The testing was performed in general accordance with the Riverside County – Low Impact Development BMP Design Handbook (Riverside, 2011) and our proposal dated March 16, 2023.

This report was revised to include additional field exploration and infiltration testing for the proposed dry well systems at the site.

PROJECT DESCRIPTION

We understand that you propose to construct a new apartment development that will include infrastructure to facilitate the infiltration of stormwater. Based on preliminary information provided by the Project Civil Engineer, KHR Associates, stormwater at the site will be infiltrated into the subsurface soils using a perforated CMP system on Site 2 (North Site), and either a perforated CMP system or dry well system on Site 1 (South Site). The infiltration systems will be located in the parking areas on the south side of the apartment buildings. The CMP infiltration chambers are planned to be founded at depths approximately 12 feet, and the dry wells are planned to be founded at least 30 feet below existing grades. The locations of the proposed stormwater systems are shown on the attached Figure 1, Site Plan.

5736 Corporate Avenue • Cypress, CA 90630 • (714) 220-2211 , FAX (714) 220-2122

SCOPE OF SERVICES

Our scope of services consisted of subsurface explorations, field infiltration testing, laboratory testing, engineering analysis and the preparation of this report.

The subsurface conditions at the site near the proposed stormwater infiltration systems were investigated by drilling and sampling five hollow stem auger borings (B-8 to B-12) to depths of approximately 23½ to 61 feet below existing grades. The infiltration characteristics of the subsurface soils near the invert depth of the proposed systems were investigated by installing 6 infiltration test wells (W-1 to W-6) at depths of approximately 12 feet, and 4 test wells (W-7 to W-10) at depths of approximately 50 feet below existing grades. The approximate locations of the subsurface explorations and infiltration tests are shown in Figure 1. A description of the field procedures and logs of the explorations are presented in Appendix A.

Laboratory soil tests were performed on select representative samples as an aid in soil classification and to evaluate the engineering properties of the soils. The limited geotechnical laboratory testing program included determinations of moisture content and dry density, and grain size analyses. Laboratory testing procedures and results are summarized in Appendix B.

SUBSURFACE CONDITIONS

The soils encountered in our explorations near the invert depths of the proposed systems consisted of predominately layered silty sands and sandy silts with limited lenses of clayey sands and clayey silts at depths between approximately 30 and 61 feet below existing grades. In general, the soils were predominately slightly moist to moist within the upper 20 feet and moist to very moist between 30 feet and the depths explored. The soils were predominately loose to medium dense and stiff to very stiff to the depths explored.

Groundwater was not encountered in our explorations to depths of 61 feet below existing grades in our recent explorations at the site. Groundwater was reported by others (GSI 2020) to be greater than 100 feet below existing grade in 2009 at a nearby property.

INFILTRATION TESTING

We performed ten infiltration tests to evaluate the infiltration characteristics for the proposed systems. The infiltration testing and construction of the wells were performed in general accordance with the County of Riverside Department of Environmental Health Guidelines (Riverside, 2011).

The test wells were constructed with 2-inch diameter slotted pipe in boreholes excavated using an 8-inch diameter hollow stem auger. The annular space between the perforated casing and the borehole was loosely filled with ¾-inch diameter gravel.

Each test well was presoaked by placing at least 5 gallons of water into the test hole and waiting for the water to fully drain. Testing was performed the same day as the presoaking process. After pre-soaking, each test was evaluated by our field engineer to confirm the tests met the County's sandy soil criteria (6 inches of water seeps away in less than 25

minutes). The test wells were then repeatedly filled to a predetermined target depth above the bottom and the water level drop and duration of each drop were recorded.

The measured infiltration rates were calculated using the drop in water level over the test increment time. The last reading for each well was used to determine the measured infiltration rate, expressed in inches per hour and is provided below:

Tests for CMP Units

Basin	Test Well	Approximate Depth of Well Tested (feet)	Measured Infiltration Rate (inches/hour)
Site 1	W-1	11.8	1.0
	W-2	11.7	0.7
	W-3	11.8	0.8
	W-4	11.6	1.3
Site 2	W-5	11.4	2.4
	W-6	11.6	6.8

Tests for Dry Wells

Basin	Test Well	Approximate Depth of Well Tested (feet)	Measured Infiltration Rate (inches/hour)
Site 1	W-7	45-50	1.3
	W-8	40-50	1.5
	W-9	45-50	1.6
	W-10	40-50	1.6

CONCLUSIONS AND RECOMMENDATIONS

The soils encountered in our explorations generally appear to be layered and have moderately favorable stormwater infiltration characteristics.

The rates shown on the tables above may be applied to the soils from 10 feet to 20 feet below existing grades for the shallow CMP units and from 35 to 55 feet below existing grades for the dry wells and at the locations tested. If rates outside of these depths or at alternative locations are required, GPI should be contacted to provide additional testing and/or recommendations.

Our subsurface investigations disclosed loose to medium dense sandy soils at depths between 12 and 40 feet below the existing grades. When saturated, these loose sandy soils have the potential to settle if subject to significant seismic forces. Due to the loose soils described above, we recommend the stormwater infiltration be set back at least 30 feet from building foundations.

Standard of practice is to set back stormwater infiltration at least 10 feet horizontally beyond the edge of proposed foundations and property lines, and at least 10 feet vertically below floor slabs.

It should be noted that the volume of water applied during our testing was relatively low as compared to the planned stormwater system. The Civil Engineer should evaluate the feasibility of subsurface infiltration using the rates provided.

It should be noted that these infiltration rates are for clean, clear water and do not include effects of sediment, fines, dissolved solids or other debris, as these materials will significantly reduce the infiltration rates of the subsurface soils. Prior to infiltration, water should be cleaned of sediment or other deleterious materials to help reduce the potential for clogging and reduced infiltration rates. Maintenance of the stormwater system should be performed on a regular basis as recommended by the system designer or manufacturer. These issues should be considered when selecting the reduction factors in the design of the system.

LIMITATIONS

The report, exploration logs, and other materials resulting from GPI's efforts were prepared exclusively for use by Iron Lofts, 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.

Furthermore, our recommendations were developed with the assumption that a proper level of field observation and construction review will be provided during grading, excavation, and construction by GPI. If field conditions during construction appear to be different than is indicated in this report, we should be notified immediately so that we may assess the impact of such conditions on our recommendations. If construction phase services are performed by others, they must accept full responsibility for geotechnical aspects of the project, including this report.

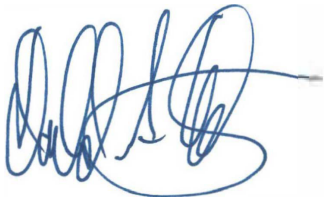
Our investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation,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

Respectfully submitted,
Geotechnical Professionals Inc.





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





Donald A. Cords, G.E.
Principal

Enclosures: References
Figure 1 - Site Plan
Appendix A - Exploratory Borings
Appendix B - Laboratory Testing

Distribution: Addressee (email)

REFERENCES

California Department of Water Resources, Water Data Library, http://www.water.ca.gov/waterdatalibrary/

Riverside County, Department of Public Works (2011), "Appendix VII – Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations," dated May 19, 2011.

Geotechnical Professionals Inc (GPI, 2014) "Report of Geotechnical Investigation, Proposed Residential Development – Iron Lofts, SEC Mission Inn Avenue and Commerce Street, Riverside California" Project No. 3044.1I Dated February 1, 2023

COMMERCE STREET

MISSION INN AVENUE

BUILDING A

EXISTING BUILDING D

POOL

129'-10"

87'-2"

BUILDING A

BUILDING A

BUILDING B

BUILDING C

EXISTING BUILDING E

84 PARKING SPACES

400 PARKING SPACES

5TH STREET

6TH STREET

4TH STREET

B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10 B-11 B-12

C-1 C-2 C-3 C-4 C-5 C-6

W-1 W-2 W-3 W-4 W-5 W-6 W-7 W-8 W-9 W-10

EXPLANATION

- B-9 — APPROXIMATE LOCATION AND NUMBER OF EXPLORATORY BORING
- W-10 — APPROXIMATE LOCATION OF INFILTRATION WELL
- B-7 — APPROXIMATE LOCATION AND NUMBER OF PREVIOUS EXPLORATORY BORING (GPI, 2023)
- C-6 — APPROXIMATE LOCATION AND NUMBER OF CONE PENETRATION TEST (GPI, 2023)

N

0 80 160 FEET

BASE MAP REPRODUCED FROM CONCEPT DESIGN PREPARED BY KTGY ARCHITECTURE AND PLANNING.: DATED 09/23/2021

GPI GEOTECHNICAL PROFESSIONALS, INC.

IRON LOFTS

GPI PROJECT NO.: 3044.1I

SCALE: 1" = 80'

SITE PLAN

FIGURE 1

APPENDIX A

APPENDIX A

EXPLORATORY BORINGS

The subsurface conditions at the site were investigated by drilling and sampling five exploratory borings. The borings were advanced to depths of 23½ to 61 feet below the existing ground surface. The locations of the explorations are shown on the Site Plan, Figure 1.

The exploratory borings were drilled using truck-mounted hollow-stem auger drill equipment. Relatively undisturbed samples were obtained using a brass-ring lined sampler (ASTM D3550). The brass-rings have an inside diameter of 2.42 inches. The ring samples were driven into the soil by a 140-pound hammer dropping 30 inches. The number of blows needed to drive the sampler into the soil was recorded as the penetration resistance.

At selected locations, disturbed samples were obtained using a split-spoon sampler by means of the Standard Penetration Test (SPT, ASTM D 6066). The spoon sampler was driven into the soil by a 140-pound hammer dropping 30 inches, employing the “free-fall” hammer described above. After an initial seating drive of 6 inches, the number of blows needed to drive the sampler into the soil a depth of 12 inches was recorded as the penetration resistance. These values are the raw uncorrected blow counts.

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 accordance with the Unified Soils Classification System. Detailed logs of the borings are presented in Figures A-1 to A-5 in this appendix.

Upon completion, the borings and infiltration wells were backfilled using bentonite slurry to the ground surface. The soil cuttings were separated and stockpiled on plastic sheets, and labeled.

The borings were laid out in the field by measuring from existing site features. Ground surface elevations at the exploration locations were estimated from the preliminary grading plan by KHR Associates and should be considered approximate.

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)
				0	**SILTY SAND (SM)** brown, dry, with gravel	875
				5		870
14.3		17	S	10	**SANDY SILT (ML)** brown, moist, very stiff	
11.2		11	S			865
9.7		8	S	15	**SILTY SAND (SM)** brown, moist, loose	
1.7		14	S		**SAND (SP)** light brown, dry, medium dense	860
8.0		16	S	20	**SILTY SAND (SM)** brown, moist, medium dense	
12.4	101	10	D		@ 22.5 feet, loose	855
					Total Depth 23.5 feet Proposed Basin #1	

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

DATE DRILLED: 4-3-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-8

FIGURE A-1

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)
				0	**SILTY SAND (SM)** brown, dry, with gravel	880
				5		875
4.2		18	S	10	**SAND WITH SILT (SP-SM)** light brown, slightly moist, medium dense	
15.3		26	S		**SANDY SILT (ML)** brown, very moist, very stiff	870
11.0		17	S	15	@ 15 feet, moist	
11.8		8	S		**SILTY SAND (SM)** brown, moist, loose	865
12.8		7	S	20	**SANDY SILT (ML)** brown, moist, firm	
15.7	102	15	D		@ 22.5 feet, very moist, stiff	860
					Total Depth 23.5 feet Proposed Basin #2	

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

DATE DRILLED: 4-3-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-9

FIGURE A-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)
				0	**SILTY SAND (SM)** reddish brown, slightly moist	880
				5		875
6.4		27	S	10	**SILTY SAND (SM)** reddish brown, slightly moist, dense	870
3.2		22	S		@ 12.5 feet, dry	
8.1		50/5"	S	15	**SANDY SILT (ML)** brown, slightly moist, hard	865
9.4		50/5"	S		**SILTY SAND (SM)** reddish brown, moist, dense	
10.8		41	S	20		860
6.9	108	50/6"	D		@ 22.5 feet, slightly moist, very dense	
					Total Depth 23.5 feet Proposed Basin #3	

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

DATE DRILLED: 4-3-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-10

FIGURE A-3

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	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.	
					0 to 30 feet not sampled	875
				5		
						870
				10		
						865
				15		
						860
				20		
						855
				25		
						850
24.0		14	S	30	**CLAYEY SAND (SC)** brown, very moist, stiff, trace clay	
						845
15.9		14	S	35	**SANDY SILT (ML)** brown, very moist, stiff	
						840

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

DATE DRILLED: 5-31-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-11

FIGURE A-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.	
10.1	109	48	D	40	**SILTY SAND (SM)** brown, moist, dense	
2.6		14	S		**SAND WITH SILT (SP-SM)** brown, dry, medium dense	835
17.6					**SANDY SILT (ML)** brown, very moist, stiff	
19.3		20	S	45	@ 45 feet, very stiff	
3.5					**SAND WITH SILT (SP-SM)** brown, slightly moist, medium dense	
5.5		23	S		**SILTY SAND (SM)** brown, slightly moist, medium dense, coarse grained	830
6.1	120	50	D	50	@ 50 feet, dense	
11.3		25	S		@ 52.5 feet, moist, medium dense	825
21.9		16	S	55	**CLAYEY SILT (ML)** brown, very moist, very stiff	
12.6		21	S		**SILTY SAND (SM)** brown, moist, medium dense	820
16.0	112	23	D	60	**CLAYEY SILT (ML)** orange brown, moist, very stiff	
					Total Depth 61 feet Proposed Basin 1	

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

DATE DRILLED: 5-31-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-11

FIGURE A-4

MOISTURE (%)	DRY DENSITY (PCF)	PENETRATION RESISTANCE (BLOWS/FOOT)	SAMPLE TYPE	DEPTH (FEET)	DESCRIPTION OF SUBSURFACE MATERIALS	ELEVATION (FEET)
				0	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.	
					0 to 30 feet not sampled	880
				5		875
				10		870
				15		865
				20		860
				25		855
9.4		14	S	30	**SILTY SAND (SM)** brown, moist, medium dense	850
7.0		50/6"	S	35	@ 35 feet, white and orange brown, slightly moist, very dense, coarse grained	845

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

DATE DRILLED: 5-31-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-12

FIGURE A-5

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.	
5.6	116	58	D	40	**SILTY SAND (SM)** orange brown, slightly moist, dense	
10.2		48	S			840
14.3		38	S	45	@ 45 feet, very moist	
32.9					**CLAYEY SILT (ML)** yellow brown, wet, hard	
18.5		42	S		**SANDY SILT (ML)** orange brown, wet, hard	835
17.5	107	72/11"	D	50	@ 50 feet, very moist	
6.7		58	S		**SILTY SAND (SM)** brown, slightly moist, very dense	830
6.1		50/6"	S	55		
27.6					**SILT (ML)** yellow brown, wet, hard	
23.0		46	S		**CLAYEY SILT (ML)** brown, very moist, hard	825
19.2	96			60		
8.6	105	50/6"	D		**SILTY SAND (SM)** orange brown, moist, very dense	
					Total Depth 61 feet	
					Proposed Basin 2	

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

DATE DRILLED: 5-31-23

EQUIPMENT USED: 8 " HOLLOW STEM AUGER

GROUNDWATER LEVEL (ft): NOT ENCOUNTERED

GPI

PROJECT NO.: 3044.1I

IRON LOFTS

LOG OF BORING NO. B-12

FIGURE A-5

APPENDIX B

APPENDIX B

LABORATORY TESTS

INTRODUCTION

Representative undisturbed soil samples and bulk samples were carefully packaged in the field and sealed to prevent moisture loss. The samples were then transported to our Cypress office for examination and testing assignments. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Detailed descriptions of the laboratory tests are presented below under the appropriate test headings. Test results are presented in the figures that follow.

MOISTURE CONTENT AND DRY DENSITY

Moisture content and dry density were determined from the soil samples. The samples were first trimmed to obtain volume and wet weight and then dried in accordance with ASTM D2216. After drying, the weight of each sample was measured, and moisture content and dry density were calculated. Moisture content and dry density values are presented on the boring logs in Appendix A.

GRAIN SIZE DISTRIBUTION

Selected soil samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. That portion of the material retained on the No. 200 sieve was oven-dried and weighed to determine the percentage of the material passing the No. 200 sieve. The percentages passing the No. 200 sieve are tabulated below.

BORING NO.	DEPTH (ft)	SOIL DESCRIPTION	PERCENT PASSING No. 200 SIEVE
B-8	15	Silty Sand (SM)	41
B-9	15	Sandy Silt (ML)	52
B-10	17.5	Silty Sand (SM)	34
B-10	20	Silty Sand (SM)	34
B-11	35	Sandy Silt (ML)	60
B-11	43	Sandy Silt (ML)	67
B-11	58	Silty Sand (SM)	46
B-12	40	Silty Sand (SM)	18
B-12	50	Sandy Silt (ML)	51

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

A Phase 1 Environmental Site Assessment was performed for the subject property. A portion of the 2,488 page document is located within this Appendix.

HILLMANN
CONSULTING

PHASE I ENVIRONMENTAL SITE ASSESSMENT



2992, 2008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue
Riverside, California 92507

Prepared For:

Iron Lofts LLC
1201 Dove Street, Suite 520
Newport Beach, California 92660

September 21, 2021

Hillmann Project Number C3-8655

Your Property. Our Priority.
Making a better future for all the communities we touch.
www.HillmannConsulting.com

HILLMANN
CONSULTING

September 21, 2021

Mr. Todd Cadwell
Iron Lofts LLC
1201 Dove Street, Suite 520
Newport Beach, California 92660

RE: Phase I Environmental Site Assessment
2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue
Riverside, California 92507
Hillmann Project No: C3-8655

Dear Mr. Cadwell:

Hillmann Consulting LLC is pleased to provide the results of our Phase I Environmental Site Assessment of the above referenced property. This assessment was performed in general accordance with the scope and limitations of ASTM Practice E1527-13, which is the latest version of the E1527 standard published by the ASTM.

We appreciate the opportunity to provide environmental due diligence services. If you have any questions concerning this report, or if we can assist you in any other matter, please contact our office at 714-634-9500.

Sincerely,

Hillmann Consulting, LLC

Stephen Bartlett
Senior Project Manager

David Rutherford
Quality Management Director

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List of Abbreviations/Acronyms

Hillmann may use the following abbreviations and acronyms for common terminology described in our report. Not all abbreviations or acronyms may be applicable to this report:

ACM	ï Asbestos Containing Material
AOC	ï Area of Concern
AST	ï Aboveground Storage Tank
ASTM	ï American Society for Testing Materials
BER	ï Business Environmental Risk
CEA	ï Classification Exception Area
CERCLA	ï Comprehensive Environmental Response Compensation and Liability Act
CERCLIS	ï Comprehensive Environmental Response Compensation and Liability Information System
CESQG	ï Conditionally Exempt Small Quantity Generator
COC	ï Chemicals of Concern
CORRACTS	ï Corrective Action Sites
CREC	ï Controlled Recognized Environmental Condition
DNPL	ï Delisted National Priority List
DTSC	ï Department of Toxic Substances Control
ENG	ï Engineering
ERNS	ï Emergency Response Notification System
FDEP	ï Florida Department of Environmental Protection
FDNY	ï Fire Department, City of New York
FDOT	ï Florida Department of Transportation
FOI/FOIA/FOIL	ï Freedom of Information / Freedom of Information Act / Freedom of Information Letter
HVAC	ï Heating Ventilation & Air Conditioning
HREC	ï Historic Recognized Environmental Condition
IAQ	ï Indoor Air Quality
ISRA	ï Industrial Site Recovery Act
LBP	ï Lead-Based Paint
LQG	ï Large Quantity Generator
LTANK	ï Leaking Storage Tank
LUST	ï Leaking Underground Storage Tank
MassDEP	ï Massachusetts Department of Environmental Protection
SDS/MSDS	ï Safety Data Sheet / Material Safety Data Sheet
NA	ï Not Applicable
NCDOH	ï Nassau County Department of Health
NFA	ï No Further Action
NFRAP	ï No Further Remedial Actions Planned
NJDEP	ï New Jersey Department of Environmental Protection
NPDES	ï National Pollutant Discharge Elimination System
NPL	ï National Priority List
NYCDEP	ï New York City Department of Environmental Protection
NYCDOB	ï New York City Department of Buildings
NYCOER	ï New York City Office of Environmental Remediation
NYSDEC	ï New York State Department of Environmental Conservation
OPRA	ï Open Public Records Act
PADEP	ï Pennsylvania Department of Environmental Protection
PAH	ï Polycyclic Aromatic Hydrocarbon
PCE	ï Perchloroethylene
RAO	ï Response Action Outcome
RCRA	ï Resource Conservation and Recovery Act
RCRIS	ï Resource Conservation and Recovery Information System
REC	ï Recognized Environmental Condition
RWQCB	ï Regional Water Quality Control Board
SCAQMD	ï South Coast Air Quality Management District
SCDHS	ï Suffolk County Department of Health Services
SDG	ï Significant Data Gap
SEMS	ï Superfund Enterprise Management System
SRP	ï Site Remediation Program
SQG	ï Small Quantity Generator
SVOC	ï Semi-Volatile Organic Compound
TCE	ï Trichloroethylene
TSDF	ï Treatment Storage and/or Disposal Facility
USEPA	ï United States Environmental Protection Agency
UST	ï Underground Storage Tank
VEC	ï Vapor Encroachment Condition
VOC	ï Volatile Organic Compound

1.0 FINDINGS, OPINIONS, AND CONCLUSIONS

Hillmann Consulting, LLC (Hillmann) performed a Phase I Environmental Site Assessment (ESA) of 2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue, Riverside, California (the Property). The assessment has been conducted in accordance with our contracted scope of work and the ASTM Standard Practice E1527-13 for Phase I Environmental Site Assessments and All Appropriate Inquiries (AAI) Final Rule 40 CFR Part 312. This section contains a summary of findings, opinions and conclusions made by this assessment. However, this section, alone, does not constitute the complete assessment. The report must be read in its entirety.

1.1 Summary of Project Details

Primary Street Address:		2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue			
City:	Riverside	**County:**	Riverside	**State:**	California
Tax ID/Parcel Number:		211-022-026, 211-022-027, 211-071-001, 211-071-002, 211-071-004, 211-071-005, 211-071-023, 211-071-024, 211-072-002, 211-072-004, 211-072-020, 211-072-021			
Property Owner:		Riverside Scrap Iron and Metal Corp.			
Zoning Designation:		M2 ï Industrial, Commercial, Residential			
Approx. Property Area:		6.89 acres			
Buildings/# of Floors		Two / two-story warehouse, burnt down office			
Approx. Building Area:		4,500 / 6,000 / 18,150			
Approx. Year Built:		1895 ï 1960			
Commercial Occupants:		None - vacant			
Current Use:		Vacant			
Prior Uses:		Scrap Metal Recycling			
Inspected By:		Ms. Shilpa Sunil			
Site Contact/Company:		Mr. Todd Cadwell			
Site Escort/Company:		Mr. Tony Thomas / Owner representative			
Inspection Date:		September 20, 2021			
Weather Conditions:		Sunny, 80 degrees F			

1.2 Findings Summary Table

Assessment Subject	No REC	REC	CREC	HREC	Rpt. Ref.
Property Regulatory Records Review:		X		X	4.3
Property Historical Records Review:		X			4.2
Bulk Petroleum Storage:				X	5.3
On-Site Operations:		X			5.3
On-Site Haz-Mat Storage/Use/Spills:		X			5.3
Transformers/Hydraulic Systems:	X				5.3
Waste Discharges:	X				5.3
Interviews:	X				6.0
Adjoining & Nearby Properties:	X				4.3 5.2
Prior Env. Reports/User Provided Info:		X			3.0
Data Gaps:	X				2.3

1.3 Findings, Opinions and Conclusions

1.3.1 Recognized Environmental Conditions

Hillmann has performed a Phase I Environmental Site Assessment in accordance with the scope and limitations of ASTM Practice E1527-13 of the Property as described in Section 2 of this report. Any additions to, exceptions to, or deletions from this practice are also described in Section 2 of this report. This assessment has revealed no evidence of *recognized environmental conditions* in connection with the Property, except for the following:

RECOGNIZED ENVIRONMENTAL CONDITIONS	
REC #1	Riverside Scrap Iron and Metal-2993 6th Street, was listed in numerous regulatory databases for site contamination resulting for the historic use as a scrap metal yard. This site is currently subject to a voluntary cleanup agreement with the DTSC to conduct further investigations and remediation. The contaminants of concern were indicated to include arsenic, lead, PCBs, poly-nuclear aromatic hydrocarbons, tetrachlorethylene and total petroleum hydrocarbons.
REC#2	The known contamination left in place after three (3) UST closures at 2993 6th Street, is considered to be a REC in connection with the Property.
REC #3	Hillmann observed several rails and wood ties within the former railroad right-of-way supporting the possibility that railroad ties may be present just below the surface soil. Railroad ties are known to be treated with oil-based and tar-based chemicals such as creosote, and railroad spurs are commonly treated with pesticides for weed control. The buried railroad line/spur is considered to be a REC in connection with the Property.
HISTORICAL RECOGNIZED ENVIRONMENTAL CONDITIONS	
HREC #1	Various UST closures at the Property have left contamination in place including a 10,000-gallon diesel UST at 3033 5th Street, analysis of soils beneath the tank indicated 62 mg/kg TPHd kept in place, which

	is below residential cleanup levels, and is therefore considered to be a HREC in connection with the Property. The closure of a reported 1,000-gallon UST at the southeast corner of the warehouse at 3596 Commerce Street with a known release, reported cleanup with regulatory closure is also considered to be a HREC in connection with the Property.
CONTROLLED RECOGNIZED ENVIRONMENTAL CONDITIONS	
	No CRECs were identified.
SIGNIFICANT DATA GAPS	
	No SDGs were identified.

1.3.2 REC Response Action Recommendations

The following table presents recommended response actions to the identified RECs for further investigation and/or corrective action:

REC RESPONSE ACTION SUMMARY TABLE	
REC	**Response Action**
REC #1, 2, 3	Complete the cleanup as laid out in the Remedial Action Plan prepared by GSI for the DTSC and seek out closure from appropriate regulatory agencies.
HREC #1	No response action recommended at this time.

1.3.3 Notable Environmental Conditions / De Minimis Conditions

The following environmental conditions were identified, but are not considered to be a REC in connection with the Property:

NOTABLE ENVIRONMENTAL CONDITIONS / DE MINIMIS CONDITIONS	
1.	The main business at the Property subject to this investigation is Riverside Scrap Iron and Metal Corporation covering all the parcels of interest. Multiple addresses are listed concurrently on the US Brownfields and FINDS databases. Additionally, multiple operations at the Property have been flagged on numerous environmental databases. Listings indicate that former underground storage tanks have left contaminants in place, ñOpen ï Assessment & Interim Remedial Action,ò and many potential contaminants of concern.
2.	Many of the adjoining properties, with the exception of some of the eastern adjoining residences, are identified on a range of environmental databases. Adjoining properties to the northeast, north-northwest, north-northeast, and north are identified on the US Brownfields database.

1.3.4 Environmental Professional Statement

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental Professional* as defined in Ä312.10 of 40 CFR 312. I have the specific qualifications based on education, training and experience to assess a *property* of the nature, history and setting of the subject *property*. I have developed and performed all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312.



David Rutherford
Environmental Professional

1.4 Business Environmental Risks / Non-ASTM Scope

Hillmann has performed a limited review of the following potential Business Environmental Risks (BER), also known as ñNon-ASTM Scope concernsò, in accordance with the contracted scope of work scope for this assessment. The following is a summary of findings for applicable BERs. For a more detailed discussion of the findings and contracted scope of work, please see the referenced report section.

BUSINESS ENVIRONMENTAL RISKS / NON-ASTM SCOPE			
Subject	**Findings**	**Not Appl.**	**Rpt. Ref.**
Asbestos	Based on the building age, asbestos may be present. Interiors of the structures were not available for inspection at this time.		7.1
Lead Paint		X	7.2
Radon	Property is located in the USEPA radon designation Zone 2 or 'moderate risk' area for radon.		7.3
Mold / Microbial Damage	Hillmann did not observe any evidence of significant problems with moisture intrusion or mold/microbial growth at the Property. However, interiors of the structures were not available for inspection at this time.		7.4
NWI Wetlands	No mapped wetland areas were depicted at the Property.		7.5
Lead in Drinking Water	Potable water service at the Property is provided by the city of Riverside Public Utilities.		7.6

2.0 INTRODUCTION

2.1 Purpose and Scope

This assessment was conducted utilizing generally accepted Phase I ESA industry standards in accordance with the ASTM Standard Practice E1527-13. The ASTM describes these methodologies as representing good commercial and customary practice in the United States of America for conducting an environmental site assessment of a parcel of commercial real estate with respect to the range of contaminants within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and petroleum products. As such, this practice is intended to permit a user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner or bona fide prospective purchaser limitations on CERCLA liability (hereinafter, the ñlandowner liability protections,ò or ñLLPsò): that is, the practice that constitutes all appropriate inquiries into the previous ownership and uses the property consistent with good commercial and customary practice as defined at 42 U.S.C. Ä9601(35) (B). The primary goal of the processes established by ASTM E1527-13 is to identify *recognized environmental conditions* in connection with the Property.

The term *recognized environmental condition (REC)* is defined by the ASTM as the presence or likely presence of any hazardous substances or petroleum products in, on or at a property: (1) due to a 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.

The ASTM has also defined the terms *historical recognized environmental conditions* and *controlled recognized environmental conditions* as two additional types of RECs. The term *historical recognized environmental condition (HREC)* 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).

The term *controlled recognized environmental condition (CREC)* 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, with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls.

Conditions determined to be *"de minimis conditions"* are not considered to be RECs, HRECs or CRECs. *De minimis condition* is defined by the ASTM, ñé 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.ò

The chief components of this assessment are generally described as follows:

- A non-invasive visual reconnaissance of the Property and adjoining properties in accordance with ASTM guidelines for evidence of RECs.

- Interviews of past and present owners and occupants and state and local government officials, seeking information related to the potential presence of RECs at the Property.

- A review of standard physical record sources for available topographic, geologic and groundwater data.

- A review of standard historic record sources, such as fire insurance maps, city directories, aerial photographs, prior reports and interviews, etc., to determine prior uses of the Property from the present, back to the Propertyôs first developed use, or back to 1940, whichever is earlier.

- A review of standard environmental record sources including federal and state environmental databases, and additional environmental record sources, to identify potential regulatory concerns with the Property, adjoining properties and properties located within the surrounding area.

An evaluation of environmental or other regulatory compliance matters is excluded from the scope of this assessment.

These methodologies are described as representing good commercial and customary practice for conducting an Environmental Site Assessment of a property for the purpose of identifying recognized environmental conditions.

2.1.1 Business Environmental Risks/Non-ASTM Scope Considerations

In accordance with our contract agreement, Hillmann may have addressed the following potential environmental subject matters that are outside of the requirements of the ASTM E1527-13 standard:

Asbestos-Containing Materials (ACM): A cursory non-intrusive visual screening for the presence of suspect ACM within the accessed areas of buildings built prior to 1990 on the Property. It is emphasized that this cursory non-intrusive visual screening does not constitute an asbestos survey/inspection of the premises. An asbestos survey/inspection should be sought by the report User(s) if more certainty is desired regarding ACM and potential asbestos hazards at the Property. Furthermore, a review of regulatory compliance matters pertaining to asbestos is excluded from the scope of work.

Lead-Based Paint (LBP): A cursory non-intrusive visual screening of the condition of painted surfaces in the accessed areas of residential buildings/units built prior to 1980 on the Property. It is emphasized that this cursory non-intrusive visual screening does not constitute a comprehensive survey for LBP or potential lead hazards. A comprehensive inspection should be sought by the report User(s) if more certainty is desired regarding LBP at the Property. Furthermore, a review of regulatory compliance matters pertaining to lead-based paint is excluded from the scope of work.

USEPA Designated Radon Potential: Review of general non-site specific data published by the USEPA regarding the Radon Zone classification for the area of the Property.

Mold/Microbial Damage: A cursory non-intrusive visual screening within the accessed areas of buildings on the Property for evidence of systemic microbial problems, including visible mold

growth, water damaged building materials or musty odors. It is emphasized that this cursory non-intrusive visual screening does not constitute a comprehensive survey for moisture/mold/microbial damage. A more comprehensive inspection should be sought by the report User(s) if more certainty is desired regarding the potential for moisture/mold/microbial damages at the Property.

NWI Wetlands: Review of US Fish and Wildlife Service National Wetland Inventory digitized data of mapped wetlands as presented in the attached EDR Radius Map plus Geocheck Report.

It is emphasized that, regardless of the wetlands data obtained via the EDR Geocheck-Physical Setting Source Addendum, a delineation of regulated wetlands by a qualified professional would be warranted to determine the presence or absence of regulated wetlands at the Property.

Lead in Drinking Water: Review of the potential for elevated levels of lead in the drinking water by determining the source of the drinking water supply and a review of available testing or compliance data reports.

2.2 Property Location/Legal Description

Property location and legal description details are described as follows:

Primary Street Address:	2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue				
City:	Riverside	**County:**	Riverside	**State:**	California
Tax ID/Parcel Number:	211-022-026, 211-022-027, 211-071-001, 211-071-002, 211-071-004, 211-071-005, 211-071-023, 211-071-024, 211-072-002, 211-072-004, 211-072-020, 211-072-021				
Approx. Land Area:	6.89 acres				
Apprx. Latitude/Longitude:	North 40.7643790 degrees/West 73.9699910 degrees				
Additional Details (if appl.):	NA				
Property Owner:	Riverside Scrap Iron and Metal Corp.				
Zoning Designation:	M2 ï Industrial, Commercial, Residential				

2.3 Data Gaps

A *data gap* is defined by the ASTM as a lack of or inability to obtain information required by this practice despite good faith efforts by the environmental professional to gather such information. A data gap is only significant if other information and/or professional experience raises reasonable concerns involving the data gap and the ability to determine the presence or absence of recognized environmental conditions. The following table summarizes data gaps encountered during the assessment as well as a discussion of their significance.

Data Gap:	Significant (Yes/No)?	Discussion
Historical records data failure	No	The date and/or type of the first developed use of the Property was not documented. Record gaps exceeding five years were encountered; however, no significant site use changes are suspected during these intervals.
Response to agency records requests not received as of date of report.	No	Any additional information indicative of a REC will be forwarded upon receipt.

2.4 User Reliance

This report is for the exclusive use of the User(s) named on the front cover. No other party(ies) shall have any right to rely on the content of this report without first obtaining the consent of the original report User; and without obtaining written consent from Hillmann in the form of a letter of reliance or report recertification.

2.5 Significant Assumptions

The following significant assumptions are made:

- The site operations at the time of the site visit are assumed to reflect typical site conditions relative to potential environmental conditions and that no concealment of environmental conditions or releases by site owners or occupants has occurred. Likewise, it is assumed that no areas of the Property with potential environmental concerns or RECs were concealed or otherwise not reported, intentionally or unknowingly, by the Property owners/occupants and/or site escort at the time of the site visit.

- For the purpose of estimating the approximate direction of groundwater flow in the absence of site specific groundwater data, unless indicated otherwise, an assumption has been made that the gradient of groundwater flow follows the surface topography of the Property and immediate surrounding area.

2.6 General Limitations and Exceptions

2.6.1 Limitations

The report turnaround time specified by the contract agreement for this assessment may present a limitation to the availability of pertinent regulatory agency records. Such limitations, if encountered, are further specified in Section 4.4.

Significant limitations related to the condition or accessibility of the Property at the time of the site reconnaissance, if encountered, are reported in Section 5.1.

2.6.2 Other Exceptions or Deletions

No other exceptions or deletions from the ASTM Standard E1527-13 are reported.

2.6.3 Special Terms and Conditions

This Phase I Environmental Site Assessment has been prepared using reasonable efforts in each phase of its work to identify recognized environmental conditions associated with hazardous substances, wastes and petroleum products at the Property. Findings within this report are based on information collected from observations made on the day of the site reconnaissance and from reasonably ascertainable information obtained from governing public agencies and private sources.

This report is not definitive and should not be assumed to be a complete or specific definition of the conditions above or below grade. Information in this report is not intended to be used as a construction document and should not be used for demolition, renovation, site development, redevelopment, or other construction purposes. No representation or warranty is made that the past or current operations at the Property are, or have been, in compliance with all applicable federal, state and local laws, regulations and codes.

Findings, conclusions and recommendations presented in this report are based on visual observations of the Property, interviews conducted, the records reviewed, information provided by the Client, and/or a review of readily available and supplied drawings and documents. Information obtained during the assessment, whether written, graphic or verbal, provided by the Property contact(s) or as shown on any documents reviewed or received from the Property contact, owner or agent, or government agency source; is assumed to be accurate except as specifically stated otherwise in this report. Independent verification of the accuracy or completeness of all information reviewed or received during the course of this assessment is not made and excluded from the scope of work for this assessment. No warranty or guarantee is made of the accuracy or completeness of information that was obtained from ostensibly knowledgeable individuals, regulatory agency representatives or other secondary sources.

Regardless of the findings stated in this report, Hillmann is not responsible for consequences or conditions arising from facts that were concealed, withheld or not fully disclosed at the time the assessment was conducted.

This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

The regulatory database report provided is based on an evaluation of the data collected and compiled by a contracted data research company. The regulatory research is designed to meet the requirements of ASTM Standard E 1527-13. Hillmann can neither warrant nor guarantee the accuracy or completeness of the information obtained from the regulatory database report provider during the course of this assessment.

Subsurface conditions may differ from the conditions implied by the surface observations and can only be reliably evaluated through intrusive techniques.

Reasonable efforts have been made during this assessment to identify aboveground and underground storage tanks and ancillary equipment. Reasonable efforts are limited to information gained from visual observation of largely unobstructed areas, recorded database information held in public record and available information gathered from interviews. Such methods may not identify

surficial and subsurface features that may have been hidden from view due to parked automobiles and other vehicles, snow cover, vegetative growth, pavement, construction or debris pile storage or incorrect information from sources.

No guarantee, explicit or implied, is made that the records pertaining to historical ownership or occupancy which were reviewed represent a comprehensive or precise delineation of past Property ownership or tenancy for legal purposes.

The ASTM E1527-13 standard states that recommendations are not required to be included in a Phase I ESA report; however, further that recommendations are an additional service that may be useful in the Userôs analysis of landowner liability protections or business environmental risks; and that the User should consider whether recommendations for additional inquiries or other services are desired.

The recommended response actions to the identified RECs presented in Section 1.3, if any, are not intended to represent the only course(s) of action to take; nor does it imply any opinion as to the timing of the action. Furthermore, it is emphasized that additional response actions may become warranted depending on the outcome of the initial action(s) taken. Hillmann advises that consultation with legal counsel familiar with environmental and real estate law may be beneficial to the decision making process for the type and timing of a response action to identified RECs, if any.

Due to the limited nature of our review of potential Business Environmental Risks, the User of the report should consider whether to take additional action(s) to further define, properly manage and/or mitigate potential BERs.

In the event of any conflict between the terms and conditions of this report and the terms and conditions of the consulting services agreement for this project, the consulting services agreement shall control.

3.0 USER PROVIDED INFORMATION

The term ñUserò is defined by ASTM as the party seeking to use Practice E1527 to complete an environmental site assessment of the Property; specifically, the entities named on the front cover to which the report has been addressed.

3.1 Prior Environmental Reports/Documentation

The following prior environmental reports/documentation was provided:

Phase I Environmental Site Assessment, 2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, 2993 Mission Inn Avenue, prepared by Hillmann Consulting and dated February 29, 2016. Hillmannôs previous Phase I also reviewed several prior Phase I and Phase II investigations. The Phase I report indicated the following:

"Recognized Environmental Conditions (RECs):

- *The known soil contamination, due to the former metal recycling operations, including PAHs, SVOCs, TPHs, PCBs, heavy metals, and VOCs, as set forth in multiple Phase II Subsurface Investigation Reports and Supplemental Phase II Subsurface Investigation Reports, is considered to be a REC in connection with the Property.*

- *The known contamination left in place after three (3) UST closures at 2993 6th Street, is considered to be a REC in connection with the Property.*

- *The history of industrial usage at the Property is considered to be a REC in connection with the Property.*

- *Hillmann observed two (2) 55-gallon drums with what appeared to be waste oil and three (3) additional drums which were full and unlabeled within the former equipment maintenance area of the warehouse building. Both sets of drums were stored in secondary containment. Hillmann observed thirteen (13) empty 55-gallon drums and one storing copper chips within the warehouse building. No leaking or staining was observed in the vicinity of any of the drums. Three (3) 5-gallon gas cans, five (5) 5-gallon diesel cans, and three (3) 5-gallon buckets of oil were observed in secondary containment within the warehouse. Additionally, Hillmann observed several oil pans which appeared to contain some amount of used oil, chemicals stored within a flammable safety cabinet and miscellaneous chemicals stored in the manufactured containers throughout the warehouse.*

- *Significant pavement staining was observed in the vicinity of the concrete posts where the balers were formerly mounted. In at least one area, the staining from the concrete baler pad continued onto bare soil. One large stain was observed on the concrete pad at the southern end of the former conveyor belt at the southwestern portion of the Property, just behind the former storage building. De minimis staining was observed on the pavement and soils throughout the Property.*

- *Regulatory database listings identify current and historic adjoining properties as a fertilizer facility, automobile and truck service stations, Standard Oil Co., and brownfields properties, are considered to be a REC in connection with the Property.*

- *Inaccessible areas including the bottoms of former scale pits, conveyor pit, and abandoned structure at 2993 Mission Inn Avenue are considered to be RECs in connection with the Property.*

- *Hillmann observed several rails and wood beams within the former railroad right-of-way supporting the possibility that railroad ties may be present just below the surface soil. Railroad ties are known to be treated with oil-based and tar-based chemicals such as creosote, and are considered to be a REC in connection with the Property.*

Controlled Recognized Environmental Conditions (CRECs):

- *No evidence of any CRECs in connection with the Property was identified.*

Historical Recognized Environmental Conditions (HRECs):

- *Closure of a 10,000-gallon diesel UST at 3033 5th Street, including analysis of soils beneath the tank at 62 mg/kg TPHd kept in place, is below residential cleanup levels and is considered to be a HREC in connection with the Property.*

- *The closure of a reported 1,000-gallon UST at the southeast corner of the warehouse at 3596 Commerce Street with a known release, reported cleanup with regulatory closure is considered to be a HREC in connection with the Property."*

Revised Remedial Action Plan, Riverside Scrap Iron & Metal, 2993 Sixth Street, Riverside, California 92507, DTSC Docket HAS-FY15/16-152; prepared by GSI Environmental, dated July 23, 2019, revised January 2, 2020. The Remedial Action Plan (RAP) objective was stated as, *"to remove soil impacted with COCs above residential criteria and dispose of it cost-effectively and safely. This will require a program of targeted removal followed by a broad Site-wide excavation plan. The off-Site residential areas will be excavated during the targeted on-Site excavation work and the impacted soil will be brought on-Site to be temporarily staged prior to off-Site disposal."* The detailed plans for the removal and off-site disposal of surficial soils to a depth of 1.0 to 2.5 feet over approximately 5.5 acres followed by soil confirmation sampling. The estimated volume of soil removal was 28,200 cubic yards, or 45,604 tons. The RAP indicated that a small portion of this mass is highly impacted and may be classified as hazardous waste.

3.2 User Questionnaire

Section 6 of the ASTM E1527-13 standard describes certain tasks required to be performed by the report User in order to qualify for landowner liability protections to CERCLA liability. To assist the report User to meet these requirements, the ASTM E1527-13 standard recommends a questionnaire of inquiries (User Questionnaire) specified in 40 CFR 312.25, 312.28, 312.29, 312.30, and 312.31 be provided to the original report User. A User Questionnaire has been provided to the report User; however, a completed questionnaire was not returned to Hillmann.

Question:	Yes/No:	Detail:
Environmental liens that are filed or recorded against the property: Did a search of recorded land title records identify any environmental liens filed or recorded against the property under federal, tribal, state or local law?	NR	*No Response*
Activity and use limitations that are in place on the property or that have been filed or recorded against the property:	NR	

Question:	Yes/No:	Detail:
Did a search of recorded land title records (or judicial records where appropriate, identify any AULs, such as engineering controls, land use restrictions or institutional controls that are in place at the property and/or have been filed or recorded against the property under federal, tribal, state or local law?		
Specialized knowledge or experience of the person seeking to qualify for the LLP: Do you have any specialized knowledge or experience related to the property or nearby properties? For example, are you involved in the same line of business as the current or former occupants of the property or an adjoining property so that you would have specialized knowledge of the chemicals and processes used by this type of business?	NR	
Relationship of the purchase price to the fair market value of the property if it were not contaminated: Does the purchase price being paid for this property reasonably reflect the fair market value of the property? If you conclude that there is a difference, have you considered whether the lower purchase price is because contamination is known or believed to be present at the property?	NR	
Commonly Known or Reasonably Ascertainable Information: Are you aware of commonly known or reasonably ascertainable information about the property that would help the environmental professional to identify conditions indicative of releases or threatened releases? For example,		
-Do you know the past uses of the property?	NR	
-Do you know of specific chemicals that are present or were once present at the property?	NR	
-Do you know of spills or other chemical releases that have taken place at the property?	NR	
-Do you know of any environmental cleanups that have taken place at the property?	NR	
The degree of obviousness of the presence or likely presence of contamination at the property, and the ability to detect the contamination by appropriate investigation: Based on your knowledge and experience related to the property are there any obvious indicators that point to the presence or likely presence of releases at the property?	NR	
Litigation/Administrative Proceedings/Government Notices As the User of this ESA, do you have knowledge of (1) any pending, threatened, or past litigation relevant to hazardous substances or petroleum products in, on, or from the property; (2) any pending, threatened, or past administrative proceedings relevant to hazardous substances or petroleum products in, on or from the property; and (3) any notices from any governmental entity regarding any possible violation of environmental laws or possible liability relating to hazardous substances or petroleum products.	NR	

NR-no response

3.3 Reason for Performing Phase I ESA

The User did not indicate the purpose of the assessment. In accordance with ASTM E1527-13, it is assumed that the Phase I ESA was being performed in order to qualify for landowner liability protection to CERCLA liability.

4.0 RECORDS REVIEW

4.1 Physical Setting Sources

The following physical setting sources were reviewed:

Source	Discussion
USGS 7.5 minute Topographic Map Data: (EDR Geocheck-Physical Setting Source Addendum)	The Property lies at an elevation of approximately 880 feet above mean sea level. An interpretation of topographic contour lines as well as a review of the EDR Geocheck-General Topographic Gradient suggested terrain sloping downward towards the west-northwest. The closest down gradient water body is the Riverside Canal, located approximately 194 feet to the west-northwest.
USDA SCS Soil Data: (EDR Geocheck-Physical Setting Source Addendum)	The soil type at the Property is classified as ñArlingtonò. This soil type is described as fine sandy loam that are moderately well and well drained with moderately coarse textures.
Geologic Data: (EDR Geocheck-Physical Setting Source Addendum)	The geologic formation in the vicinity of the Property is described as plutonic and intrusive rocks of the Mesozoic Era, Cretaceous System, and Cretaceous Granitic Rocks Series.
Prior Env. Reports: (Section 3.1)	No additional relevant site specific geologic data was noted from a review of the prior environmental reports listed in Section 3.1.
Additional Sources/ Data:	No additional physical setting sources or data was obtained.
Groundwater Flow Discussion:	Based on a review of the above information as well as observation of the site, the direction of shallow groundwater flow at the site is inferred to be towards the west-northwest.
NWI Wetlands Data: (EDR Geocheck-Physical Setting Source Addendum)	No NWI mapped wetlands areas were depicted at the Property.

4.2 Historical Use – Property and Adjoining Properties

Research has been conducted in an attempt to develop a history of the previous uses of the property and surrounding area, in order to help identify the likelihood of past uses having led to RECs in connection with the property. Standard historical sources have been sought in an attempt to document the past uses of the Property as far back as it can be shown that the Property contained structures; or from the time the Property was first used for residential, agricultural, commercial, industrial or governmental purposes.

4.2.1 Fire Insurance Maps

A Certified Sanborn Map Report was obtained from EDR for a review of published historic fire insurance maps for the Property and surrounding area. The following is a summary of site uses and notable details depicted by the available maps:

Year(s)	Prop/Adj	Depicted Use(s)	Notable Details
1887	**Property:**	Not depicted	Not depicted
	Adjoining:	Not depicted	Not depicted
1888, 1891	**Property:**	Not depicted	Not depicted
	Adjoining:	Industrial	Fruit Packing Warehouse
1895	**Property:**	Industrial, dwelling	Cox Feed and Fuel Co.

Year(s)	Prop/Adj	Depicted Use(s)	Notable Details
	Adjoining:	Residential, Industrial	Fruit Packing Warehouse, Riverside Barley Mills, Standard Oil Co. Warehouse, Railroad
1908	**Property:**	Residential, Industrial	Orange Packing Warehouse, Sutherland Fruit Co., Riverside Heights Orange Growers Association Packing Warehouse, Railroad
	Adjoining:	Residential, Industrial	Fruit Packing Warehouses, Standard Oil Co. Warehouse, Railroad
1950, 1952, 1953, 1954, 1955	**Property:**	Residential, Industrial	Shell Oil Co. Warehouse and oil tanks, Tractor and Equipment Storage, Lernerôs Riverside Grain Milling Co., Riverside Heights Orange Growers Association Packing Warehouse, Andrew Bros. Riverside Growers Inc., Bottling Works, Railroad
	Adjoining:	Residential, Industrial	Standard Oil Co. Warehouse, Hansen and Gully Lumber Yard, Feed Grinding Warehouse, Westbrook Co. Furniture, National Orange Company Packing House, Sheet Metal Works
1957, 1958, 1959, 1960, 1961, 1962	**Property:**	Residential, Industrial	Shell Oil Co. Warehouse, Tractor and Equipment Storage, Lernerôs Riverside Grain Milling Co., Drugs Warehouse, Building Supplies Warehouse, Railroad
	Adjoining:	Residential, Industrial	Standard Oil Co. Warehouse, Hansen and Gully Lumber Yard, Feed Grinding Warehouse, Westbrook Co. Furniture, National Orange Company Packing House, Sheet Metal Works
1965, 1968, 1969	**Property:**	Residential, Industrial, Scrap Metal Storage Yard	Tractor and Equipment Storage, Lernerôs Riverside Grain Milling Co., Drugs Warehouse, Building Supplies Warehouse, Railroad, Scrap Metal Storage Yard
	Adjoining:	Residential, Industrial	Standard Oil Co. Warehouse, Feed Grinding Warehouse, Westbrook Co. Furniture, National Orange Company Packing House, Sheet Metal Works

A copy of the Certified Sanborn Map Report is attached in Appendix D.

4.2.2 City Directories

An EDR City Directory Abstract report was reviewed for data of former occupants of the Propertyôs street address. The following is a generalized summary of the findings of city directory research for past occupants of the Property.

Property	
Use(s) / Occupant(s):	**Years**
Keen Lillian, Frederick Clifton Ruth, Hazen CEO, Riverside Scrap Iron & Metal	1960
El Dorado Marble & Granite	2008

The EDR City Directory Abstract report was also reviewed for listings of historic occupants of the adjoining properties. The following is a general summary of listings of historic adjoining property occupants:

Adjoining Properties	
Use and/or Occupant(s)	**Years**
Standard Oil Co.	1945 ï 1966
Riverside Heights Orange Growers Association, Star Milling Co	1951 ï 1960
Bransford Auto Trim, Wreckers, Reliable Auto, Tuggy Radio Lab, Precision Saw Works, Valley Feed Mills	1930 ï 1939
National Orange Company	1955 ï 2001
Various Industrial sites	1930 ï 2001

A copy of the EDR City Directory report is attached in Appendix D.

4.2.3 Historical Topographic Maps

Historical topographic maps of the Property and vicinity obtained from an EDR Historical Topographic Map report (as attached in Appendix D) have been reviewed. The following interpretation of land usage was made by review of the maps:

Year(s)	Summary	
1901	**Property:**	Several small structures
	Adjoining:	Several small structures
1942	**Property:**	Large warehouse style structures, railroad
	Adjoining:	Large warehouse style structures, railroad
1947, 1953	**Property:**	Shaded to denote general urban development, railroad
	Adjoining:	Shaded to denote general urban development, railroad
1967, 1980	**Property:**	Shaded to denote general urban development, large warehouse structures, railroad
	Adjoining:	Shaded to denote general urban development, large warehouse structures, railroad
2012	**Property:**	No building development depicted on the topographic map
	Adjoining:	No building development depicted on the topographic map

4.2.4 Historical Aerial Photographs

Historical aerial photographs of the Property and vicinity obtained from an EDR Aerial Photo Decade Package report, as attached in Appendix D, were reviewed. The following interpretation of land usage was made by review of the aerial photographs:

Year(s)	Summary of Interpretation	
1931, 1938, 1949, 1953, 1959	**Property:**	Residential homes, industrial warehouses, railroad
	Adjoining:	Residential homes, industrial warehouses
1966, 1968, 1975, 1978, 1985, 1989, 1990, 1994, 2002, 2006, 2009, 2012	**Property:**	Industrial warehouses, junk/scrapyards, railroad
	Adjoining:	Residential homes, industrial warehouses
2016	**Property:**	Industrial warehouses
	Adjoining:	Residential homes, industrial warehouses

4.2.5 EDR High-Risk Historical Records

The EDR Radius MapÊ report, which is discussed in greater detail in Section 4.3, provided a search of proprietary databases of potential historical high-risk uses at or in the vicinity of the Property. These databases include EDR Historic Cleaners ï a database of property addresses with records of historical occupancy by suspected cleaners businesses; EDR Historic Auto ï a database of property addresses with records of historical occupancy by potential automotive gas/filling stations and repair facilities; and EDR MGP- a database of sites historically occupied by manufactured gas plants and related facilities.

EDR Database	On-site Listings:	Adjoining/Off-Site Listings
Historic Cleaners: (on-site/adjoining only)	None	None
Historic Auto: (on-site/adjoining only)	None	None
MGP: (1-mile distance)	None	None

4.2.6 Petroleum/Natural Gas Well Review

The historical record sources and the California Geologic Energy Management Division (CalGEM) online mapping application were reviewed for records of historic petroleum and/or natural gas wells at the Property. No record of any historical petroleum/natural gas wells at or adjoining the Property was identified.

4.2.7 Additional Historical Data

Where applicable, the following additional pertinent historical data was obtained:

Interviews/Anecdotal:	No additional pertinent historical data was obtained.
Local Gov't Records:	No additional pertinent historical data was obtained.
Prior Env. Reports: (Section 3.1)	Prior environmental reports reviewed as part of this assessment, as detailed in Section 3.1, did not provide additional pertinent detail of historical site usage.
Site Observations:	Indications of historic uses of the Property or adjoining properties were not observed during the site reconnaissance.
Other Sources:	No additional pertinent historical data was obtained.

4.2.8 Summary of Identified Historic Uses

The following table presents a summary of the types and approximate date ranges of identified prior uses of the Property:

Property	
Date Range	**Use**
1895 to 1962	Industrial including Shell Oil Warehouse, Fruit Packing Warehouses, and Feed Warehouses. Several residences also present. Railroad runs through Property.
1965 to 2012	Industrial including Riverside Scrap Metal. Railroad runs through Property.
2016 to Present	Vacant

The following table presents a summary of the types of identified prior uses of the adjoining properties:

Adjoining Properties	
Date Range	**Use**
1895 to Present	Residential to the east, industrial to the north, south, and west

4.2.9 Historical Records Data Failure

The ASTM E1527-13 standard defines data failure as a failure to achieve the ASTM specified historical research objectives after reviewing the standard historical sources that are reasonably ascertainable and likely to be useful. The objective is to identify all obvious uses of the property from the present, back to the propertyôs first developed use, or back to 1940, whichever is earlier. Furthermore, records of historic use/conditions should be sought in intervals no less than approximately five years, unless the property conditions appear unchanged over a longer interval.

Objective	Met?	Detail	Significant?
First developed use/date determined?	Yes	The first developed use of the Property was a feed and fuel warehouse built circa 1895.	NA
Record sources at 5-year intervals back to 1940 or first developed use?	No	Historical record gaps exceeding five years were encountered. However, significant site-use changes or undiscovered site uses appear unlikely to have occurred during the record gaps.	No
All obvious prior uses identified?	Yes	See Section 4.2.8.	NA

Please refer to Section 2.3 for additional discussion of data gaps and their significance to the findings of the assessment.

4.2.10 Historic Uses REC Discussion

The review of historical records indicated evidence of the following potential RECs in connection with the Property:

The Property appears to have been utilized largely with various industrial uses which include a scrap metal recycler and a Shell Oil Warehouse with various petroleum storage tanks. Due to the age and duration of these industrial uses, and the contamination identified by previous Phase II work, the historic usage of the Property is considered to be a REC.

4.3 Standard Environmental Record Sources

A regulatory database report, titled EDR Radius MapÊ Report, prepared by Environmental Data Resources of Shelton, CT was obtained and reviewed. The report provided a search of standard environmental record sources for listings of the Property, adjoining properties and sites within the surrounding area; and has been reviewed for the purpose of identifying listings suggesting a potential impact to the Property due to presence or migration of hazardous substances and/or petroleum products. Additional descriptions of the meaning and significance of the regulatory databases can be found in the regulatory database report in Appendix E. The EDR Radius MapÊ

Report provided a search of the following database categories in accordance with the requirements of the ASTM Standard E1527-13:

Regulatory Database	Search Distance
Fed. National Priorities List (NPL/a.k.a. ñSuperfundò sites) & Proposed NPL	1-mile
Fed. Delisted NPL	İ -mile
Fed. Superfund Enterprise Management System (SEMS; formerly CERCLIS)	İ -mile
Fed. SEMS-ARCHIVE (formerly known as CERCLIS NFRAP)	İ -mile
Fed. RCRA Corrective Action Sites (CORRACTS)	1-mile
Fed. RCRA Transport/Storage/Disposal (TSD) sites	İ -mile
Fed. RCRA Generators (LQG, SGQ & CESQG)	Site & Adjoining
Fed. Institutional Control/Engineering Control (IC/EC) Registries	Site only
Fed. Emergency Response Notification System (ERNS)	Site only
State/Tribal Hazardous Waste Sites (SHWS)	1-mile
State/Tribal Landfill and/or Solid Waste Disposal (LF/SWF)	İ -mile
State/Tribal Leaking Storage Tanks	İ -mile
State/Tribal Registered Storage Tanks	Site & Adjoining
State/Tribal IC/EC Registries	Site
State/Tribal Voluntary Cleanup Sites	İ -mile
State/Tribal Brownfields	İ -mile
Additional Federal, State, Tribal and Local Environmental Databases	Variable

Reported distances for adjoining listings discussed in Section 4.3.4, if applicable, are approximate and indicative of the presence of a public roadway or right-of-way between the adjoining site and Property.

The reported gradients indicated where applicable in Sections 4.3.4 and 4.3.5 have been estimated based on a number of factors including but not necessarily limited to field observation, review of topographic maps, database listing details and/or site specific geo-technical data.

4.3.1 Supplemental Database Listings

The regulatory database report was also reviewed for listings on supplemental databases, in addition to the Standard Environmental Record Sources. Any property or adjoining property listings on such databases of significant concern, if identified, is discussed in Sections 4.3.3 and 4.3.4. Otherwise, none of the other supplemental database listings identified by the regulatory database report are considered to be a REC in connection with the Property.

4.3.2 Limited Tier I Vapor Encroachment Screening

Limited analysis of the details of on-site, adjoining and vicinity database sites was conducted to identify potential sources of sub-surface vapor encroachment. This review was based on elements of the ASTM ñStandard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactionsò (ASTM E 2600-15); and also on elements of ñMethodology for Identifying the Area of Concern Around a Property Potentially Impacted by Vapor Migration from Nearby Contaminated Sourcesò (Buonicore, 2011-S-103-AWMA). Vicinity database sites pertaining to non-petroleum product releases within 1,760 feet of the Property in the up-gradient direction, 365

feet of the Property in the cross gradient direction and 100 feet of the Property in the down gradient direction; and vicinity database sites pertaining to petroleum product releases within 528 feet of the Property in the up-gradient direction, 165 feet of the Property in the cross gradient direction and 100 feet of the Property in the down gradient direction were reviewed to identify active contamination sites with the potential to affect subsurface vapor conditions at the subject property. The potential for vapor encroachment was considered in assessing whether or not a REC exists in connection with the Property when reviewing applicable sites within those distances.

Regulatory database sites with active petroleum or non-petroleum releases that are considered to constitute a vapor encroachment condition (VEC) to the Property, if any, are identified and discussed in Sections 4.3.3, 4.3.4 and 4.3.5.

4.3.3 Property Listings

The following listings of the Property were identified:

The main business at the Property subject to this investigation is Riverside Scrap Iron and Metal Corporation and covers all the parcels of interest. Multiple addresses are listed concurrently on the US Brownfields and FINDS databases. Below is a summary of the pertinent details extracted from the listings and condensed into one category:

Name/Address:	3008-3032 6th Street / 3008 5th Street / 6th and Commerce Streets / 4th and Commerce Streets / 2993 7th Street
Database(s):	FINDS, BROWNFIELDS
Data Discussion:	Seven (7) US Brownfields are described at the Property over various addresses and associated with Riverside Scrap Iron and Metal Corporation. None of the listings provide details about the types of contaminants reported at the Property. The ACRES Property IDôs are: 15980, 15979. 15985, 15983, 15984, and 15982 respectively. The FINDS database listings provide the following Registry ID #ôs: 110038693606, 110038693599, 110038693651, 110038693633, and 110038693642 in order of the above listed addresses.
REC Discussion:	Based on the details provided above, a REC in connection with the Property has been identified.
VEC Discussion:	Based on the available data, a VEC exists.

Name/Address:	Riverside Scrap Iron and Metal Corporation / 2993 6th Street, 3033 5th Street, 2992 5th Street
Database(s):	SWEEPS UST, CA FID UST, HIST UST, UST, LUST, CHMIRS, LUST, SLIC, WDS, CIWQS, AST, HWTS, HAZNET, Envirostor, VCP
Data Discussion:	The SWEEPS UST listing indicates four underground tanks at the Property. Four (4) tanks are listed as ñActiveò with an active date as 11-18-1992. One tank is 8,000-gallons and stores diesel and the three other tanks are 100-gallons with unknown contents. The CA FID UST listing indicates a status of ñActive.ò Riverside Scrap Iron & Metal, 3033 5th St. The Historic UST listing describes an 8,000-gallon diesel tank with a stock inventory and visual leak detection system.ò The second Historic UST listing indicates a total of three (3) tanks were formerly registered to the metal scrap processor. The tank system includes a 550-gallon regular product tank and two (2) unknown size and content underground tanks. The listing provides a facility ID (#648) and a latitude/longitude but no additional pertinent details. The LUST listing identifies the case type as ñsoil onlyò and the status as ñClosed/action completed.ò The CHMIRS listing describes a spill of 2-gallons of hydrochloric acid onto the roadway which caused a vapor cloud. The incident date is reported as 5/4/2000 and the incident was contained by the Riverside City Fire Department. Additionally, the listing describes three 30-gallon containers of xylene abandoned and not leaking at the address on 5/3/2000. The date completed is ñnot reportedò for the second CHMIRS incident. The second LUST listing indicates a status ñCompleted ï Case Closedò as of 10/03/2000. Gasoline is listed as a potential contaminant of

	concern affecting soil. The listing also specified that MTBE was not tested. The SLIC listing indicates a facility status of ñOpen ï Assessment & Interim Remedial Actionò as of 02/27/2014. Potential contaminants of concern are listed as PCE, PCBs, Arsenic, Lead, PAHs, and TPH. The NPDES listing describes that Riverside Scrap Iron & Metal, an industrial facility, operated up until 09/01/2015 with a scrap metal permit discharging into the municipal storm water system. The WDS listing describes the Riverside Scrap Iron & Metal business as a Category C facility that does not utilize a waste treatment system. The facility has a minor threat to water quality. The facility has a permit for a 2,000-gallon above-ground tank. No additional details are provided. The HWTS listing indicates that the site is on the Hazardous Waste Tracking System. The HAZNET listings indicates that various hazardous materials have been generated and disposed of from the Property. The Envirostor indicates an ñActiveò status as of 04/25/2016. The site type is noted as voluntary cleanup. Hillmann reviewed documents available on Envirostor which indicated that a final RAP had been submitted and approved, however, Hillmann also noted letters indicating the termination of the voluntary cleanup agreement due to the current ownerôs apparent unwillingness to complete the RAP. The CIWQS listing indicates that the Property is on the California Integrated Water Quality System database with no other pertinent information.
REC Discussion:	Based on the details provided above, a REC in connection with the Property has been identified.
VEC Discussion:	Based on the available data, a VEC exists.

Name/Address:	Inland Frame and Design / 3596 Commerce Street
Database(s):	LUST, HIST CORTESE, LUST
Data Discussion:	Two LUST listings for the same case number were indicated with a status of ñCompleted ï Case Closedò as of 07/17/1995. The potential contaminant of concern is identified as gasoline potentially affecting soil. A No Further Action Letter (#RCDEH0717) was issued on 07/17/1995 after remediation processes of excavation and soil vapor extraction (SVE) system were implemented. The HIST CORTESE listing provides a regulatory ID (083302339T) but no additional pertinent information. The second LUST listing describes the same case (Global ID #T0606500340) and adds a leak and MTBE was detected during a tank closure on 7/29/1993. A vapor extraction method was utilized to abate the contamination.
REC Discussion:	Based on the details provided above, a HREC in connection with the Property has been identified.
VEC Discussion:	Based on the available data, a VEC is not suspected.

4.3.4 Adjoining Property Listings

The following adjoining property listings were identified. Reported distances, where applicable, are approximate and indicative of the presence of a public roadway or right-of-way between the adjoining site and Property. The reported gradient has been estimated based on a number of factors including but not necessarily limited to field observation, review of topographic maps, database listing details and/or site specific geo-technical data.

Several adjoining sites are identified on the US Brownfields database, no pertinent information is provided by these listings.

Name/Address:	West Coast Wire and Steel / 3120 Fifth Street				
Database(s):	LUST, HIST CORTESE, LUST, HIST UST				
Distance in feet:	20	**Direction:**	NNW	**Gradient:**	Down
Data Discussion:	The 1st LUST listing indicates a ñCompleted ï Case Closedò status as of 03/06/1990. MTBE was not required to be tested by the local agency. The potential contaminant of concern was identified as gasoline, which potentially affected only soil at the site. The HIST CORTESE listing provides no pertinent information. The 2nd listing identified the case type as ñSoil onlyò				

	and a facility status of closed/action completed The Historic UST listing identified two former tanks at the site, a 2,000-gallon diesel tank and a 1,000-gallon unleaded tank.
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.
VEC Discussion:	Based on the available data, a VEC is not suspected.

Name/Address:	National Orange Packing Co. / 3604 Commerce St				
Database(s):	HIST UST, EMI, HIST UST				
Distance in feet:	72	**Direction:**	WSW	**Gradient:**	Cross
Data Discussion:	One HIST UST listing identified a 560-gallon tank storing an unspecified product. The EMI listing lists that five tons of total organic hydrocarbon gases and four tons of reactive organic gases were emitted and monitoring by the South Coast AQMD in 1987. The other HIST UST listing describes the above-mentioned tank.				
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.				
VEC Discussion:	Based on the available data, a VEC is not suspected.				

Name/Address:	Tilden Coil Constructors Inc. / 3460 Commerce				
Database(s):	RCRA-SQG, FINDS				
Distance in feet:	226	**Direction:**	NNE	**Gradient:**	Cross
Data Discussion:	The RCRA-SQG lists the operation as a small quantity generator with no violations found. The FINDS database lists the business on the Resource Conservation and Recovery Act program and the US EPA Assessment, Cleanup, and Redevelopment Exchange System.				
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.				
VEC Discussion:	Based on the available data, a VEC is not suspected.				

Name/Address:	Purgero Company Unit 158 / 2622 3rd St				
Database(s):	RCRA-SQG, FINDS				
Distance in feet:	226	**Direction:**	NNE	**Gradient:**	Cross
Data Discussion:	The RCRA-SQG lists the operation as a small quantity generator with no violations found. The FINDS database lists the business on the Resource Conservation and Recovery Act program and the US EPA Assessment, Cleanup, and Redevelopment Exchange System.				
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.				
VEC Discussion:	Based on the available data, a VEC is not suspected.				

Name/Address:	Riverside Fertilizer Works / 2622 3rd Street				
Database(s):	ENVIROSTOR, AST, SEMS-Archive				
Distance in feet:	226	**Direction:**	NNE	**Gradient:**	Cross
Data Discussion:	The listing indicates a status of ñInactive ï Needs Evaluationò as of 03/06/2006. The site did not qualify for the NPL. Past use of the 1.36-acre property as retail created a potential of perchlorate contamination affecting ñother and soil mediaò. The AST listing indicated permits for 22,500 total gallons of aboveground storage at the address under the business Western Farm Service Branch. The CERCLIS listing described that the site did not qualify for the NPL but no additional pertinent details were provided.				
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.				
VEC Discussion:	Based on the available data, a VEC is not suspected.				

4.3.5 ASTM Search Distance Findings

The following is a discussion of non-adjoining sites identified as located within the ASTM specified search distance surrounding the Property. In order to keep this discussion informative and concise, discussion(s) is/are provided of the listed site(s) for each database category that appears most likely to impact the Property based on distance, area topography and/or regulatory status. Listings of sites

within the applicable search distances not specifically discussed below were reviewed and concluded not to be RECs in connection with the Property or VECs based on various factors including distance, area topography, known or inferred groundwater flow direction and/or regulatory status. Listings for the following databases, if identified, have been discussed above in Sections 4.3.3 and 4.3.4: Registered Storage Tanks, Federal RCRA Generators, Federal and State EC/IC, ERNS. A copy of the full regulatory database report, including available details of all listed sites, is included in Appendix E.

Federal NPL				**# of sites:**	1	**Search Distance:**	1-mile
Notable Listing:	Alark at 2777 Main Street						
Distance in feet:	2,921	**Direction:**	NNW	**Gradient:**	Down		
Data Discussion:	The listing indicates that the site is currently on the Final NPL. Groundwater is contaminated around the site with hexavalent chromium, the contaminant plume does not appear to extend under the current Property.						
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.						
VEC Discussion:	Based on the available data, a VEC is not suspected.						

Federal Delisted NPL				**# of sites:**	0	**Search Distance:**	1-mile
Notable Listing:	None						
Distance in feet:		**Direction:**		**Gradient:**			
Data Discussion:							
REC Discussion:							
VEC Discussion:							

Federal SEMS				**# of sites:**	0	**Search Distance:**	İ -mile
Notable Listing:	None						
Distance in feet:		**Direction:**		**Gradient:**			
Data Discussion:							
REC Discussion:							
VEC Discussion:							

Federal SEMS-ARCHIVE				**# of sites:**	1	**Search Distance:**	İ -mile
Notable Listing:	See Section 4.3.4.						
Distance in feet:		**Direction:**		**Gradient:**			
Data Discussion:	The SEMS-Archive listing is discussed in Section 4.3.4.						
REC Discussion:							
VEC Discussion:							

Federal CORRACTS				**# of sites:**	0	**Search Distance:**	1-mile
Notable Listing:	None						
Distance in feet:		**Direction:**		**Gradient:**			
Data Discussion:							
REC Discussion:							
VEC Discussion:							

Federal RCRA-TSD		**# of sites:**	0	**Search Distance:**	İ -mile
Notable Listing:	None				

Distance in feet:		**Direction:**		**Gradient:**	
Data Discussion:					
REC Discussion:					
VEC Discussion:					

State HAZARDOUS WASTE SITE			**# of sites:**	16	**Search Distance:**	1-mile
Notable Listing:	Weiland and Company at 3491 Commerce					
Distance in feet:	168	**Direction:**	N	**Gradient:**	Down/Cross	
Data Discussion:	The listing indicates an inactive status as of 03/06/2006. No further pertinent information is provided.					
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.					
VEC Discussion:	Based on the available data, a VEC is not suspected.					

State SOLID WASTE FACILITY/LANDFILL			**# of sites:**	0	**Search Distance:**	Ì -mile
Notable Listing:	None					
Distance in feet:		**Direction:**		**Gradient:**		
Data Discussion:						
REC Discussion:						
VEC Discussion:						

State LEAKING STORAGE TANKS			**# of sites:**	27	**Search Distance:**	Ì -mile
Notable Listing:	Kenõs Arco at 2871 University Avenue					
Distance in feet:	648	**Direction:**	SSE	**Gradient:**	Up	
Data Discussion:	The listing indicates a status of ñCompleted ï Case Closedò as of 06/24/2011. Soils and groundwater, were impacted with gasoline at the site, however, only limited groundwater contamination was observed.					
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.					
VEC Discussion:	Based on the available data, a VEC is not suspected.					

State VOLUNTARY CLEANUP SITES			**# of sites:**	3	**Search Distance:**	Ì -mile
Notable Listing:	So Cal Gas/Riverside MGP at 10th Street and Howard					
Distance in feet:	1,293	**Direction:**	SSW	**Gradient:**	Cross	
Data Discussion:	The listing indicates a status of ñCertified O&M ï Land Use Restrictions Onlyò as of 07/29/2013. Soils at the site were impacted with various contaminants due to the historic usage as a manufactured gas plant.					
REC Discussion:	Based on the details provided above, a REC is not suspected in connection with the Property.					
VEC Discussion:	Based on the available data, a VEC is not suspected.					

State BROWNFIELD SITES			**# of sites:**	0	**Search Distance:**	Ì -mile
Notable Listing:						
Distance in feet:		**Direction:**		**Gradient:**		
Data Discussion:						
REC Discussion:						
VEC Discussion:						

UNMAPPED/ORPHAN LIST SITES	
	Hillmann has also reviewed a list of unmapped sites (a.k.a. ñOrphan Listò sites) indicated by the database report. Unmapped sites that were identified as falling within an applicable specific search distance or warranting discussion have either been discussed in the preceding tables or are detailed below:
Notable Listings:	None

4.4 Additional Environmental Record Sources

Requests have been submitted to local, municipal and state agencies for pertinent records pertaining to the Property, particularly with regard to potential environmental concerns such as petroleum storage tanks, storage and usage of hazardous substances and petroleum products, and/or known or suspected environmental contamination. Where applicable, internet research of government environmental regulatory databases was also conducted, as well as a general cursory internet search of the Property address, for information indicative of a REC. The following table summarizes the findings of the research:

Source	Type of Request	Outcome
CA DTSC (Envirostor)	FOI request	A response was received providing the following pertinent records: Response indicated that records were available on the HWTS database and the Envirostor database. Hillmann reviewed records on the Envirostor database on work conducted on the site since Hillmann last conducted work on the site in 2017.
Fire Prevention/Marshall	FOI request	No response was received prior to report issuance.
Building/Code Enforcement.	FOI request	A response was received providing the following pertinent records: Correspondence between planning department and developer
South Coast Air Quality Management District (SCAQMD)	FOI request	A response was received providing the following pertinent records: Records related to emissions and equipment for Riverside Scrap Metal were reviewed.

5.0 SITE RECONNAISSANCE

5.1 Methodology and Limiting Conditions

The site reconnaissance consisted of visual and/or physical observations of the Property and improvements, adjoining properties as viewed from the Property boundaries and the surrounding area based on visual observations from adjoining public thoroughfares. Building exteriors were observed at ground level, unless otherwise indicated. Where applicable, representative areas of building interiors were accessed and observed to the extent they were made safely accessible with the cooperation of the site escort.

Site Inspection Personnel:	Ms. Shilpa Sunil
Property Escort/Company:	Mr. Tony Thomas / Owner representative
Inspection Date:	September 20, 2021
Weather Conditions:	Sunny 80 degrees F

5.1.1 Significant Inaccessible Areas

The following significant areas of the Property were not accessed at the time of the site visit:

The interior of the structure at 3596 Commerce Street was inaccessible as the building has been sealed due to structural and safety concerns. According to Mr. Thomas, the building was a former Sunkist packaging warehouse and has been unoccupied over the years.

Hillmann observed former concrete pits that were used as scales. At the time of the assessment the pits were covered with steel plates.

5.1.2 Significant Limiting Site Conditions

No significant limiting site conditions were noted at the time of the site reconnaissance.

5.2 General Site Setting

5.2.1 Site and Vicinity Characteristics

Abutting Roadways:	Main Street to the north; East 5th Street to the west
Current Property Use:	Vacant
Evidence of Past Property Uses:	None observed.
Evidence of Past Adjoining Property Uses:	None observed.
Surrounding Area Uses:	Residential, railway, vacant lots, and industrial warehouses

5.2.2 Current Adjoining Property Uses

Dir	Street Address	Description
N	33 East 61st Street	Residential apartments, with street level restaurant
NE	540 Park Avenue	Loews Regency Hotel, parking garage, restaurants, hair salon & spa
E	38 & 40 East 61st Street	Sothebyôs International Realty, residential condominiums
S	35-39 East 61st Street	Residential apartments, with street level commercial occupancy including a nail salon and spa

No visual observations indicative of a potential environmental concern were noted on the adjoining properties.

5.2.3 Topographic Characteristics

Terrain:	Flat to gently sloping
Direction of Downward Slope:	Towards the north-northwest
On-site Water Bodies:	None observed
Other Significant Features:	None observed

5.2.4 General Description of Structures

Buildings/# of Floors	Two/ two-story warehouse, burnt down office
Approx. Building Area:	4,500 / 6,000 / 18,150
Approx. Year Built:	1900
Ancillary Structures:	None observed
Sources of Heating & Cooling:	NA
Potable Water/Sewage Disposal:	No potable water or sewer services were present at the Property.

5.3 Interior & Exterior Observations

5.3.1 Storage/Usage of Hazardous Substances and Petroleum Products

The following hazardous substances and petroleum products were observed to be stored and used by property occupants:

Occupant	Substance	Qty/Container Type	Storage Conditions
NA	No significant storage or use noted		

5.3.2 Drums

No hazardous substance or petroleum product drums were noted on the Property.

5.3.3 Unidentified Substance Containers

No unidentified substance containers suspected of containing hazardous substance or petroleum product were noted on the Property.

5.3.4 Other Hazardous Substances/Petroleum Products

No other containers of hazardous substances or petroleum products were noted on the Property.

5.3.5 Bulk Petroleum/Hazardous Material Storage Tanks

The following storage tanks for bulk petroleum or hazardous material storage were identified or reported to be present; or are suspected to be present based on visual observations:

AST/ UST	Product	Capacity	Construction	Year Installed	Status	Location/Notes
(none)						

While no visual evidence of a UST was noted, considering the history of development at the Property, the potential presence of abandoned USTs and/or associated buried piping at the Property cannot be ruled out.

5.3.6 PCBs in Oil Filled Electrical/Hydraulic Equipment

The existing site improvements were established prior to the ban of PCBs in 1979. The following oil-filled electrical/hydraulic equipment was identified at the Property:

Several pole mount utility owned transformers were observed along 5th Street, 6th Street and Mission Inn Avenue. No leaking or staining was observed in the vicinity of the transformers.

5.3.7 Odors

No strong, pungent or noxious odors were noted at the Property.

5.3.8 Pools of Liquid

No standing water or pools of liquid likely to contain hazardous substances or petroleum products were noted at the Property.

5.3.9 Interior Stains or Corrosion

Hillmann did not have access into the on-site structures to inspect for interior stains or corrosion.

5.3.10 Interior Drains/Sumps

Hillmann did not have access into the on-site structures to inspect for the presence of floor drains.

5.3.11 Exterior Pits/Ponds/Lagoons

No exterior pits, ponds or lagoons was identified on the Property in connection with waste treatment or disposal.

5.3.12 Stained Soil, Pavement/Stressed Vegetation

No stained soil, pavement or stressed vegetation was observed at the Property.

5.3.13 On-Site Solid Waste Disposal/Fill Material

The following evidence of on-site solid waste dumping/disposal was observed:

Stockpile of demolished building materials and scrap metal was observed on the 2993 Mission Inn Avenue and 2993 6th Street parcels. Trash and debris were scattered around the entirety of the Property. Several soil stockpiles were observed along 2993 6th Street and on vacant parcel 211-022-027. Mr. Thomas reported the soil stockpiles were native to the Property. No other evidence of unauthorized on-site solid waste dumping or unknown fill material was noted at the Property.

5.3.14 Waste Water

Sanitary sewage generated at the Property is discharged via a connection to the local public sewer system.

Storm water runoff at the Property is discharged off-site to local streams/drainage systems via overland flow and catch basins.

No additional waste water discharges were identified at the Property.

5.3.15 Septic Systems

No septic systems were identified at the Property.

5.3.16 Wells

No potable, monitoring or other groundwater wells were identified at the Property.

5.3.17 Railroad Spurs

The following railroad spurs were noted on the Property: Hillmann observed several rails and wood ties within the former railroad right-of-way supporting the possibility that railroad ties may be present just below the surface soil. Railroad spurs were observed on the northwest portion of the parcel-211-071-023 just below the surface soil. The former railroad spurs were used to service the

former packaging warehouse located at 3596 Commerce Street. Former railroad spurs were observed along Commerce Street. Railroad ties are known to be treated with oil-based and tar-based chemicals such as creosote, and railroad spurs are commonly treated with pesticides for weed control. The buried railroad line/spur is considered to be a REC in connection with the Property.

6.0 INTERVIEWS

6.1 Interviews with Past and Present Owners and Occupants

Subject	Name/Affiliation	Summary
Property Owner / Representative	Mr. Todd Cadwell	Mr. Cadwell completed an environmental questionnaire and was interviewed during the site inspection. Pertinent information from the interview and questionnaire, where applicable, has been referenced in various sections of this report.
Property Occupants	Mr. Tony Thomas	Property was unoccupied. Mr. Thomas was interviewed at the time of the assessment. Reported the former structures were fire damaged.
Past Owners, Occupants, Operators	Not applicable	Past owners/occupants of the Property were not available for interview at the time of the assessment.
Owners/Occupants of Adjoining or Nearby Properties	Not applicable	The Property was not an abandoned property with evidence of unauthorized uses or uncontrolled access; therefore, interviews with adjoining or nearby property owners or occupants were not conducted.

6.2 Interviews with State and/or Local Government Officials

Written and on-line requests for environmental records of the Property from State and Local governmental agencies are detailed in Section 4.4.

7.0 BUSINESS ENVIRONMENTAL RISKS

In accordance with the contract agreement for this assessment, Hillmann has performed cursory reviews of several potential Business Environmental Risks (also known as ñNon-Scope Considerationsò). The ASTM E1527-13 standard defines the term business environmental risk (BER) as, *"a risk which can have a material environmental or environmentally-driven impact on the business associated with the current or planned use of a parcel of commercial real estate, not necessarily limited to those environmental issues required to be investigated in this practice."*

7.1 Asbestos-Containing Material (ACM)

The contracted scope of work included a cursory visual screening of the accessed portions of buildings at the Property built prior to 1990 for suspect asbestos containing materials (ACM). The information provided in this section, where applicable, is limited to identification of potential suspect materials in the readily accessible and observed areas of the building, and their general condition. This is not intended to be a comprehensive survey for the presence of ACM, and no testing has been conducted.

Based on building age, ACM may be present, however, interiors of the structures were not available for inspection at the time of the site visit due to safety concerns.

7.2 Lead-Based Paint

The contracted scope of work included a cursory visual screening of the condition of painted surfaces in the accessed areas of residential buildings/units built prior to 1980. This is not intended to constitute a comprehensive survey for LBP or potential lead hazards, and no testing has been conducted.

No residential buildings built prior to 1980 were present at the Property.

7.3 Radon

Data compiled by the USEPA, as summarized by the regulatory database report, indicated that the Property is located in an area classified as Zone 2 or 'moderate risk' area for radon. Radon testing was not included in the scope of this assessment.

7.4 Mold/Microbial Damage

As per the contracted scope of work, Hillmann conducted a cursory visual screening of the accessed areas of the building for evidence of significant damage to building materials and finishes as result of moisture intrusion and/or mold/microbial growth.

Interiors of the structures were not available for inspection for mold/microbial damages at the time of the site visit due to safety concerns.

7.5 NWI Mapped Wetlands

As indicated in the Physical Setting Source table of Section 4.1, no NWI mapped wetlands areas were depicted at the Property by the EDR Geocheck-Physical Setting Source Addendum (attached in Appendic E).

The scope of work for this assessment excludes a visual determination of regulated wetlands at the Property. It is emphasized that, regardless of the wetlands data obtained via the EDR Geocheck-Physical Setting Source Addendum, a delineation of regulated wetlands by a qualified professional would be warranted to determine the presence or absence of regulated wetlands at the Property.

7.6 Lead in Drinking Water

The scope of work for this assessment included a review of the potential for elevated levels of lead in drinking water by determining the source of the drinking water supply and a review of available compliance or testing data.

Potable water service at the Property is provided by a utility connection with the City of Riverside Public Utilities. A recently published water quality report from the utility indicated compliance with USEPA water quality standards for lead in drinking water. A copy of the report has been attached in Appendix F.

8.0 REFERENCES

ASTM E1527-13-Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process; ASTM International, 2013

ASTM E12600-15-Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transaction, ASTM International, 2015

EDR Radius Map Report with GeoCheck™, Environmental Data Resources, 2021

EDR City Directory Abstract Report, Environmental Data Resources, 2021

EDR Sanborn Map Report, Environmental Data Resources, 2021

Methodology for Identifying the Area of Concern Around a Property Potentially Impacted by Vapor Migration from Nearby Contaminated Sources; A. Buonicore, 2011

Phase I Environmental Site Assessment, 2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, 2993 Mission Inn Avenue, Hillmann Consulting, February 29, 2016

Revised Remedial Action Plan, Riverside Scrap Iron & Metal, 2993 Sixth Street, Riverside, California 92507, DTSC Docket HAS-FY15/16-152; GSI Environmental, July 23, 2019, revised January 2, 2020

9.0 APPENDICES

Appendix A	Site Diagram / Vicinity Map
Appendix B	Site Photographs
Appendix C	Questionnaires / User Provided Information
Appendix D	Historical Records Documentation
Appendix E	Regulatory Records Documentation
Appendix F	Other Documents / Lab Results
Appendix G	Project Personnel Qualifications

APPENDIX A

MAPS / DIAGRAMS



HILLMANN CONSULTING

Figure 1: Site Vicinity Map

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue
Riverside, California

N

SCALE: (NOT TO SCALE)

PROJECT No.: C3-8655



HILLMANN CONSULTING

Figure 2: Site Diagram

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue
Riverside, California

N

SCALE: (NOT TO SCALE)

PROJECT No.: C3-8655

APPENDIX B

SITE PHOTOGRAPHS

SITE PHOTOGRAPHS



View of 2993 Mission Inn Avenue looking south



View of former building pads



View of the Property looking west



View of concrete pits - former scale with metal plates



View of the Property looking northwest



View of the building on the southeast portion of the Property

PHASE I ESA - SITE PHOTOGRAPHS

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce,
& 2993 Mission Inn Avenue,
Riverside, California

Project No.:	C3-8655

HILLMANN
CONSULTING

SITE PHOTOGRAPHS



Interior view of the building on southeast portion of the Property



View of the portion of the building collapsed due to recent fire



View of former elevator shaft



View of 3596 Commerce Street and 2993 6th Street



View of building material debris, scrap metal, and former concrete pit scale



View of canopy area to the east – 2993 6th Street parcel

PHASE I ESA - SITE PHOTOGRAPHS

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue,
Riverside, California

Project No.:	C3-8655

HILLMANN CONSULTING

SITE PHOTOGRAPHS



View of former concrete pads for former bailer and cranes on the 2993 6th Street parcel



View of remains of the former structure on the 2993 6th Street parcel



View of the northern portion of the Property



Railroad spurs to the north west side of the Property observed along parcel 211071023



View of trash dumpster



View of former packaging warehouse – 3596 Commerce Street- sealed

PHASE I ESA - SITE PHOTOGRAPHS

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue,
Riverside, California

Project No.:	C3-8655

HILLMANN CONSULTING

SITE PHOTOGRAPHS



View of the Property from the southwest corner



View of the Property from the southern corner



View of adjoining property across 4th Street



View of adjoining properties to the north west along 5th Street



View of adjoining property to the east along 6th Street



View of pole mount transformer

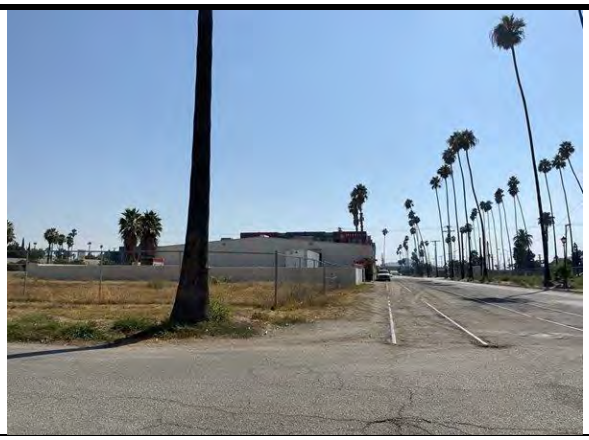
PHASE I ESA - SITE PHOTOGRAPHS

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce,
& 2993 Mission Inn Avenue,
Riverside, California

Project No.:	C3-8655

HILLMANN
CONSULTING

SITE PHOTOGRAPHS



View of former rail road spurs along Commerce Street



View of property looking north -211-022-027 parcel

PHASE I ESA - SITE PHOTOGRAPHS

2992, 3008 5th Street, 2993 6th Street, 3596 Commerce, & 2993 Mission Inn Avenue,
Riverside, California

Project No.:	C3-8655

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Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Not Applicable.

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall only be used in conjunction with BMP designs from the LID BMP Design Handbook)

Company Name: KHR Associates — Date: 8/2/2024

Designed by: James H. Kawamura — Case No:

Company Project Number/Name: Iron Lofts

BMP Identification

BMP NAME / ID: DW 1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E: D_{85} = 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
1A	24,357	Ornamental Landscaping	0.1	0.11	2690.4			
1B	61,934	Roofs	1	0.89	55245.1			
1C	21,520	Concrete or Asphalt	1	0.89	19195.8			
1D	44,125	Concrete or Asphalt	1	0.89	39359.5			
	151936	Total			116490.8	0.60	5824.5	5,875

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall only be used in conjunction with BMP designs from the LID BMP Design Handbook)

Company Name: KHR Associates — Date: 8/2/2024

Designed by: James H. Kawamura — Case No:

Company Project Number/Name: Iron Lofts

BMP Identification

BMP NAME / ID: DW 1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
DMAs	1A	24,357	Ornamental Landscaping	0.1	0.11	2690.4			
	1B	61,934	Roofs	1	0.892	55245.1			
	1C	21,520	Concrete or Asphalt	1	0.892	19195.8			
	1D	44,125	Concrete or Asphalt	1	0.892	39359.5			
		151936	Total			116490.8	0.20	0.5	1.1

Notes:

DRYWELL & DETENTION DESIGN CALCULATIONS

Drywell #1 (Combination of DW1A, DW1B, DW1C, DW1D)

Mitigation Volume, V_{BMP}:	5,825	C.F.	From BMP Design Worksheet
Infiltration Rate, $K_{sat,measured}$:	1.60	in/hr	Test Well W-9
Factor of Safety, FS:	3		
Number of Drywells; $DW_{quantity}$:	4	each	
DW Chamber ø:	4	feet	
DW Chamber Area, DWC_{Area}:	12.57	square feet per foot	
DW Chamber Volume, DWC_{Volume}:	12.57	cubic feet per foot	
$DW_{chamber,depth}$ (from invert down):	7.45	linear feet	
DW Rock Shaft ø:	4	feet	
DW Rock Shaft Area, DWR_{Area}:	12.57	square feet per foot	
DW Rock Shaft Volume, DWR_{Volume}:	12.57	cubic feet per foot	
$DW_{rock,depth}$:	50.00	linear feet	
$DW_{infiltration,depth}$:	57.45	linear feet	
DW Bottom Area, DWB_{Area}:	12.57	square feet per foot	
T (Maximum Drawdown Time):	48	hr	
CMP Diameter (detention):	8	feet	
CMP_{Volume}:	50.2	cubic feet per foot	
CMP_{Length}:	90	linear feet	

Determine Design Infiltration Rate; $K_{sat,design}$

$K_{sat,design} = K_{sat,measured} \div FS$

$K_{sat,design}$ = 0.53 in/hr 0.000012 ft/sec

Determine Minimum Infiltration Surface Area, A_{min}

$A_{min} = (V_{BMP} \times 12\ in/ft) \div (T \times K_{sat,design})$

A_{min} = 2,730 S.F.

Determine Infiltration Surface Area, A_{actual}

$A_{actual} = (DW_{infiltration,depth} \times DWR_{Area} + DWB_{Area}) \times DW_{quantity}$

A_{actual} = 2,939 S.F.

Determine Volume of Drywell, $V_{drywell}$

$V_{drywell} = (DWC_{Volume} \times DW_{chamber,depth}) + (DWR_{Volume} \times DW_{rock,depth} \times 0.40) \times DW_{quantity}$

$V_{drywell}$ = 1,380 C.F.

Determine Volume Remaining to Detain in CMP, V_{detain}

$V_{detain} = V_{BMP} - V_{drywell}$

V_{detain} = 4,445 C.F.

Determine CMP Detention Volume, $V_{CMP,detain}$

$V_{CMP,detain} = CMP_{Volume} \times CMP_{Length}$

$V_{CMP,detain}$ = 4,495 C.F.

Determine DW & CMP Volume, V_{design}

$V_{design} = V_{CMP,detain} + V_{drywell}$

V_{design} = 5,875 C.F.

Determine Drawdown Time, T_{actual}

$T_{actual} = (V_{design} \times 12\ in/ft) \div (A_{actual} \times K_{sat,design})$

T_{actual} = 44.98 hr

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall only be used in conjunction with BMP designs from the LID BMP Design Handbook)

Company Name: KHR Associates — Date: 8/2/2024

Designed by: James H. Kawamura — Case No:

Company Project Number/Name: Iron Lofts

BMP Identification

BMP NAME / ID: DW 2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E: D_{85} = 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
2A	20,932	Ornamental Landscaping	0.1	0.11	2312.1			
2B	70,323	Roofs	1	0.89	62728.1			
2C	13,732	Concrete or Asphalt	1	0.89	12248.9			
2D	45,214	Concrete or Asphalt	1	0.89	40330.9			
	150201	Total			117620	0.60	5881	5,909

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall only be used in conjunction with BMP designs from the LID BMP Design Handbook)

Company Name: KHR Associates — Date: 8/2/2024

Designed by: James H. Kawamura — Case No:

Company Project Number/Name: Iron Lofts

BMP Identification

BMP NAME / ID: DW 2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
DMAs	2A	20,932	Ornamental Landscaping	0.1	0.11	2312.1			
	2B	70,323	Roofs	1	0.892	62728.1			
	2C	13,732	Concrete or Asphalt	1	0.892	12248.9			
	2D	45,214	Concrete or Asphalt	1	0.892	40330.9			
		150201	Total			117620	0.20	0.5	1.1

Notes:

DRYWELL & DETENTION DESIGN CALCULATIONS

Drywell #2 (Combination of DW2A, DW2B, DW2C, DW2D)

Mitigation Volume, V_{BMP}:	5,881	C.F.	From BMP Design Worksheet
Infiltration Rate, $K_{sat,measured}$:	1.60	in/hr	Test Well W-10
Factor of Safety, FS:	3		
Number of Drywells; $DW_{quantity}$:	4	each	
DW Chamber ø:	4	feet	
DW Chamber Area, DWC_{Area}:	12.57	square feet per foot	
DW Chamber Volume, DWC_{Volume}:	12.57	cubic feet per foot	
$DW_{chamber,depth}$ (from invert down):	9.78	linear feet	
DW Rock Shaft ø:	4	feet	
DW Rock Shaft Area, DWR_{Area}:	12.57	square feet per foot	
DW Rock Shaft Volume, DWR_{Volume}:	12.57	cubic feet per foot	
$DW_{rock,depth}$:	50.00	linear feet	
$DW_{infiltration,depth}$:	59.78	linear feet	
DW Bottom Area, DWB_{Area}:	12.57	square feet per foot	
T (Maximum Drawdown Time):	48	hr	
CMP Diameter (detention):	6	feet	
CMP_{Volume}:	28.2	cubic feet per foot	
CMP_{Length}:	156	linear feet	

Determine Design Infiltration Rate; $K_{sat,design}$

$K_{sat,design} = K_{sat,measured} \div FS$

$K_{sat,design}$ = 0.53 in/hr 0.000012 ft/sec

Determine Minimum Infiltration Surface Area, A_{min}

$A_{min} = (V_{BMP} \times 12\ in/ft) \div (T \times K_{sat,design})$

A_{min} = 2,757 S.F.

Determine Infiltration Surface Area, A_{actual}

$A_{actual} = (DW_{infiltration,depth} \times DWR_{Area} + DWB_{Area}) \times DW_{quantity}$

A_{actual} = 3,056 S.F.

Determine Volume of Drywell, $V_{drywell}$

$V_{drywell} = (DWC_{Volume} \times DW_{chamber,depth}) + (DWR_{Volume} \times DW_{rock,depth} \times 0.40) \times DW_{quantity}$

$V_{drywell}$ = 1,497 C.F.

Determine Volume Remaining to Detain in CMP, V_{detain}

$V_{detain} = V_{BMP} - V_{drywell}$

V_{detain} = 4,384 C.F.

Determine CMP Detention Volume, $V_{CMP,detain}$

$V_{CMP,detain} = CMP_{Volume} \times CMP_{Length}$

$V_{CMP,detain}$ = 4,412 C.F.

Determine DW & CMP Volume, V_{design}

$V_{design} = V_{CMP,detain} + V_{drywell}$

V_{design} = 5,909 C.F.

Determine Drawdown Time, T_{actual}

$T_{actual} = (V_{design} \times 12\ in/ft) \div (A_{actual} \times K_{sat,design})$

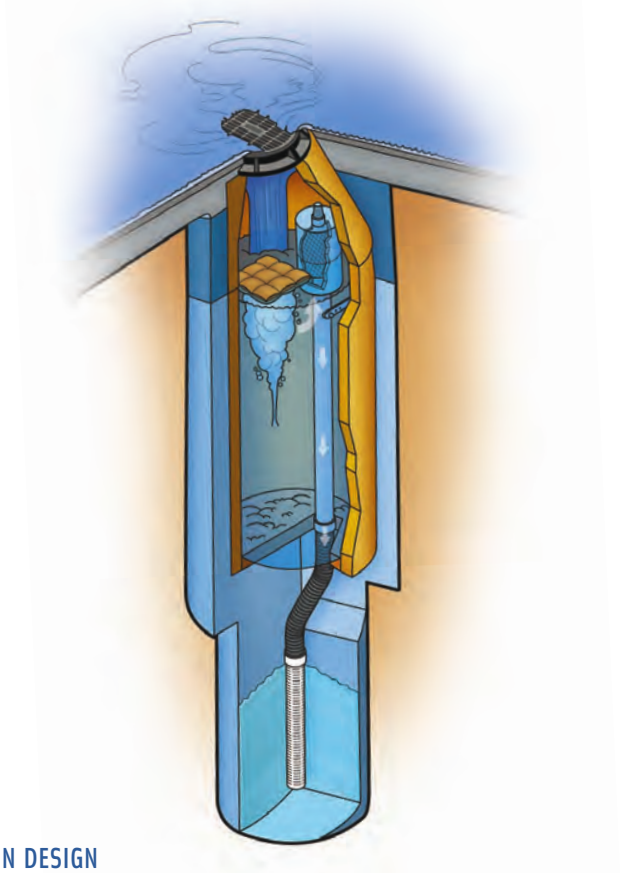
T_{actual} = 43.51 hr

MaxWell® IV DRAINAGE SYSTEM

Product Information and Design Features

TORRENT® RESOURCES

The ***MaxWell® IV,*** as manufactured and installed exclusively by Torrent Resources Incorporated, is the industry standard for draining landscaped developments and paved areas. This patented system incorporates the latest refinements in pre-treatment technology.



PROVEN DESIGN

Since 1974, nearly 65,000 MaxWell® Systems have proven their value as a cost-effective solution in a wide variety of drainage applications. They are accepted by state and municipal agencies and are a standard detail in numerous drainage manuals.

ADVANCED PRE-TREATMENT

Industry research, together with Torrent Resources' own experience, have shown that initial storm drainage flows have the greatest impact on system performance. This "first flush" occurs during the first few minutes of runoff, and carries the majority of sediment and debris. This results in the need for effective processing of runoff from landscaped and paved surfaces. In the ***MaxWell® IV,*** preliminary treatment is provided through collection and separation in a deep, large-volume chamber where silt and other heavy particles settle to the bottom. The standard MaxWell IV System has over 1,500 gallons of capacity to contain sediment and debris carried by incoming water. Floating trash, paper, pavement oil, etc. are effectively stopped by the **PureFlo®** Debris Shield on top of the overflow pipe. Water is drained from the system by rising up to the top of the overflow pipe and under the Debris Shield. The solid metal shields are equipped with an internal screen to filter suspended matter and are vented to prevent siphoning of floating surface debris. The drainage assembly returns the cleaned water into the surrounding soil through the **FloFast®** Drainage Screen.

ABSORBENT TECHNOLOGY

The MaxWell IV settling chamber is equipped with an absorbent sponge to provide prompt removal of pavement oils. These floating pillow-like devices are 100% water repellent and literally wick petrochemical compounds from the water. Each sponge has a capacity of up to 128 ounces to accommodate effective, long-term treatment. The absorbent is completely inert and will safely remove runoff constituents down to rainbow sheens that are typically no more than one molecule thick.

SECURITY FEATURES

MaxWell IV Systems include bolted, theft-deterrent, cast iron gratings and covers as standard security features. Special inset castings that are resistant to loosening from accidental impact are available for use in landscaped applications. Machined mating surfaces and "Storm Water Only" wording are standard.

THE MAXWELL FIVE-YEAR WARRANTY

Innovative engineering, quality materials and exacting construction are standard with every MaxWell System designed, manufactured and installed by Torrent Resources Incorporated. The MaxWell Drainage System Warranty is the best in the industry and guarantees against failures due to workmanship or materials for a period of five years from date of completion.

Manufactured and Installed Exclusively by Torrent Resources Incorporated

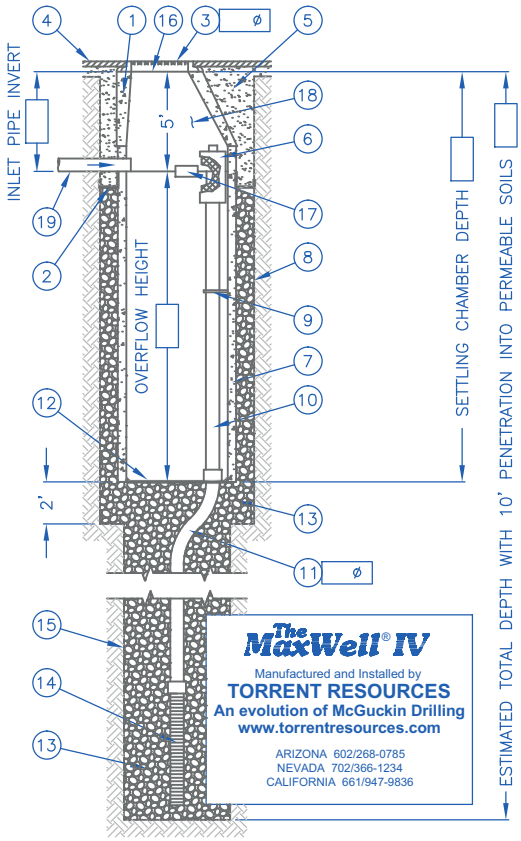
Please see reverse side for additional information

U.S. Patent No. 4,923,330

MAXWELL® IV DRAINAGE SYSTEM DETAIL AND SPECIFICATIONS

ITEM NUMBERS

1. **Manhole Cone** - Modified Flat Bottom.
2. **Moisture Membrane** - 6 Mil. Plastic. Applies only when native material is used for backfill. Place membrane securely against eccentric cone and hole sidewall.
3. **Bolted Ring & Grate** - Diameter as shown. Clean cast iron with wording **"Storm Water Only"** in raised letters. **Bolted in 2 locations** and secured to cone with mortar. Rim elevation ±0.02' of plans.
4. **Graded Basin or Paving** (by Others).
5. **Compacted Base Material** - 1-Sack Slurry except in landscaped installtions with no pipe connections.
6. **PureFlo® Debris Shield** - Rolled 16 ga. steel X 24" length with vented anti-siphon and Internal .265" Max. SWO flattened expanded steel screen X 12" length. **Fusion bonded epoxy coated.**
7. **Pre-cast Liner** - 4000 PSI concrete 48" ID. X 54" OD. **Center in hole** and align sections **to maximize bearing surface.**
8. **Min. 6' Ø Drilled Shaft.**
9. **Support Bracket** - Formed 12 Ga. steel. **Fusion bonded epoxy coated.**
10. **Overflow Pipe** - Sch. 40 PVC mated to drainage pipe at base seal.
11. **Drainage Pipe** - ADS highway grade with TRI-A coupler. **Suspend pipe** during backfill operations to prevent buckling or breakage. Diameter as noted.
12. **Base Seal** - Geotextile or concrete slurry.
13. **Rock** - Washed, sized between 3/8" and 1-1/2" to **best complement soil conditions.**
14. **FloFast® Drainage Screen** - Sch. 40 PVC 0.120" slotted well screen with 32 slots per row/ft.Diameter varies 120" overall length with TRI-B coupler.
15. **Min. 4' Ø Shaft** - Drilled to **maintain permeability** of drainage soils.
16. **Fabric Seal** - U.V. resistant geotextile - **to be removed by customer** at project completion.
17. **Absorbent** – Hydrophobic Petrochemical Sponge. Min. to 128 oz. capacity.
18. **Freeboard Depth** Varies with inlet pipe elevation. Increase settling chamber depth as needed to maintain all inlet pipe elevations above overflow pipe inlet.
19. **Optional Inlet Pipe** (Maximum 4", by Others). Extend moisture membrane and compacted base material or 1 sack slurry backfill below pipe invert.



AZ Lic. ROC070465 A, ROC047067 B-4, ADWR 363
CA Lic. 528080, C-42, HAZ.
NV Lic. 0035350 A - NM Lic. 90504 GF04

U.S. Patent No. 4,923,330 - ™ Trademark 1974, 1990, 2004

The referenced drawing and specifications are available on CAD either through our office or web site. This detail is copyrighted (2004) but may be used as is in construction plans without further release. For information on product application, individual project specifications or site evaluation, contact our Design Staff for no-charge assistance in any phase of your planning.

CALCULATING MAXWELL IV REQUIREMENTS

The type of property, soil permeability, rainfall intensity and local drainage ordinances determine the number and design of MaxWell Systems. For general applications draining retained stormwater, use one standard **MaxWell IV** per the instructions below for up to 3 acres of landscaped contributory area, and up to 1 acre of paved surface. For larger paved surfaces, subdivision drainage, nuisance water drainage, connecting pipes larger than 4" Ø from catch basins or underground storage, or other demanding applications, refer to our **MaxWell® Plus** System. For industrial drainage, including gasoline service stations, our **Envibro® System** may be recommended. For additional considerations, please refer to **"Design Suggestions For Retention And Drainage Systems"** or consult our Design Staff.

COMPLETING THE MAXWELL IV DRAWING

To apply the **MaxWell IV** drawing to your specific project, simply fill in the blue boxes per instructions below. For assistance, please consult our Design Staff.

' ESTIMATED TOTAL DEPTH

The Estimated Total Depth is the approximate depth required to achieve 10 continuous feet of penetration into permeable soils. Torrent utilizes specialized **"crowd"** equipped drill rigs to penetrate difficult, cemented soils and to reach permeable materials at depths up to **180 feet.** Our extensive database of drilling logs and soils information is available for use as a reference. Please contact our Design Staff for site-specific information on your project.

' SETTLING CHAMBER DEPTH

On MaxWell IV Systems of over 30 feet overall depth and up to 0.25cfs design rate, the **standard** Settling Chamber Depth is **18 feet.** For systems exposed to greater contributory area than noted above, extreme service conditions, or that require higher design rates, chamber depths up to 25 feet are recommended.

' OVERFLOW HEIGHT

The Overflow Height and Settling Chamber Depth determine the effectiveness of the settling process. The higher the overflow pipe, the deeper the chamber, the greater the settling capacity. For normal drainage applications, an overflow height of **13 feet** is used with the standard settling chamber depth of **18 feet**. Sites with higher design rates than noted above, heavy debris loading or unusual service conditions require greater settling capacities

"Ø DRAINAGE PIPE

This dimension also applies to the **PureFlo®** Debris Shield, the **FloFast®** Drainage Screen, and fittings. The size selected is based upon system design rates, soil conditions, and the need for adequate venting. Choices are 6", 8", or 12" diameter. Refer to "Design Suggestions for Retention and Drainage Systems" for recommendations on which size best matches your application.

"Ø BOLTED RING & GRATE

Standard models are quality cast iron and available to fit 24" Ø or 30" Ø manhole openings. All units are bolted in two locations with wording "Storm Water Only" in raised letters. For other surface treatments, please refer to "Design Suggestions for Retention and Drainage Systems."

"Ø INLET PIPE INVERT

Pipes up to 4" in diameter from catch basins, underground storage, etc. may be connected into the settling chamber. Inverts deeper than 5 feet will require additional settling chamber depth to maintain effective overflow height.

TORRENT RESOURCES INCORPORATED

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Nevada 702~366~1234

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TORRENT RESOURCES (CA) INCORPORATED

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www.TorrentResources.com

An evolution of McGuckin Drilling

The watermark for drainage solutions.®

TORRENT® RESOURCES

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INDUSTRY SERVICES
SITE DRAINAGE SYSTEMS
TECHNICAL ANALYSIS
RECHARGE SYSTEMS
ENVIRONMENTAL APPS.
DRAINAGE RENOVATION
DRAINAGE MAINTENANCE
COMPANY OVERVIEW
ONLINE RESOURCES

WATERTIGHT SOLUTIONS 35 YEARS

DRAINAGE MAINTENANCE

With over thirty years of experience to draw on, Torrent Resources records clearly show that utilizing regular inspection and cleaning procedures can significantly enhance the service-life and performance of the drainage systems it installs. *Maintenance Data Sheets* accompany all MaxWell and Envibro Systems at the time of completion that provide operational information and instructions for inspection and service.

As a benefit to all MaxWell and Envibro owners, Torrent offers a full range of maintenance programs to protect the investment made in its drainage systems. With thorough knowledge and experience to analyze the operational and structural aspects of our patented products, we can effectively accomplish these basic, yet important services.

Torrent can provide Preventive Maintenance Programs that are tailored for your site including full service contracts. These services would include a preliminary inspection of the settling chambers and internal components and an assessment of the site drainage to insure that the system meets operational guidelines. A written report is provided at the completion of each inspection.

MaxWell system cleaning is accomplished with truck mounted hydro-vactor equipment, utilizing water and air to dislodge and remove debris and sediment deposits. All chambers, inlets, connecting piping and catch basins are cleaned with the contents evacuated and transported off-site for disposal. Geotextile fabric base seals and hydrophobic petrochemical sponges are removed and replaced in each chamber. Inlet grates and covers are then re-installed and re-secured with existing locking devices.

Envibro system cleaning utilizes similar maintenance equipment. Servicing includes removal of debris from the trash basket under the collector grate inlet, hydro-vactoring all chambers and cleaning of silt filters. All, inlets, connecting piping and catch basins are cleaned as well with the contents evacuated and transported off-site for disposal. Inspection of the Imbiber Beads® Drain Field assembly is also included in standard maintenance. All hydrophobic absorbents blankets are replaced and inlet grates and covers are re-installed and re-secured with existing locking devices.

Under normal operation, Envibro cleaning is recommended annually or following heavy rainfalls and high loading of the system with foreign trash and debris. Should a spill or other discharge occur, complete service of the systems and replacement of activated Imbiber Beads® Drain Field assembly is normally required.

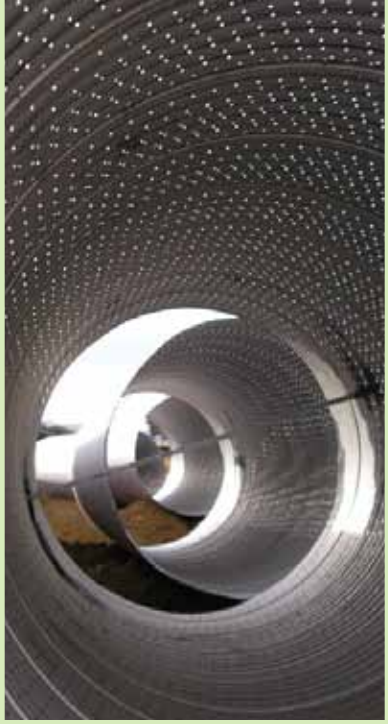
Below is a list of our Drainage Maintenance services:
Preventative Maintenance
Service Contracts
Drywell Cleaning

Imbiber Beads® is a registered Trademark of Imbibitive Technologies Corporation



"Sun State Builders has had the privilege of working with Torrent Resources for several years. We find their work to be of excellent quality and their customer service is superior. We look forward to utilizing their services in all of our projects in the future."

Andrea Vallas
Assistant Project Manager
Sun State Builders



CONTECH®
ENGINEERED SOLUTIONS

Corrugated Metal Pipe Infiltration System

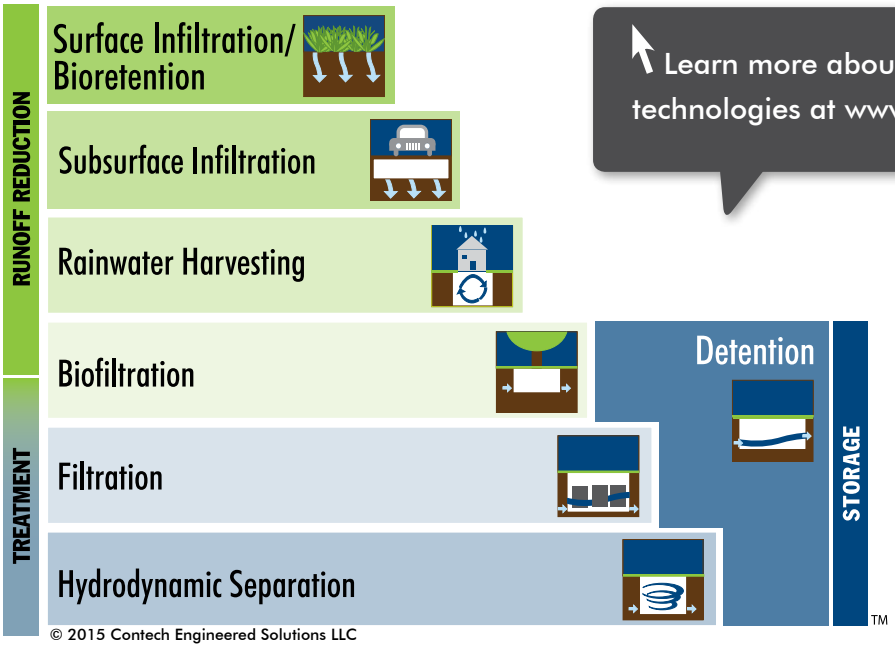
Solutions Guide



Stormwater Solutions from Contech

Selecting the Right Stormwater Solution Just Got Easier...

It's simple to choose the right stormwater solution to achieve your goals with the Contech Stormwater Solutions Staircase. First, select the runoff reduction practices that are most appropriate for your site, paying particular attention to pretreatment needs. If the entire design storm cannot be retained, select a treatment best management practice (BMP) for the balance. Finally, select a detention system to address any outstanding downstream erosion.



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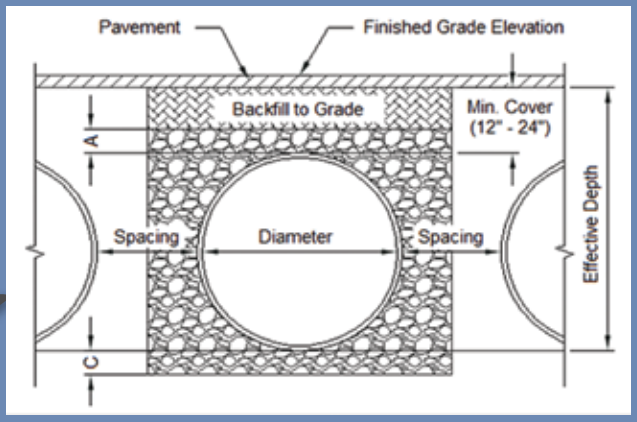
Learn more about all of our stormwater technologies at www.ContechES.com/urbangreen

DYODS

Design Your Own Detention or Infiltration System

The Contech DYODS is an exclusive online design tool to that allows users to quickly and easily design their own detention or infiltration system. Just input your required storage volume to calculate the quantity of the material needed for your Contech CMP, CON/SPAN®, or ChamberMaxx® system.

To use the *Design Your Own Detention or Infiltration System* tool, visit: www.ContechES.com/dyods



Subsurface Infiltration as a Stormwater Management Strategy

The only sure way to eliminate stormwater pollution is to eliminate stormwater runoff. In recognition of this fact, Green Infrastructure and Low Impact Development based stormwater management regulations prioritizing runoff reduction have proliferated throughout the United States.

Where site conditions allow, infiltration is typically the most cost effective and reliable runoff reduction approach. In urban environments where there are competing demands for land, subsurface infiltration can provide many of the benefits of landscape based systems but without requiring dedicated land area. Infiltration systems are commonly comprised of a pretreatment component designed to remove sediment, trash, and oil, followed by plastic, metal or concrete storage units surrounded by permeable stone creating a high voids storage gallery. Infiltration systems are typically designed to support vehicular loading and to withstand lateral pressures from surrounding soil that allows the overlying land to be used for virtually any non-building application.

Subsurface infiltration meets the objectives of LID by reducing runoff with the added benefit of saving land space in urban environments.



LID benefits include runoff volume reduction, peak flow control, ground water recharge, and water quality improvement.

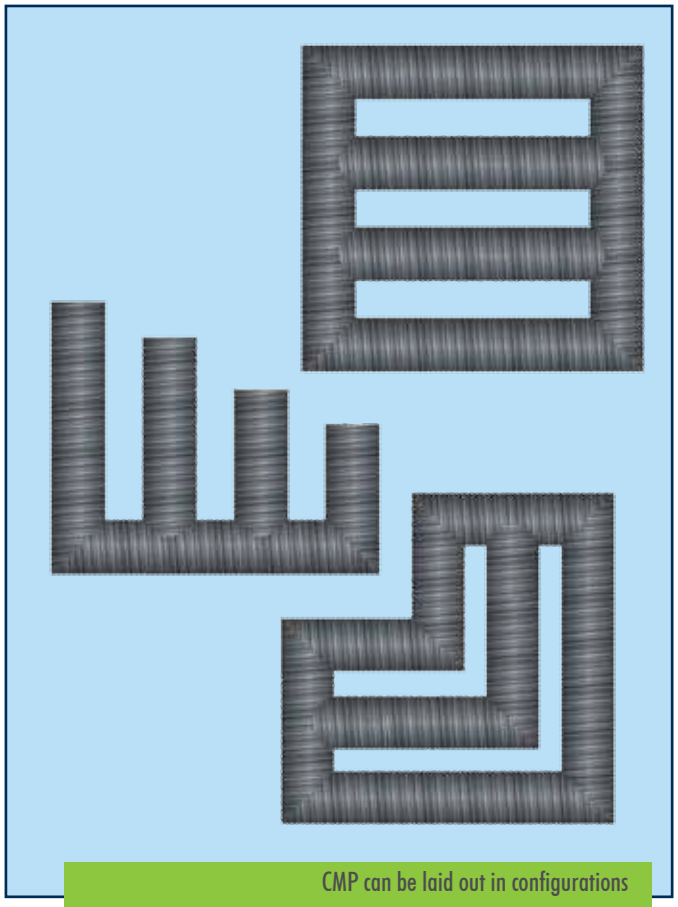


CMP infiltration is used at Pitzer College in Claremont, California.

CMP – the "Go To" Material for Subsurface Infiltration

The purpose of the storage vessel is to hold stormwater runoff underground while allowing it to infiltrate the surrounding soil. For the majority of applications, corrugated metal pipe (CMP) is the "go to" material for subsurface infiltration.

- A minimum of 75-year service life for most soil/water conditions.
- Various pipe coatings and materials are available to accommodate site-specific needs and extend service life: Aluminized Steel Type 2 (ALT2), Galvanized, CORLIX® Aluminum, and Polymeric.
- Wide range of gages, corrugations, and shapes, in diameters 12" – 144".
- Pipe can be fully or partially perforated for infiltration, retention, or groundwater recharge applications.
- Custom access risers and manifolds provide direct access for maintenance.
- Outlet control devices can be incorporated within the system, eliminating the need for a separate structure.
- Customizable - a variety of fittings allow CMP to match most layout configurations.
- May be designed for heavy loading and high maximum cover.
- Contributes to LEED points.
- Available locally; quick turnaround time.
- The most economical installed solution.



CMP can be laid out in configurations not achievable with other materials.

With its low cost, a wide variety of diameters, layout configurations, and materials, no other material can match CMP's flexibility and versatility.



A wide range of CMP diameters and coatings are available to meet site specific needs.

Addressing the Question of Longevity

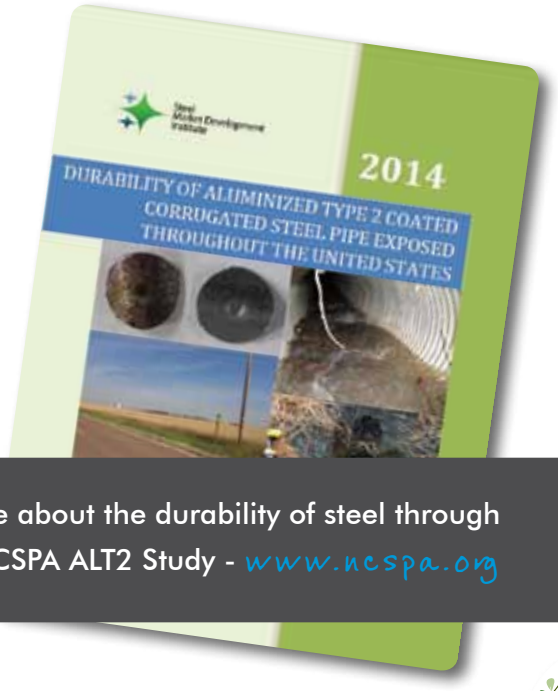
Some engineers are hesitant to use corrugated metal pipe (CMP) for stormwater applications because they have read or heard about CMP being used in culverts that have corroded. This shouldn't be the case. Many decades ago, galvanized pipe was the coating of choice for culverts; that now has been replaced with Aluminized Type 2 (ALT2). The primary reason for culvert failure is the galvanized coating was not properly designed to withstand a high flow and abrasive environment, which wears the galvanized coating off the invert of the pipe. The ALT2 is far more abrasive resistant for applications such as culverts and has a wider range for pH and resistivity. Additionally, a detention/infiltration application is not an abrasive environment, so these concerns are further mitigated. Finally, a properly designed infiltration system includes pretreatment and flow control, as well as a stone envelope which prevents interaction with native soils, further reducing the potential for abrasion and corrosion.

- A minimum of 75 year service life for most soil/water conditions and has a proven service life that exceed 100 years with proper specification that meets all AASHTO and ASTM pipe specifications.
- CMP infiltration systems can be designed to meet HS-20 or greater load requirements with proper depths of cover.
- With no abrasion and low flows, coatings remain intact and protect against corrosion inside the pipe that holds stormwater runoff.
- Protective pipe coatings and materials such as ALT2, Galvanized, Polymeric, and CORLIX® Aluminum are matched to the pH and resistivity of the surrounding soil.
- CMP infiltration systems are surrounded by clean crushed rock to provide increased storage capacity. The entire system is wrapped with fabric on the sides and top to prevent the soils from having contact with CMP. Thus, corrosive soils do not come into contact with the pipe.

CMP infiltration systems have a proven service life that exceeds 100-years with proper specification that meets all AASHTO and ASTM pipe specifications.



CMP has a proven service life



Learn more about the durability of steel through the recent NCSPA ALT2 Study - www.ncspa.org

Learn more at www.ContechES.com/cmp-detention

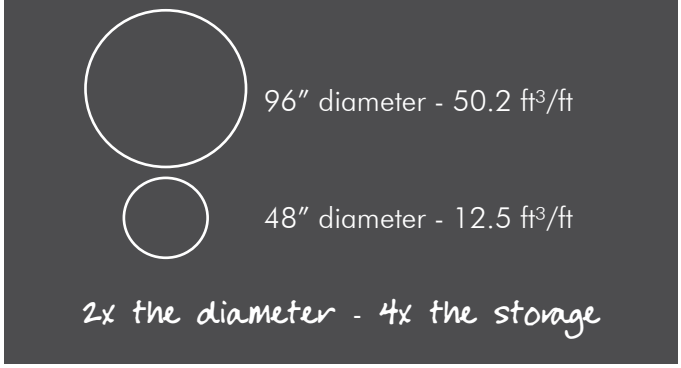
Maximizing Vertical Space: Every Inch Counts

One of the most overlooked advantages of CMP is its ability to maximize vertical storage space.

Increasing the depth of a CMP infiltration system allows for more water storage in the same footprint. For example, doubling the diameter of pipe yields four times as much storage volume in the pipe. This provides a significant cost savings per cubic foot of storage. In addition, more vertical storage space means a smaller footprint, less excavation, and lower project costs.

Contech's Corrugated Metal Pipe Detention systems maximize vertical storage space.





Sizing

Round Pipe – CMP → 6-in to 144-in

Diameter (inches)	Volume (ft³/ft)	Min. Cover Height	Diameter (inches)	Volume (ft³/ft)	Min. Cover Height
12	.78	12″	78	33.1	12″
15	1.22	12″	84	38.4	12″
18	1.76	12″	90	44.1	12″
21	2.40	12″	96	50.2	12″
24	3.14	12″	102	56.7	18″
30	4.9	12″	108	63.6	18″
36	7.0	12″	114	70.8	18″
42	9.6	12″	120	78.5	18″
48	12.5	12″	126	86.5	18″
54	15.9	12″	132	95.0	18″
60	19.6	12″	138	103.8	18″
66	23.7	12″	144	113.1	18″
72	28.2	12″			

The Need for Effective Pretreatment

Infiltration systems have multiple components, and one of the most important is pretreatment. The purpose of a pretreatment device is to prolong the life of the infiltration system by removing debris and sediment that can collect on the invert and within the stone backfill voids. Pretreatment will maintain the efficiency of an infiltration system as well as extend the life cycle, therefore preventing a premature replacement. Pretreatment also offers these additional benefits:

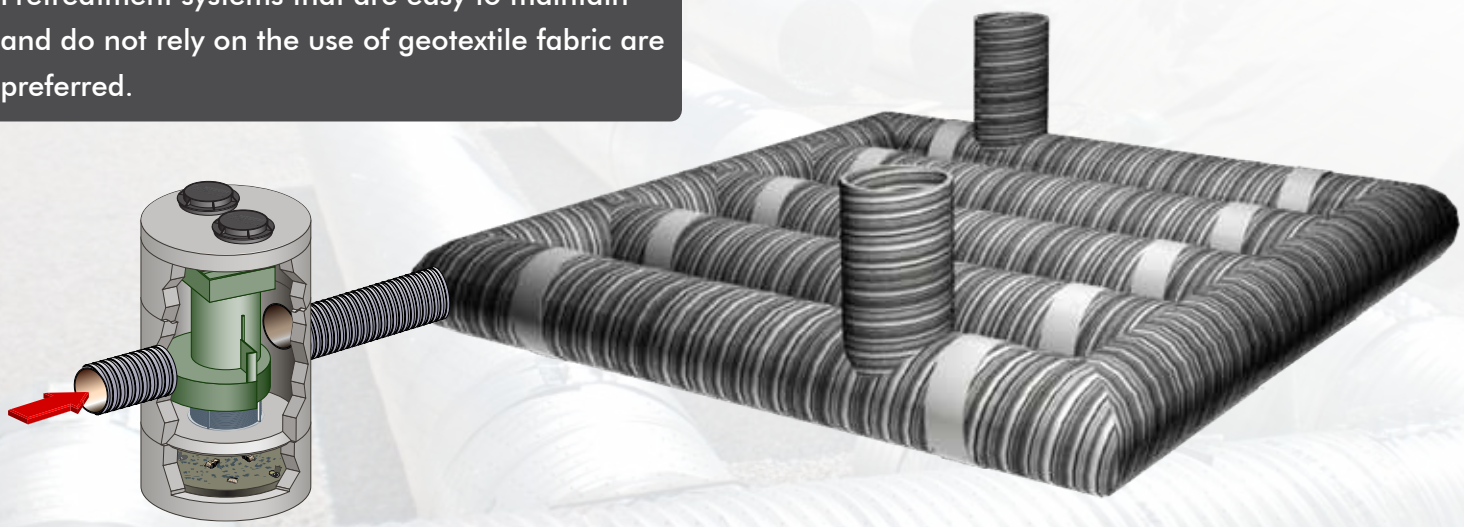
- Easier to clean and maintain compared to the infiltration system itself.
- Cost savings due to the extended service life of the system.
- Removing trash and debris protects downstream outlet control structures from clogging.

Pretreatment Design Considerations

When choosing a pretreatment system, it is important to consider the following:

- Downstream outlet control structures may require protection from a pretreatment device that screens trash and debris.
- Pretreatment system selection depends on pollutant targets. Trash, debris, and larger particles can be removed with hydrodynamic separators. Removing high percentages of fine particles and associated heavy metals and nutrients requires filtration.
- Reduced long term maintenance or replacement cost of the infiltration system can help justify pretreatment construction costs.
- Inlet and pipe layout will influence the number and type of pretreatment systems used. A combination of different systems may be appropriate for the various inlet locations and flows.

Pretreatment systems that are easy to maintain and do not rely on the use of geotextile fabric are preferred.



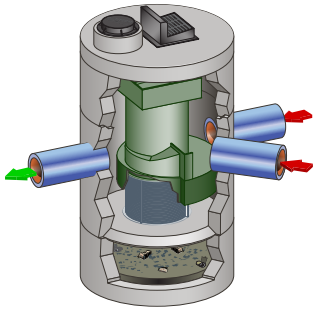
Learn more at www.ContechES.com/cmp-detention

7

Pretreatment Options

Contech offers a number of pretreatment options, all of which will extend the life of subsurface infiltration systems and improve water quality. The type of system chosen will depend on a number of factors including footprint, soil conditions, local regulations, and the desired level of pretreatment.

CDS provides direct access to cleaning, and the built-in high flow bypass weir eliminates the need for a separate bypass structure.



Hydrodynamic Separation

Hydrodynamic Separation (HDS) provides a basic level of pretreatment by capturing and retaining trash and debris, sediment, and oil from stormwater runoff.

CDS®

The CDS uses a combination of swirl concentration and indirect screening and is the only non-blocking screening technology available in an HDS system.

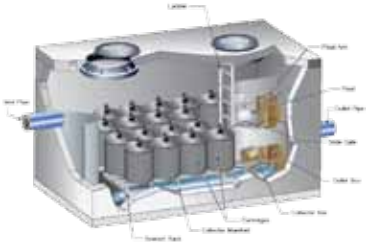


Filtration

Filtration provides a higher level of pretreatment and improved water quality by removing trash and debris, oil, fine solids, and dissolved pollutants such as metals, hydrocarbons, and nutrients.

Filterra® Bioretention System

Filterra is an engineered bioretention system that has been optimized for high volume/flow treatment and high pollutant removal.



The Stormwater Management StormFilter®

The StormFilter system is comprised of a structure that houses rechargeable, media-filled cartridges. The media can be customized to target site-specific pollutants.



Jellyfish® Filter

The Jellyfish filter uses membrane filtration in a compact footprint to remove a high level and a wide variety of stormwater pollutants such as fine particulates, oil, trash and debris, metals, and nutrients.

Alternative Materials for Subsurface Infiltration

There may be instances where alternative materials are needed for subsurface infiltration due to site specific needs.

Plastic Chambers

Plastic chambers are best suited to shallow depth applications; minimum cover is 18 inches, and maximum cover is 96 inches. Some benefits of chambers are:

- Chambers may be beneficial for sites with limited vertical storage.
- Lightweight and installed by hand.
- Heavy equipment is not required to set units into place.
- Centralized stocking locations for short lead times.

Concrete Structures/Vaults

Some concrete structures and vaults are best suited for high loading applications such as railroads or airports. Concrete units are also ideal in corrosive environments or areas with high salinity. Some benefits of concrete structures are:

- Wide range of spans and heights.
- Greater underground infiltration storage in a smaller footprint.
- Ample and easy maintenance access.
- Fast installation.



Project Profiles: CMP Infiltration Systems in Action

Edie and Lew Wasserman Building, UCLA

Westwood, California

- The new six-story, 100,000 square foot Edie and Lew Wasserman Building was built on a very dense site that needed to meet sustainability requirements.
- The design needed to maximize infiltration volume, match existing inverts, and work around existing utilities.
- The stormwater management systems included a CDS pretreatment system and a CMP infiltration system using 57' of 72" perforated CMP.
- Perforated CMP was selected to avoid utilities, minimize excavation, meet the City of LA LID requirements, contribute to the building's LEED certification, and to provide space for the buildings "outdoor room" and gardens.





Creative Office Space

El Segundo, California

- A stormwater infiltration solution was needed for a new group of office buildings.
- The owner wanted to maximize the use of the parking area in the urban setting.
- The site had a tight footprint and multiple utility constraints, requiring the design of five separate systems.
- A total of 860 LF of perforated CMP was installed providing of 25,265 CF of storage.
- Perforated CMP was selected for its design flexibility, cost effectiveness, and ease of installation.

City Center Regional Stormwater Facility

Mountlake Terrace, Washington

- The city of Mountlake Terrace, Washington needed a new stormwater retention facility to provide stormwater treatment and downstream flood control.
- There was limited footprint for 80,000 CF of runoff, and the system was required to be very deep, with about 15' of cover.
- Engineers designed a system consisting of a CDS pretreatment system in front of 800 linear feet of 120" diameter, perforated, aluminized type 2 CMP that allows the runoff to slowly infiltrate the surrounding soil.
- Perforated CMP was selected for its ability to accommodate the deep bury, the relatively small footprint, and cost effectiveness.



The Right Partner Can Make All the Difference

Regardless of your project's objectives and constraints, our team of stormwater design engineers, regulatory managers, and local stormwater consultants are here to provide you with expert advice and assistance. If your goal is to eliminate or detain runoff, you can rely on Contech for a wide range of subsurface infiltration, detention, and rainwater harvesting solutions. If treatment is needed, our landscape-based biofiltration or subsurface filtration designs can fit into virtually any site and can be tailored to address specific pollutants.

At every stage of your project, count on Contech to provide engineering services including:

- Regulatory guidance and permitting assistance
- Preliminary standard details and/or site specific final CAD drawings and specifications
- Low Impact Development design assistance
- Engineering calculations for hydraulics/hydrology, rainwater harvesting, and detention/retention
- Online "Design Your Own" tools
- Review of preliminary site design, feasibility screening, and layout assistance
- Value engineering – cost estimates and options analysis
- Pre-construction support, project scheduling, and contractor coordination
- Installation and construction support
- Maintenance support:
  - » Guidance manuals
  - » Demonstrations
  - » Qualified contractor identification

The result: an efficient design process, the right product, greater land space savings, and faster permitting. The entire Contech stormwater team welcomes the opportunity to work with you on your stormwater projects.

To get started, please visit www.conteches.com/localresources or call us at 800-338-1122.





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Find all the information you need at www.ContechES.com, including field and laboratory test results, approvals, brochures, design guides, standard details, and specifications within the product section of our site.

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While you're there, be sure to check out our upcoming seminar schedule or request an in-house technical presentation.

Start a Project

If you are ready to begin a project, contact your local representative to get started. Or you can check out our design toolbox for all our online resources at www.ContechES.com/designtoolbox.

Links to Stormwater Tools:

To use the Land Value Calculator, visit:
www.ContechES.com/lvc
(Look under the Stormwater Management section to download the Land Value Calculator)

To use the Design Your Own Detention System tool, visit:
www.ContechES.com/dyods

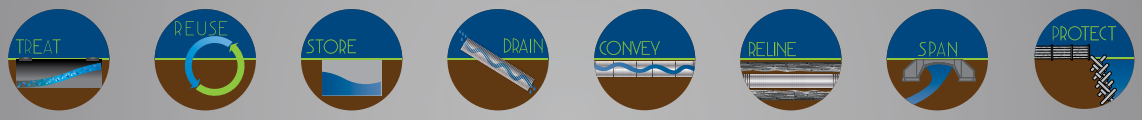
To use the Design Your Own Hydrodynamic Separator tool, visit: www.ContechES.com/dyohds

To use the Rainwater Harvesting Runoff Reduction Calculator tool, visit: www.ContechES.com/rwh-calculator

To use the LID Site Planner , visit:
www.ContechES.com/LIDsiteplanner

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COMPLETE SITE SOLUTIONS



Treatment Solutions
Helping to satisfy stormwater management requirements on land development projects
- Stormwater Treatment
- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretention

Pipe Solutions
Meeting project needs for durability, hydraulics, corrosion resistance, and stiffness
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- Steel Reinforced Polyethylene (SRPE)
- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)

Structures Solutions
Providing innovative options and support for crossings, culverts, and bridges
- Plate, Precast & Truss bridges
- Hard Armor
- Retaining Walls
- Tunnel Liner Plate

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CMP Infiltration Bro (5M as of 1/15) PDF 10/15

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AquaShield

AQUA-SWIRL™

HYDRODYNAMIC SEPARATION



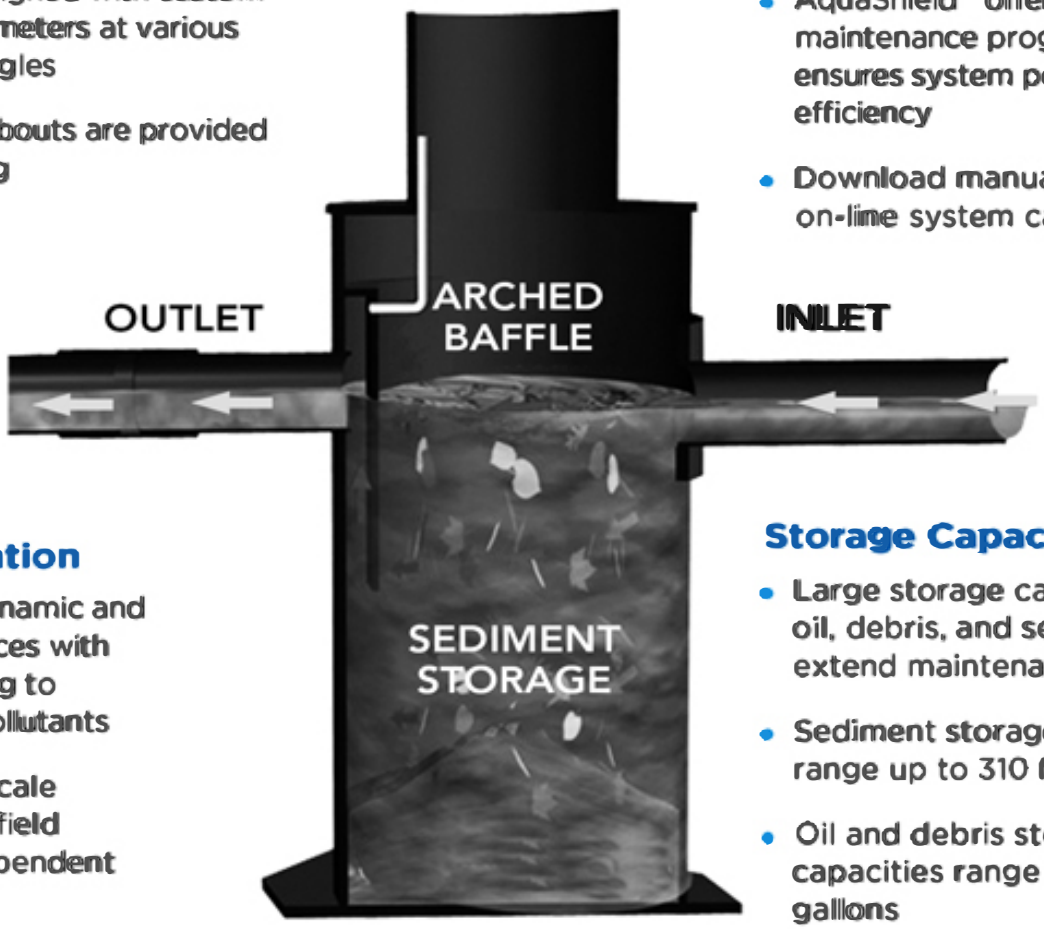
1. Floatable debris, oils, and grease enter the storm drain
2. Contaminated water enters the Aqua-Swirl™ via the main conveyance storm pipe
3. The Aqua-Swirl™ is constructed of durable, lightweight, and high performance materials
4. Vortex separation is used to remove the gross sediment, floating debris and free-oil
5. Independent validation for TSS removal into sensitive receiving waters

INNOVATING GOOD CLEAN WATER

AQUA-SWIRL™

Pipe Connections

- Systems are designed with custom inlet / outlet diameters at various configuration angles
- Inlet / outlet stubouts are provided for easy coupling



Inspection & Maintenance

- AquaShield™ offers an extensive maintenance program that ensures system performance efficiency
- Download manuals from the on-line system catalog

Vortex Separation

- Utilizes hydrodynamic and gravitational forces with quiescent settling to remove gross pollutants
- Extensive full-scale laboratory and field testing by independent third parties

Storage Capacities

- Large storage capacities for oil, debris, and sediment extend maintenance cycles
- Sediment storage capacities range up to 310 ft^3
- Oil and debris storage capacities range up to 1986 gallons

Bypass

- Systems are designed to treat water quality flow rates and bypass peak storm events
- Internal and external bypass configurations are available

Installation Benefits

- Quick and simple installation, resulting in measurable project cost savings
- H20 loading capabilities
- Small footprint design reduces excavation costs
- Lightweight and durable construction
- Lifting supports & cables provided

Aqua-Swirl™ System

- Provides customized solutions for project specific requirements
- Systems designed for specific water quality treatment flows
- Modular sizes from 2.5 - 13 ft diameters with attached risers to finish grade
- On-line project and system design tool at http://pda.aquashieldinc.com

AquaShield™
WATER TREATMENT SOLUTIONS

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STATEMENT OF QUALIFICATIONS

AQUA-SWIRL® STORMWATER TREATMENT SYSTEM

January 2017

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Aqua-Swirl® Statement of Qualifications

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AQUA-SWIRL® STATEMENT OF QUALIFICATIONS

1.0 OVERVIEW

1.1 Mode of Operation

The Aqua-Swirl® Stormwater Treatment System (Aqua-Swirl®) is a custom engineered, post-construction flow-through structure designed to remove sediment, floating debris, trash and free-floating oil by utilizing hydrodynamic vortex-enhanced separation (Figure 1). The United States patent, "Drainwater Treatment System for Use in a Horizontal Passageway," U.S. Patent No. 6,190,545 currently applies to the Aqua-Swirl®.

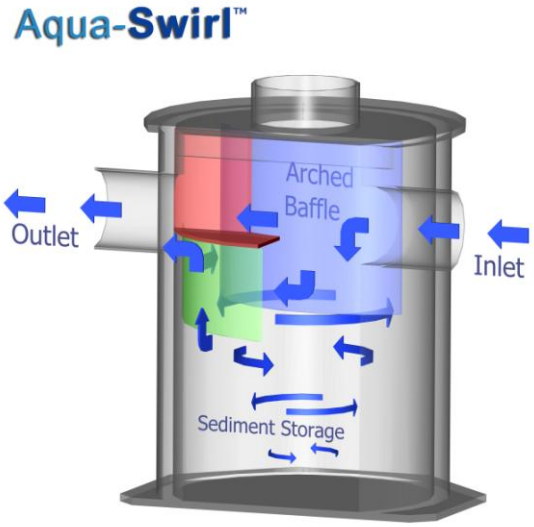


Figure 1. Diagram of Aqua-Swirl® Stormwater Treatment System showing the circular flow of water through the system which encourages settling of sediment and retention of floatable materials.

Aqua-Swirl® technology is a rapid or high flow rate device that has no moving parts and operates on gravity flow or movement of the stormwater runoff entering the structure. Operation begins when stormwater enters the Aqua-Swirl® by means of its tangential inlet pipe thereby inducing a circular (swirl or vortex) flow pattern. The diameter of the swirl chamber represents the effective treatment area of the device. Both sediment capture and sediment storage is accomplished within the swirl chamber. A combination of gravitational and hydrodynamic drag forces results in solids dropping out of the flow and migrating to the center of the swirl chamber where velocities are the lowest. Flow circulates downward where water exits the swirl chamber by flowing underneath and upward behind the arched inner baffle. The top of the baffle is sealed across the treatment channel to eliminate floatable pollutants from escaping the swirl chamber. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, thus preventing a siphon from forming at the bottom of the baffle. Sediment is stored at the base of the swirl chamber while floatables remain captured with the treatment area.

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1.2 General Equipment Design

A unique quality of the Aqua-Swirl® is its modular design which allows for faster and simpler installation on new construction or retrofit projects for existing storm drainage structures. The Aqua-Swirl® can operate in either an offline or online configuration. Offline designs rely on the use of a separate external bypass structures. The diversion structure directs only the designed water quality treatment flow (WQ_f) to the unit whereby flows in excess of the WQ_f bypass the Aqua-Swirl®. Online Aqua-Swirl® systems utilize an internal bypass design (models designated as "BYP") to allow for the conveyance of both the WQ_f and the bypass flow volumes. Aqua-Swirl® systems provide for equal invert elevations for both the inlet and outlet pipe stubouts. No external driving head is needed for operation other than that needed to convey flow according to the site design.

The diameter of the swirl chamber's treatment area varies from 2.5 to 13 feet depending on model size necessary to treat the WQ_f. Table 1 summarizes the available Aqua-Swirl® models, swirl chamber inner diameters, and oil/debris and sediment storage capacities.

Table 1. Aqua-Swirl® Models and Storage Capacities

Aqua-Swirl® Model	Swirl Chamber Inner Diameter (ft)	Water Quality Treatment Flow Rates (cfs)	Oil/Debris Storage Capacity (gal)	Sediment Storage Capacity (ft^3)
AS-2	2.5	1.1	37	10
AS-3	3.3	1.8	110	20
AS-4	4.3	3.2	190	32
AS-5	5.0	4.4	270	45
AS-6	6.0	6.3	390	65
AS-7	7.0	8.6	540	90
AS-8	8.0	11.2	710	115
AS-9	9.0	14.2	910	145
AS-10	10.0	17.5	1,130	180
AS-11	11.0	21.2	1,422	222
AS-12	12.0	25.2	1,698	270
AS-13	13.0	29.6	1,986	310
AS-XX		Custom*		

* Custom designs to meet site-specific criteria, can include multiple (twin) units for increased flow and materials storage capacity.

The Aqua-Swirl® is also designed so that it can easily be used for retrofit applications. When the invert of the inlet and outlet pipe of the Aqua-Swirl® is positioned at the same elevation the unit can easily be connected directly to the existing storm conveyance drainage system.

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Shop drawings and any other pertinent design drawings are provided on a site-specific basis. Additional information on custom designs and detail drawings can be provided on request for each of the construction materials available for the Aqua-Swirl® (see Section 2.0 construction materials). Given that Aqua-Swirl® systems can be custom designed, a number of offline configurations can be utilized. AquaShield™ can assist with facility layouts to minimize an Aqua-Swirl® footprint.

The Aqua-Swirl® has been designed and fabricated as a modular unit with no moving parts or on-site assembly required. Since the system is fabricated from high performance, lightweight and durable construction materials, the device can be installed without the use of a crane. Lifting supports are provided to allow easy offloading and installation with a backhoe or trackhoe. In addition, manufactured stubouts for the inlet and outlet piping are provided which allows the installer to simply attach the Aqua-Swirl® directly to the main conveyance storm pipe with Fernco™ or equivalent couplings. Pick weights are available on request.

All Aqua-Swirl® systems are supplied with octagonal base plates which typically extend a minimum of six inches beyond the outside diameter of the swirl chamber. The function of the base plate extension is to provide additional surface area to counter any buoyant force exerted on the system. The forces created on the base plate by the weight of the surrounding fill material offsets the buoyant force generated within the system. If needed, concrete can be poured directly onto the base plate to provide additional resistive force. AquaShield™ routinely performs buoyancy calculations for all system installations.

1.3 Range of Operating Conditions

Aqua-Swirl® systems have been designed to provide water quality treatment at a range of flow rates. AquaShield™ actively assists design engineers to properly size a system to meet site-specific water quality design storm. It is important to consider that when two identical Aqua-Swirl® units are installed in parallel the operating range can double from that of a single unit such that exceptionally large flow rates can be effectively treated.

1.4 Contaminants to be Treated

The primary waterborne contaminants of concern to be treated by the Aqua-Swirl® include:

- Suspended Sediment (commonly referred to as Total Suspended Solids, TSS)
- Trash/Debris
- Free-floating oil

The quantities of the COCs to be treated are based on site-specific pollutant loading factors. While the Aqua-Swirl® is not specifically designed to function in lieu of an oil-water separator, the device still provides treatment against free floating oil when conditions allow.

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1.5 Inspection and Maintenance

A comprehensive Aqua-Swirl® Inspection and Maintenance Manual is provided for each site delivery for end users to understand system operations and track and document system inspection and maintenance cycles. AquaShield™ recommends that periodic Aqua-Swirl® system inspections be performed to determine whether the disposal of captured material is needed to ensure proper operation of the treatment system. It is important to keep in mind that ***all*** stormwater control measures (SCMs), including manufactured treatment devices (MTDs), require some degree of maintenance. Maintenance cycles are ultimately dependent on site-specific pollutant loading conditions.

Upon installation and during construction, AquaShield™ recommends that an Aqua-Swirl® treatment system be inspected every three months and the system be cleaned as needed. A typical maintenance event for the cleaning of the swirl chamber can be accomplished with a vacuum truck without the need to enter the chamber. The Aqua-Swirl® should be inspected and cleaned at the end of construction regardless of whether it has reached its capacity for sediment or oil storage. During the first year post-construction, the Aqua-Swirl® should again be inspected every three months and cleaned as needed. AquaShield™ recommends that the system be inspected and cleaned once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity. For the second and subsequent years post-construction, the Aqua-Swirl® can be inspected and cleaned once annually if the system did not reach full sediment or floatable pollutant capacity in the first year post-construction. If the Aqua-Swirl® reached full sediment or floatable pollutant capacity in less than 12 months in the first year post-construction, the system should be inspected once every six months and cleaned as needed. AquaShield™ further recommends that all external bypass structures (divergent and convergent) should be inspected whenever an inspection and maintenance event is performed. These structures can adversely affect performance and functionality if left unchecked.

Essential elements of a swirl chamber inspection include observing floating materials and measuring the accumulated sediment at the base of the swirl chamber. These two activities can be performed at the ground surface (for a typical subsurface installation) and there is no need to enter the device. Provided that there are no significant access restrictions to the facility, it is considered that a system inspection should not exceed one half hour. A typical maintenance event includes the vacuuming and disposal of floatable pollutants and sediment from the swirl concentrator. Cleaning of the swirl chamber is often accomplished by use of a vacuum truck. It is estimated that the on-site activities for maintenance should not exceed one hour and can be performed by a one or two man crew. AquaShield™ recommends that if entry to the swirl chamber is necessary for any reason, then confined space entry techniques should be followed.

Proper health and safety protocols should be followed during all inspection and maintenance events. AquaShield™ recommends that all materials removed during the maintenance process be handled and disposed in accordance with all applicable federal, state and local guidelines. Depending on the influent pollutant characteristics of the system drainage area, it may be appropriate to perform Toxicity Characteristics Leaching Procedure (TCLP) analyses on representative samples of the removed material to ensure that the handling and disposition of materials complies with all applicable environmental regulations.

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2.0 CONSTRUCTION MATERIALS

The Aqua-Swirl® is available using construction materials of either High Density Polyethylene (HDPE) or Polymer Coated Steel (PCS). Unique site conditions may require deviations to standard installation specifications. It is recommended that AquaShield™ be contacted prior to extraordinary installations to determine the extent to which any deviation, if possible, can be made to ensure that the integrity, functionality and product warranty of the device is maintained. Both HDPE and PCS provide high structural integrity for both long term durability and traffic loading conditions. Material specifications can be provided on request.

3.0 USE APPLICATIONS

Aqua-Swirl® technology can be applied to a wide variety of land uses and facilities. Common system applications include, but are not limited to, the following types of settings:

- Retail/Commercial Developments
- New and Existing Industrial Facilities
- Highway Construction
- Transportation facilities
- Watershed Protection
- Redevelopment/Retrofit Sites
- Government Facilities
- Military Installations, Bases and Berthing Wharfs
- Vehicle and Equipment Wash Rack Areas
- Fueling Centers and Convenience Stores
- Fast Food Restaurants
- Office Complexes
- Religious Centers
- Educational Facilities
- Residential Developments (single and multi-family)
- Coastal Zone Management Communities
- Drinking Water Well-head Protection Areas

Thousands of Aqua-Swirl® systems have been installed throughout the United States including the Commonwealth of Puerto Rico and the Territory of Guam. Aqua-Swirl® systems are also installed in Brazil, Canada, Hong Kong, India, the Middle East, Russia, South Korea and United Kingdom. Climatic conditions for Aqua-Swirl® installations range anywhere from sub-arctic (e.g., central Alaska) to sub-tropical locales. Information concerning domestic and international projects can be provided on request.

4.0 PERFORMANCE TESTING

The Aqua-Swirl® has completed comprehensive, independent full scale model testing in both laboratory and field settings. Summaries of both testing programs are provided in the following two sections.

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4.1 Laboratory Testing

Independent performance testing of an Aqua-Swirl® Model AS-3 was conducted by the Department of Civil and Environmental Engineering at Tennessee Tech University (TTU), Cookeville and is described in the findings report, *Laboratory Evaluation of TSS Removal Efficiency for Aqua-Swirl® Concentrator Stormwater Treatment System*. The test parameters included loading rates, sediment concentrations, specific gravity, head loss, and particle size distribution. The test sediment was OK-110 manufactured by U.S. Silica, having a specific gravity of 2.65. The test material has a particle size range of approximately 50 to 150 microns (µm), representing the finest fraction of sand particulate. The test sediment manufacturer reports a median (d_{50}) particle size of 110 µm. However, other independent laboratory-specific testing programs performed in association with Aqua-Swirl® product development actually demonstrated a d_{50} of 90 to 95 µm. Note that OK-110 is no longer manufactured due to the manufacturer's inability to consistently meet the product specification.

Total suspended solids (TSS) concentrations were determined by the Suspended Sediment Concentration (SSC) analytical method consistent with ASTM D3977. The SSC method differs from the commonly cited TSS analytical method, EPA 2540D (formerly EPA 160.2) such that the SSC analysis is a whole sample TSS procedure. The analytical results of influent and effluent sample pair concentrations were used to calculate SSC removal efficiencies for each run at the target loading rates and concentrations. This study concluded that Aqua-Swirl® achieves an SSC removal efficiency of 91% on a net annual basis.

The results of this laboratory testing program have been independently verified by the New Jersey Corporation for Advanced Technology (NJCAT). The Washington State Department of Ecology has also assigned the General Use Level Designation (GULD) for Pretreatment (TSS) for the Aqua-Swirl®.

4.2 Field Testing

An Aqua-Swirl® Model AS-5 completed a 27 month independent field testing program in accordance with the Technology Acceptance Reciprocity Partnership (TARP) Tier II Field Testing Protocol. A total of 18 storms and 15.16 inches of rain were sampled between March 2009 and June 2011, demonstrating that the Aqua-Swirl® achieved 86% and 87% TSS and SSC removal efficiency, respectively. AECOM of Philadelphia, Pennsylvania served as the independent field testing organization. The test site is an asphalt covered parking lot with landscaped areas at the urban retail center in Silver Spring, Maryland (metro Washington D.C.). All samples were collected using ISCO autosamplers positioned at the influent and effluent pipe connections. ISCO area-velocity modules were used to gauge influent and effluent flow conditions. Suspended sediment analyses were performed by both the TSS and SSC Methods as cited above. Particle size distribution (PSD) was determined by serial filtration. Average influent PSD data indicates that 86% of the particulate is <125 µm and 72% of the particulate is silt (1.5 to 63 µm). The test site particulate is classified as a clay loam textured sediment. The target NJDEP PSD is to exhibit a particulate range of 1.0 to 1,000 µm and a d_{50} of 67 µm. Figure 1 illustrates the influent PSD curve for the AS-5 and includes the NJDEP PSD standard. All field test analyses were performed by Test America, Inc. of Burlington, Vermont, a NELAP and New Jersey certified facility.

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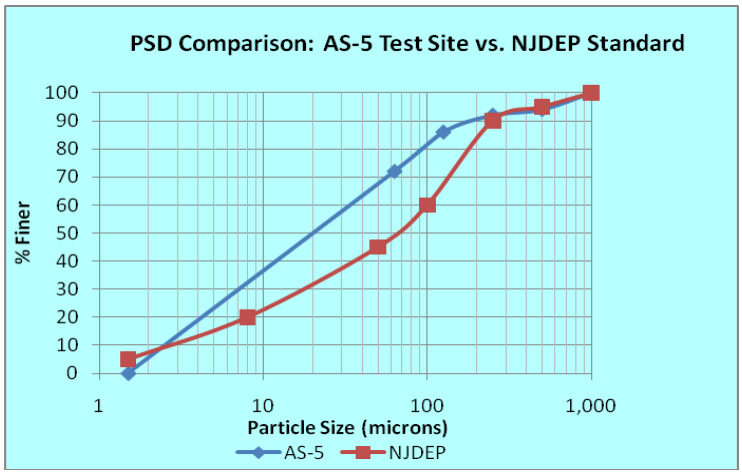


Figure 2. Particle size distribution for AS-5 Field test versus NJDEP laboratory test sediment particulate distribution.

Table 2 summarizes TSS and SSC removal efficiencies, storm durations, storm sizes, peak intensities, peak loading rates and percentage TVSS of TSS. Cumulative average sediment removal efficiencies for TSS and SSC are 86 and 87%, respectively. Cumulative average influent TSS and SSC concentrations are 132 and 145 mg/L, respectively. Storm sizes range from 0.11 to 4.4 inches with storm intensities ranging from 0.15 to 5.49 in/hr. Influent loading rates range from 1.9 to 35.4 gpm/ft^2.

The AS-5 field testing results have also been independently verified by NJCAT to achieve 86% TSS removal on an annual basis, consistent with the laboratory findings. The Washington State Department of Ecology subsequently issued Conditional Use Level Designation (CULD) for the Aqua-Swirl® based on the results of the AS-5 field test.

5.0 REGULATORY APPROVALS

The approval lists included herein are not intended to represent all Aqua-Swirl® approvals or installation locations. Instead, the listings represent regulatory agencies that have some recognized measure of technology review in association with their local approval process for manufactured stormwater treatment devices (MTDs). Given that there are a number of scenarios that can be followed in order to gain a regulatory approval, the lists included below provide a high level of credibility toward the approval of the Aqua-Swirl® in a variety of regional and regulatory diverse settings. Additional information can be provided regarding regulatory approvals and installation locales.

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Table 2. Summary of Sediment Removal Efficiency and Storm Characteristics

#	Sample Date	TSS RE (%)	SSC RE (%)	Storm Duration (hr:min)	Storm Size (in)	Peak Storm Intensity (in/hr)	Peak Loading Rate (gpm/ft^2)	% TVSS of TSS
1	3/14/2009	98.3	99.3	0:30	0.11	0.26	4.1	NA
2	4/1/2009	86.8	82.7	0:50	0.18	0.46	8.1	NA
3	4/6/2009	82.5	85.5	2:00	0.15	0.26	4.8	NA
4	12/25-26/2009	99.0	99.5	11:45	0.56	0.38	4.8	NA
5	1/17/2010	94.8	96.3	4:48	0.59	0.42	10.4	NA
6	7/25/2010	94.1	96.5	0:46	0.55	1.21	16.9	38.8
7	8/12/2010	63.9	68.0	3:00	1.82	5.49	30.9	22.3
8	9/12/2010	96.5	96.6	3:45	0.61	0.49	13.1	31.0
9	9/29-30/2010	59.9	57.4	12:05	4.40	2.56	35.4	20.9
10	12/1/2010	89.1	86.9	6:20	0.71	1.82	4.1	16.7
11	12/11/2010	96.1	97.7	3:40	0.72	0.58	2.3	29.2
12	2/25/2011	73.0	72.8	2:15	0.29	0.25	4.1	29.0
13	3/6/2011	86.1	92.5	4:50	1.42	0.46	11.0	25.4
14	3/15-16/2011	88.1	91.7	5:06	0.42	0.35	1.9	24.4
15	4/8/2011	94.1	95.8	3:55	0.52	0.15	3.4	25.2
16	4/28/2011	80.4	82.0	2:19	0.23	0.23	12.5	71.4
17	5/14/2011	90.6	90.3	3:05	0.85	0.47	5.7	48.9
18	6/16/2011	74.3	82.7	3:20	1.03	0.91	13.1	48.9
	Average	**86.0**	**87.3**		**0.84**	**0.93**	**10.4**	**33.2**
				Total	15.16			

5.1 States and Provinces

The following states and Ontario are recognized to issue use level designation for MTDs. Both NJDEP and Washington State administer the most widely recognized stormwater management programs throughout the U.S.

State / Province	Agency	Aqua-Swirl® Approval Status
New Jersey	Department of Environmental Protection	Field Test Certification
		Laboratory Test Certification
Washington	Department of Ecology	General Use Level Designation for Pretreatment (TSS)
		Conditional Use Level Designation for Basic (TSS) Treatment
Maryland	Department of the Environment	Approved
Virginia	Department of Environmental Quality	Approved (Total Phosphorus 20%)
Wisconsin	Department of Commerce.	Approved
Ontario	Ministry of the Environment	Certificate of Technology Assessment

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5.2 State Departments of Transportation

Several states utilize their respective Departments of Transportation as a regulatory agency to administer the MTD approval process. These approvals can include use level designations specific to highway projects and can extend to most other installation applications for which MTD technologies can be utilized. It should also be kept in mind that a number of local jurisdictions also rely on their state's DOT for MTD approvals. The table below lists state DOTs that have approved the Aqua-Swirl®.

State DOT	Aqua-Swirl® Designation
California	Approved
Michigan	Approved
New Jersey	Approved
North Carolina	Provisional Use
Ohio	Qualified Products List
Rhode Island	Approved
Texas	Approved
Utah	Approved

5.3 Regional Planning Authorities / Water Use Districts

The Aqua-Swirl® maintains several approvals at the regional planning authority or water use district levels such that municipalities within those jurisdictions typically adopt these MTD approvals. Examples of such jurisdictional approvals for which the Aqua-Swirl® are cited below.

Jurisdiction	Example Municipality(s)
Northwest Florida Water Mgmt. District	Tallahassee
Nashville, TN Metro Water Services	Nashville, Brentwood, Franklin
Puerto Rico Electric Power Authority	Island
St. Louis, MO Metro Sewer District	St. Louis and surrounding municipalities, Missouri
Tahoe Regional Planning Agency	Lake Tahoe Basin, Nevada and California

5.4 Counties

Aqua-Swirl® approvals have also been issued through several counties that administer stormwater management programs that include an MTD approval process. These approvals may be implemented such that an MTD can be installed at locations only outside of an incorporated municipality in that county (e.g., Montgomery County). Or, the county approval can be used such that an Aqua-Swirl® can be installed at any location within the county (e.g., Whitfield County). The Aqua-Swirl® is approved at the following county levels:

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County	State	Example Municipality(s) w/in County
Ada, Highway District	Idaho	Boise
Hamilton	Tennessee	Chattanooga
Knox	Tennessee	Knoxville
Los Angeles	California	Greater Los Angeles area
Montgomery	Maryland	Unincorporated areas
San Diego	California	San Diego
Whitfield	Georgia	Dalton

5.5 Municipalities

A representative list of municipalities that have required some degree of Aqua-Swirl® evaluation and approval is provided below. It should again be kept in mind that this list does not include every locale where either approvals or installations have occurred.

State / Province	Municipality	State / Province	Municipality
Alabama	Mobile	North Carolina	Hendersonville
California	Santa Monica	Ontario	Hamilton
	Stockton		Oshawa
Georgia	Alpharetta		Ottawa
Hawaii	Honolulu		Simcoe
Idaho	Boise		Toronto (pending)
	Caldwell	Oregon	Eugene
	Meridian		Prineville
Indiana	Auburn	Quebec	Montréal
	Fishers		Port de Tois-Rivières
	Indianapolis		Quebec City
Maryland	Rockville		Lac Mégantic
	Bethesda	Tennessee	Chattanooga
	Laurel		Knoxville
	Waldorf		Murfreesboro
Michigan	Farmington Hills	Utah	Salt Lake City
	Fenton		South Jordan
	Novi		Vernal
Montana	Billings	Washington (Eastern)	Spokane
	Bozeman	Washington D.C.	District of Columbia
	Butte	Wyoming	Jackson Hole

6.0 LIMITED WARRANTY

An Aqua-Swirl® one year limited warranty comes standard with each device and covers against failure due to improper workmanship or defective materials for one year from delivery date. Liability limitations are described in the warranty which is available on request.

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Table 17. BMP Performance – Influent/Effluent Water Quality.

BMP	Sediment (mg/L)	Nitrogen (mg/L)	Phosphorus (mg/L)	Metals – Zn (µg/L)	Oil and Grease (mg/L)	Bacteria (#/100mL)	Temp	Notes
Bioretention without underdrain	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Bioretention with underdrain	34/15.5*	1.68/1.14†	0.61/0.16*	107/46*	30.8/2.5‡	641.5/86.5§	Moderate**	
Permeable Pavement without underdrain	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Permeable Pavement with underdrain	xx/17.0††	xx/1.23††	xx/0.09††	xx/17††	xx/0.018‡‡	No data	Moderate	
Capture and Reuse	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Vegetated Roofs	No data	1.3/1.63***	0.012/0.057***	No data	N/A	xx/22§	Moderate	
Downspout Disconnection	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Soil Amendments	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Vegetated Filter Strips	114/27.6§§	1.12/0.66‡‡	0.38/0.86§§	355/79§§	No data	No data	Low	
Vegetated Swales	114/58.9§§	No data	0.38/0.62§§	355/96§§	No data	13,492/5,947§	Low	
Infiltration Basins	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Infiltration Trenches	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge

Source: Data assembled by the Low Impact Development Center, Inc.

Table 17 (Cont.): BMP Performance – Influent/Effluent Water Quality.

BMP	Sediment (mg/L)	Nitrogen (mg/L)	Phosphorus (mg/L)	Metals – Zn (µg/L)	Oil and Grease (mg/L)	Bacteria (#/100mL)	Temp	Notes
Dry Wells	0	0	0	0	0	0	Excellent	Infiltration practices are assumed to have zero discharge
Dry Ponds	114/46.6§§	0.96/0.98‡‡	0.38/0.28§§	355/136§§	2.72/2.54‡‡	2,218/1,741§	Poor	
Constructed Wetlands	37.8/17.8††	2.12/1.15††	0.27/0.14††	47/31††	No data	2,097/257§	Poor**	
Wet Ponds	114/11.8§§	2.29/1.46‡‡	0.38/0.54§§	355/37§§	0.82/0.88‡‡	2,693/446.4§	Poor**	
Media Filters / Filter Basins	114/11.3§§	No data	0.38/0.25§§	355/36§§	No data	1,820/541.3§	Poor	Includes Austin sand filter, Delaware sand filter, Multi-chambered treatment trains
Proprietary Devices	varies	varies	varies	varies	varies	varies	Poor	Performance is device-specific

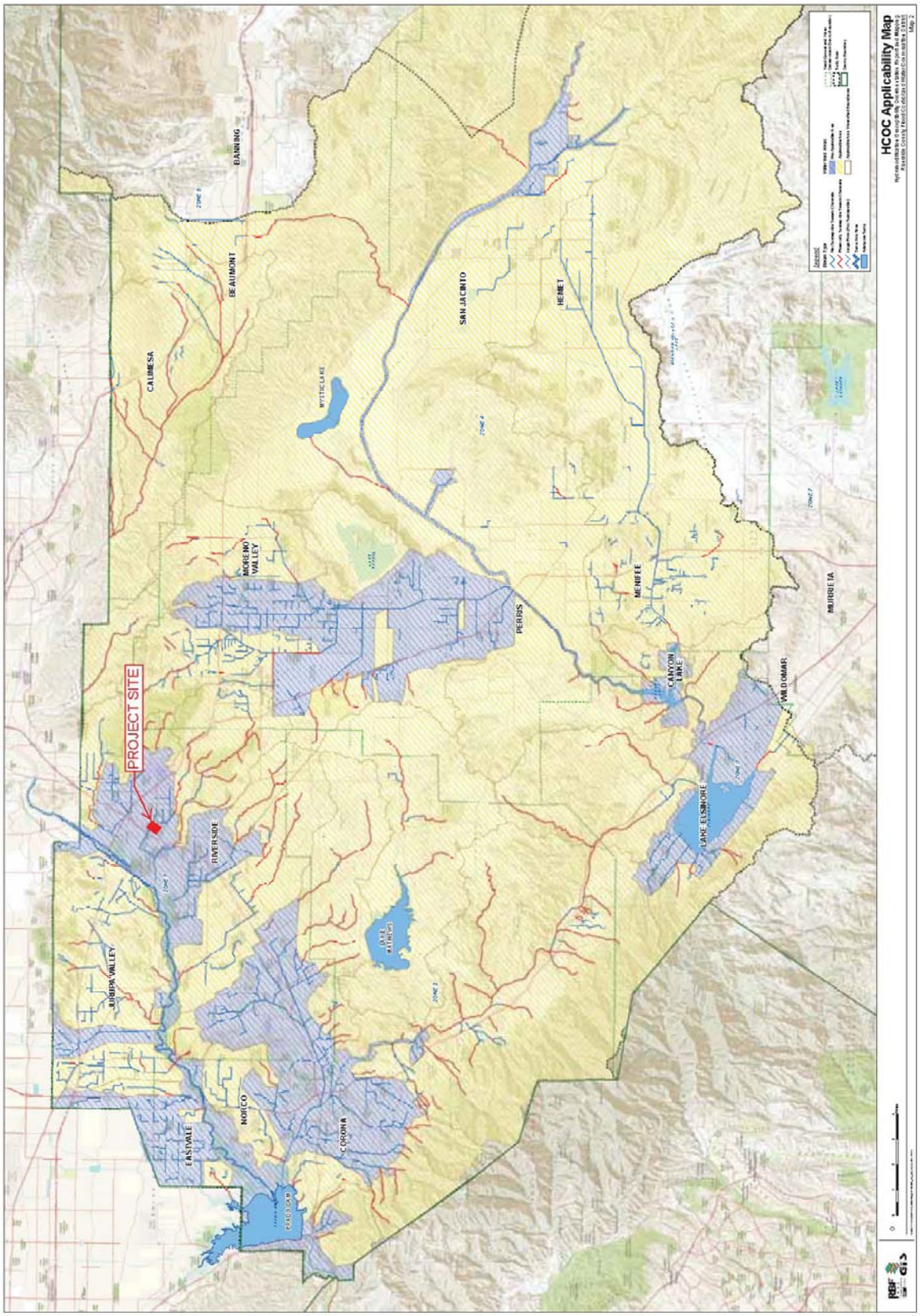
Key: *Davis, 2007 §Clary et al, 2008 †Hunt et al, 2008 ‡Hong et al, 2006 ***Teemusk and Mander, 2007
**Jones and Hunt, 2008 §§Caltrans, 2004 ††Geosyntec, 2008 ‡‡International Stormwater BMP Database, 2009

Source: Data assembled by the Low Impact Development Center, Inc.

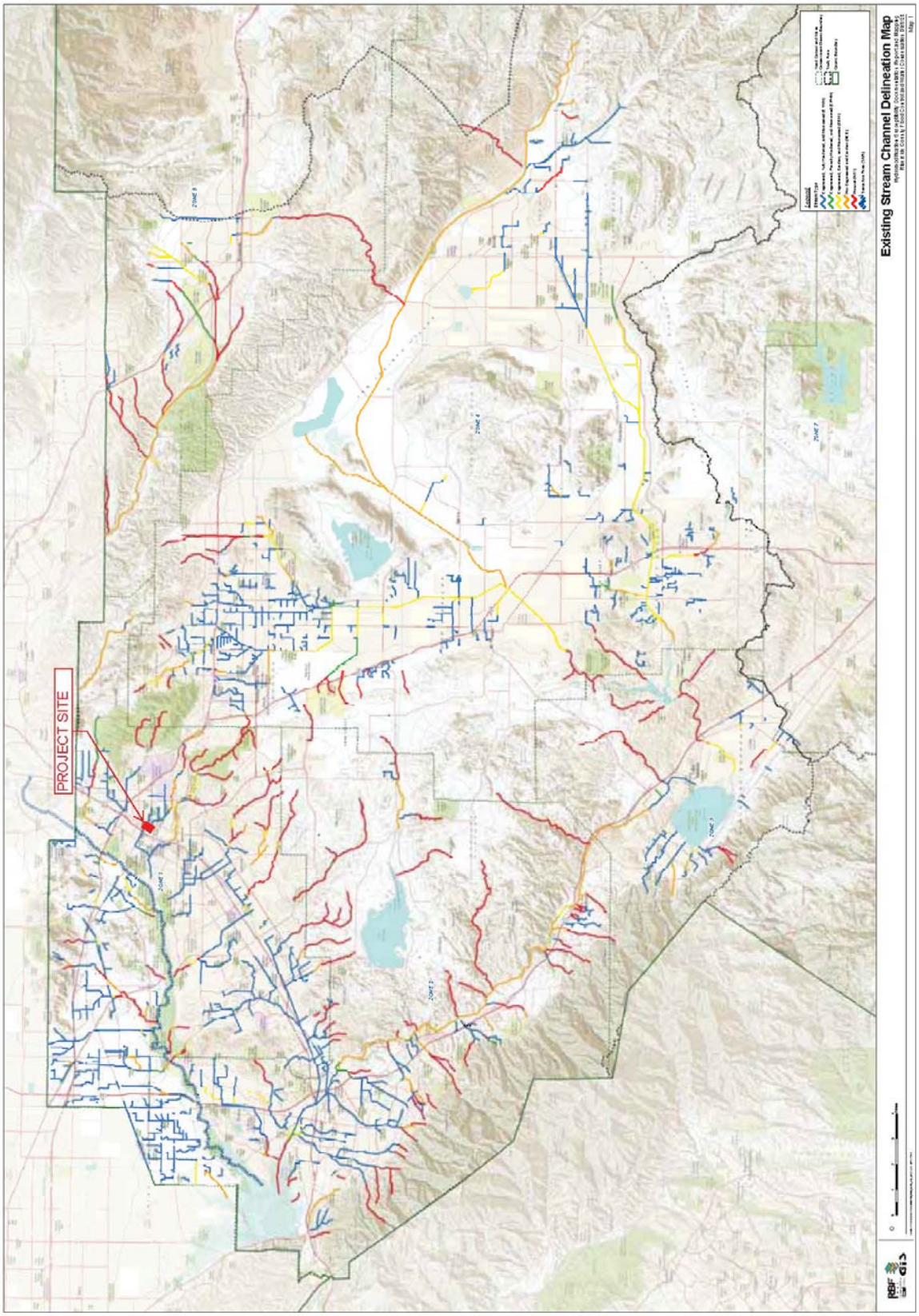
Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

HCOC Applicability Map



Existing Stream Channel Delineation Map



Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1 on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	**2 Permanent Controls—Show on WQMP Drawings**	**3 Permanent Controls—List in WQMP Table and Narrative**	**4 Operational BMPs—Include in WQMP Table and Narrative**
☒ A. On-site storm drain inlets	☒ Locations of inlets.	☒ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	☒ 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 System 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."
☐ B. Interior floor drains and elevator shaft sump pumps		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ C. Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **D1.** Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.
☒ **D2.** Landscape/ Outdoor Pesticide Use	☐ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☒ Show self-retaining landscape areas, if any. ☒ Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	State that final landscape plans will accomplish all of the following. ☐ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☒ 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. ☒ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ☐ Consider using pest-resistant plants, especially adjacent to hardscape. ☐ To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☒ Maintain landscaping using minimum or no pesticides. ☐ See applicable operational BMPs in "What you should know for.....Landscape and Gardening" at http://rcflood.org/stormwater/Error! Hyperlink reference not valid. ☒ Provide IPM information to new owners, lessees and operators.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ **E.** Pools, spas, ponds, decorative fountains, and other water features.	☒ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☒ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☐ **F.** Food service	☐ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☐ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☐ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
☒ **G.** Refuse areas	☒ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☐ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☐ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☒ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☐ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☒ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ H. Industrial processes.	☐ Show process area.	☐ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	☐ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	☐ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **J. Vehicle and Equipment Cleaning**	☐ Show on drawings as appropriate: **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	☐ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ☐ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ☐ **Car dealerships and similar may rinse cars with water only.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ K. Vehicle/Equipment Repair and Maintenance	☐ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ☐ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ☐ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	☐ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ☐ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ☐ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ☐ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ☐ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ☐ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ L. Fuel Dispensing Areas	☐ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ☐ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		☐ The property owner shall dry sweep the fueling area routinely. ☐ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ M. Loading Docks	☐ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ☐ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ☐ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☐ Move loaded and unloaded items indoors as soon as possible. ☐ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☐ **N.** Fire Sprinkler Test Water		☐ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ☐ Boiler drain lines ☐ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☐ 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. ☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☐ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☒ P. 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.

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

BMP Name	BMP Location	Frequency
Structural Treatment		
Catch Basin Marker Inspection	As designated on WQMP Plot Plan	Bi-annually
Catch Basin Marker Maintenance	As designated on WQMP Plot Plan	Yearly
Trash Storage Areas	As designated on WQMP Plot Plan	Weekly basis
Irrigation and Landscape	As designated on WQMP Plot Plan	Monthly basis
Non-Structural Treatment		
Educational Material	Manager's Office	Upon hire and annually
Activity Restriction	Manager's Office	Daily basis
Common Landscape Management	Throughout project site	Monthly basis
BMP Maintenance	Manager's Office & staff	Daily basis
Common Area Litter Control	Throughout project site	Weekly basis
Employee Training	Manager's Office	Upon hire and annually
Common Area Catch Basin Inspection	As designated on WQMP Plot Plan	After and before rain storm
Sweeping of Parking Structure/Driveway	As designated on WQMP Plot Plan	Monthly basis
Fountain and Pool Maintenance	As designated on WQMP Plot Plan	As needed
Treatment Control		
Aqua-Swirl Inspection	As designated on WQMP Plot Plan	Quarterly, before, during, after rain event
Aqua-Swirl Maintenance	As designated on WQMP Plot Plan	Annually and as needed
CMP Inspection	As designated on WQMP Plot Plan	Quarterly, before, during, after rain event
CMP Maintenance	As designated on WQMP Plot Plan	Annually and as needed
Drywell Inspection	As designated on WQMP Plot Plan	Quarterly, before, during, after rain event
Drywell Maintenance	As designated on WQMP Plot Plan	Annually and as needed

MaxWell IV Drywell

The Operation and Maintenance Program will include the following key components:

1. **Inspection Procedures:**

   The settling chambers and internal components of the unit will be inspected regularly. Additionally, an assessment of the site drainage will be conducted to insure that the system meets operation guidelines. The visual inspection will ascertain that the unit is functioning properly (no blockages or obstructions to inlet and/or infiltration chamber), measuring the amount of solid materials, fine sediment, and floating trash and debris within the chamber. Schedules for inspections and cleanout will be based on storm events and pollutant accumulation due to failure of upstream pre-treatment device. During the rainfall season, the unit will be inspected at least once every 30 days. Accumulation of sediment and floatable material captured by the MaxWell IV will be recorded in a maintenance log.

2. **Cleanout Procedures:**

   Truck mounted hydro-vactor equipment will be used to clean the system utilizing water and air to dislodge and remove debris and sediment deposits. All chambers, inlets, connecting piping and catch basis are cleaned and the contents discharged. The accumulated contents are transported off-site for disposal. Within each chamber, geotextile fabric base seals and hydrophobic petrochemical sponges are removed and replaced. Inlet grates and covers are re-installed and then re-secured with the existing locking devices.

3. **Stenciling:**

   Legibility of stencils and/or signs at all storm drain inlets and catch basins within the project area must be maintained at all time.

4. **Maintenance Log:**

   Keep on-site a log of all inspections and maintenance performed on the MaxWell IV.

Maintenance

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

Aqua-Swirl®
Stormwater Treatment System

Inspection and Maintenance Manual

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AquaShield™, Inc
Stormwater Treatment Solutions

The highest priority of AquaShield™, Inc. (AquaShield™) is to protect waterways by providing stormwater treatment solutions to businesses across the world. These solutions have a reliable foundation based on over 20 years of water treatment experience.

Local regulators, engineers, and contractors have praised the AquaShield™ systems for their simple design and ease of installation. All the systems are fabricated from high performance, durable and lightweight materials. Contractors prefer the quick and simple installation of our structures that saves them money.

The patented line of AquaShield™ stormwater treatment products that provide high levels of stormwater treatment include the following:

- **Aqua-Swirl® Stormwater Treatment System:** hydrodynamic separator, which provides a highly effective means for the removal of sediment, floating debris and free-oil.

- **Aqua-Filter™ Stormwater Filtration System:** treatment train stormwater filtration system capable of removing gross contaminants, fine sediments, waterborne hydrocarbons, heavy metals and total phosphorous.



Aqua-Swirl® Stormwater Treatment System



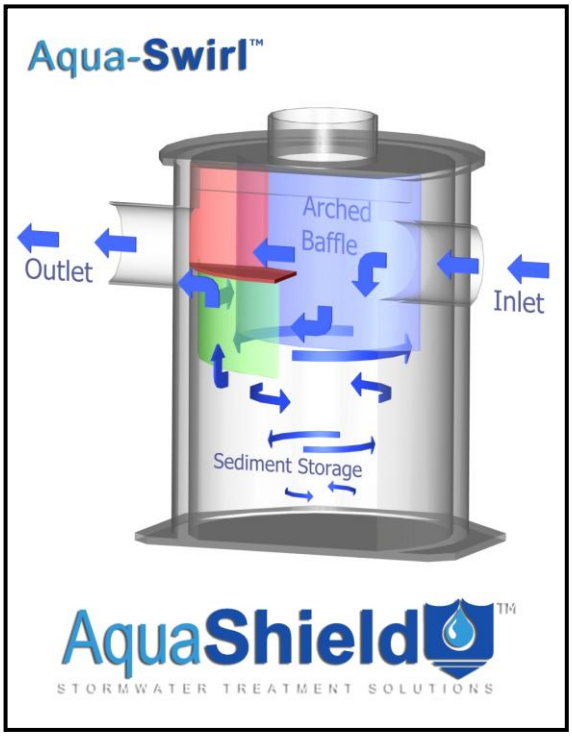
Aqua-Filter™ Stormwater Filtration System

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Aqua-Swirl® Stormwater Treatment System

The patented Aqua-Swirl® Stormwater Treatment System is a single chamber hydrodynamic separator which provides a highly effective means for the removal of sediment, free oil, and floating debris. Both treatment and storage are accomplished in the swirl chamber without the use of multiple or "blind" chambers. Independent laboratory and field performance verifications have shown that the Aqua-Swirl® achieves over 80% suspended solids removal efficiency on a net annual basis.

The Aqua-Swirl® is most commonly installed in an "off-line" configuration. Or, depending on local regulations, an "in-line" (on-line) conveyance flow diversion (CFD) system can be used. The CFD model allows simple installation by connecting directly to the existing storm conveyance pipe thereby providing full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe.



The patented Aqua-Swirl® Stormwater Treatment System provides a highly effective means for the removal of sediment, floating debris, and free oil. Swirl technology, or vortex separation, is a proven form of treatment utilized in the stormwater industry to accelerate gravitational separation.

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Floatable debris in the Aqua-Swirl®

Each Aqua-Swirl® is constructed of high performance, lightweight and durable materials including polymer coated steel (PCS), high density polyethylene (HDPE), or fiberglass reinforced polymer (FRP). These materials eliminate the need for heavy lifting equipment during installation.

System Operation

The treatment operation begins when stormwater enters the Aqua-Swirl® through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminates to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl® retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

Custom Applications

The Aqua-Swirl® system can be modified to fit a variety of purposes in the field, and the angles for inlet and outlet lines can be modified to fit most applications. The photo below demonstrates the flexibility of Aqua-Swirl® installations using a “twin” configuration in order to double the

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water quality treatment capacity. Two Aqua-Swirl® units were placed side by side in order to treat a high volume of water while occupying a small amount of space.



Custom designed AS-9 Twin Aqua-Swirl®

Retrofit Applications

The Aqua-Swirl® system is designed so that it can easily be used for retrofit applications. With the invert of the inlet and outlet pipe at the same elevation, the Aqua-Swirl® can easily be connected directly to the existing storm conveyance drainage system. Furthermore, because of the lightweight nature and small footprint of the Aqua-Swirl®, existing infrastructure utilities (i.e., wires, poles, trees) would be unaffected by installation.

AquaShield™ Product System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the AquaShield™ Stormwater Treatment Systems allowing all inspections to be performed from the surface.

It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained.

In order to ensure that our systems are being maintained properly, AquaShield™ offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.

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Inspection

All AquaShield™ products can be inspected from the surface, eliminating the need to enter the systems to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection for the first year of operation to develop an appropriate schedule of maintenance. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is reduced to semi-annual inspection.

Aqua-Swirl® Maintenance

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

Aqua-Swirl® Inspection Procedure

To inspect the Aqua-Swirl®, a hook is needed to remove the manhole cover. AquaShield™ provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal information plate

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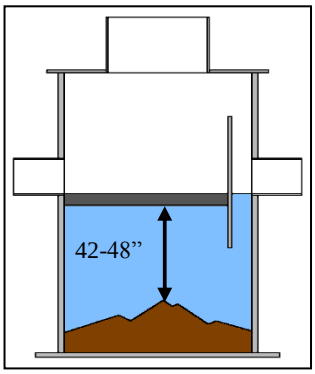
affixed inside the access riser which provides our contact information, the Aqua-Swirl® model size, and serial number.

The only tools needed to inspect the Aqua-Swirl® system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.

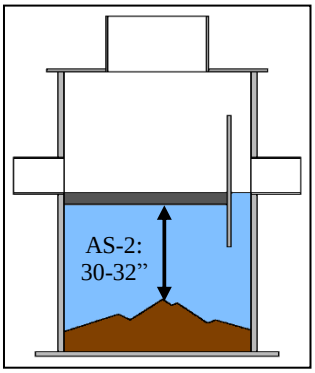


Sediment inspection using a stadia rod in a single chamber

The maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when the sediment pile is within 42 to 48 inches of the standing water surface. For the Aqua-Swirl® Model AS-2, maintenance is needed when the top of the sediment pile is measured to be 30 to 32 inches below the standing water surface.



Maintenance trigger for Aqua-Swirl® Models AS-3 through AS-13 occurs when sediment pile is 42-48 inches below water surface.



Maintenance trigger for Aqua-Swirl® Model AS-2 occurs when sediment pile is 30 to 32 inches below water surface.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

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The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated above. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

Aqua-Swirl® Cleanout Procedure

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® design is that the entire sediment storage area can be reached with a vacuum hose from the surface (reaching all the sides). Since there are no multiple or limited (hidden or "blind") chambers in the Aqua-Swirl®, there are no restrictions to impede on-site maintenance tasks.

Disposal of Recovered Materials

Disposal of recovered material is typically handled in the same fashion as catch basin cleanouts. AquaShield™ recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used.

AquaShield™ also recommends that all materials removed from the Aqua-Swirl® and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.



Vacuum truck quickly cleans the Aqua-Swirl® from a single chamber

Aqua-Swirl® Inspection and Maintenance Work Sheets on following pages

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Aqua-Swirl® Inspection and Maintenance Manual
Work Sheets

SITE and OWNER INFORMATION

Site Name: _____

Site Location: _____

Date: _____ Time: _____

Inspector Name: _____

Inspector Company: _____ Phone #: _____

Owner Name: _____

Owner Address: _____

Owner Phone #: _____ Emergency Phone #: _____

INSPECTIONS

I. Floatable Debris and Oil

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl®.
2. Remove floatable debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (½) inch or more oil is present.

   Note: Water in Aqua-Swirl® can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

II. Sediment Accumulation

1. Lower measuring device (e.g. stadia rod) into swirl chamber through service access provided until top of sediment pile is reached.
2. Record distance to top of sediment pile from top of standing water: _____ inches
3. For Aqua-Swirl® Models AS-3 through AS-13, schedule cleaning if value in Step #2 is 48 to 42 inches or less.
4. For Aqua-Swirl® Model AS-2, schedule cleaning if value in Step #2 is 32 to 30 inches or less.

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III. Diversion Structures (External Bypass Features)

If a diversion (external bypass) configuration is present, it should be inspected as follows:

1. Inspect weir or other bypass feature for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling (concrete or brick) or decaying (steel).
2. Inspect diversion structure and bypass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. When feasible, measure elevations on diversion weir or piping to ensure it is consistent with site plan designs.
4. Inspect downstream (convergence) structure(s) for sign of blockage or structural failure as noted above.

CLEANING

Schedule cleaning with local vactor company or AquaShield™ to remove sediment, oil and other floatable pollutants. The captured material generally does not require special treatment or handling for disposal. Site-specific conditions or the presence of known contaminants may necessitate that appropriate actions be taken to clean and dispose of materials captured and retained by the Aqua-Swirl®. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Swirl® during the maintenance process be handled and disposed in accordance with local and state environmental or other regulatory requirements.

MAINTENANCE SCHEDULE

I. During Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed. The Aqua-Swirl® should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance trigger.

II. First Year Post-Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed.

Inspect and clean the system once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity.

III. Second and Subsequent Years Post-Construction

If the Aqua-Swirl® did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once

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every six (6) months and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its sediment or floatable pollutant capacity.

IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl® is inspected. Maintenance should be performed on bypass structures as needed.

MAINTENANCE COMPANY INFORMATION

Company Name: _____

Street Address: _____

City: _____ State/Prov.:_____ Zip/Postal Code: _____

Contact: _____ Title: _____

Office Phone: _____ Cell Phone: _____

ACTIVITY LOG

Date of Cleaning: _____ (Next inspection should be 3 months from this data for first year).

Time of Cleaning: Start: _____ End: _____

Date of Next Inspection: _____

Floatable debris present: Yes No

Notes: _____

_____

_____

Oil present: Yes No Oil depth (inches): _____

Measurement method and notes: _____

_____

_____

STRUCTURAL CONDITIONS and OBSERVATIONS

Structural damage: Yes No Where: _____

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Structural wear: Yes No Where: _____

Odors present: Yes No Describe: _____

Clogging: Yes No Describe: _____

Other Observations: _____

_____

_____

NOTES

Additional Comments and/or Actions To Be Taken	Time Frame

ATTACHMENTS

- Attach site plan showing Aqua-Swirl® location.
- Attach detail drawing showing Aqua-Swirl® dimensions and model number.
- If a diversion configuration is used, attach details showing basic design and elevations (where feasible).

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Aqua-Swirl®

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: _____

Date Construction Ended: _____

During Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity. In addition, the system should be cleaned at the **end of construction** regardless of whether it has reach full pollutant storage capacity.

First Year Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity.

Second and Subsequent Years Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed												X*
Inspect Bypass, maintain as needed												X*
Clean System*												X*

* If the Aqua-Swirl® did **not** reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® **reached** full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months or more frequently if past history warrants, and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.

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Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

To be included with Final WQMP.